The Jewelers Circular.

D. E. Hopkinson, Publisher.

42 Nassau Street, New York.

THE JEWELER'S CIRCULAR AND HOROLOGICAL REVIEW, established in 1869, has improved in variety and quality of its contents, increased in size, strengthened in power and influence, and enlarged its circulation until it is now recognized as the representative organ of the trade, and appreciated as the most complete and valuable periodical of its class published in any country. It reaches every branch of the jewelry, watch, clock, silverware and kindred trades throughout the United States, and is the only publication representative of the trade, which has secured, by its intrinsic merits and acknowledged benefits, a legitimate and *bona fide* patronage of paying subscribers, including many of the leading firms in England, France, Germany, Switzerland, Mexico, the West Indies, Brazil, the South American Republics, and other foreign countries.

The JEWELERS' CIRCULAR is regarded throughout this wide circle of interested and careful readers as a *reliable authority* and *independent chronicle* with regard to all matters connected with the trade, in its moral, mercantile and mechanical aspects, while its decided straightforward and consistent course of conduct in relation to commercial questions has won widespread, continuous and unanimous approval.

To the practical workman the JEWELERS' CIRCULAR is invaluable as a text-book and work of reference. Its pages furnish him with the latest scientific and mechanical ideas, set forth in plain comprehensible language by specialists of ability and experience. The technical information contained in its columns represents the progress of the age, and every intelligent workman in the country acknowledges the advantages resulting from the study of its pages.

To the country dealer the JEWELERS' CIRCULAR affords thorough, correct and perfect information as to staple and original articles of trade. From it he can learn what to order and where to obtain supplies, he can discover the best source of materials in common use, while the latest novelties are without exception first announced in its columns.

To the leading manufacturers and jobbers The JEWELERS' CIRCULAR has proved to be *the best advertising medium for the trade.* Its readers comprise the customers of those houses, and consequently the business announcements are carefully studied and liberally responded to. Hence an extensive and increasing patronage has been accorded to the JEWELERS' CIRCULAR by the leading manufacturers and jobbers, which speaks for itself and needs no further comment.

The JEWELERS' CIRCULAR has acquired an enviable reputation, by its undeviating advocacy of the highest standard of commercial integrity, and its persistent opposition to those who dishonor and demoralize business by compromise and fraud. It has always been ready to promulgate and further plans and enterprises tending to the public good, and its columns have always been open to the honest expression of private opinion concerning matters which needed to be mended. Its information on commercial matters, much of which is nowhere else to be obtained, is of great importance and benefit, while the completeness of its trade directory and business columns render it indispensable to those concerned in the trade.

The JEWELERS' CIRCULAR is an art journal worthy of the artistic interests and industries which it represents. The technical articles are illustrated by carefully executed diagrams, and during the past year new designs and trade novelties have been presented, in ten splendid plates, printed in gold, silver and colors. Its elegant and tasteful typography is apparent in its advertising pages, where every announcement is rendered attractive and conspicuous.

The JEWELERS' CIRCULAR is a welcome visitor and powerful influence in the workshop, in the store and in the counting room. The best testimony to its merits is to be found in the indorsement accorded to it by the trade at large, set forth in detail within. Every one who has goods to sell finds that *it pays to advertise* in the JEWELERS' CIRCULAR, because all who buy goods seek and find their information in its pages, while every dealer and workman finds that *it pays to subscribe*, because they obtain a return in intelligence and instruction of infintely greater pecuniary value. In the future, as in the past, no expense or care will be spared to improve the JEWELERS' CIRCULAR, and render it attractive, beneficial, instructive and indispensable; while it is hoped that the continuance of the subscription price at $2 per annum (a rate far beneath that of any monthly publication of its size and contents), will obtain for it the widest possible circulation both at home and abroad.

All communications to be addressed to D. H. HOPKINSON, 42 Nassau Street, New York.

Adams & Shaw Co.

We congratulate you and the trade generally that through your efforts *a journal of great typographical beauty and general excellence* has been established to represent the interests of those *important trades and industries with which it has become identified.* It is fitting that interests so vast and extended should have a worthy sponsor, and it is a worthy ambition to occupy that relation. We doubt not but that the JEWELERS' CIRCULAR finds a friendly welcome in every jeweler's household.

ADAMS & SHAW CO.,
Silversmiths,
694 BROADWAY, N. Y.

Aikin, Lambert & Co.

The jewelry trade has for many years needed a *journal to thoroughly and honestly represent* its many and varied interests. It is now fully realized in the establishment of the JEWELERS' CIRCULAR—*a journal justly recognized as the organ of the jewelry trade,* as its large circulation attests.

AIKIN, LAMBERT & CO.,
Manufacturers of Jewelry, Gold Pens, etc.,
12 MAIDEN LANE, N. Y.

American Clock Company.

We are pleased to state that we have been from the first issue subscribers to and advertisers in the JEWELERS' CIRCULAR, and interested observers of its success and progress. The paper, always a good one, has been steadily improving until it has become *a model trade journal.* We know from conversations with our customers that its technical articles are highly appreciated by practical workmen, and we *can testify to its value as a means of communication between manufacturers and wholesale dealers and the trade.*

AMERICAN CLOCK CO.,
HINE & THOMAS,
581 BROADWAY, N. Y.

American Watch Company.

The JEWELERS' CIRCULAR AND HOROLOGICAL REVIEW is in our opinion a *strictly independent trade journal,* encouraging those who strive to give a *high character to the trade by conscientious dealing and skillful workmanship.* We, therefore, deem it worthy the support of all engaged in those industries it so ably represents.

AMERICAN WATCH CO.,
R. E. ROBBINS, *Treasurer,*
BOSTON.

Ansonia Brass & Copper Co.

We take pleasure in adding our testimony to the value of your journal, the attractive form in which it is published, and the ability of its conduct; *it is unsurpassed as an advertising medium.*

ANSONIA BRASS & COPPER CO.,
19 & 21 CLIFF ST., N. Y.

Baldwin, Sexton & Peterson.

It affords us much pleasure to express our appreciation in the work you have undertaken in establishing the JEWELERS' CIRCULAR, and cordially congratulate you on the success it has achieved. As *a means of advertising just in the right direction and at a moderate expense,* and its very interesting articles on subjects pertinent to the interests it represents, we know of *no other journal approaching it.* It has a fund of useful information, practical and historical, which renders it particularly interesting. Its endeavors to inculcate sound business principles, and its correction of trade morals are deserving of the highest praise. Contrasting the small sheet of years past with the beautiful journal of to-day, we congratulate you on its success.

BALDWIN, SEXTON & PETERSON,
Manufacturing Jewelers,
694 BROADWAY, N. Y.

Berger, Albert, & Co.

Among the oldest of your subscribers and advertisers, we have watched the course of the JEWELERS' CIRCULAR with a great deal of interest and satisfaction, and take great pleasure in giving our testimony of its value to us.

ALBERT BERGER & CO.,
Importers of Watch Glasses, Optical Goods, etc.,
47 MAIDEN LANE, N. Y.

Bishop, Victor, & Co.

The jewelry trade is particularly fortunate in having so able and reliable a journal to represent its interests as the JEWELERS' CIRCULAR. We think it an honor to the trade, and deserving o the support of all its members.

VICTOR BISHOP & CO.
Importers of Coral Jewelry and Precious Stones.

Bliss, John, & Co.

After some seven years' acquaintanceship with the JEWELERS' CIRCULAR AND HOROLOGICAL REVIEW, it gives us no little pleasure to say that, whether as a source of information or a channel of communication to reach the watch and jewelry trade, *your journal unquestionably stands at the head of its class.* Every watchmaker and jeweler in the country should read it, for many original *hints* and *ideas* may be found in its columns, worth more than a whole year's subscription, while the most valuable selections from the leading foreign journals greatly add to its value.

JOHN BLISS & CO.
Manufacturers of Standard Marine Chronometers and Transits,
110 WALL STREET, N. Y.

Bowden, Joseph B.

I deem the JEWELERS' CIRCULAR AND HOROLOGICAL REVIEW *worthy the support of every member of the jewelry trade.*

JOSEPH B. BOWDEN,
Manufacturer of Gold Rings,
11 MAIDEN LANE, N. Y.

Brown, Thos. G.

I have for many years been a subscriber to your valuable journal, and do not hesitate to express my appreciation of its value and usefulness to the interests it represents. Its editorial conduct evinces good taste, judgment, and intelligence, and reflects credit on the ability of the editor.

The JEWELERS' CIRCULAR has become *a great favorite in the trade*; and we welcome its monthly appearance in our office as we would welcome the coming of an old and familiar friend.

THOS. G. BROWN,
Manufacturing Jeweler,
7 BOND STREET, N. Y.

Buckenham, Cole & Hall.

It is with pleasure and confidence that *we strongly recommend all in any way connected with our trade, or with any branch of it, to advertise in the* JEWELERS' CIRCULAR, conducted by Mr. D. H. Hopkinson. We are enabled truthfully to testify to the advantages we have derived from advertising in its columns.

BUCKENHAM, COLE & HALL,
Importers of Diamonds, Precious Stones, Jewelry, &c.,
10 MAIDEN LANE, N. Y.

Carter, Howkins & Sloan.

It gives us great pleasure in adding our testimony to the general expression of satisfaction in the conduct and management of the JEWELERS' CIRCULAR. We have taken it from the first number, and have been greatly interested in its contents. We believe that *its critical treatment of trade questions is inculcating a higher standard of business morals*, and educating and guiding modern thought in the direction of improvement.

CARTER, HOWKINS & SLOAN,
Manufacturing Jewelers,
694 BROADWAY, N. Y.

Chatellier & Spence.

Permit us to express to you our best wishes for the success of the JEWELERS' CIRCULAR. *We believe that your journal has done and is doing much good to the trade*, and trust you may receive the support and encouragement you truly merit.

CHATELLIER & SPENCE,
Manufacturing Jewelers,
652 BROADWAY, N. Y.

Chatterton & Dodd.

We would congratulate you most heartily upon the success of the JEWELERS' CIRCULAR. Having known you previous to the issue of the first number of your valuable journal, and being aware of *the immense amount of money and untiring industry expended upon it*, we are not surprised that you have made it one of the *best trade journals published. It should be in the hands of every manufacturer, jobber*, and *retailer*, not only in this country, but in every land where jewelry is made and sold.

CHATTERTON & DODD,
Manufacturing Jewelers,
19 JOHN STREET, N. Y.

Colby & Johnson.

As an old subscriber of the JEWELERS' CIRCULAR, we cheerfully offer *our testimony as to its value to the trade.* We always derive much pleasure and valuable information from a perusal of its columns.

COLBY & JOHNSON,
Manufacturing Jewelers,
17 MAIDEN LANE, N. Y.

Courvoisier, Wilcox & Co.

The JEWELERS' CIRCULAR AND HOROLOGICAL REVIEW, the representative organ of the watch, clock, jewelry, and kindred branches of industry, is in our opinion one of the most useful and interesting of trade papers, and is deservingly popular throughout the trade it so excellently represents.

COURVOISIER, WILCOX & CO.,
Importers and Jobbers of Watches, and Manufacturers of Watch Cases,
12 MAIDEN LANE, N. Y.

Cross & Beguelin.

We have noticed with pleasure the rise and progress of the JEWELERS' CIRCULAR. It seems to us to be *all that is needed for the trade.* The information it imparts is worth a great deal more than its yearly subscription.

CROSS & BEGUELIN,
Importers of Watches and Watch Materials,
21 MAIDEN LANE, N. Y.

Dennison & Co.

Our advertisement in the JEWELERS' CIRCULAR brings us *many inquiries*, and is worth all we pay for it.

DENNISON & CO.,
Jewelers' Findings,
198 BROADWAY, N. Y.

Fitch, D. M. & Co.

The senior member of this firm having been *one of the earliest subscribers* to your valuable journal, has watched its course with much interest and satisfaction, and very *cheerfully and heartily indorses all our friends say of it.*

D. M. FITCH & CO.,
Manufacturing Jewelers,
15 JOHN STREET, N. Y.

Frasse & Co.

As one of your oldest patrons, we take great pleasure in congratulating you upon the success that has attained your efforts to make the JEWELERS' CIRCULAR the leading trade organ. As an advertising medium, we have found it *of so much value that we appear in every number issued.*

FRASSE & CO.,
Dealers in Fine Tools, Files and Supplies.
62 CHATHAM STREET, N. Y.

Ginnel, Henry.

The JEWELERS' CIRCULAR AND HOROLOGICAL REVIEW is undoubtedly the leading journal of its kind published in this country, and owing to its large circulation among *buyers of goods*, its value to those who desire to present their specialties to the trade must be apparent to all.

HENRY GINNEL,
Importer of Watches and Materials.
31 MAIDEN LANE, N. Y.

Gorham Manufacturing Co.

We consider the JEWELERS' CIRCULAR the best possible advertising medium for reaching the *whole trade*, and the *only trade journal that we use for advertising purposes.* We appreciate what the CIRCULAR has done and is doing for the trade, and hope your success in future may exceed your most sanguine expectations.

GORHAM MANUFACTURING CO.,
Silversmiths,
37 UNION SQUARE, N. Y.

Hale & Mulford.

We *fully concur* in all that our friends say of the JEWELERS' CIRCULAR.

HALE & MULFORD,
Manufacturing Jewelers,
BROADWAY COR. 4TH STREET, N. Y.

Haskel, H. C.

It gives me great pleasure to recommend the JEWELERS' CIRCULAR. I fully appreciate its merits as an advertising medium for manufacturers to make known their specialties to the trade throughout the country. *Every week brings orders from dealers, and many customers have been added to our list from my advertisement in your paper.*

H. C. HASKEL,
Manufacturer of Rings and Jewelry,
12 JOHN STREET, N. Y.

Hayes, Alex. M. & Co.

We know of *no trade journal that is at all comparable* to the JEWELERS' CIRCULAR AND HOROLOGICAL REVIEW, the recognized organ of the jewelry, watch, clock and kindred industries

ALEX. M. HAYES & CO.,
Importers of Bronzes, Clocks, &c.,
25 MAIDEN LANE.

Kahn, L. & M.

We do not hesitate to say, that *of all the mediums* we have used during the past few years, we have found the JEWELERS' CIRCULAR to be the best.

L. & M. KAHN,
Importers of Watches,
10 MAIDEN LANE, N. Y.

Kossuth, Marx & Co.

We have made use of your truly artistic journal, and have found it not only all we desire, but *exceeding our most sanguine expectations*, as we have received unusual benefits thereby.

KOSSUTH, MARX & CO.,
30 MAIDEN LANE, N. Y.

Le Boutillier & Co.

The JEWELERS' CIRCULAR & HOROLOGICAL REVIEW, the recognized organ of the trade, *is the only journal we use in communicating with dealers in the interior*, and we deem it worthy of the support it enjoys.

LE BOUTILLIER & CO.,
Importers of Fancy Goods,
3 UNION SQUARE, N. Y.

Lorsch, Albert.

I have been an advertiser in the JEWELERS' CIRCULAR for several years, and take pleasure in recommending it as the most *honorable, trustworthy, and enterprising journal of our times.*

ALBERT LORSCH,
Manufacturer of Spectacles, Eye Glasses, etc.
37 MAIDEN LANE, N. Y.

Magnin-Guedin, Ve. J. & Co.

We take great pleasure in adding our name to the list of so many *well-deserved* testimonials and are happy to state that the introduction of your monthly publication has opened the field to an immense amount of not only very interesting and valuable information, but also of useful, practical commercial advice. We warmly recommend it to all persons interested in the progress of *fine arts.* We see in your success the *well-merited consequences of independent journalism*, which is the *characteristic feature* of your paper, and we wish, both for the benefit of the trade and your own welfare and satisfaction, a long, progressive continuance of success.

VE. J. MAGNIN-GUEDIN & CO.,
Importers,
652 BROADWAY, N. Y.,
Sole agents for the James Nardin Watch.

Mathey, L. & A.

As one of the earliest friends of the JEWELERS' CIRCULAR, we have watched its course with pleasure and satisfaction. Our *continuous advertisement attests our appreciation of its value to us.*

L. & A. MATHEY,
Importers of Fine Adjusted Watches and Movements,
119 FULTON ST., N. Y.

Meriden Britannia Co.

Having for a number of years been advertisers in your valuable journal, we consider it *one of the institutions of the trade* which we feel *we cannot well do without*. With the enterprise and ability you have displayed in its conduct, we can conscientiously say it has *no equal as a trade journal*.

THE MERIDEN BRITANNIA CO.
HORACE C. WILCOX, *Pres.*

Miller Bros.

It gives us pleasure to congratulate you upon the eminent success you have achieved in establishing a first-class art journal, so thoroughly devoted to the interests and requirements of those industries it represents. *Its columns are replete, not only with useful knowledge and practical advice of a character interesting to mechanics and artisans*, but its pages embrace a great variety of original and instructive matter, both trustworthy and entertaining. Having been advertisers in the JEWELERS' CIRCULAR since its first issue, we feel competent to judge of its character and merits.

MILLER BROS.,
Manufacturing Jewelers,
11 MAIDEN LANE, N. Y.

Post & Spier.

The JEWELERS' CIRCULAR is in our opinion the *only representative organ of the jewelry, watch, clock and silverware industries* that deserves the support of the trade.

POST & SPEIR,
Manufacturing Jewelers,
192 BROADWAY, N. Y.

Reed & Barton.

We consider the JEWELERS' CIRCULAR AND HOROLOGICAL REVIEW, *the representative organ of the Jewelry trade*, and worth the support of every member of it.

REED & BARTON,
Silver-Plated Goods,
686 BROADWAY.

Richardson, Enos, & Co.

Having been advertisers for some time in your publication known as the JEWELERS' CIRCULAR, we cheerfully add our testimony as to its merits and advantages as a journal in every way *adapted to the requirements and interests of the jewelry, watch and silverware trades*, and we commend it to the attention of all in any way connected with those industries it represents.

ENOS RICHARDSON & CO.,
Manufacturing Jewelers,
23 MAIDEN LANE, N. Y.

Riley, John A., & Co.

We beg to make acknowledgment to you of our high appreciation of your valuable journal for its *intelligent and candid discussions of all questions interesting to the jewelry trade, also for its abundance of beneficial information and many desirable suggestions*. We are thoroughly cognizant of the many advantages enjoyed in the possession of your journal, and it is with great pleasure that we see the demand for it daily increasing.

JOHN A. RILEY & CO.,
Manufacturing Jewelers,
7 BOND ST., N. Y.

Robbins & Appleton.

We find the advertising columns of the JEWELERS' CIRCULAR AND HOROLOGICAL REVIEW *the most effective and satisfactory medium of communication* with interior dealers.

ROBBINS & APPLETON,
Agents American Watch Co.,
9 BOND ST., N. Y.

Rogers & Bro.

We regard the JEWELERS' CIRCULAR as the best trade journal extant. We congratulate you upon its merited success, richly deserved by its able management. Its bright, crispy pages are full of interest; and we think no live jeweler can afford to be without the *journal of his craft*. As an advertising medium *we find it of great value in our business*.

ROGERS & BRO.,
Manufactory of Finest Quality Electro-Silver-Plated Goods.
650 BROADWAY, N. Y.

Smith, Hedges & Co.

It is with much pleasure we notice through our foreign correspondence that your journal is attracting attention abroad. Identified (as advertisers) with its interests from its very first number, we have noticed with the greatest satisfaction its continual improvement and rapid rise in favor, until we believe *all now regard it as the recognized organ of the trade—the medium of communica'n between the importer, manufacturer and the retail dealers*. May your list of foreign subscribers soon equal your long array of patrons in this country, who welcome the JEWELERS' CIRCULAR each month.

SMITH, HEDGES & CO.,
Importers of Diamonds,
1 MAIDEN LANE, N. Y.

Spencer Optical Manf'g Co.

We have watched the growth and prosperity of the JEWELERS' CIRCULAR AND HOROLOGICAL REVIEW with a great deal of interest. *It is consistent in its course, fair and honorable in its treatment of trade questions, and its utterances may be relied upon.* We deem it worthy of the support and patronage of every member of the trade.

SPENCER OPTICAL MFG. CO.,
13 MAIDEN LANE, N. Y.

Springfield Watch Co.

We consider the JEWELERS' CIRCULAR *the best advertising medium ever placed at the disposal of the jewelry trade.*

SPRINGFIELD WATCH CO.,
OFFICE, 11 MAIDEN LANE, N. Y.

Taylor & Brothers

Having been advertisers in your journal since the issue of its first number, we have watched with much interest its steady and rapid progress and development, and beg now to add to the many communications of like nature which you are doubtless constantly receiving, our assurances of appreciation of the energy and skill you have evinced in the editing and general management of the journal. We have no hesitation in pronouncing the JEWELERS' CIRCULAR *the best conducted trade journal issued in this city.* It supplies in our own branch of industry *a long-needed source of communication between the importer, manufacturer, and jobber and the trade in general* throughout the country. We have heard of your new enterprise in carrying the CIRCULAR into foreign lands, and we commend most heartily the energy shown in this effort and predict important and advantageous business results arising from it. We cannot wish for your journal a better future than a continuance of the marked success which has heretofore attended your efforts in this direction.

TAYLOR & BROTHER,
Importers of Clocks and Bronzes, Watches, Diamonds, etc.
676 BROADWAY, N. Y.

Tiffany & Co.

We deem the JEWELERS' CIRCULAR AND HOROLOGICAL REVIEW *of the utmost importance to those industries it so ably represents.* As advertisers we esteem it of great value in our business.

TIFFANY & CO.,
Makers of Fine and Complicated Watches.
14 JOHN STREET, N. Y.

Todd, Edward, & Co.

We take great pleasure in saying that we consider the JEWELERS' CIRCULAR *a great success "every way,"* and we congratulate you on the *able management* shown throughout. Its editorials are clear, demonstrative, and well calculated to develop and educate the trade to a high standing of business morals. We find its pages useful as an advertising medium and earnestly hope for its success.

EDWARD TODD & CO.,
Gold Pen and Pencil Case Manuf'y,
652 BROADWAY, N. Y.

Waterbury Clock Co.

We congratulate you upon the measure of success which has attended your efforts in the publication of a periodical so *creditable to yourself and the trade of which it is the representative.* We have taken note of its course with unabated interest from its first issue over seven years ago until now, and very cheerfully testify to a growing appreciation of its worth and its service as a source of information and the best possible means of communication with the jewelry trade of this country.

WATERBURY CLOCK CO.,
M. BAILEY, *Treasurer,*
4 CORTLANDT STREET, N. Y.

Whiting Manufacturing Co.

It is with great pleasure that we avail ourselves of this opportunity to speak in the highest terms of the JEWELERS' CIRCULAR, and to say that as a *trade journal* we believe it to be *peerless.* Wishing you uninterrupted success,

WHITING MANUFACTURING CO.,
Silversmiths,
BROADWAY & FOURTH ST., N. Y.

THE Jewelers' Circular and Horological Review.

VOLUME XI. NEW YORK, FEBRUARY, 1880. No. 1

THE

JEWELERS' CIRCULAR AND HOROLOGICAL REVIEW,

The recognized organ of the Trade, and the official representative of the Jewelers' League and the Watchmakers' and Jewelers' Guild of the U. S.

A Monthly Journal devoted to the interests of Watchmakers, Jewelers, Silversmiths, Electro-plate Manufacturers, and those engaged in the kindred branches of art industry.

SUBSCRIPTION:

To all parts of the United States, Canada, Great Britain and the West Indies,

$2.00 Per Annum; Postage paid.

To France, Switzerland, Germany, Mexico, the Republics of South America, and Australia, $2.50 per annum. Postage paid.

☞ *All communications should be addressed to* D. H. HOPKINSON, 42 *Nassau Street, New York.* ☜ *Advertising rates made known on application.*

NOTICE TO SUBSCRIBERS.

The Eleventh Volume of this Journal begins with the present number. Those of our readers whose term of subscription expired with the last issue, and who have been notified by our usual circular, will confer a favor by responding as promptly as possible. All subscriptions terminating with the last number will be discontinued if not renewed.

A Government Stamp of Value.

IN the January issue of THE CIRCULAR we printed a communication from Mr. W. N. Boynton, President of the Iowa Retail Jewelers' Association, wherein he opposes the plan proposed by us of asking Congress to provide by law for the stamping of wrought gold goods with marks that shall indicate their intrinsic value. Mr. Boynton favors instead the adoption of a Guild stamp by the Jewelers' Associations, which stamp shall be the guarantee of such Associations that the goods stamped with it shall be of the value represented. We know Mr. Boynton to be an honest and sincere man, who has the best interests of the trade at heart, and who also desires that the public shall have some means of protection from the frauds now practised upon them by the manufacturers of so-called gold goods. He and THE CIRCULAR differ only as to the means to be employed to secure this result. He would have the Retail Dealers' Associations adopt a stamp to be used only on goods manufactured for them, the quality of which they can guarantee; he would have members of such Associations buy their goods from those manufacturers who would make such as they ordered, and on which this stamp should be placed, and the dealers exert themselves to sell the goods so guaranteed. We would have the government prescribe, 1st, what a karat is; 2d, the degrees to which pure gold may be debased in wrought goods and still be considered gold; 3d, that every manufacturer shall be required to indicate, by stamp or otherwise, the fineness, in karats, of the goods he manufactures; 4th, that any goods manufactured that are not of the value they are represented to be shall be liable to confiscation, and the manufacturers of them subject to fine or imprisonment. By our plan, all manufacturers would be placed on the same platform, and all dealers, as well as the public, would be protected from imposition. Our plan extends to the entire trade, while that proposed by Mr Boynton extends only to members of the Jewelers' Associations, the manufacturers who consent to make the goods they desire, and that portion of the public who buy of members of the Associations. His plan is open to the objections, 1st, that it applies to only a portion of the dealers; 2d, that only a portion of the public would be benefitted by it; 3d, that the manufacturers are in no wise restricted in the manufacture of fraudulent goods; 4th that no penalties are or can be provided for the punishment of manufacturers of bogus goods, or for counterfeiting the stamp that might be prescribed by the Associations. The Guild stamp he proposes would be used just so far as manufacturers found it profitable to do so, and would be counterfeited by unscrupulous men to precisely the same extent. The Associations have not the power to regulate the use of such a stamp, to make laws for the governance of manufacturers, or to inflict penalties. The government has this power, and the crying evils gathered about the trade demand that this power should be exercised. Mr. Boynton would have the trade regulated partially; we would have laws that should bear equally upon every member of it. He would have that portion of the public that buys from members of the Association protected from imposition; we would have the entire public.

Mr. Boynton argues that if all goods are required to be stamped with a government stamp of value, every peanut seller who chooses to sell jewelry will be on a par with the legitimate dealers in jewelry This is true, and the public would, therefore, naturally seek out the regular dealer in preference to the itinerant peddler. But suppose, instead, the peanut vender has a lot of bogus goods bearing a counterfeit Guild stamp, and he warrants them to be of the same quality as those displayed by the legitimate dealers, is he not likely, by reason of selling them at a less rate than the genuine goods, to command the trade? And who is to punish him for the deception? Will the deception, as a matter of fact, be any greater than is now carried on by the same class of venders? If the manufacturers were prevented by law from making bogus goods, there would be no temptation for rascals to attempt to compete with honest dealers. Manufacturers of bogus goods live by fraud, and are ruined when forced to be honest.

Mr. Boynton makes the point that as the members of the various State Associations are making this fight against fraud in jewelry they ought to have the advantage of any benefits that may result from it, whereas if the government regulates the manufacture of jewelry, all dealers would be placed on an equality. This is a phase of human nature that Mr. Boynton will find everywhere—the masses hang back and let the leaders do the fighting, and then step in and share the benefits. But suppose those dealers who are not members of the Association still hold out, what is to prevent their buying goods bearing the Guild stamp and so competing with the authors of it? The Associations can prescribe no law to prevent manufacturers selling to "outsiders," any more than they can prevent a stamp from being counterfeited. There is always to be found a class of men who will run counter to all trade regulations, and to indulge in practices that are neither legitimate nor honest. The only way to keep such men in the traces is by the strong arm of the law, and even then they "slop over" most fearfully.

Mr. Boynton fully agrees with us that the trade and the public need some protection from the gross frauds that are now practiced

upon it by unscrupulous manufacturers. These frauds are not only a swindle upon the public, but they are undermining the integrity of the entire trade, and destroying all incentive to honest work and the production of honest goods. When men who are striving, by the excellence of their designs and the superiority of their workmanship, to bring honor and credit to their profession, find their fine goods reproduced in base metal and sold as genuine gold goods, they are naturally deterred from spending their time, talents, and capital for the benefit of unprincipled swindlers. If their goods were protected by a law providing penalties for the production of bogus imitations, they would have some incentive to continue their efforts for the elevation of the standard of American jewelry. If all goods were required to be stamped with some sign declaring their actual quality, it would be impossible to palm off upon dealers and the public goods that are nine-tenths brass. Without such a law, this is a matter of hourly occurrence, and no regulation of any Jewelers' Association or Guild can prevent it.

Mr. Boynton says: "I am sick of this class of fraudulent goods. I am tired of unwittingly robbing my friends and patrons, and placing the fruits of the steal in the pockets of fraudulent manufacturers, and consumers are generally getting tired of being commercially pillaged in this way, and will soon demand protection from such rascality, *and they will get it.*" He agrees with us, and with hundreds of the best men in the trade, who have written to us from all sections of the country, commending us for the course we have taken, and urging us to bring the subject to the attention of Congress. Honest dealers cannot compete with the debased goods that are now being sold for genuine on every hand. Men, as well as goods, are being corrupted by these practices, and dealers who desire to do a legitimate business are used as tools to defraud the public. Nothing but a general law, applying equally to all manufacturers, will put an end to this species of swindling, place the trade upon an honest platform, and give it a chance to retrieve its reputation. Congress will be appealed to this winter to pass such a law, and whatever influence THE CIRCULAR may possess, will be thrown in its favor.

The experience of many years in European countries has demonstrated the wisdom of having a government stamp to designate the actual value of gold goods. A dealer handling these goods knows their value, and can conscientiously recommend them. Purchasers know also that the articles bearing this stamp are what they are represented to be. With us the case is entirely different. The art of debasing wrought gold has been brought to such perfection in this country that even experts cannot tell the bogus from the genuine goods. Jewelry marked 14 or 18 karats fine are made of such debased metal that they will not assay above 6 or 8 karats fine. Such goods cease to be gold, and are simply base metal imitations. A Guild stamp made for the benefit of the members of Jewelers' Associations will not have the least effect in driving these goods from the market. On the contrary, a counterfeit Guild stamp will be attached to them, and they will be the more readily foisted upon the public. At present, the only guarantee that purchasers have that they are not having debased goods palmed off upon them for the genuine, lies in the reputation of the dealer. A few dealers of high standing have recognized this fact, and attach to their goods a certificate, equivalent to a stamp, which pledges the honor of the firm that the goods are precisely as represented. In this manner Robbins & Appleton have built up the reputation of the American watches, and purchasers have confidence in the certificate which they affix to them. This would be the effect of a government stamp—the public would recognize it as a guarantee of value.

But such government stamp would not accomplish the object sought unless the law prescribing it provided penalties for counterfeiting it, and for any misrepresentation in connection with it. These penalties should work the confiscation of the bogus goods and the punishment of the manufacturers of them. With such a law on the statute books, every honest dealer's hand would be turned against the swindlers and imposters in the trade, and they would soon be driven to the wall. Swindlers thrive because their lack of conscience gives them an advantage over those who possess that commodity. Deprive them of the power to swindle, and honest men have an advantage over them at once. No argument that Mr. Boynton advances in favor of a Guild stamp but applies with tenfold force in favor of a government stamp. The adoption of a Guild stamp is an attempt to create a monopoly in favor of certain manufacturers and dealers that cannot possibly succeed; the regulation of the matter in question by Congress, making bogus manufacturers criminals in the eyes of the law, will drive out the unscrupulous men in the trade, and place all that remain on an equality, at the same time protecting all purchasers alike from imposition.

The Boys on the Road.

THE gentlemen employed as commercial travellers for the jewelry trade made a good record for themselves during the latter part of 1879. Their sales were large and satisfactory, and would have been larger could the houses they represent have filled their orders. But the unexpected demand for goods so depleted the stocks in the hands of manufacturers and jobbers that it was found necessary to call in the travellers. Accordingly, the "boys of the road" have most of them been home, have enjoyed a short respite from business, have exchanged the discomforts of traveling for the comforts of home, and are now ready to start afresh to win new laurels in the year's business. Most of them have made new arrangements with their employers for the coming year, and, we are glad to know, in many instances have secured advanced compensation. If any class of persons in the trade deserves this recognition it is the commercial traveler to whom the trade is so much indebted for the prosperity of the past few months. These ambassadors of respectable and well known houses have carried to every point of the compass the novelties and new designs of the manufacturers, and offered to the retail dealers opportunities for buying as favorably as they could do if they visited the factories in person. The dealers have thus been saved heavy traveling expenses and much loss of time. They have, as a rule, excellent standing in the trade, and are selected to visit customers because of their ability to faithfully and honestly represent their employers. The reports made by these gentlemen to the home establishments furnish a basis upon which the year's experience is largely conducted. From their contact with retail dealers, they judge what kind of goods will be most in demand, what modifications are necessary, and the quantity of each kind that will be required. The travelers are the skirmishers of the trade, being its eyes and ears, as the cavalry is to an army. Commercial travelers, representing responsible houses, are entitled to every consideration at the hands of dealers, and should be encouraged by liberal orders. We wish "the boys on the road" the greatest possible success during the year, comfort attainable in their frequent flittings.

Goods on Memorandum.

DURING the past few months, when trade has been brisk, the practice of sending out goods on memorandum has been very much restricted. It should be abolished altogether. It is an abuse that is entirely foreign to legitimate commercial transactions. With the facilities now offered dealers, by means of commercial travelers, to examine styles, there is no excuse for their asking for samples. They know what kind of goods are required by their customers, or if they do not it is their fault, and they should not hesitate to give a positive order for what they want. Some dealers have been in the habit of sending to manufacturers and jobbers generally for goods on memorandum, keeping them a few weeks and then returning them. By this means they are able to make a good show of stock, very little of which belongs to them. But those who furnish the samples are greatly inconvenienced. To supply all the requests of this character, they would have to carry immense stocks, the greater part of which would be loaned out on memorandum to a hundred or more different

dealers. The practice works greatly to the disadvantage also of those dealers who buy for cash, for they cannot afford to keep up such a varied stock as those who simply borrow their goods, and do not expect to pay for them. Now is a good time to abolish entirely the practice of sending out goods on memorandum. The actual demand for goods at present is sufficient to constitute an excellent trade, and it is better to confine it to legitimate bounds than to cater to a practice that does not add a dollar to actual sales. The memorandum business may give an appearance of large transactions, but as the goods are returned the delusion disappears in disappointment and dissatisfaction. Now is a good time to eradicate the evil.

MR. JAMES MACTEAR, the Scotch chemist, who claimed to have discovered a method for making artificial diamonds, has written a letter to the London *Times* in which he acknowledges he was mistaken. In company with Mr. Maskelyne, of the British Museum, he spent four days in investigating the substances he had taken for diamond dust, and says while it very strongly resembles Brazilian "boart," or diamond dust, it consists almost entirely of silica and alumina and a residue insoluble in hydrofluoric acid. Even after forty-eight hours' action the residue still contained a few minute crystalline forms. Mr Maskelyne thinks it probable that by some modification of these experiments the desired result may yet be obtained. Mr. Mactear thinks it improbable that diamonds of any size can be produced artificially, but firmly believes that the time is not far distant when crystalline carbon in the form of dust, such as he still hopes to produce, will be obtained in quantity, and will have before it a great future in the arts. Thus ends another diamond sensation precisely as we predicted it would.

THE Annual Meeting of the Jewelers' League was held in the rooms of the Board of Insurance Brokers, on Broadway, January 20. A large number of the members was present, all of whom manifested a warm interest in the growing success of this organization. The reports of the Secretary and Treasurer were very gratifying, showing increasing membership and a satisfactory interest in its pecuniary welfare. John D. Lyons, the former Secretary, resigned his official position, and S. W. Sexton, of the firm of Sexton & Cole, was elected to fill the vacancy. The League has had but one death loss to pay since its organization, and is to be congratulated upon the healthfulness of its members. Thomas Slater, President of the Association, has rendered himself so useful in this position, and has so endeared himself to the members, that he was unanimously re-elected, and the probability is that he will hold his office for life.

AN attempt was recently made in Baltimore to make commercial travelers pay the same tax as resident dealers. The agent of the Pacific Mills of Massachusetts was indicted for selling goods by sample, none of the goods being in the State at the time of sale. Judge Puickney, of the Criminal Court, after a careful examination of the law, found there was no cause for holding the defendant, and he was acquitted. Some years ago the Supreme Court of the United States decided that the Maryland law, imposing a license tax of $300 on non-resident salesmen, was unconstitutional, since which time no attempt has been made to collect a license until the present case. When it was sought to make non-residents pay the tax imposed on resident dealers. According to this decision, commercial travelers can do business in Maryland with no one to molest or make them afraid.

IN the next number of THE CIRCULAR we shall commence an interesting series of articles on optical glasses, treating of spectacles, lenses, eye glasses, etc., in their various forms, and also of the various processes of grinding, focussing, and fitting glasses. As this is an important branch of the jewelry trade, we commend this series of articles to the careful perusal of our readers. Their author is a gentleman of large practical experience, who thoroughly understands the subject whereof he treats.

THE Jewelers' Protective Union held its Annual Meeting on the 19th of January, and elected its former officers to serve during the ensuing year. The report of the condition of the Association was read by Ira Goddard, Secretary and Treasurer, and showed it to be in a satisfactory and gratifying condition. The Association has met with extraordinary and unexpected success in recovering stolen property, which fact should commend it to the trade in general. Every thief whom the Association got track of has been convicted, and is now in the prisons of various States. The membership of the Union now embraces upwards 170 leading firms in the trade, and the energy of its President, W. R. Alling, has made it a terror to evil doers.

THE Sidney *Morning Herald* devotes nearly two columns to an elaborate description of the magnificent exhibit of silverware placed by the Gorham Manufacturing Company in the Garden Palace of the Australian Exhibition at that city. The display is described as being the most elegant of its kind ever seen in that country, embracing a great variety of articles of rare workmanship and design. This collection, valued at $35,000, is in charge of D. Manson, of the Waltham Watch Company. Mr. Manson has also a full line of watches of the Watham Company's manufacture, which attract marked attention. These watches are well known in Australia, as they are in all quarters of the globe. Their excellence is a matter of wonder to foreigners, and the *Herald* is enthusiastic in their praises

Annual Dinner of the Chicago Jewelers' Association.

THE fifth annual dinner of the Chicago Jewelers' Association was given at the Palmer House, on the evening of December 30th. There were present between fifty and sixty of the leading jewelers of the Northwest, and a number of invited guests who are identified with the trade. Mr. H. F. Hahn, president of the Association, presided. The banquet hall was handsomely decorated, and the tables were resplendent in silver equipments and immaculate linen, giving hopeful presage of the elegant repast that was to be served later in the evening.

The members and guests being in the places assigned them, the president called the assemblage to order, and welcomed them to the festivities of the evening. He congratulated the trade on the improved condition of business, and rejoiced in the fact that after six years of unusual depression in all branches of commerce, the country was now emerging from the cloud that had overspread it, and was being rapidly brought into the full light of universal prosperity. The jewelry trade had shared in this prosperity during the past six months, and, in closing the books for 1879, could point to a greater volume of business transacted than it had known in many years before. During the holidays especially, the members of the trade had been kept busy—they were, in fact, day and night, animated streaks of electricity; they were kept so busy that when the rush was over they had to be introduced to their families as new acquaintances. I congratulate the trade on the success of the Chicago Jewelers' Association. It has exerted a beneficial influence from a business standpoint, holding its members together as a band of merchants whose interests, being identical, were to be promoted by all legitimate means. The social phase of the Association is well illustrated by the scene now presented to us, and to which I bid you a hearty welcome.

The President's remarks were received with applause, after which he read letters from Daniel F. Appleton, President of the New York Jewelers' Association, and others, regretting their inability to be present.

Dinner was then served in the elegant manner for which the Palmer House is noted, and which cannot be excelled in the West. Ample justice was done to the feast by all present. The *menu* was as follows :—

MENU.

Bluepoints on Half Shell.

Mock Turtle Soup.

California Salmon a la Financiere.
Parisian Potatoes.

Fillet of Beef, Larded, with Mushrooms.
Croquettes of Potatoes.

Sweethreads with Green Peas.

Turkey, Stuffed. Sweet Potatoes.

Roman Punch.

Broiled Quail on Toast. Saratoga Potatoes.

Chicken a la Mayonnaise. Lettuce Salad.

Desert.

Fruit.

Coffee.

While the bill of fare, printed on heavy white silk, gave no promise of beverages of either a spirituous or vinous nature, there was an abundance of both, and good wines flowed freely, rejoicing the souls —otherwise stomachs—of the thirsty multitude assembled. Chicago is so well surrounded with water that it palls upon the sight, and is an offence to the palate of every self-respecting resident.

The first toast of the evening was "The City of Chicago," which was responded to by Theodore Kearney, of the firm of Kearney & Swartchild. His brilliant remarks were listened to with rapt attention, as he paid a glowing tribute to the city of his adoption. He alluded to the natural commercial advantages of the city, to the enterprise and liberality of its merchants, to the beauty of its women, and predicted for it a glorious future. New York, Boston, and Philadelphia were respectable cities, but too distant from Chicago to be desirable places of residence. He alluded to the rapid growth of the city and to the undeveloped resources of the country tributary to it. He pointed with pride to the magnificent palaces of its residents, their princely places of business, the owners of which were among the most active business men of the country. He called attention to the immense elevators and granaries, bursting with their stores of grain, for which the nations of the earth are competing. The numerous canals which intersect the city rival those of Venice for foul odors and filth, and from their placid bosoms arise the tuneful songs of the gay gondalier and screech of the busy steam-tug, blending in euphonious unison, while pigmy St. Louis listens with green envy. The speaker concluded with a glowing eulogy of the members of the jewelry trade, who are recognized as among the leading business men of the leading city of the west.

The second toast, "The Jewelers of the North-west," was responded to by Mr. Otto Young, of the firm of W. B. Clapp, Young & Co. Mr. Young eulogized the jewelers of the Northwest as the most active and enterprising men in the trade. They are the main stays of the manufacturers, who, without the dealers of the West, would be revelling in bankruptcy and beggary. The Northwestern jewelers consume more catalogues and price lists than all others in the country combined. The fruits of their industry, in the shape of good solid money, come pouring into Chicago, and contributes largely to swell the wealth of resident jewelers, who take their "rake" out of it, and send what is left to the eastern manufacturers. But, laying aside all joking, the speaker eulogized the Northwestern dealers as an enterprising, vigorous class to whom the trade was largely indebted. They were the pioneers in opening up the great West to an appreciation of art and fine workmanship in gold goods, and were carrying the artistic tastes of the manufacturers to the very frontier of civilization. They are possessed of a keen sense of honor, and as a class, were prompt in meeting their obligations. He was proud to be recognized as one of them, and hoped his life might be passed among them.

The third toast, "The Progress made in manufactured articles, useful and ornamental, incident to the Trade," was responded to by Mr. Stedman H. Hale. The speaker alluded to the great progress made by the trade in the production of useful and ornamental articles, and was proud to know that Chicago, the commercial metropolis of the wilderness, was unexcelled in the world in the concoction of mixed drinks. If there was one thing in which his soul rejoiced more than another, it was in a sherry cobbler, with plenty of ice, and a very large and very long straw; next to this he ranked the fragrant Tom and Jerry. In the production of these useful and ornamental articles Chicago stood without a rival, as all present could testify to from personal experience. The invigorating whiskey sour and the matutinal cocktail were useful articles of modern invention in which he took especial pride, greatly preferring them to the insidious champagne with which they were solacing themselves. But one staple article of solid use, a necessity to the whole world, which might also be considered ornamental, if not musical as well, Chicago produced in greater quantities than any other city in the world. He alluded to the hog. There was a time when Cincinnati bore the palm in the pork packing business, but as Chicago increased in population, she rapidly ran ahead of Cincinnati in the production of hogs—hogs alive and hogs dead; hogs on the hoof and in the barrel; hogs salted, and hogs fresh; pork, ham, sides, bacon—in fact, all that goes to make up that most useful and ornamental article, the hog Chicago excelled. [The speaker's notes blew out of the window and he wandered from his subject, passing down the St. Lawrence river, over into Canada, and back to Lake Michigan, when he was invited to take water in his, and he sat down.]

[Mr. Hale's enumeration of beverages was confusing to the reporter, and he may have made some errors in recording the speaker's remarks.]

In responding to the fourth toast, "Our Guests," Mr. Moore, a lawyer, of Chicago, thanked the Association for the invitation extended to him to be present. He had voted unanimously to accept it, and was glad he did, for it had enabled him to enjoy the first square meal he had had in six months. He was grateful to the jewelers of Chicago for certain of them had contributed liberally to the support of the profession of which he was a member. Whenever an unscrupulous man has acquired a fortune, and wishes to secure it inviolate from a horde of grasping creditors, he hies him to a lawyer, and forthwith the thing is arranged. Occasionally a member of my profession is found weak enough to advise a compromise with creditors, and, as a consequence, a portion of the debtor's estate is sacrificed to pay his debts. But, as a rule, Chicago lawyers don't do business in that way. They do not consider that a non-resident creditor has any rights that a resident debtor is bound to recognize. Therefore, when lawyers settle up the affairs of a delinquent debtor, they make it a point to secure for him all that portion of his estate that they can appropriate to themselves. In conclusion, gentlemen, I thank you for the privilege of meeting you, and of assuring you of the appreciation in which Chicago holds you as business men.

Mr. Stanley, a jeweler of Milwaukee, being called upon, also responded to the toast of "Our Guests." He thanked the Association for the opportunity granted him of tasting champagne, a beverage he had often heard spoken of, but never tasted before. He was free to say that, for a steady drink he preferred Milwaukee lager. Some of the speakers, he said, have alluded to the size and importance of Chicago. Milwaukee is a much larger city, covering vastly more area—on the map. Unfortunately, it is not built up so compactly as Chicago. This is due mainly to the fact that there are not so many houses, and the fact that we have not so many houses is to be attributed probably to the lack of inhabitants. Still, Milwaukee is the larger city of the two—on the map. As to the enterprise of Milwaukee, we are willing to admit that Chicago is ahead of us in some thing. We are going to have a Jewelers' Association in Milwaukee as soon as we grow up to our city limits, and I expect to be the first President of it. I shall then return your hospitality by asking you over to banquet with us, and hope to be able to convince you of the importance of Milwaukee as a commercial city.

The speechmaking now became general, and every one present deluged the assembly with a flood of eloquence, and the reporter, who also made a few remarks, found it utterly impossible to record what was said. But it was a good time; everybody enjoying himself, and the assembly was unanimous in its praises of the hospitality of the Chicago jewelers. The party dispersed at an early hour—next morning—full of enthusiasm and fully impressed with the value and importance of the Chicago Jewelers' Association.

Juvet's Time Globe.

THE above illustration represents a time globe, invented by Louis Paul Juvet, of Canajoharie, in this State. It has long been a study with scientific men to obtain a terrestrial globe that should combine with it a perfect time-keeper. Various devices have been tried by horologists, but none have heretofore been satisfactory. The requirements of a scientific instrument of this character are correct time, completeness of map-surface, and readiness of adjustment to any desired inclination for purposes of examination and illustration. Mr. Juvet claims to have fulfilled all these requisites. The globe shown in the illustration contains a chronometer movement in its interior. The shell that envelops the works and protects them against accident or dust is very light and uniform in thickness, allowing the mechanism to turn freely, equably, and in perfect balance. The globe surface is as hard and smooth as a sheet of steel, being made of an entirely new material, which is unaffected by moisture, or heat, or cold. The meridian ring used for the support of the globe at its polar extremities, graduated for the measurement of latitude, is placed at some distance from the sphere to give lightness and beauty, and also to admit more easily examining the globe surface. It is held in any desired position by a simple swiveled clutch and holder. At the northern end the meridian ring is expanded into a holder for a transparent heavy plate glass clock dial, with the usual hour figures and minute marks. The hands are under the dial, and the time is easily read, yet the dial is not an obstacle to the free examination of any portion of the globe. At the equator a zone dial encircles the globe, the hour figures and minute marks on which, by following the meridian line of any locality to it, gives the exact time of any place. In the illustration the hands of the clock show 12.20, the local time of New York city, the meridian line of which, it will be seen, stands also before 12.20 P. M. on the equatorial dial. It will be noted, also, that San Francisco is yet on the morning side of the meridian, while London is almost in darkness, and stands before 5.16 evening on the equatorial zone.

One half of the equatorial zone is darkened, being nearly black at midnight, and shaded lighter on the left to 6 A. M., and on the right to 6 P. M., thus showing at a glance which part of the world is in daylight and which in darkness. The automatic motion of the globe, reproducing on a small scale the very movement of the earth, illustrates the phenomenon of day and night, and solves a problem that, simple as it is, is yet incomprehensible to many.

This globe is, in fact, a miniature earth in position and motion, being lightly and yet strongly made, with every portion of it visible. A clock and globe gives local and universal time with accuracy. It measures by its motion the comparative, and by the simplest computation the exact size of any country as it passes the meridian ring and equatorial zone. It can be placed in any position without derangement, and we are informed that it cannot be fractured by blows. It is unaffected by climatic changes. It is covered by a map, which is a special edition of the celebrated Edinburgh (Johnston's) maps corrected to date, having all the recent political changes and geographical discoveries, and also blue lines indicating average winter, and red the average summer temperature of every country on the globe; the water being represented in blue of a desirable shade clearly shows by the white lines the ocean currents. Whenever a change in the boundaries of countries, addition of States, or important discoveries make it desirable, this globe can be remapped at a nominal expense. The axis of the earth is represented by a gracefully shaped arrow, the feathered end of which is used as a stem winder for the clock within, which runs four days, and is regulated from the outside. The works are simple, and can be taken apart or repaired by any mechanician.

It received the highest award at the Centennial Exhibition at Philadelphia, and has the most cordial indorsement of scientists at home and abroad.

SOME months ago the pearl fisheries of the Miami River, Ohio, were described at considerable length in this paper. The past season has been signalized by the discovery of an agatized pearl, weighing forty-six and a half grains. The groundwork is beautifully agatized with the pearly irridescence shining through. It is the only pearl of the kind in pearl history, a history which dates back at least two thousand years, for the Ceylon fishery has been known for quite that length of time. Being the first of its kind, its value cannot be estimated. It is singular, too, that it was found embedded in the flesh of the mussel; all others taken from this river were found between the flesh and the shell, or embedded in the shell.

The prosecution of this industry is due largely to Mr. Israel Harris, a banker of Waynesville, Ohio, who has already a collection of over a thousand Miami pearls, of all sizes and values, some of them of odd and irregular forms. Some resemble human hands; one is a small shell, to which a coating of pearl has been added. His latest important acquisition, the agatized pearl, he calls the "Kohinoor."

CHARLES DICKENS once wrote to Sir John Bennett, the clockmaker, a letter which has just been published for the first time in the *London Daily News*. It runs thus:

"*My Dear Sir*—Since my hall clock was sent to your establishment to be cleaned it has gone (as, indeed it always has) perfectly well, but has struck the hours with great reluctance; and, after enduring internal agonies of a most distressing nature, it has now ceased striking altogether. Though a happy release for the clock, this is not convenient to the household. If you can send down any confidential person with whom the clock can confer, I think it may have something on its works that it would be glad to make a clean breast of. Faithfully yours, CHARLES DICKENS."

Sir John Bennett replied, giving good hope of the clock's perfect restoration.

Practical Hints on Watch Repairing.

By Excelsior. No. 59.

PROPER FORMS FOR TEETH AND LEAVES.

(930.) Having now secured wheels and pinions of the proper sizes, having the correct numbers of teeth and leaves, (thus giving an equal pitch to each, and insuring a correct pitching,) we have finally to consider their shapes. We find, in our daily practice, teeth of many different forms. Evidently, their action will vary as greatly as their shape. And as each shape will be the best one for some particular situation and use, it becomes important to know the special situation and use for which each of these shapes is best adapted. Knowing this, we shall be able to select, from a miscellaneous stock of wheels, the one whose teeth have the shape which will be most nearly perfect in action, in the circumstances of any particular case, instead of picking out one at random, and perhaps taking the worst one in the lot. We shall also be able to detect unsuitable forms when examining work already finished, and know how to improve their shapes, when practicable, so as to lessen the friction, rubbing, butting, dropping, etc., and secure a smooth and easily running gearing.

(931.) The shape of the driving tooth is the principal point to be looked after, as its addendum presses against the radial flank of the leaf and carries it through the angle of motion represented by the pitch, while the addendum of the driven tooth or leaf does not touch the driver, unless the driver and driven come together before the point of contact reaches the line of centers. A shape of tooth which is right for a certain wheel and pinion, would not be right for acting on the same pinion if the wheel had a greater or less number of teeth, even if its diameter and the center distance were changed in proportion, to make the pitching and depthing correct. When the teeth are improperly shaped, the wheel moves irregularly, faster at some times than at others, and this occurs as each tooth acts upon a pinion leaf. The acting surfaces may be so formed that contact will occur long before the line of centers, attended by butting, wedging, or the two surfaces "sliding up hill" on each other as they come together, and greatly reducing the velocity of the tooth as it forces the leaf along; or, on the other hand, they may have a tendency to slide off or pass each other too rapidly, and the tooth will move rapidly while impelling the pinion leaf very little, or none,—in the latter case wasting a portion of the motive force in mere "drop," or motion producing no useful effect, but positive injury.

(932.) An improperly shaped tooth also transmits the motive force irregularly, acting upon the leaf to better mechanical advantage in some positions than in others, so that a main wheel with unsuitably formed teeth can neutralize the equalizing effect of a fuzee and chain, producing great differences in the extent of the balance vibrations, for each tooth of the wheel. In the going-barrel watch, such a defect adds to, and can even double, the irregularity of the balance vibrations due to the varying motive force. Moreover, as the mainspring must be strong enough to give a good vibration, even when the teeth act at the poorest advantage, and when the least amount of the motive force reaches the balance, a much stronger mainspring is required than would suffice if the train gearing was in good condition, —being, in fact, altogether too strong when wound up, and the teeth acting advantageously, thus causing excessive friction, strain, and wear of the acting parts. If the error in the shape of the teeth is considerable, it may cause so much friction, dropping, butting, etc., that the watch will stop frequently, or even be unable to go at all. It will thus be seen that the shape of the teeth,—a matter which many workmen know nothing about, and do not even notice or think of when examining a watch,—is one of very great importance.

(933.) *The Different Curves.*—We are not confined to any particular shape of tooth or leaf, for securing a uniform transmission of velocity and motive force; for the teeth or leaves may be of any regular figure, whether round, square, triangular, or otherwise, provided the teeth or leaves which act upon them are suitably formed. But, in practice, our choice from among possible forms is controlled by due regard for facility of execution. In ordinary watch trains, as well as other machinery, custom has settled upon straight, radial flanks for both teeth and leaves, out to the pitch circle, while outside of that, their faces are curved according to the particular use and conditions of each case. When one of the wheels is movable, so that the center distance can be varied, and the wheel and pinion work into each other at different depths, or when the wheel drives several pinions of different diameters, the teeth and leaves are given what is called the involute curve. But when the centres are fixed, and the depthing is always the same, their faces have the epicycloid curve, and their flanks are made radial, as already stated. In an internal wheel, the faces of the teeth are formed with the hypocycloidal curve. Finally, if the wheel or pinion works into a rack, the faces of its teeth are formed with the cycloid curve.

(934.) *An Involute Curve* is described by the end of a straight line rolled upon the circumference of a circle. In Fig. 45, *A* represents the circle, *B* the straight line rolled without slipping upon the circle, *CC* the curve, marked by the end *D*. In practice, a piece of mainspring may have one end screwed to a circular piece, so that it can not slip, and a pencil fixed to the other end. The spring is then wound tighly around the circle, and the pencil point brought to its edge. The spring is then unwound, pulling always endwise upon it, to keep the unwound portion perfectly straight. A still simpler way is to attach a piece of stout twine, that will not stretch, to the circle at one end, form a loop in the other, through which pass the point of an ordinary pencil, wind the cord straight around the circle, bring the point of the pencil to its edge, hold it perfectly upright, and keep the curve well strained. As the pencil moves from the circle, it describes the involute curve *CC*. The other end will, of course, be similar, but reversed.

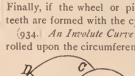


Fig. 45

(935.) *A Cycloid Curve* is formed by a point in a circle which is rolled along a straight line. Fig. 46 shows the line *A*, circle *B*, and curve *CC*, which is marked by the point *D* in the circle. Rolling the circle in one direction will form the curve for one face of the tooth *a* on the rack, and, in the other direction, the other face, *A* represents the pitch line of teeth, where the straight or radial flanks end, and the curved faces of the addenda begin. This is the case with all the figures, in sections (934) to (941), both inclusive.

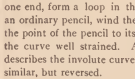


Fig. 46.

(936.) *A Hypocycloid Curve* is formed by a point in a circle which is rolled around the inside of another circle. In Fig. 47, *A* is the principal or *base circle*, *B* the *generating circle*, which forms the hypocycloid curve. *CC*¹ is another curve, formed by a generating circle larger than *B*. The point *D* in the generating circle is placed at the point *D* in the base circle, and is rolled to the left to form the right face of an internal tooth, or the right flank of an external tooth whose addenda is outside of the base circle, and in the other direction for the other side. The base circle always represents the pitch circle of the teeth, whether they are internal or external. When the generating circle is one-half the diameter of the base circle, the resulting hypocycloid will be a straight diametrical line, as at *CC* 2. Hence, when the flanks of teeth are formed with such a circle, they will be in radial lines, which will not be the case with a generating circle of any other proportional diameter.

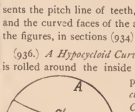


Fig. 47.

(937.) As it is customary, in all ordinary gearing, to form the flanks of teeth and leaves in radial lines, it is of course unnecessary to

describe them with an internal generating circle, but they are at once found by drawing radial lines from their roots to the pitch circle. The only practical use for the hypocycloid curve, therefore, is to form the addendum for an internal tooth, or one whose flanks are outside of the base circle and pointing towards the center. At the point where each of these radial flanks strikes the pitch circle, the curve of the addendum commences, on the inside of the pitch circle. The point *D* in the generating circle being placed exactly on each of those points, in turn, and the circle *B* rolled in the right direction, for each side, forms the addendum, and completes the tooth, save that all of the addendum is cut off except that part which actually acts upon the pinion leaf in driving it. The generating circle should be one-half the diameter of the pinion driven by the internal wheel, and the pitch circles of the wheel and the pinion should just meet, without intersecting, the same as with external gearing.

(938.) *The Epicycloid Curve* is formed by a point in the circle which is rolled around the circumference of another circle. In Fig. 48, *A* is the base circle, *B* the generating circle and *CC* the epicycloid curve, marked by the point *D* in the generating circle. The circle *A* represents the pitch circle of the wheel. At *a* and a^1 are the flanks of a tooth. *D* being placed exactly upon the end of *a*, where it strikes the pitch circle, and rolled in one direction, forms one curve of the addendum; placed upon a^1, and rolled in the other direction, it forms the other curve. Where these curves meet is the point of the tooth, unless the point is taken off and made flat, which is sometimes the case, as we shall see shortly. In marking the curves, the point of the pencil or pen must be exactly in the circle *B*, neither projecting outside nor falling inside of it. Whether the generating circle is large or small, the general properties of the resulting curve are the same, although its form is changed by varying the size of the generating circle.

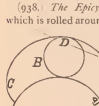


FIG. 48.

(939.) In ordinary watch wheels, the centers of motion are no changable, and the wheels are not intended to work into larger or smaller pinions. The epicycloid curve is therefore adopted for the addenda of the teeth—the flanks being radial. It is not necessary to go into the abstruse mathematical calculations which prove the fitness of the epicycloid curve for this use, but it has been found that it enables the addendum formed with it to act upon the radial flank of a pinion leaf, so as, practically speaking, to transmit both the power and velocity of the wheel uniformly to the pinion—and for a pinion addendum to act upon the radial flank of a tooth in the same way. Inasmuch as the addenda of the teeth act only upon the flanks of the pinion leaves, in driving them, (or at least in that part of the driving which is after the line of centers, and which, theoretically, is the only way in which the driving should be done), it is evident that any change in the form of the flanks of the leaves would necessitate a corresponding change in the form of the addenda of the teeth, and *vice versa*, in order to still drive uniformly. It has been shown that whatever forms we give to the addenda of the teeth, by using a generating circle of any particular size, the proper form of flanks to suit that will be given by using the same generating circle to describe hypocycloidal curves for the flanks of the pinion leaves. If we use a larger generating circle around the pitch circle of the wheel, to form the epicycloidal curves of the addenda, and so change their shape, we must use the same enlarged generating circle inside of the pinion pitch circle, to form the flanks of the leaves, and their shape will then be changed to correspond to the new addenda.

(940.) But regard for facility of construction dictates the use of radial flanks for the leaves, and such flanks can only be described by an internal generating circle one-half the diameter of the base circle, or pitch circle of the pinion, as shown in section (936). We therefore form the addenda of the teeth by adopting the same generating circle, one-half the primitive diameter of the pinion, rolled around the pitch circle of the wheel. And, conversely, when the pinion drives, so that its leaves must have epicycloidal addenda, we form them by a generating circle one-half the primitive diameter of the wheel, rolled around the pitch circle of the pinion. We then give the addenda a certain form of epicycloid curve adapted for acting upon radial flanks, and producing a practically uniform transmission of power and motion. Having previously determined the correct pitching and depthing, we have now arrived at the third and last requisite of a good gearing: the correct form to give the faces and flanks of both the teeth and the leaves. To recapitulate, the forms of the *faces* of the teeth or leaves are given by a generating circle one-half the diameter of the pitch circle of the wheel or pinion they are to *act upon*, while the flanks are radial, or formed by a generating circle one-half the diameter of their own pitch circle.

(941.) *Lantern Pinion Gearing.*—An exception to this rule is found in the case of the lantern pinion gear, in which the pinion leaves are round pins or wires, and consequently have no radial flanks. In such a pinion the pitch circle passes through the centers of the pins, which are theoretically regarded as so many points. The teeth of the wheel which acts upon it are therefore formed with the epicycloid curve described by a point in a generating circle which is *equal* in diameter to the pitch circle of the pinion, rolled around the pitch circle of the wheel in the manner already fully described. A well-made lantern pinion has its pins free to revolve on pivots, or portions of smaller diameter, at their ends, thus constituting a sort of friction rollers; and it really affords a closer approximation to a true anti-friction gearing than a solid pinion with radial flanks to the leaves. But the holes in which the ends of the pins turn soon wear, and the pins get out of position, distorting the pinion. Fig. 49 shows such a gearing. *A* is the base circle, *B* the generating circle, or pitch circle of the pinion, *b*, *b*, the pins or leaves of the pinion. The addenda of the teeth show the epicycloid curve formed by rolling the generating circle on the pitch circle of the wheel, in each direction. The form of the flanks of the teeth is immaterial, as the pinion pins can never touch them, except in case of their pivot holes being worn. This form of gearing, although unsuitable for watches, is much used in clocks, and some makers show a lamentable ignorance of the principles which should govern its construction, making the ends of the teeth almost square, having the corners barely rounded off a little. An inspection of Fig. 49 will show the evil effects of such a shape, and its wide variation from the proper form.

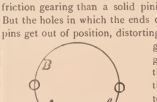


FIG. 49.

(942.) *Epicycloid and Hypocycloid Curves Simultaneously Described by the Same Generating Circle.*—In Fig. 50, *RR* is the wheel or base circle, *XX* the circle of the pinion, with its center at *a*, and *B* is the generating circle with its center at *o*, the three circles being in contact on the line of centers at *O*. If the wheel is revolved, the other two circles are also revolved, each on its own fixed center. The generating circle will roll on the exterior of *RR* and on the interior of *XX*, and its scribing point will at the same time describe an epicycloid curve on the circle *RR*, and a hypocycloid within the circle *B*. As we have made our generating circle ½ the diameter of *B*, the hypocycloid will be a radial or diametrical line. Then supposing the points *N*, *b* and *r* to have originally been in contact at *O*, and the circles revolved without slipping till reaching their present positions, the scribing point will have described the epicycloid curve *N b*, and the hypocycloid *r b*. As both were marked by the same point,

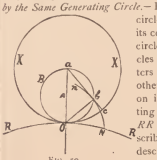


FIG. 50.

they must have been in contact at the scribing point in every position of the generating circle, as they are now in contact at *b*. A line drawn from the point of contact to *O*, where the three circles touch, will be perpendicular to the radial line *c b a*, and also to the curve *N b*, at the point *b*, in that position ; and the radius will be a tangent to the curve at that point. A tooth whose addendum is shaped in a curve so formed, will be adapted to drive a radial pinion flank with uniform force and velocity.

(943.) Another illustration is found in Fig. 51, where only one half of the generating circle is shown, at *a b r s t u O*. Supposing the points *N* and *c* on the pitch circles and *b* on the generating circles to have been placed together at *O*, when they reached the positions as shown the two curves would have been marked as before stated. If *r* had been the generating point, and the points *r*, 1, and r^1 touched on *O* at the start, there would have been drawn the same form of curves as before, but the epicycloid starting from 1^1, and the hypocycloid from 1, and a point at r^1 on the former would touch the radius 1*a* at *r*. So if we suppose 5 generating points at equal distances apart on the generating circle, there would be drawn 5 radial lines starting from *c*, 1, 2, 3, and 4, and 5 similar curves starting from *N*, 1^1, 2^1, 3^1, 4^1, each pair of which would be in contact at their respective generating points *b*, *r*, *s*, *t*, *u* ; and lines drawn from each such point of contact to *O* (only one of which *S O* is shown), where the three circles touch, will be perpendicular to the respective curves and radii at those points. The importance of this latter fact will be seen hereafter.

Metals and Alloys.

BY THE AUTHOR OF THE "PRACTICAL GOLDWORKER," "SILVERSMITH'S HANDBOOK," ETC.

(*From the British Jeweller and Metalworker.*)

Coloring Gold.—One of the earliest and most common recipes for enriching the surface of high-quality gold, when this mode of finishing jeweler's work became fashionable, used, either in its employment for the purpose of ornamentation in contrast to the former method of bright finishing, or as a destrable mode of altering the naturally pale color of polished gold work, by imparting to it the color of very fine gold. To accomplish the latter purpose, the following chemical salts were employed in various ways, and were found to produce satisfactory and serviceable results, with the quality legally workable at that period:—

Saltpetre	6 ozs.
Alum	3 "
Salt	3 "
Sulphate of zinc	3 "
	15 ozs.

The ingredients are first of all reduced to a fine powder, and well mixed together, in order to procure a thorough union ; a little water is then added, and the whole stirred well together ; the water should be added little by little, well stirring after each addition, care being taken not to make the coloring paste too liquid, which is very objectionable to the process. The paste should be, when properly prepared, of the thickness and consistency of cream. In this state it attaches itself more firmly to the work, the surface of which only it acts upon and deepens ; but always remember, in proportion to the nature and goodness of the gold alloy, *i.e.*, the smaller the amount of base alloy which the article contains, and, still more, the smaller the amount of silver in that base alloy, so will be, in proportion, the depth and richness of color imparted to the work at the close of the process performed.

The work, which is prepared chemically clean by the action of acids upon it, is now taken and dipped into the paste, or otherwise well rubbed over with it, so as to leave no part exposed from the mixture, and subsequently placed upon a clean copper pan (copper being decidedly the best), and heated until all hissing or crackling noise has subsided; in fact, the heat should be continued until the coloring paste has actually become fused to the surface of the work, when it may be withdrawn and plunged into acidulated pickle water, which dissolves the salts, and shows up the high and rich tint of pure gold. If the color is not deep enough the process should be repeated, though it is seldom required but once, if the alloy is right and the gold good in quality.

Such a process as the above is only fit to be employed upon very rich gold, such, for example, as 22 carat gold, if good commercial results are to be accomplished. The film of coloring paste is very thin, and consequently can bestow very little action on the surface of the work. This and similar gold-coloring processes are very often given in scientific periodicals and published books, without a sufficient amount of real practical detail of the facts here laid down, and they are consequently utterly worthless to amateurs and scientific experimentalists, because through having been applied by them to some unsuitable alloy and quality, their labors have resulted in complete failure.

With 22 carat gold the process here described can be accomplished with a very fair amount of success, but with any lower quality the results would, we are quite sure, be very indifferent to that produced by other processes for accomplishing the same object, viz., the enriching and beautifying of the surface of alloyed gold.

To modern processes we shall refer hereafter, our aim being at present to point out the defects of gold work manipulations as acquired from book learning, and to show the advantages which may be derived from their *proper* application, by supplying the necessary information which usually accompanies these recipes as they appear to be copied in the works of unpractical authors, one after another, most of whom never, probably, manipulated a piece of gold work in their whole lives, and whose information, therefore, is most unreliable for the successful practice of an art which requires, more than any other, exact, careful, trustworthy information upon so important a branch as this one of gold coloring.

The above ingredients and proportions, if prepared and mixed together, and then put into a black-lead color pot, and heated until dissolved in their watet of crystalization, will effectually color 20 carat gold, and even 18 carat gold may be colored in this mixture. When the salts are dissolved the mixture will rise up in the pot, and then is the time for the immersion of the work, which must be gently moved about for a minute or so, then withdrawn, and immediately dipped into a pickle of nitric acid and water at nearly the boiling point If the color is not intense enough, the water should be well shaken from the work, and another dip must take place to bring up the purple color, and with 18 carat gold sometimes a third dip is even rendered necessary to raise the color to the desired point of perfection. The rinsing water or pickle may be of the strength of one of acid to twenty of water, and may be made by boiling the water and adding the acid to it. The finishing of the work after any of these methods of coloring may be according to the purpose for which the work is intended. As there are various ways of finishing colored work it will be well to name them. The one in most general use is scratching at the lathe with a circular brass wire brush, upon which runs a mixture of ale and water, producing a slippery substance, which glides over the surface of the work, rendering it bright and smooth, as the revolutions of the brush come in contact with it. Another method is to burnish the work, using suitable tools of steel and agate to accomplish it with. The same mixture as for scratching may be employed to enable the tools to glide easily over the surface, or one of soft soap. Washing the work out with a solution of soap and water, to which is added a little polish, with a soft clean brush, is another method, and each one imparts a rich and different looking surface to the work.

To be continued.)

CHASING.

CHASING and embossing have always formed a very important branch of metal work, and especially in connection with gold and silver. the latter is the artists favorite metal, but gold, bronze, and even iron, have been embossed.

The colossal statue of gold and ivory made by Phidias and Polycletus about 450 years B. C. were richly decorated in this way, as were also armour, goblets, candelabra, etc., etc.

Embossed chasing was brought to a high state of perfection by Benvenuto Cellini, in the sixteenth century. This remarkable man, by his energy and passionate enthusiasm, aided the cause of art in his day, in a manner that has been rarely equalled ; he not only excelled in chasing, but in all branches of metal work, jeweler, silversmith, die sinker, and bronze worker, he was an accomplished artist in each. One of his well-known works, an embossed shield, presented by Francis 1st to Henry 8th of England, is in the possession of Queen Victoria, and the celebrated Cellini cup is in the British Museum, London ; these two, and a richly ornamented salt-cellar in Vienna, are the choicest of his smaller productions.

During the present century, another artist in metal has shown us to what perfection it is possible to bring *repoussé* chasing. Antoine Vechte has been called the Benvenuto Cellini of modern times, and his works have a European reputation, his excellence of tooling and manipulation of the metal, combined with the richness of textures and delicate surfaces produced by him are very remarkable. Some of his principal works are the Bredalbane Vase, the Centaur and Lapetha Vase, A Coupè, entitled Harmony in Olympus, The Genius Shield, A Missle Cover, and a Gold Repoussé Medallion, designed to commemorate the dogma of the immaculate conception, and presented by the Catholic clergy of England and Scotland to Pope Pius IX. That very able art critic, the late Cardinal Wiseman, after writing a description of the medallion, says : "The workmanship was never surpassed even by Cellini himself ; Vechte textures are always wonderful, as rich as his flesh is soft and delicate. Though not affording great opportunities, this medallion exhibits the excellence of the master in these respects ; his extremities have a rare finish and free articulation now very uncommon, and down to a lock of hair upon a cherub's head there is the same minute care and attention to natural details. The flowers and embroidery on our Lady's robe, by the finest touch of Vechte's magic graver, are made most clean and distinct, without prominence, overcrowding, or interfering with greater effects. We believe that the artist himself considered this the masterpiece of his unrivalled glyptic genius." His works undoubtedly are what all costly plate ought to be, fine works of art, and rank equally high with the choicest productions of painter and sculptor.

Chasing may be classified into three parts—embossed or *repoussé* work, cast, and flat chasing. The process of embossing or *repoussé* work consists of hammering up a given design from a flat surface, the masses being formed or modelled direct in the metal, and the various textures afterwards applied. Cast chasing is the method of applying the finishing textures to a subject already modelled and cast. Flat chasing consists of an indented outline of the subject drawn.

To explain more comprehensively the process of *repoussé* work, we will presume the piece to be embossed is a vase. Having selected a suitable form, and arranged the design, say a festoon of flowers, which is drawn on the silver and afterwards marked with a steel point to prevent the drawing from becoming obliterated by the hand, the vase is then placed on the snarling iron, in the exact position required, and a blow struck upon it, the workman at the same time pressing the vase down, when the spring of the iron striking against the silver will produce a bruise, or in other words, raise that part of the vase which is to form the flowers from the ground ; this process is repeated until the whole of the design is raised or snarled up, and it presents the appearance of a bruised and battered piece of work. The snarling process completed, the article must be filled with a composition of pitch and plaster of Paris, or mason's dust, melted together, and poured in whilst in a liquid state ; when this has become cool and hardened, the vase is ready to commence chasing.

In massing out the work, the chaser commences by hammering down any part that may too high in relief, the flowers are then marked round with a blunt tracer, and the leaves and other details formed, the ground hammered down so as to give higher relief to the whole if required ; a rough surface tool is generally prefered in this part of embossing, as it is really modelling in silver direct, instead of a softer material,

As soon as the massing or modelling is completed, the workman can finish as he proceeds, each particular flower is given a different texture, the stems varying from the leaves, and each presenting a surface that is distinct from the flowers, so that a great variety of color and light and shade is produced on the work.

The ground should be matted if a flat surface is desirable, or marked with various punches that suits the design ; each chaser is governed entirely by his own taste in the method he adopts to produce the desired effects.

When the subject to be embossed is a draped figure, the chaser gives a different texture to the drapery than to the flesh and surrounding surfaces ; these effect are produced in various ways, sometimes with a punch having marks across the face thus (), and others can be obtained with the same tool when held in different positions, and it can be again varied by the force of the blow from the hammer.

The riffle is a very important tool, being largely employed in finishing ; some chasers use it very dexterously, and produce a number of fine effects and textures with it, especially on bronze and silver cast work ; it is also very useful to remove any roughness that may appear on the metal.

The great difficulty to contend with in embossing is the management of the metal; the snarling up must in all cases be lower in relief than the work is intended to be when finished, because, as the work proceeds, the hammering causes the metal to expand and rise, and if the relief as a whole becomes too high, it is utterly impossible to hammer it back, and should the chaser attempt to do so, the vase will spread out of shape beyond the power of the silversmith to remedy.

Vechte's works afford an excellent illustration of the foregoing, the wonderfully high relief of the Genius Shield, and the beautifully low relief of Harmony in Olmpus, show a complete command over the metal; the contrast between these two is great, and the skill required to work the metal as he has done in both cases, is sufficient proof of his remarkable ability as a *repoussé*ur.

All who are acquainted with the process of modelling know that to produce a good general effect, requires considerable knowledge and practice, but when the material expands, as it is worked, there is great difficulties in keeping a uniform relief, and it can only be accomplished by slow degrees This troublesome expansion of the metal seriously interferes with the modelling and drawing of the design, and it requires the most watchful care in working, otherwise, the design may become distorted and the drawing lost, almost before the chaser is aware, and the metal become so stretched that it will be impossible to keep it in the required shape. It often happens in this

way that the whole of the work must be bolder than was originally intended. In arranging a group of figures to be embossed, the designer should endeavour to bring them together, or so connect his composition with draperies or accessories of some sort that the metal has no unnecessary strain upon it; it is better to avoid any sudden or pronounced relief, but gradually approach the higher parts by these assistant accessories, or if the embossing is an arrangement of flowers, the chaser can snarl up the whole of the flowers in one mass and set down the ground around them, thus obtaining a good relief, and he can then work out the details and secure any contrasts of light and shade that suits his fancy.

No method of decoration for silverware has such a distinct character as chasing, it was always recognised and sought after by the ancients as representing the highest standard of art decoration in metal; it has stood the test of centuries, and although in modern times a great number of other methods of ornamentation have been introduced, with a view of superceding it, none have proved equal to it for durability and beauty.

A well finished piece of work always represents a certain amount of thought, and is clearly the work of mind as well as hand. An embosser to become successful, must faithfully and thoroughly study drawing, it being as necessary to his education as to that of a painter or sculptor, for unless the chaser can follow the drawing of his work from stage to stage, it is utterly impossible for him to keep a proper control over the metal. *Repoussé* chasing is undoubtedly the poetic method of metal decoration, and certainly should rank very high in the estimation of patrons of the arts.

By this process, each and every article can have a new design, or if the same is repeated, there will be just that difference of mind and hand passing over the work, suggesting some little fancy that will add to its value, the turn of a leaf, or a little extra light and shade here, or more color there, without interfering with the general grouping of the masses, will stamp it with an individuality that cannot be produced by a machine.

Fine *repoussé* work is as far above and removed from common chasing as a fine painting is superior to a chromo, but those who can afford to decorate their walls with the highest efforts of the painter's art will, it is only reasonable to suppose, equally extend their patronage to the artists in metal.

Cast chasing is the method of applying the finishing textures to a subject already modelled and cast, and assuming the work is a figure, and it has been cast hollow, the chaser first fills it with the composition of pitch, etc., and in some cases securely imbeds it upon an iron block also filled with pitch and stone to form a solid bed, he then chisels off or sets down the rough pieces or burr, and any seams that result from the casting; when he has thoroughly gone over the whole of the figure in this manner, he then rifles his work or uses a scraper to get a perfectly smooth surface, when it is ready to finish; he will then give to the hair a texture that is appropriate, and the drapery another, perhaps finishing this part with a riffle—the great variety of finishing effects produced by this one tool is surprising—when the flesh textures are added, and afterwards the whole is rubbed with a cork dipped in a little oil and powdered rotten stone; some artificers obtain flesh textures with a wheel tool; the skilled workman uses every means to obtain diversity of color and variety of finishing effects in his work.

The chaser, in commencing, almost invariably tools the metal all over, which gives it a very rough and chopped appearance; great care must be taken not to spread the metal, but by this means the pores of the surface are brought close together, and effectually closes up any little sand holes that may exist in the casting; some are very imperfect in this respect, and will give the chaser considerable trouble. Embossed chasing has an advantage over cast work in this particular, the grains or pores of the metal is thoroughly kneaded together by the continual hammering, and never at any time has the porous look that sometimes exists in cast metal work.

Flat chasing is another method of ornamentation that has not been used as extensively as it might be, especially as the effects to be produced by it are quite rapidly obtained, making it an inexpensive process; it is an extremely simple style of chasing, and very very effective. Having drawn the design on the vase, it is filled with the usual composition of pitch, the chaser then marks or traces on the design already drawn with a blunt tracer, or a sharper one if the design requires it; when this is completed, the ground is set down slightly here and there, and with a worn matting tool various parts are worked over very much in the same manner that a modelling stick is used; there should be no attempt to remove or efface the tool marks; on the contrary, they should be carefully preserved. The thickness of the outline must be governed entirely by the character of the design, but all subjects should be drawn in a bold, broad manner, and the marking with the tracer should be executed with the same vigorous spirit, and a pleasing effect will always be insured.

In London this style of work is in much greater demand than in the American market; it has a very pleasing character, quite distinct from the other styles of chasing, that no doubt it would eagerly be sought after if it were only better known. A very agreeable variation could also be produced by filling the tracery of the design with a Niello composition, that will give a strong and pronounced outline, but even without this filling process the introduction of matting will give all the color and light and shade that is requisite.

Main Spring Barrels.

ARGUMENT ON THE MERITS AND DEFECTS OF THE DOUBLE-BRIDGED OR BOTTOM-SUPPORTED AND SINGLE-BRIDGED OR HANGING MAIN SPRING BARRELS IN HORIZONTAL AND OTHER KINDS OF SWISS WATCHES WITHOUT A FUZEE.

Continued from Page 196, Vol. X.

T. D. I find the principal difference in the two systems not in the support of the *mainspring barrels*, but in the support of the *arbors*. Both kinds of barrels find their support in the pivot holes, which hold the ends of the axis. The axis is the part around which the barrel turns, and terminates on the outside of the pivot holes. Whether the square of the ratchet of the winding, which forms the axis of the barrel, is made of one solid piece is quite indifferent. I find it inexplicitly expressed to call the solid piece of steel work consisting of the square and ratchet, the axis of the barrel, and when the support of the *barrel* is mentioned, the support of the *arbor* is meant. To call a hanging balance *unsupported*, could be understood only if the recess for the stopfinger would be turned out to such a depth that the piece falls entirely out, and the pivot enters quite free. I experienced in course of repairing, generally more trouble with the double-bridged than with the hanging barrel. I never found one of the enumerated faults when the hanging barrel was properly made, but have on the contrary, generally found in ordinary watches with the double-bridged barrel, the pivots of the arbor with more or less shake, and had often to bush the holes and repair the winding part. In manufacturing the making of an arbor with a ratchet may, perhaps, cost a trifle more, yet the difference in the amount cannot be of any importance as we find them in the cheapest watches, and pay no more than for the others.

In repairing it does not often happen to replace an arbor, and I doubt whether the extra work of fitting an arbor with a ratchet will overbalance the extra work of the repairs with the barrel between two bridges, and as the decision of some watchmakers is based merely on their own personal experience, it cannot be considered an authority for setting up a rule.

F. K. K. Without commenting on the expressed opinion on the subject, I think it as the best to employ a "double-bridged or hanging barrels" where best adapted, and found to be most practically applied. Common sense will teach that a barrel between two bridges is best adapted for a so-called "Boston Lever," or any three-quarter plate watch, whilst a hanging barrel is the proper one for a flat watch, and I think repairers would not have great praise for watches with doubled-bridged barrels, manufactured on a large scale. The advantage derived from the simple way of replacing a ratchet wheel diminishes greatly through the faults of the system, if properly taken in due consideration. The winding and safety of the hanging barrel is of almost unlimited duration, if the examining of the watch had been effected with due attention. How often do we find beautiful watch dials cracked from winding watches with barrels between two bridges, when the lower bridge is that thin as not to be able to sufficiently withstand the pressure of winding. It will consequently be best to employ the double-bridged barrels in high built and keyless, and the hanging barrels in flat or in such watches as adapted for the construction.

Graham, the renowned London watchmaker, *invented* the horizontal escapement about the year 1720, but derived very little benefit from it by not giving it a thought to improve the shape and size of his watches so constructed, and consequently being but little favor with the public, and the watchmakers of his time were too accustomed to the verge watches, to fully appreciate the importance of the new escapement; but Berthoud, the celebrated Parisian watchmaker, acquired great distinction by *applying* Graham's invention to his ship chronometers; yet Lepine, another skillful Parisian watchmaker, who *adopted* Graham's invention and at the same time gave his watches the greatly appreciated flat shape, realized a fortune, which secured to his heirs the respectable sum of 40,000 francs yer annum.—*Extracts from French Horological Literature, by H. Bush, Hull.*

Practical Experiments in Magnetism, with Special Reference to the Demagnitization of Watches.—No. 4.

BY ALFRED MAYER.

On the Magnetization and Demagnetization of Steel.—To understand thoroughly our process for taking the magnetism out of a watch one must be in possession of certain facts which have been discovered about the magnetization and demagnetization of steel. These facts I will now give:

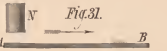


Fig. 31.

Let A B, Fig. 31, represent a piece of steel laid on the table. N is the north pole of a bar magnet, which is held vertically over the end, A, of the piece of steel. Bring the end, N, of the magnet to touch the end, A, of the steel and slide the magnet over the steel, in the direction of the arrow, to the end, B. Slide it off the end, B, and lifting it in the air, again bring N down on A, and repeat the operation. Even after one stroke of the magnet on the steel, the latter will be found to have received a charge of magnetism, which generally increases in strength up to a certain number of strokes of the magnet; after which further strokes of the magnet have no effect in increasing the magnetic charge in the steel. On now taking the steel, A B, to the magnetometer and resting its magnetic condition, as has already been explained in Figs. 7 and 10, you will find that the end, B, of the piece of steel is of S. magnetic polarity. If the bar magnet, N, strokes the steel from B to A, then B will be found of S. magnetic polarity. In other words, it is a general law that the end of the piece of steel *toward* which the magnet slides is of the opposite polarity to that of the end of the magnet which stroked the steel.

It is, however, not necessary for the magnetization of the steel that the magnet should rest on it while it glides over it. If the magnet be strong enough and if the steel be not too hard, the latter may be magnetized by passing the magnet along the length of the needle and at some distance above it, as shown in Fig 31.

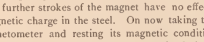


Fig. 32.

Let N, in Fig. 32, stand for the N. end of a magnet, while A B is a piece of steel which has been brought near to the end, N, of the magnet. If the magnet be strong and the steel of the quality of sewing needle steel, that is, not too hard, you will find on testing the steel A B at the magnetometer, that the end, A, which faced the north end of the magnet is of south polarity, while the end, B, is of north polarity. If the piece of steel, A B, had been brought near the south end of the magnet, instead of the north end, then you would have found that the end of the steel which had been nearest the south end of the magnet was of north polarity. In other words, when a steel rod is brought near a magnet it is magnetized, and the end of the steel rod nearest the magnet is of a polarity opposite to that of the end of the magnet toward which the rod points.

If, instead of holding the steel rod at a distance from the magnet, we bring it to touch its end, then the magnetic charge given to the steel will be greater than in the former experiment

Fig. 36.

The polarity given to the end of the steel which touches the magnet is always opposite to that end of the magnet touched.

So much for the magnetization of the steel rod. Its demagnetization consists in taking the magnetism out of it, and is effected by operations similar to those just described in magnetization. These processes we had better describe by the aid of Figs. 31 and 32.

In Fig. 31, let A B be a magnetized rod of steel, with its north pole at A, its south pole at B. We have found out that this pole was magnetized, with its poles as just described, by stroking it from A towards B with the north pole of the magnet, N. The reverse direction of stroking will demagnetize it, that is, if the north end of the magnet be drawn over A B, from B toward A, then the magnetism will disappear from the rod, A B; and if the operation be repeated after the magnetism has disappeared, we will even remagnetize the rod; but this remagnetization will place its north pole at B, and its south pole at A.

It is not necessary, however, that the magnet should touch the steel rod during the operation of demagnetization. It is sufficient, if the magnet be powerful, to pass it over the steel rod at a distance above it and in a direction always opposite to that in which the magnet moved when it magnetized the rod.

In Fig. 32, let A B be a magnetized rod of steel, having its south pole at A and its north pole at B. This condition of magnetism has been given to it by the presence of the north pole of the magnet, N. Now, if we take away the magnet, N, and bring up to the bar, A B, the south pole of the magnet, we will find that the rod, A B, will be demagnetized. If the rod, A B, be of very hard steel, and the magnet not very powerful, it may be necessary for the magnet actually to touch the rod, A B, in order to demagnetize it.

Here it is in order to describe more explicitly the operation of demagnetization. To demagnetize a rod does not require as strong a magnetic action as that which was required to give the rod its present magnetic charge. So, in performing the operations of demagnetization, we should be careful not to give too many reverse strokes to the rod nor to approach it too near to the demagnetizing magnet. It is better to pass the magnet over the magnetized rod at a short distance above it, and after such operation to test its gradually falling magnetic charge at the magnetometer. The critical point is when this residual charge becomes small; for then the danger is that you will not only demagnetize the rod by the next operation but will actually remagnetize it, with, of course, its poles reversed.

In the course of my experiments on the demagnetism of watches I made a series of novel experiments on the demagnetization of steel rods placed at right angles to the demagnetizing magnet. The steel subjected to experiment was of the hardness of that of sewing needles. These experiments explain some curious facts in our mode of demagnetizing watches, and therefore form a natural introduction to the practice of our process.

The rods of steel on which these experiments in demagnetization were made were formed of pieces of No. 1 sewing needles. The points and eyes of the needles were broken off, thus leaving rods of about two and one-eighth inches long. The rat-tail file magnet was used for the demagnetizing magnet.

The manner of experimenting was as follows: The needle was magnetized by stroking it repeatedly with the end of the magnet

It was then placed pointing toward the center of the magnetometer needle and at right angles to the magnetic meridian. In this position the needle produced a certain angular deflection in the needle of the magnetometer. The needle was now placed in an upright position, as shown at *n s* in Fig. 33. The demagnetizing magnet, N S, was mounted on a block which slid between guides, so that the magnet, N S, could be gradually brought up to the needle, *n s*, and during all the time of its approach the axis of the magnet, N S, pointed toward the center of and at right angles to the needle, *n s*. The approach of the magnet to the needle in these circumstances was found to have lowered the magnetic charge of the needle, and this took place evenwhen the greatest care had been taken to have the magnetic axis of the demagnetizing magnet at right angles to the *magnetic center* of the needle, *n s*. The following table will show the manner in which the magnet, N S, demagnetizes *n s* when the former approaches the latter.

After the needle was magnetized it deflected the magnetometer							22
After the magnet had been placed ½ inch from needle							18°
"	"	"	"	¼	"	"	18°
"	"	"	"	⅛	"	"	15½°
"	"	"	"	1-16	"	"	12°
"	"	"	"	1-16	"	"	12°

Examining the above record of the experiments it will be seen that the approach of the magnet to one-quarter of an inch of the center of the needle brought down its magnet charge from 22° to 18°, and that a repetition of this experiment had no further effect in demagnetizing the needle. The same is observed on the repetition of the experiment when the magnet was placed at one-eighth and one-sixteenth inch from the needle. The total effect on the needle of the presence of the magnet at one-sixteenth inch from its center was to lower the needle's effect, on the magnetometer from 22° to 18° of deflection. Of course it will be understood that in any one series of experiments the end of the needle was always placed at the same distance from the center of the magnetometer needle.

In another series of experiments the needle had its magnetic charge lowered from 61° to 35° deflection on the magnetometer.

The reader will be careful to observe that I have stated that in these experiments I took every care to have the magnetic axis of the demagnetizing magnet at right angles to the magnetic center (or equator) of the needle. If this could be really done it might be a question whether the magnet would have any effect on the needle. Yet, all of our experiments show that it *always* has an effect of demagnetization. For a long time it has been known that for the demagnetization of a magnet it requires a far weaker magnetic action than that of the magnet which gave it its magnetism; now, when the magnet is at right angles to the needle, as in Fig. 33, the north pole, N, of the magnet acts *equally* on the two poles of the needle, *n s*. It tends to repel the magnetism in *n* and hold that in *s*. It may be that the freeing power of N on the needle is greater than its holding power. It is also here to be stated that, in a long series of experiments made exactly as described above, only with the demagnetizing magnet two feet long and the needles one quarter inch thick and six inches long, and hardened to the greatest degree possible before magnetizing them, this large magnet had no effect whatever on these *intensely hard needles*, though every care was taken to get the magnetic axis of the demagnetizing magnet truly at right angles to the axis of the needles and pointing towards their centers.

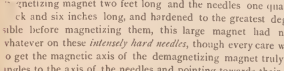


Fig. 33.

We will now describe another series of experiments in demagnetization in which the needle is *rotated* before the pole of a magnet, with the center of the needle on a line in the prolongation of the axis of the magnet.

In Fig. 34, N S is the demagnetizing magnet, and *n s* is the needle operated on. The following descriptions of one of the series of experiments will give an accurate idea of all of those made.

The center of the needle, *n s*, was one inch and three-quarters from the end of the magnet, N S. After the needle had been magnetized it was placed opposite the magnetometer, and caused a deflection of 61° in its needle. The needle was now placed in a vertical position at right angles to the magnet, N S, and with its center one inch and three-quarters distant from the end, N, of the magnet. The needle was now turned around its center so that its south pole went through 90°, and approached the north pole, N, of the magnet. The magnet was now removed and the needle tested at the magnetometer. As might have been expected it produced the same deflection of 61° as it did before the experiment. The needle was again placed in its old position, the magnet brought to the same distance from its center, and the needle again rotated before the magnet: but this time the north pole of the needle turned round 90° towards the north pole of the demagnetizing magnet. After this operation the needle had had its magnetic charge lowered so that it now only produced a deflection of 32.5° in the magnetometer. A repetition of the experiment brought down its magnetic charge to 30°. A third experiment brought it to 27°, while after the fourth experiment its deflection on the magnetometer needle amounted to only 16°. Further experiments had no effect in reducing the magnetic charge. It should have been mentioned above that in all these experiments the needle was really oscillated around its center before the magnet; that is, its *south* pole was always brought before the magnet (this tended to magnetize the needle); then its north pole was brought before the magnet (this tended to demagnetize the needle); then the needle's south pole was again brought before the magnet, and the experiment terminated. Thus we see that the magnet first tended to magnetize the needle, then to demagnetize it, and lastly to magnetize it. Notwithstanding that the needle was subjected to a magnetizing influence from the magnet after its demagnetization it had its magnetism lowered, so much less magnetic force being required to demagnetize than to magnetize a magnet.

In the following series of experiments the needle was placed as in the preceding experiments, and it was rotated through a whole revolution before the pole of the magnet instead of through only a half revolution as in the preceding experiments. Before an experiment was made on the needle it deflected the magnetometer needle 51°. The needle was now rotated before the magnet through a whole revolution, its south pole approaching first the magnet, then passing it and turning over the circumference of the circle till it had made an entire revolution and had come back again to its first position at *s*, in Fig. 34. After the first revolution the needle was demagnetized so that its effect in deflecting the magnetometer needle was only 9°, instead of 51°, the deflection which it caused before it was rotated before the magnet. The whole of this demagnetization was caused by the passage of the north pole of the needle across the N. end of the magnet, N. The passage of the *s*. pole of the needle athwart the N. pole of the magnet could have had no other effect than to magnetize it.

A second rotation similar to the above reduced the deflecting power of the needle on the magnetometer to 5°. A third experiment brought it down to 4°; after which no further rotation had any effect in reducing the magnetic charge of the needle.

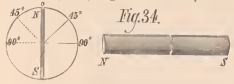
ON THE DEMAGNETIZATION OF WATCHES.

The reader who has made for himself the magnetic experiments, which we have so minutely described, or who has even read the accounts we have here given of them, will have no difficulty in seeing the reasons for the various operations which I will now describe in giving an account of the way to take the magnetism out of a watch.

A watch is formed of a case of gold or silver, and glass inclosing brass or nickel plates, between which are a number of steel arbors forming the axles and pinions of the brass wheels. There is also the

spring of steel which uncoils itself in the plane of the watch. The older watches have in addition a steel chain which uncoils from the fuzee on to a brass barrel inclosing the mainspring. The hairspring, parts of the balance wheel escapement, stem winding apparatus, etc., are also of steel. So we see that there is abundance of material for magnetization in a watch. Fortunately, these parts are formed of steel, which is only moderately hard, and, therefore, as we have already seen, easy to demagnetize.

Of these various parts some have their lengths at right angles to the plane of the watch, like the arbors; others, like the main and balance wheel springs and the nickel (nickel takes a magnetic charge like steel or iron, only feebler) plates inclosing the movements, have their greatest dimension in the plane of the watch. The position of these bodies determines to a great extent the directions of their magnetic axis. By magnet axis we mean an imaginary line joining the two poles of a magnet. The arbors will have their magnetic axis in the direction of their lengths, where as plates are most likely to have theirs in the direction of one of their diameters. But we have already seen that no matter in what direction their magnetic axis are in the watch, all of these bodies (thanks to the facts already shown in our experiments) may be demagnetized *by properly oscillating the watch before the pole of a magnet.* How this is to be done I will now show, and in order to shorten what might otherwise be a long story, I will give an account of the process by describing the experiments actually made in the course of demagnetizing an old Tobias fuzee watch, which I saturated with magnetism by deliberately placing it on one of the poles of the large magnet of my laboratory in the Stevens Institute of Technology, and thus purposely obtained a very badly magnetized watch to practice a cure on.



The watch is placed quite close to the magnetometer, and with the center of the thickness of the watch about on a level with the center of the needle of the magnetometer, and with the line, connecting the center of the watch, C, Fig. 35, and the center, *c*, of the needle, at right angles to the magnetic meridian; in other words, at right angles to the direction which the needle has when no magnetic body is near it. The watch is then turned slowly around on its center as an axis, and each hour on its dial is in succession brought opposite to the center, *c*, of the magnetic needle of the magnetometer.

The following were the results of such experiments on our magnetized watch. We give them in the form of a table: N. and S. indicate the kind of magnetic polarity at each hour, and the angles show the effect in angular deflection on bringing that hour of the dial opposite the center of the magnetometer needle:

TABLE I.

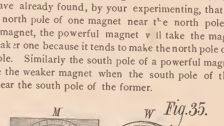
Hour.	Ang. of Deflection of Magnetometer.	Kind of Magnetism.
XII.	20°	N.
I.	5°	N.
II.	18°	S.
III.	72°	S.
IV.	56°	S.
V.	22°	S.
VI.	5°	N.
VII.	17°	N.
VIII.	16°	N.
IX.	16°	N.
X.	20°	N.
XI.	24°	N.

When the hour III. was brought opposite the magnetometer needle the fuzee axle and the center of the semi-circular steel catch of the inner cover of the works were presented to the magnetometer. The strong south magnetism of hour III. was due to the magnetization of these bodies, which deflected the needle of the magnetometer 72°. The strong north magnetic action of hour XI. was due to the magnetized mainspring.

We may now regard this watch as a magnet, having the form of a disk, and with its north magnetic pole at the hour XI. and with its south pole at III. o'clock.

This being the information given by our magnetometer, we are in possession of facts which enable us to take the north magnetism out of eleven o'clock and the south magnetism out of three o'clock.

You have already found, by your experimenting, that when you bring the north pole of one magnet near the north pole of a more powerful magnet, the powerful magnet will take the magnetism out of the weaker one because it tends to make the north pole of the latter a south pole. Similarly the south pole of a powerful magnet will demagnetize the weaker magnet when the south pole of the latter is brought near the south pole of the former.



You have also found out by your experiments that when a small magnet, made of steel not to hard, is vibrated around its center in front of the pole of a powerful magnet, the small magnet is demagnetized. These facts show how we must proceed in the demagnetization of the watch.

The hour XI. is of the strongest north magnetism of any on the dial; therefore, we place this hour opposite the north pole of our rat-tail file magnet, as shown in Fig. 26. The center of the watch, C, is placed so that the prolongation of the axis of the magnet (shown by the dotted line, X X) passes through it. The watch is now vibrated round an axis passing through C and at right angles to X X. By this operation the watch is successively brought into the positions, A and B, of Fig. 36. After several vibrations of the watch before the north pole of the magnet, I turned the hour III, of strong south polarity, opposite the south pole of the magnet, and vibrated the watch as in the previous experiment. By these vibrations the watch cuts across the lines of magnetic force, and, as we have seen, any magnetism in it is thus taken out. After these operations performed on the hours XI. and III., the watch was again examined before the magnetometer, and the following table shows the effects of the vibrations before the magnet:

TABLE II.

Hour.	Ang. of Deflection of Magnetometer.	Kind of Magnetism
XII.	2°	N.
I.	5°	N.
II.	4°	N.
III.	0°	
IV.	5°	S.
V.	8°	S.
VI.	2°	S.
VII.	4°	N.
VIII.	4°	N.
IX.	2°	N.
X.	1°	N.
XI.	0°	

There is certainly a great difference between the magnetometer deflections of Table I. and those of Table II. It is observed at once that the hours III. XI., which were respectively of strong south and north magnetism in Table I., are in Table II. marked 0°.

This result was not attained, however, at one trial, as might be inferred from our description of the experiments, but after each series of vibrations before the pole of the demagnetizing magnet the magnetic condition of hours III. and XI. was tested. Sometimes their magnetism almost disappeared. Then we found it had changed, or rather inverted, so that hour III. had north instead of south polarity, and hour XI. had south instead of north magnetism. When this happened we had to present hour III. before the north pole of the magnet, the hour XI. before the south pole. After repeated trials I succeeded in demagnetizing hours III. and XI. so that they produced no action whatever, or 0°, on the needle of the magnetometer.

I now again brought the watch before the magnet and vibrated its V. o'clock before the south pole till this south magnetism had disappeared; in other words, produced no deflection whatever on the needle of the magnetometer. I then made an examination of the magnetism of the watch before the magnetometer, with the following results:

TABLE III.

Hour.	Ang. of Deflection of Magnetometer.	Kind of Magnetism.
XII.	1°	
I.	0°	
II.	0°	
III.	0°	
IV.	2½°	S.
V.	2°	S.
VI.	2°	N.
VII.	6°	N.
VIII.	3°	N.
IX.	2°	N.
X.	1°	S.
XI.	2½°	S.

I now demagnetized hour VII. of its 6° of north magnetism by vibrating this hour opposite the north pole of the demagnetizing magnet, and after I had succeeded in this I found that no hour on the dial of the watch when presented to the magnetometer caused a deflection of even one degree, so I considered the watch demagnetized; in which conclusion I was justified, for the watch has kept as good time and with about the same rate as it did before it was magnetized. The "accident" to which I referred in the first of these articles happened to a valuable watch made with special care by Lange, of Dresden. It was so strongly magnetized that IV. o'clock on its dial produced a deflection of 83° south magnetism on the needle of the magnetometer, and VII. o'clock a deflection of 40° of north magnetism. This watch I demagnetized exactly as has been described, and after its demagnetization, though it had lost a half hour in three hours when magnetized, it kept a rate even more uniform than before its magnetization. Before its magnetization it lost about one second per day; after its demagnetization it has gained from ¼ to ½ second per day, and has a very uniform rate, indeed, as uniform as one could wish for in a pocket watch subjected to daily vibrations on the railway.

What the Silversmiths are Doing.

In no branch of decorative art is there greater improvement than in that connected with the service of the table. In gold and silver ware the plates, fruit and cake compotiers, ewers, flasks, tipped and two-handled jugs, chalices, perfume bottles, take antique shapes after Indian and Japanese models, uniting exquisite beauty with educating processes. Odd pieces are now introduced of silver closely imitating the beautiful iridescence which is the result of decay, similar in color to the treasures found in the vaults of Kurium. For instance, a Chinese tea caddy of silver darkened by alloys, has one side inlaid by odd dashes and lines of copper; on the other side are a bird, vine and leaves of the same dull copper hue applied. A bowl, gold lined, presents the same appearance of corroded silver, with dull iridescent hues, with a few dark gold leaves applied. A small sugar basket and creamer has the effect of dark hammered copper, with tints of brown and faint iridescence. These have a decoration of dark leaves and fruit of the blackberry vine. A squirrel in copper tints is perched on one side. This style of decoration is not laid on, but inlaid, the design being cut out and the metal set in.

Some of these rarities in silver resemble old Limoges enamel. A small coral scuttle for sugar of hammered silver, darkened and colored by means of different alloys, is decorated with applied work in dull colors with a butterfly and branch. A cake platter is hammered and oxidized, having decoration of a Chinese soldier, a cluster of three yellow gold leaves and crab, and a cock in copper color repousse pecking at grain. A Persian silver jar has the appearance of being corroded and stained bo age. A large water pitcher of satin-finished silver is decorated with cranes pecking at lily-buds, a tall cluster of aquatic plants and a dragon fly, all inserted in different alloys. There are three tints of russet, brown and gray in the cranes. A set of small teaspoons have similar decorations on the handles, each different from the other. A pair of small bon bon plates of yellow hammered gold differ in decoration; one has a graceful vine of blackberries in dark metal repousse, the other represents water in waving lines of gold of greenish tint, clusters of water lillies, a fish and lily-pods; these are in niello work, shaded with black, as fine as the most artistic etching. An exquisite fruit tray of red satin-finished gold is in niello work; the pineapples and grapes in the centre are produced in green and amber tints shaded with black, like an India-ink etching. This rests on a silver napkin with the fibres and pattern of the imitation linen worked out so carefully that the illusion is marvellous until it shows that it is substantial enough to act as a tray, the fringe being closely matted. A four-sided flower-vase of dark hammered gold has on one side a pellow gold dragon in high repousse relief; on the three other sides are foliage, dragon flies, a bird in copper and iron alloy.

A new style of ground decoration on silver is in an elaborate shell pattern; a Persian call bell in this style has a decoration of butterflies and branch in copper repousse. A pair of peppers in similar flat wheat pattern, shows a fly and leaf in copper and iron alloys. All dishes and compotiers have low standards, according to the present custom of serving meats and vegatables from sideboards. Trays take the place of cake baskets, and there are exquisite fruit and bread trays of silver, similar to those used for cake, with mirror-like centres, having borders in repousse; these take mostly long, low, oval shapes. A pair of peppers in Japanese four-sided shape are colored with copper and gold inlay, and decorated with a bird and branch. Epergnes are no longer seen. A vase of Oriental shape, two feet high, has elaborate handles with Eastern designs, with training vines gracefully twisted about them. Alloys in six delicate colors in metals rise from the base in vines and blossoms; the background has a matted gray finish. This costs $1,000.

Dinner and tea services in sets are of purest white silver, elaborate with repousse in high relief, embracing each article necessary for use, and interspersed about the table are plates and trays good enough for the banquet of the gods, which it seems a shame to soil with food of the exquisite odd pieces described. The chasing, chiseling, pouncing and embossing on these beautiful pieces are indescribably graceful. The style most affected is the Damascene work in the incrustation of one metal in another, but the imitation of iridescent decay on silver is the newest and most wonderful. The flower vases, two-handled jars and smaller pieces seem made for the pretty hanging cabinets. The unique bowls, gold lined, can also be used in the way of pastille braziers, billed instead with rose leaves, sandal and violet wood, musky spices and cardamon, and are set upon a pedestal, filling the room with a faint, subtle perfume.

Proceedings of the Horological Club.

A Distinguished Body of Watch and Clock Makers.

Seventieth Discussion.—Communicated by the Secretary.

[Notice.—Correspondents should write all letters intended for the Club separate from any other business matters, and headed "Secretary of the Horological Club." Direct the envelope to D. H. Hopkinson, Esq. *Write only on one side of the paper*, state the points briefly, mail as early as possible; as it must be received here *not later* than two days before the end of the month in order to be discussed and reported in the Circular for the next month.]

EQUALIZING THE POWER OF THE MAINSPRING.

Secretary of the Horological Club:

In my communication of last month, I simply made the broad statement that the force of a spring cannot be equalized in J. H. P.'s manner, and believed that the members of the Club would be best convinced by the model I sent.

Mr. McFuzee admits that a diminution instead of an increase of force is indicated by the spring being attached further from the centre, but still maintains the error made by J. H. P. and others, in contradiction to the fact which, I think, the model conclusively proves. As the error is in violation of natural law, and apt to mislead, even to the attempt to construct a perpetual motion machine on that erroneous principle (which could be accomplished if the principle were correct), I will try to explain and point out how the error is made. I have no doubt that it is reasoned in the way of comparing it with a scale beam weight, which will certainly exert a force proportional to the distance from the resting place of the beam or lever, on the weight at the opposite end of the resting place, and if there was an opposite end to the centre of a mainspring barrel, this lever action could be made use of as a force equalizer; but as a mainspring is wound around a centre, and there is no weight or force to be overcome on the opposite side of the centre (which it does not admit of), this lever action does not exist here, and there is nothing in natural law that will permit us to assume that such action may exist. That there is a diminution of force when the spring is hooked further from the centre, agrees with the condition of less tension the spring is in, in that case. B. F.

Mr. McFuzee, being called upon to maintain his position, admitted the correctness of Mr. F.'s statement about the spring. There could, of course, be no leverage principle about it, when one end was fixed to a stationary arbor. The other end would simply pull, with a certain amount of force, which constituted the motive force, when applied to the wheel. But he held that the leverage principle did come in, in the application of this motive force to driving the going barrel or main wheel. But the lever was in the wheel, not in the spring. If the outside end of the spring would sustain a weight of 4 ounces suspended from it tangentially, then that was the power applied to the lever, to move the watch. The fulcrum of the lever was the arbor on which the wheel turned; the length of the power end of the lever was the distance from the point where the power was applied to the fulcrum, and the length of the other end was the distance from the fulcrum to the tooth which acted on the centre pinion. If this power of 4 ounces was applied at the same distance from the fulcrum, on one side of it, as the tooth was on the other side, the tooth would act on the pinion with a force of 4 ounces. If the power arm was double the length of the other arm of the lever, the tooth would exert twice the power on the pinion, or 8 ounces,—but it would only move half as far as the power end of the lever. If the power arm was only half the length of the other, then the tooth would only have a power of 2 ounces, but it would move twice as far as the power end.

All this could be proved mathematically, showing that the power of the spring exerted a force on the wheel according to the distance from the centre to the hook or point where it was applied. It would be easily understood by supposing a straight lever, with the fulcrum at the middle, the tooth at one end, and the weight or power at the other. But the leverage would be the same whether the two arms were in a straight line, or at a right angle, or any other angles. It would show that the power exerted by the spring on the barrel must depend on the place where the spring was attached to it, provided he spring always pulled in the same direction. The most advantageous direction was at a right angle to the power arm of the lever, like a weight suspended from it,—as if the spring pulled on the hook tangentially, or in the circle of the hook, as he had explained at the November meeting. If the same spring was attached at different distances from the centre, it would not pull in the same direction. If the hook or pin was at one point, the spring would pull in the circle. Then, if the hook was placed further from the centre than the outer coil of the spring, the spring would pull somewhat towards the centre, and the same strength of spring would have less effect on the wheel,—and a greater strength of spring would perhaps have the same effect on the wheel as a less strength would by pulling tangentially.

In concluding, he said he was willing to admit that the leverage principle did not apply to the strength of the spring, but he held that it did govern the effect of the spring on the wheel, and that a spring falling with the same strength would exert a different force on the wheel, according to where it was attached to it and in what direction it pulled on the hook or pin. The spring might lose as much by pulling obliquely, as it gained by being hooked further from the centre, so that its effect on the wheel would be no greater, and might even be less. There could be no perpetual motion machine made by such principle, because in all levers what is gained in power is lost in velocity or space passed through. He thought there was really no disagreement between Mr. F. and himself as to the facts, only in their ways of explaining them.

PROPER AMOUNT OF END SHAKE—WHY GOLD RINGS BLACK THE FINGER—GLASS LATHE COVER.

Secretary of the Horological Club:

I shall be pleased to have your honorable body state how much end-shake the lever, the escape, and balance wheels should have? each one, why it is that 18 k. rings will black some people's fingers and not others?

I sold a lady a ring, and it blacks her finger, and I am sure that it is 18 k., as I have bought of the same house for nine years and believe them to be honest.

I see that Z. W. Earnest states in November number of the Circular how he made a lathe cover.

I made one two months ago, but have made it somewhat differently. I take strips of linen cloth ¾ inch wide and glued all around each piece, then when dry, glued them together, with strips inside as well as outside.

Then I took slats out of a thread case, and glued three of them together. Have the middle one about ⅜ as wide as the two outside pieces. I made four such strips, mitered them, and made a base, then glued it to the glass. By having the middle piece narrower, the glass will fit in betwixt the outside pieces.

Then I took green paint and painted the base and cloth strips inside and out. I have dropped it once about 2½ feet, and it did not break. It struck on the base, however. I also intend to varnish the base and strips of cloth. Coloraio.

Mr. Clerkenwell said that if the parts which work together were all at their proper heights, the jewels in good condition, and the cocks tight, so that they could not change their positions, the usual custom was to give end shake in the escapement equal to the thickness of the pivots. This would give more end shake with large coarse pivots than with fine ones. But there must be always end shake enough to give freedom in all positions.

The reason why the rings blacks the fingers is probably because she perspires easily and the skin is naturally moist. The perspiration of some persons is more acrid and corrosive than others. A damp clammy hand will turn a ring that would not black on a dry skin. If not sure that the rings are 18 k., it would do no harm to test the quality of one of them with the testing needles.

Our correspondent's way of making a lathe cover would certainly insure strength, and it could be made as ornamental as desired.

Mr. O. O. G. writes to say that he had purchased one 8 by 8 by 15 inches, for $3.10, inclusive of packing, from Theodore Schmitz, of this city, but did not know his street or number.

CHANGING THE PENDULUM OF A REGULATOR.

Secretary of Horological Club :

Looking over some old files of the JEWELERS' CIRCULAR, I find, in the controversy about compensation pendulums, November 1877, page 157, the following :

"Can any one conceive a worse abomination than the so-called compensating Swiss gridiron pendulum, etc., etc. And, on the other extreme, a greater fraud than furnishing pendulum frames with glass jars," etc. etc.

Now I wish to give your honorable body my practical experience in this matter. I have one of these Swiss regulators with the so-called gridiron pendulum. I first tried to remedy its bad ways, putting in a new scape wheel and pallets, but found very little improvement. In May, 1876, I sent for a frame and glass jar, as described by Mr. Horologer, and attached it to the old suspension. Soon had it regulated to within 15 seconds a month fast, which rate it kept up until the temperature fell below 60° Fahr., when it commenced gaining rapidly. Here I was puzzled about too much or too little mercury, and resorted to another experiment. The suspension piece being very heavy, I cut off the lower end, and substituted a piece brass (February, 1877). Had it regulated to its old rate of 15 seconds a month, which rate it kept up for twelve months, when I commenced regulating closer, so that for the last twelve months it ran at a regular rate of 5 seconds a month. In the course of observation, I noticed one singular and I believe unheard of coincidence, that from June 12th to July 12th there was at no time a deviation of ¼ second between my regulator, a box chronometer. After that time, without much change in temperature, except storms, the chronometer went astray. I would remark that I have a Bliss Transit to regulate by.. MAX KUNEY.

Mr. Horologer said that Mr. K. showed good judgment in not bothering with the faulty gridiron pendulum, but discarding it and supplying its place with a mercurial compensation. He also seems to have excellent success in rating and adjusting the latter. But his heroic treatment with the suspension piece cannot be recommended for general imitation. In this case, however, it seems to have really been too heavy, and the change was therefore a benefit. If he discovers the cause of the chronometer's vagary, we would be glad to receive particulars.

REMOVING BROKEN SCREWS.

Secretary of Horological Club :

I have sometimes been unable to remove a broken screw from a plate by either unscrewing, drilling, or punching, and have practised the following method where it was in such a place that it would not be very objectionable :

Drill a hole about the size of the broken screw or a little larger, as near the screw as you can, and then with a good punch, by driving towards the hole just drilled, it can be started and removed. Afterwards broach out the hole to get into regular convenient shape, and plug up, drill, and tap for a new screw.

In case of Swiss bridge screws, a very creditable job can be done in a short time, and even if it is noticeable, is better than leaving the bridge without the screw; and, in fine work, it could be finished and gilded if required. I have seen screws that it was impossible to remove in any other way. PINION.

LIGHTER BALANCES AGAIN.

Secretary of Horological Club : . .

At your November meeting, Mr. D. B. speaks of a "lighter balance." In reply, Mr. Isochronal says : "There is a certain proportional thickness and breadth * * * which is found to act most uniformly. * * * Therefore a rim, which is a good deal thinner and lighter, cannot be permitted for any reason." If that is the case, is there not ONLY ONE *right* balance wheel? and if so, how can Marion & Springfield, Ill., and Elgin's be brought to keep correct time? for, by weighing them, each is different from the other. I do not wish to argue the lighter balance, but write just for information.—Yours,

E. Y. D.

Mr. Isochronal replied that the Secretary had not reported him exactly as he meant to say, which was that there was a proper thickness of rim in proportion to the size of the balance, in compensation or expansion balances. A thicker rim would be slow in action, and more liable to "set," by extremes of heat and cold, and a thinner one would have its vagaries, and very often would be entirely reliable. The rim must be strong enough to properly support the screws, and they must be heavy enough to produce the compensation, or the balance cannot be adjusted. The height or breadth of the rim can of course be increased without greatly affecting the manner of its compensating action, and in that way the strength and weight of the balance would be increased. It can also be made narrower, but if too narrow, it will be too weak to properly sustain the screws, the same as if too thin.

There is no particular size or weight of balance which can be considered "best,"—it must be proportioned to the movement it belongs in. But there is a certain proportion between the thickness of the brass and the steel in the rim, and between the thickness of the rim and the size of the balance, which makers consider best. These proportions are not exact and unchangeable, but can be varied within reasonable limits, and are so varied by different makers. These variations, with those in the height of the rim, and the weight of the screws, would make a considerable difference in the weights of balances, even with the same diameters.

What he meant by his remarks at the November meeting was to show that a rim which was "a good deal thinner" than the ordinary proportion could not be permitted, because it could not compensate properly. The balance proposed by D. B. had *two* rims,—a solid steel rim outside, and within it a separate laminated rim for compensating purposes. *Both rims together* were to be much *lighter* than the ordinary balance, which would make the inside rim "a good deal thinner" than that of the common balance,—so thin, in fact, that it would be impossible for it to compensate. The laminated rim must compensate for the effects of heat and cold on the entire balance, if it was to be adjusted,—and it would be doubtful if such a thin rim could carry screws heavy enough to compensate for itself, without the outside rim.

Mr. E. Y. D. of course understands that all this refers only to the capability of balances to *compensate* or be *adjusted for heat and cold.* The ability to "*keep correct time*" depends on the strength of the hair-spring, if the *weight* of the balance is suited to the movement. An uncut balance might have its rim made thick or thin, with indifference, if its weight was correct, but such a balance would not compensate at all. The difference between keeping time or regulating, and compensating for heat and cold, must be kept in mind. Only the latter is concerned in this discussion.

BALANCE STAFF PIVOTS HEADED DOWN—MAINSPRINGS LOSING THEIR TEMPER.

Secretary of the Horological Club :

In Swiss watches, and the cheaper grades of American, I often find the pivots of the balance staff flat on the ends with a sharp kind of burr, as though they had been hammered on the *ends* as in riveting. What causes them to spread and form the burr? Also, I find more mainsprings that have become worthless from loss of temper in the last six month than *ever* before.

Some that have done good service from one to seven years, suddenly became like a strip of tin for elasticity. Will you please explain through the CIRCULAR? and oblige, G. W. S.

Mr. Uhrmacher thought that the burr was really caused by blows on the ends of the pivots. It was well known that American watches would "stand banging," and they received rougher treatment than most other kinds, in the way of thumps, squeezing, falls, etc. The pivots were generally flat on the ends, and closely fitted in their holes, so that a very little "spreading" or heading down would make them tight in the jewels. It hardly seemed possible that they could be hit hard enough to do that, without breaking the cap jewels, but the American end stones were generally quite thick, and so well supported by the sittings that it required a very heavy blow to break them.

It might not always be the case that the pivots were spread by knocks on the end, but he was satisfied that they often were. He recollected one very recent instance, in an American watch which he

had put in thorough repair, including a new balance staff, on the pivots of which he had taken considerably off the corners and rounded up the ends in adjusting. In about three weeks it came back, with the lower pivot tight in its hole, and he found it impossible to pull it out, notwithstanding all his efforts, without completely shattering the jewel pieces, so much had the pivot been spread. The owner insisted that nothing had happened to it, but afterwards remembered that it had fallen "about a foot," but "not enough to hurt it any." He had had several other cases, which convinced him that the pivots were really spread by blows on the ends, or by the balance cock being pressed down upon the staff.

He said he had not noticed any such peculiar failure in mainsprings losing their temper as mentioned by Mr. S. We would be glad to hear if it has also occurred with others.

The following communication was then read by the Secretary, but owing to the lateness of the evening discussion was reserved until the next evening:

You are wrong in supposing that I refer to moss agates when I use the words photographic derivation; I applied that term to solid colored stones. There are large families of colored stones, and while many, and we may say the majority, derive their color from oxides, still I claim that many are of photo derivation. Some fourteen years since, I invested in photo chemicals and instruments—had a dark room, etc., etc. In the dark room I found an old negative, the plate having been exposed and developed, but proving not good—had been laid down. When this negative was found, the glass had changed in spots to a yellow color—a fine topaz color. There was a reason for the change. What was it? That question bothered me, until one day when making a new silver bath, in adding a little iodide of potassium, the mystery was solved, or at least I so accepted it, and have since. Potash enters largely into the manufacture of glass, in the shape of pearlash. The potassium (iodide) which had been added to the bath, having an affinity for that in the glass, was gradually absorbed, producing a yellow color, where so absorbed. If moss agates are (silex) silicates, or of that formation, is it not reasonable to suppose that there is a certain portion of potash of some kind in their construction, as the country where they are found is alkaline. If so, they too may take the *fancied* pictures which they contain by the potash, acting on them as it did on the before mentioned glass, where not covered or shaded from the light. This glass was not of a uniform color; some parts were clear; that I suppose was caused by some resisting power, as the removal of the iodide from the surface by the iron used in developing the picture. This subject to pursue it further, will take too much of your valuable space, and be of but little benefit as other theories are just as plausible. I started with the idea of simply remedying and placing myself right as regards moss agates.

About the comparison of watches which you have given as coming from a correspondent A. It being my production also, I took the words of Mr. J. W. T. as they were, not as they might be construed, viz., Is it possible for a person to compare two American watches together, and tell within half a second how close they are together? This is the question. There is nothing said as to the mode of comparison. Still it may be that J. W. T. intended to be understood as measuring "the difference by the eye." If so, he is pretty nearly correct in his opinion of the impractability of finding it. The eye is not quick enough. As to the manner in which I used the movements together, I would say you have given the *modus operandi*, except that it is not necessary to wait until the beats come together, as you can readily observe, which gains on the other. For instance, the beat is not alike; after a time come together. You have made up your mind which one gains; after they come together; observe how much it has gained in a certain time, say 10 minutes; if in that time it has gained 1 beat, it is either ½ or ⅓ second, as the case may be, depending on the movement. I will say this—that for workmen who have the advantage of regulators, etc., etc., this is not necessary, as the plan given by Excelsior is the one to be used, modified as the user may deem best. But it must be remembered that all watch repairers do not have the regulators, tools, etc., that are necessary and have to get along the best they can. And right here let me add that in many cases when directions are given in repairing, the person who gives his views on how to do the job, does so with a seeming idea that the person he seeks to instruct has a shop full of tools, and is up to the times—while the fact is the poor devil of a watchmaker can't buy—and has no money to pay the dealer for what he has got, owing perhaps to the fact that the aforesaid dealer has sold a bill of goods, of watches, clocks, etc., to the drug-store proprietor, and he undersells the said poor devil, thereby depriving him of the means of payment. I have been there myself. Now my stock of goods is *nil*. I find that repairing is the safe way in hard times to make a living. When wholesale dealers will sell to merchants those goods which should be given only to the jewelry trade, notwithstanding the leagues, they should not expect that things would move along smoothly, and prompt payment be the rule. To give a dog poison and then expect him to live, without some aid or antidote, is absurd.

R. B. FREEMAN.

The Lick Observatory.

PROFESSORS Burnham and Newcomb have decided upon Mount Hamilton as the best site, astronomically, for the proposed Lick Observatory. Mount Hamilton is fourteen miles east by south from San José, Santa Clara County, California. A space of 1,535 acres on the summit of the mountain has been set apart for the observatory. The exact size of the telescope to be used has not yet been determined, and will depend to some extent upon the success of the glass now being made for M. Otto Struve, of Russia. In order to observe the transit of Venus in 1882 the trustees purpose to secure at once a 12 inch refractor, which will become a permanent fixture of the observatory. The buildings necessary to the complete equipment of the observatory are as follows, though, of course, no definite plan has been decided upon: The observatory proper, which will consist of a single building, exteriorly connected with which will be a library, study, computing room and a sleeping room. As essential adjuncts to the chief observatory buildings will be a house for the astronomer in charge, another for his assistants, stables and various outbuildings, and a large building for the accommodation of the general public, which last building will doubtless be rented as a hotel. The formation of the summit of Mount Hamilton is trap rock and porphyry, with croppings of metamorphic slate lifted by later upheavals. At the summit of Observatory Peak a space of 120×260 feet will be graded to a depth of 20 feet. This will afford ample room for the observatory buildings proper, and the other buildings can be placed to advantage on a shelf of the hill lower down. The main observatory buildings will be about 70 feet in diameter. The foundation will be stone and brick, the walls iron and steel. The walls will be 30 feet high and the dome 30 feet additional. There remains much to be done before the design of the donor can be realized; but the trustees have their work well in hand, and it is hoped that next year will see its active prosecution begun.

IN the course of some excavations now going on in the bed of the Rhone, near Geneva, many interesting objects, assigned by archæologists to the age of polished stone, have been brought to light, the most curious of which is a scraper of jade, highly finished, and in a condition as perfect as when it left the hands of the workman. The question arises, the *Times'* correspondent states, and is being warmly discussed by the learned in *lacustrino lore*, how this instrument, made of material which exists in a natural state only in Asia, can have found its way into the Rhone gravel at Geneva. Was jade ever an article of trade between the West and the East in prehistoric times, or is this scraper a solitary specimen brought by Aryan wanderers from the cradle of their race on the Hindoo Koosh? As yet no satisfactory solution of the problem has been suggested.

Horology and Thermometry at Yale College.

YALE COLLEGE has recently made a new departure in the matter of scientific instruction that cannot fail to be of great value to the country. This consists of the addition of a Bureau of Horology and a Bureau of Thermometry, to be conducted in connection with the Winchester observatory, of which Professor Layman is the head. The object of the Horological Bureau is two-fold—to furnish standard time of rigorous exactness to the public, as far as the public wish to avail themselves of it (as for railroads, public buildings and jewelers), and to aid in perfecting all time manufacture notably watches, by providing the means for rating watches, clocks, and chronometers with a high degree of accuracy. The public value and appreciation of a standard time service are attested by several already in operation. The most perfect of these in the quality of its work is that under the direction of the Harvard Observatory, which aided by the finest observations from the best instruments in maintaining the accuracy of its standard clock, sends from this the time by telegraph to all jewelers and many public buildings in Boston, indicates true noon to Boston by a time ball, and more than all, records particular beats of the same clock at every station on nearly 3,000 miles of railroad diverging from Boston as far as Springfield on the west and New Brunswich on the north and east.

The competent management of the Yale time service is guaranteed by the directorship of Dr. Leonard Waldo, who is known to scientists in many departments of astronomy, and who for some years has managed the Cambridge time service. The introduction of systematic tests for timepieces is his own idea, and he comes to New Haven because he can obtain there facilities which the authorities at Cambridge were unwilling to grant. Yale men will be pleased to find an instance in which their college has been willing to take the initiative.

Swiss watch manufacturers have been in the habit of submitting the higher grades of their work to thorough tests at the observatories at Geneva and Neuchatel. These tests consist in recording the daily rate and variations of a watch for a suitable time in various positions and exposed to extremes of temperature. If the performance of the watch is up to a certain grade of excellence, a certificate is issued for it, stating its capacities, and this for the better running pieces much increases their value. Further, it is found that under the operation of this system there has been a yearly improvement in the movements presented for trial. At the Philadelphia Exposition, by the request of the judges, Professor Watson, late of Ann Arbor, undertook such a test of some of the watches exhibited, and published an exhaustive report upon them on which the awarding of prizes was based.

The Waltham Watch Company is about to enter at the Horological Bureau some hundreds of watches for trial. These are deposited in the steel vaults of the New Haven Safe Deposit Company, where by help of a chronograph and telegraphic connection they are daily compared with the standard clock of the Winchester Observatory. An illustration of the conditions under which the watch is rated is as follows:

Dial up—Twelve days at ordinary temperatures; one day in the refrigerator; one day in the oven.

Dial vertical—Fourteen days pendant up; two days pendant right; two days pendant left.

Dial down—Two days.

Dial up—Eight days.

The temperature of the refrigerator is 40° F., and that of the oven 90°. If the daily variation of rate with "dial up" and "pendant up" is not more than 2 seconds per day, or in changing from "dial up" to "dial vertical" is not more than 10 seconds, or for 10° change of temperature is not more than 3 seconds, a certificate will be issued of the first class. In the refrigerator the watch is kept at 40° F., and in the oven at 90°. These tests, extending over more than a month, will furnish an accurate guide to what may be expected of any watch under all possible circumstances, and it is believed that with a knowledge of the system there will grow up a demand for certified watches.

The Horological Bureau begins work with an excellent equipment, including a transit telescope of 4-inch aperture, presented to the college by Dr. William Hillhouse, and of a high degree of optical excellence. A sidereal clock by Bond & Sons, of Boston, may be expected, from its record before it left their hands, to equal the performance of any timepiece in the country. So uniform has been its running that the curve representing its daily rate and variation is found to correspond very closely with the curve of barometric pressure. It is proposed to enclose it in an air-tight case in which an air-pump would maintain a partial vacuum, corresponding, say, to a barometer of twenty-eight inches, thus freeing the pendulum from atmospheric disturbance. There may also be mentioned a mean time clock from Howard & Co., of Boston, a second sedereal clock lent by Dr. Hillhouse, a Clark chronograph for watch comparisons, and a Bond chronograph for observatory work, and a large collection of telegraphic apparatus, much of it especially designed for this work by Mr. Waldo.

Four classes of certificates will be issued. No. 1 certificate to the mean daily rate; mean variation; variation for 1° Farenheit; difference before and after oven and refrigerator; difference between pendant up and dial up; difference between pendant up and pendant right; difference between pendant up and pendant left; difference between dial up and dial down; difference between first and last week; difference between the extremes of rate. This certificate is for the higher grades of watches, and the other certificates correspond to the tests to which the watches are subjected. The establishment of these Scientific Bureaus in connection with the Yale College cannot fail to be of great value to the watchmaking industry of the country.

AT the Industrial Exhibition of Chaux-de-Fonds (canton of Neufcoatel), recently held, a clock was exhibited which is described as a perfect marvel of mechanism. It indicates hours, minutes, seconds, and half seconds, the seven days of the week, with their planets, each day of the month as it comes round, the decades, the twelve months with the signs of the zodiac, the number of days of the respective month, the sun's perihelion, the phases of the moon, the solar system, sunrise and sunset, according to the calendar, the four seasons, the equinoxes, and the solstice. On the number VI. of the dial are two chronometers of different systems, and the pendulum is a barometer. The clock strikes the hours and quarter-hours. After striking the hour it plays a tune, and by means of a mechanism the eight pieces of music which the work contains may be interchanged. The name of the artist workman is Rapin.

Following the attempt to produce minerals and precious stones artificially, comes the attempt to convert one mineral into another—a less costly into a more valued gem. Two Germans have patened a process for converting ordinary agate into onyx. Lorenz and Cullman place the cut and polished agates for a week in a solution of iron in nitric acid only one millimeter deep, and then treat those portions of the stone which are to be white with a solution of equal parts of carbonate and hydrate of potash, dried, and burned in an earthen pot until the desired color is obtained. Cannot some of our readers devise a method for converting ordinary feldspar, orthoclase, into Amazon stone? The latter has a bright, emerald-green color, which is destroyed by heat, but brightened and intensified by certain hydrocarbons, like turpentine oil.

EIGHT thousand trade marks have been registered at the Patent Office, and they have hitherto been regarded as a sufficient protection to the parties interested—but under the decision just announced by the United States Supreme Court, they are null and void, because the Federal law, under which they were issued, is unconstitutional. Another important question is thus opened, which vitally concerns the trade of the country, and especially the manufacturing interest.

Business Notes.

H. Muhr's Sons, of Philadelphia, have opened the Spring trade with a large number of new designs in gold rings (a specialty with them). The trade will doubtless appreciate their efforts.

Ricket's Eye Shade Company has introduced a marked improvement in the manufacture of Eye Shades. They are now producing these goods in morocco, which renders them lighter and more agreeable to the eyes.

An error in the Swift Manufacturing Co.'s advertisement in the November and December number of the CIRCULAR, caused us to style them manufacturers of Jewelers' wood nested mailing boxes. It should have read manufacturers of Jewelers' wood nested and mailing boxes.

Messrs. Simpson, Hall, Miller & Co. have been extending their works at Wallingford, Conn. They have recently added a new wing to their salesroom for the better display of their celebrated wares. They open the spring trade with many new designs, that will doubtless attract the attention of the trade

Some time since we noticed the fact that none of our manufacturers had reproduced the household broom. We find we were mistaken, however, for Mr. Noah Mitchell, among other artistic designs for scarf pins, has made a very beautiful representation of the broom. So that woman's sceptre has not been neglected, as we supposed it had.

The Spencer Optical Manufacturing Company are reaping the reward of their enterprise in the large number of orders they are receiving for their celebrated Celluloid Eye Glass Frames, which have become exceedingly popular throughout the trade. They are receiving orders for these goods from the remotest sections of the United States, as well as from Foreign countries, and these orders, several times duplicated, attest in the most practical manner the excellence of their goods.

Our good friend, Richard Oliver, No. 23 John Street, announces that on receipt of $1 he will forward directions for making McLane's anti-oxydizer, the original solution for preserving the color of gold while being soldered. This solution is used by many of the largest manufactories for protecting gold goods while being passed through the fire, and has given universal satisfaction. Mr. Oliver is an old practical Jeweler, and his representations may be relied upon.

The Duplex Pantascopic Spects is a new and valuable improvement in spectacles. By means of an extra joint on each side of the frame the wearer, when reading, is enabled to turn the glasses so that the line of vision is through the centre of them instead of through the lower part, as in those with fixed frames. This avoids all straining of the eye, and gives great relief to the wearer. These goods are introduced by Albert Lorsch, of No. 37 Maiden Lane, and will, doubtless, become exceedingly popular.

Patents.

Containing notes of all Patents, Designs, Trade Marks, Labels, &c., relating to the trades represented by the CIRCULAR, granted by, or registered in, the Patent Office, since the last issue; and also notes of decisions in the Circuit Courts and the Supreme Court of the United States, which involve new or interesting points of practice on the subject of Patents:

PREPARED BY JOHN P. ADAMS.

Nov. 4. PATENTS.

221,155. Watch-Cases. George K. Colby, Brooklyn, and Robert A. Johnson, New York, N. Y. A watch case having a centre of metal and back and front or bezel of celluloid, or like plastic compound containing pyroxyline as its most important ingredients, etc.

221,179. Ear-Rings. William A. Miller, San Francisco, California.

221,189. Separable Buttons. Charles F. Quinby, Attleborough, Mass.

221,210. Striking Clocks. Dudley W. Bradley, Brooklyn, Assignor to the Seth Thomas Clock Company, N. Y. A marine clock having two hammers adapted to strike in quick succession, so as to strike two blows near together with greater interval between them and the next, etc.

221,213. Clock Pendulums. Hiram Camp, New Haven, Conn., Assignor to the New Haven Clock Company.

221,231. Wallace M. Hedges, Newark, N. J., Assignor to A. J. Hedges & Co., New York, N. Y. The process of manufacturing compound ornamented metallic plate, which consists in mounting pieces of metals or alloys of different colors directly on the back-plate of metal, and rolling down the same into the back-plate to produce thereby a plate having a smooth, uniform, multicolored face, etc.

221,233. Ornamented Chains. Adam Horst, Providence, R. I.

221,310. Clock Movements. Arthur E. Hatchkiss, Cheshire, Conn.

221,331. Clock Escapements. Charles E. Lord, Boston, Mass., Assignor to Henry W. Williams, same place.

221,363. Buttons and Studs. Edwin A. Robinson, Attleborough, Mass.

Nov. 11.

21,490. Clock E-capements. Robert S. Abernethy, Happy Home, N. C.

21,484 Lock-Work for Clocks. Anson L. Atwood, Bristol, Conn., Assignor to E. Ingraham & Co., same place.

21,495. Buttons. Loring W. Barnes, Attleborough, Mass.

221,511. Bracelets. Thomas G. Brown, New York, N. Y. An improvement in locking apparatus.

221,571. Key-Rings. George W. Jopson, Meriden, Conn.

221,606. Watch Regulators. Aloys Platt, New York, N. Y.

Nov. 18.

221,666. Winding Attachments for Watches. Silas H. Cate, Watertown, Mass.

221,715. Pin and Pencil Cases. William Appleton, Providence, R. I., Assignor to Frank T. Pearce and John Hoagland, same place.

221,728. Finger Rings. Charles W. Halsey, San Francisco, Cal.

221,815. Fountain Pens. Charles Henkmann, La Salle, Ill.

Nov. 25.

221,926. Bracelets. Adolph W. Magerhaus, New York, N. Y. On clasp and hinge.

222,009. Call Bells. John W. Butler, New Britain, Assignor to Bradley & Hubbard Manufacturing Company, West Meriden, Conn. The hammer arm is pivoted to the standard within the bell, and a portion projects at the side to serve as a finger piece. Suitable stops are provided to prevent either the hammer or finger piece from interfering with the vibration of the bell.

Nov. 4. DESIGNS.

11,481. Watch Chain Ornaments. Joseph U. Grow, Brooklyn, N. Y. Term 3½ years.

11,495. Breastpin or Similar Article of Jewelry. Hiram S. Somes, Attleborough, Mass. Term 3½ years.

Nov. 11.

11,506. Handles for Table Casters. Albert Hart, Hartford, Conn., Assignor to The William Rogers Manufacturing Company, same place. Term 3½ years.

11,508, Spoon and Fork Handles. Frederick Waterhouse, Walingford, Conn., Assignor to Hall, Elton & Co., same place. Term 3½ years.

Nov. 18.

11,510. Spoon. John M. Calver, Wallingford, Conn., Assignor to Wallace Brothers, same place. Term 3½ years.

11,517. Table Service. Elijah Chetwynd, Hanley, Staffordshire, England, Assignor to Birks Brothers & Leddon, same place. Term 7 years.

11,526. Coffin Plates. Eli H. Eldridge and John H. Eldridge, Taunton, Mass. Term 3½ years.

PATENTS.

Dec. 2.

222,123. Nose Clamps for Eye Glasses. Alonzo C. Blethen, Lynn, Mass. The clamp surrounded by an elastic rubber tube.

222,152. Collar Buttons. Silas J. Allen, Providence, R. I., Assignor to William J. Godfrey. A button composed of two detachable parts.

222,176. Metallic Stock for Bracelets. George H. Boyce, Attleborough, Mass., Assignor to Samuel D. Mason, same place. Strips of metal interlocked spirally and brought into desired form by rolling.

222,228. Buttons or Studs. Robert B. Bassiter, Providence, R. I. Front and back disk detachable.

222,235. Watch Cases. Ambrose Breese, Bellevue, Iowa. The catch spring is so arranged in a recess in the pendant as to prevent dust entering at that point into the movement.

Dec. 9.

222,356. Separable Buttons. August R. Lendner, Washington, D. C.

222,377. Calendar Clocks. Willard L. Bundy, Auburn, N. Y.

222,424. Electro Magnetic Clocks. Charles Shepard, Alexandra Road, St. John's Wood, County of Middlesex, Great Britain.

222,441. Separable Buttons or Studs. Frank P. Barney, Norton, Mass.

222,444. Pitchers. Henry Berry, Huntington, Assignor to the Derby Silver Company, Derby, Conn. The inner receptacle is removable, being secured in position by spring catches. The cover is also removable, carrying with it a flange perforated to form a strainer, and having hinged lid resting on the ledge of the spout.

222,460. Dial Attachments for Stem Winding Watches. Charles P. Corliss, Elgin, Ill., Assignor to the Elgin National Watch Co. To adopt the dial for use either in hunting-case or open-faced watch without any change in the movement.

Dec. 16.

222,657. Stem Winding Attachment for Watches. D. Arro A. Buck, Waterbury, Conn., Assignor to himself and Edward A. Lock, same place. The gearing is changed by means of the rotation of a radial shaft.

222,658. Watch Dial. D. Arro A. Buck, Waterbury, Conn., Assignor to himself and Edward A. Locke, same place.

222,580. Relief Jewelry. Charles Test, New York, N. Y.

222,716. Separable Button. Nathan P. Maker, Providence, R. I.

222,720. Buckle Shield. David Mosman, New Britain, Conn.

222,729. Manufacture of Spoons. James M. Perkins, Meriden, Conn., Assignor to the Charles Parker Company, same place. Cutting blank from sheet metal, bending and shaping handle and bowl, ornamenting handles by dies in which are cut reverse of ornamentation to be produced.

Dec. 23.

222,847. Pen. James P. Wallace, Burlington, Iowa. A gold pen provided with reciprocal cross tongue or rollers.

222,913. Twelve-bells Striker for Clocks. John Kenmuir, St. Joseph, Mo.

222,959. Fountain Pen. William W. Stewart, Brooklyn, N. Y. A wire inserted in the ink chamber of the holder with ends protruding therefrom for the purpose of conducting the bubbles of air which come in through the vent to the upper end of the ink chamber, and facilitating the flow of ink along the discharge passage.

Dec. 30.

223,043. Bracelet. William Hamilton, Jr., Providence, R. I. A device for connecting or disconnecting the two ends of a bracelet or band.

DESIGNS.

Dec. 16.

11,540. Watch Chain Charm. Joseph U. Gerow, Brooklyn, N. Y.

Dec. 23.

11,549. Coffin Handles. William M. Smith, West Meriden, Conn., Assignor to the Meriden Britannia Company, same place.

Trade Gossip.

W. T. Carter has retired from the firm of Carter, Howkins & Sloan.

The serpent bracelet is the latest. It is a kind of beau-a-constrictor.

The Newark jewelry factories, after a two weeks' shut down, are again running full time.

G. Oakland has succeeded William Bruce, deceased, the well-known jeweler of Milwaukee.

Mr. MacTear, of Gleskie, should not forget that diamonds are called the curse of Scotland.

The Iowa State Association of Jewelers will hold its next Convention at Cedar Rapids, Iowa, March 19.

Max Freund, of the firm of Max Freund & Co., sailed for Europe on the 28th of January in the steamer Gallia.

A. C. Haymes, a jeweler doing business at Port Jefferson, is reported to have left town taking with him a his stock of jewelry.

Scarf pins for gentlemen are in many designs. Crescents, horseshoes, owls, etc., are all worn, and everything that is odd is in style.

R. W. White, Jr., formerly with Simpson, Hall, Miller & Co., has entered into a business engagement with the Meriden Silver Plate Company.

"George, where's that diamond ring you promised me?" "My love, I sent you five tons of coal, which MacTear has proven is the same thing."

A fire recently broke out in the establishment of the Western Dynamo Electric Machine Company, Newark. Loss fully covered by insurance.

E. S. Johnson has purchased the building on the southwest corner of Maiden Lane and Nassau streets, and will occupy the ground floor about May 1.

Miller Bros., of this city, have commenced suit in Providence against A. J. Smith and D. Wilcox jointly, for an alleged infringement of their patented designs.

Complaints are reaching us from all parts of the country that the catalogue people of Chicago are again deluging outside dealers with catalogues and price lists.

The firm of Arkell & Co., of Canajoharie, N. Y., has dissolved by mutual consent. The firm, however, will be continued under the same name, Mr. Brown only retiring.

The firm of D. Bruhl has changed to D. & M. Bruhl, admitting M. Paul Bruhl as partner, and giving an interest in the business to Mr. S. Schleim, S. Bass, and L. Lilienthal.

Mr. Schuyler, of the firm of Schuyler, Hartley & Graham, has retired from the firm and from active business. The firm will be conducted in the future under the name of Hartley & Graham.

Professor Doremus was asked if, among his many chemical experiments, he had ever made diamonds, and replied that he had not—that he did not have time. Life is too short for the operation.

C. E. Mason, Mechanical Superintendent of the Springfield Watch Company, has severed his connection with that establishment. He has the reputation of being one of the ablest mechanics in his line in this country.

Mr. C. A. B. Halverson, of Butte City, Montana, has issued a very neat circular directing attention to the "Painless" Ear Piercer, patented by Mulford & Bonnet, which he has used with great success and satisfaction.

A box, containing a valuable diamond necklace, coronet and earrings, has been laying in the vaults of the Bank of England over one hundred years waiting for some one to take it away. The original owner has no use for it now.

A resident of Detroit, Mich., is reported to be the possessor of one of the largest private collections of ancient Roman coins in the United States. He inherited most of them from his grandfather, who was known as one of the most prominent numismatists in this country.

Henry F. Piaget and wife celebrated the fiftieth anniversary of their wedding on the 20th ult. A large number of friends met at the residence of the old horologist in Great Neck, N. J., and warmly congratulated the happy pair who had passed half a century in peaceful wedlock.

The report that the Princess Louise was about to add another jewel to England's crown is unfounded. She went home to see her ma, but has returned to Canada and her loving spouse, the Marquis of Lorne, who is said to have satisfactorily discharged the duties of Governor-General during her absence.

The German Watchmakers' Society was among the sufferers at the recent fire in Turn Hall, where seven lives were lost. They held their meetings in the building, and lost some of their paraphernalia. This is a very useful organization, and we hope it has suffered no permanent injury.

A western jeweler sold out his business sometime since and went to Leadville to make a fortune. After a few months he returned home, minus cash and business. Being asked how he succeeded in the mines he replied that he got rich—rich in experience. He is now looking for another opening in the jewelry business.

F. Barnum's jewelry store at Louisville, Ky., was recently destroyed by fire. Damage to the stock is estimated at $40,000, and to the fixtures $18,000. A safe, containing fine jewelry, diamonds, etc., fell into the cellar, and its contents are supposed to be safe. Risks, aggregating $45,000, are distributed among a dozen different companies.

C. J. Warner alias J. B. Wagner, of the firm of McElvoy & Wagner, Shreveport, La., who some time ago was arrested on an alleged charge of bigamy, has been indicted by the Grand Jury. He is reported to have disposed of his business interests to his partner, and has left the town. Warner, or Wagner, was under $1,500 bail to appear for trial.

Numerous accidents have occurred on the Elevated Railroads in consequence of persons falling between the platform of the station and the car steps. Charles H. Shaw, a jeweler of Troy, N. Y., has patened an invention which, he claims, will remedy this difficulty, and secure safety to passengers. He has been highly complimented by railroad men on his invention, which is declared to be a success.

A new free school for workers in metal was opened January 13 at No. 31 Union Square, under the management of the trustees of the Metropolitan Museum of Art. The object of the school will be to teach carving in wood, engraving on gold, silver, steel and other metals, and learn to design artistically, etc. The establishment of this school is largely due to the efforts of Prof. Thomas Egleston, one of the ablest scientists of this country.

The Pendleton (Ind.) *Republican* prints an amusing article, headed "Scenes in a Jewelry Store." It is excellent, and depicts scenes from life. When we wrote it originally, we thought it was good, especially as the incidents were of actual occurrence, and now, when we see it floating around among the newspapers, without credit, we know that our judgment was right. The article originally appeared in the May number of THE CIRCULAR, which fact we beg to impress upon those journals that have credited it to the Pendleton *Republican*.

When Edison's electric light is perfected and comes into general use it will add greatly to the attractiveness of jewelry stores, displaying goods as well in the evening as by daylight. It is suggested, however, that the presence of electricity will interfere with the running of watches. Edison must invent an insulator that will protect everything from the effects of his electricity, except the incandescent paper horse shoe that gives out the light.

A wealthy gentleman, whose passion for diamonds is well remembered by his friends, was in the habit of carrying about with him a magnificent stone, which he valued at $10,000. He carried it in his pocket, wrapped up in a piece of paper. One day he dropped into Salom's Bazaar, and, showing it to the proprietor, asked him what he thought it was worth. The proprietor turned to one of the young ladies who had charge of the "jewelry" counter, and asked her what it was worth. She examined it closely, noted its color and weight, and finally said, slowly, "Well, if it was a little *smaller*, I think we might get thirty-seven cents for it."—*Boston Courier*.

Professor Leidy exhibited at a recent meeting of the Academy of Natural Sciences of Philadelphia a black agate sleeve-button, in which was set centrally, raised in a gold setting, a rose diamond, about 7mm. broad. It had been submitted to him by Mr. Kretzmar, a jeweller, who informed him that the person who wore it was recently leaning with his head upon his hand on a window-ledge in the sun, when the diamond exploded audibly, and with sufficient force to drive a fragment into his hand and another into his forehead. On examining the diamond the fractured surface, following a cleavage plane, exhibited apparently the remains of a thin cavity such as is sometimes to be seen in quartz crystals. The fracture also exposed a conspicuous particle of coal. Professor Leidy thought that the explosion had been due to the sudden expansion of some volatile liquid contained in the cavity, as frequently occurs in cavities in many minerals. Mr. Goldsmith thought it possible that the liquid was carbonic acid, as he was impressed with the idea that diamond originated from this material in the liquid condition. Inu-

THE

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THE

JEWELERS' CIRCULAR AND HOROLOGICAL REVIEW,

The recognized organ of the Trade, and the official representative of the Jewelers' League and the Watchmakers' and Jewelers' Guild of the U. S.

A Monthly Journal devoted to the interests of Watchmakers, Jewelers, Silversmiths, Electro-plate Manufacturers, and those engaged in the kindred branches of art industry.

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☞*All communications should be addressed to* D. H. HOPKINSON, 42 *Nassau Street, New York.* ☜*Advertising rates made known on application.*

NOTICE TO SUBSCRIBERS.

The Eleventh Volume of this Journal began with the February number. Those of our readers whose term of subscription has expired, and who have been notified by our usual circular, will confer a favor by responding as promptly as possible, as all subscriptions terminating with the last volume will be discontinued if not renewed.

Courtesy in Business.

TRAVELERS on the road complain that they are frequently treated with neglect by retail dealers that amounts to positive discourtesy. A traveler for a responsible house, well known to all the trade, should be treated with all the consideration that would be extended to a member of the firm. He is the trusted representative of the firm, and visits their customers as a matter of business, and of accommodation to the dealer. His time is of value to himself and his firm, and, when he calls on a dealer, this fact should be borne in mind. It is no discourtesy to tell him you do not desire any goods, but it is discourteous to keep him waiting two or three hours before telling him so. He has other customers to visit, and his time has to be economized to enable him to make his railroad and steamboat connections. He asks of the dealer but a few moments' consideration, and that should be given him promptly. We are aware that there are numerous drummers on the road for cheap houses, manufacturers of that class of goods designated in the vernacular of the trade as "snide jewelry;" these men are impudent, pertinacious, and, as a rule, decided bores. We do not wonder that retailers lose their temper with them occasionally. But there is a wide distinction between the ordinary "snide drummer" and the commercial traveler, who represents a house of good repute and of well earned standing in the trade. Retailers know the difference between these two classes, and should be careful how they confound the one with the other. To treat a respectable traveler discourteously may lead to your own discredit, for principals are sensitive, and quick to resent a slight put upon the men whom they select to represent them upon the road. The "snub direct" may lead to a discontinuance of credit, and to lose credit with one house of high standing may jeopard the retailers credit with other houses. But, independent of business considerations, the travelers for reputable houses are usually gentlemen possessed of more than ordinary intelligence, of recognized influence and position in the trade, who are entitled, for their own sakes, to every courtesy that can be extended to them. The dealer who treats him otherwise is false to his own interests both pecuniarily and socially.

Anticipated Advance in Prices.

THE retail trade will have to pay something more for goods this year than it did last, owing to the fact that the workmen in the factories are demanding advances for their labor. During the dull times of the past few years, the men at the bench had their wages reduced to the very lowest possible point. Even then, there was not employment enough for them all, and many were driven into other occupations. With the revival of trade in all branches of industry, the workmen naturally looked for a restoration of wages to the old standard, and this has been conceded in order to bring them back to the bench. As a consequence, there must be something of an advance in the price of goods. But we desire to caution the workmen not to be too exacting in their demands. It is true that the trade has wonderfully improved of late, but this fact leads to an apprehension that the market may be easily overstocked with goods. The holiday trade consumed large quantities, but the holidays do not last all the year round, and the demand for goods is dropping back to its normal condition. To maintain a permanent improvement, as is much to be desired, there must be no very serious advance in prices, else the demand ceases, the factories close, and the workmen will be again thrown out of employment. We believe in paying good prices for good work, but, after so long a period of depression, it is better to go slow—to creep before they attempt to run. We have every reason to believe that the good times have come to stay, but it will not be safe to kill the goose that lays the golden eggs. Make haste slowly, and do not attempt to force the manufacturers into the payment of wages that the demand for goods does not warrant and will not maintain. As the new condition of things becomes more fixed and determined it will be time enough to press for increased compensation. For the present, he is a fortunate man who obtains all the work he can do at fair living wages.

Artificial Diamonds.

THE fact that a canny Caledonian, Mr. Hannay, has succeeded in making artificial diamonds which respond favorably to all the tests applied to them by so eminent a man as Mr. Maskelyne, seems to have awakened more interest than it is fitted from the scientific point of view to excite. The diamond has become the supreme symbol in the popular mind of wealth and splendor, and the difficulties supposed to be met with in producing even a minute diamond have cast a popular glamour over the work. If the boring of artesan wells shall ever become an extensive and paying industry it is possible that the success of Mr. Hannay may acquire a mercantile value, but except for such purposes and those of the glazier, nothing of consequence is likely to come of it. The number of these gems turned out of nature's workshop is not likely to increase, nor is the size of those produced in the laboratory of man. Mr. Hannay, how-

ever, is to be congratulated in having directed public attention to discoveries made years before he began his experiments. As long ago as 1828 diamond particles were produced by chemical processes, and the diamond dealers of London utilized the fact by inducing holders of genuine diamonds to dispose of them at low rates. But that excitement died a natural death, leaving nothing behind but a clue which Mr. Hannay has taken up. In 1853 a Frenchman named Despretz obtained a sort of diamond dust, which, mixed with oil, would cut diamonds. He exhibited his process at Sorbonne, but artificially made diamonds never resulted from the excitement he then created. The experiments of St. Clair-Deville, Joyce and Wohler were also interesting, and it was thought for a time that a grave effect would be produced on trade and commerce by the formation, through the processes of Wohler and Deville, of bodies akin to the natural carbon diamond but consisting of the element boron. What Mr. Hannay has done is simply to contrive such an adaptation of means controllable by man as to let the powers of nature produce an allotropic form of an element rarely found in nature. But the same result had been previously effected, and the last product is not intrinsically worth more, we suspect, than those which preceded it. Mr. Hannay has the advantage over his predecessors, however, in that the press and the cable telegraph have been invoked to give publicity to his work. Let the Scotch chemists work away at this problem, while men and women in general are debating how much longer it will be safe for the trade to hold its dazzling stocks of Golcondas and Brazilians.

Going into Business.

THE improved condition of business during the past few months, while most acceptible to those who profit by it, is fraught with some danger. It offers a temptation to speculators to go into the business, not as a legitimate enterprise, but to make all the money they can in the shortest possible space of time. It is also a temptation to workmen to leave the bench and set up for themselves, in the hope of establishing a permanent business. There is danger that by this means the market will be overstocked with goods, and the demand stifled, as it was a few years ago. We are informed that thirteen new manufacturers springing up in Providence within the last three months. To the speculators we have nothing to say, but we dot wish them success if it is to be purchased at the cost of the regular trade. But to the workmen who contemplate going into business for themselves, we would say "look before you leap." A man may be a thoroughly competent mechanic, full of valuable ideas, and an expert workman, and yet be entirely lacking in those qualities essential to the successful management of a business enterprise. The training necessary to make a successful business man and a skilled mechanic is as different as can be. We do not expect to see the salesman or commercial travelers taking their seats at the bench and undertaking to do the work of mechanics, and the workmen, as a rule, are little better qualified to fill the places of the salesmen and travelers. We will heartily applaud any workman who steadily advances in his business, but those who have been most successful in conducting business have associated with them some enterprising business man, whose training has been of a commercial rather than a mechanical character. We throw out this warning in the hope that it may prevent some of the men at the bench taking a false step.

Selling Goods to Outsiders.

WE have frequently denounced the practice indulged in by a certain class of jobbers of sending out catalogues and price lists to persons outside of the trade, offering to sell them goods at retail at wholesale prices. This practice is designed to rob the retail dealer of his legitimate custom, and jeopardize his prospects of paying his legitimate debts from the profits of his business. But this practice is no worse than that indulged in by certain manufacturers, who represent that they sell only to jobbers, and then, after stocking them up, bid for the trade of the retailers and all classes of outside rivals of the jobbers and dealers. Yet this is done daily by certain Eastern firms, who seek not only to monopolize the manufacturing business, but the jobbing and retailing trade as well. Jobbers should make a black list of those manufacturers who indulge in this practice, and discriminate against them in giving their orders. There are three well defined branches of the jewelry business—the manufacturers, the jobbers, and the retail dealers—and no individual or firm can combine two branches without encroaching upon the rights and privileges of others. If the manufacturer runs a competition with the jobber, he cannot expect the jobber to pay his debts. Only one class of persons can command the retail trade, and if the jobbers and manufacturers undersell the retailer, he is ruined in his business, and must "put up his shutters." The same result is reached when the manufacturer usurps the place of the jobber, and robs him of the patronage of the retail dealers. Let every one stick to his special line, and not encroach upon his neighbor. By doing so, the best interests of the trade in general will be served.

A Bad Precedent.

SOME of the large buyers from the interior have lately resorted to a novel, not to say cheeky, method of obtaining additional time on their purchases. They come to the city, look over styles, select what they want, then cooly remark that, inasmuch as they are buying early in the season, before trade has really commenced, they would like to have their bills dated twenty or thirty days ahead. This has been conceded in some instances, and the buyer has thereby obtained thirty days more time than the custom in the trade warrants. This is a dangerous precedent to establish, and is directly at variance with established usages. It is susceptible of very grave abuses, and, if encouraged, is calculated to work seriously to the disadvantage of manufacturers and jobbers. Better adhere to the true commercial precedents that time has demonstrated to be safe, and all that are necessary for the welfare of the trade. The man who asks an additional thirty days to-day will want sixty to-morrow, and so the abuse will extend till all established customs and usages are upset. The time usually accorded to purchasers is all that can be granted with safety, for the manufacturer must get his returns for goods sold with a fair degree of promptness or his factory must close and his workmen suffer. This is not a good time to be giving greater latitude to creditors; on the contrary, when goods are in demand, they should be sold at the nearest approximation to cash possible. The nimble sixpence, when trade is good, is better than the laggard shilling.

Rents Advancing.

MAIDEN LANE has been the abiding place of a large portion of the jewelry trade from time immemorial, but there is danger that the manufacturers and dealers who inhabit it will be scattered before long, owing to the inordinate greed of the landlords. They are already giving notice of an advance in rent for the coming year. We are surprised that the jewelers do not combine together and remove to some pleasanter quarter of the city, and abandon the old ricketty buildings in the Lane, with their dirty surroundings and dark and dismal offices. There is scarcely a building in the street that affords respectable facilities for the exhibition and sale of jewelry, which, above all other goods, require good light and attractive surroundings. What the landlords ought to do if they wish to keep the trade down town is to tear down two or three of their old rickety buildings and erect a Goldsmith's Hall, that will be a credit to the guild, an ornament to the city, and that will afford them ample facilities for the transaction of their business. This has been frequently talked of, and, should the landlords continue their extortions, the idea will take root in some other part of the city. We hope to live long enough to report the "house warning" that will be indulged in when the Goldsmith's Hall of the future shall be formally inaugurated.

THE merchants of the country are petitioning Congress to pass a new national bankruptcy law. This is very much needed, for without a national law governing bankruptcy proceedings, the practice in the various States is so different that business men do not know how to proceed to prevent frauds. The creditor class is, under existing conditions, at the mercy of unprincipled debtors, as state laws generally are calculated to protect citizens of the State against non-resident creditors. Any new bankruptcy law, however, should be free from certain objectionable features in the old law that enabled a fraudulent debtor to slip through its meshes, defraud his creditors, and retire from the proceedings with an ample fortune secreted where it could not be reached. But how would it do to pass a national law preventing men from going into bankruptcy, and compelling them to pay their debts whether they had anything to do it with or not? If the debtor had not available property, the government might issue its bonds to make up the deficiency! We throw out this idea for the consideration of our national legislators.

THERE is a proposition on foot having for its object the organization of a society for the protection of chain manufacturers. The idea is to establish uniform prices for the sale of gold chain. As this has an intrinsic value common to all, it would seem to be to the interest of all to have such a tariff of prices. But there are a few manufacturers, always a curse to the trade, who hang back, and cut prices whenever by so doing they can injure the trade of a competitor. It is to be hoped that some arrangement may be perfected at an early day by means of which this cut-throat game may be put an end to. It is injurious alike to manufacturers and dealers, and tends frequently to make customers dissatisfied.

Since the above was in type we learn that some forty manufacturers have agreed to establish a uniform standard of prices for gold chain to go into effect at once. The society is composed of the best houses in the trade, and there is no reason why it should not exert a good influence.

THE contract for watches to be used by the officials on the Indian State Railways, says the *British Jeweler and Metalworker*, has again been secured by the American Watch Company. This is the third time that Messrs. Robbins & Appleton have received this distinction, which is not a barren one, for it must be evident to the most prejudiced individual that the timekeepers supplied on the previous occasions must have given satisfaction, and answered the tests required of them. This is a mortifying fact for Englishmen, especially for those who believe that were manufacturers here to show more enterprise they would be able to compete advantageously in the manufacture of all grades of watches. Our Coventry friends should bestir themselves, for such contracts as those to which we refer should not be lost to this country.

IN the suit of Miller Bros., brought against Herbert G. Mackinney for infringement of design covered by letters patent. Judge Blatchford recently denied the motion for a preliminary injunction. In doing so he said: "I do not think the plaintiff has established a case so free from doubt on the question of infringement as to warrant the granting of a preliminary injunction, even if all other points were resolved in favor of the plaintiffs, as to which no opinion is expressed." It will be seen from Judge Blatchford's decision that the case is not disposed of by any means, and Miller Bros. announce that it will be tried on its merits at an early day.

THE following named manufacturers of clocks, members of the Clock Manufacturers' Association, have issued a circular revoking all price lists and quotations in existence previous to the 1st of February. On that date they issued new quotations of prices, and these have been adopted as standard by all the companies named: New Haven Clock Co., E. N. Welch Manufacturing Co., Welch, Spring & Co, Waterbury Clock Co., Ansonia Clock Co., Wm. L. Gilbert Clock Co., E. Ingraham & Co.

THE Waltham Watch Company is now engaged in the laborious operation of moving a portion of its machinery into the wing recently erected to the main building of its factory. No one not engaged directly in the watchmaking business can comprehend what a serious undertaking it is for such a company to remove from one point to another. The plant of a watch company like the Waltham is not made in a day or a year, but is the growth of years, special machinery being invented from time to time to do special work, and added to that already in existence. The great success of the Waltham Company is due to the intelligence, skill, and inventive faculty possessed by its workmen, who have developed it through various stages to its present perfection. By the addition of the new wing to the factory, the company acquires additional facilities for producing its goods, which will soon make themselves felt.

Two Hundred Dollars for a Quart of Watch Oil.

MANY years ago a Boston gentleman discovered a process for making watch oil. It was a difficult operation, requiring a thorough knowledge of the chemical properties of the ingredients used, and great patience to get them to assimilate. It was necessary to destroy all the acid in the ingredients, and all their gummy qualities, and, at the same time, retain their lubricating qualities in a form of perfect limpidity. The gentleman devoted much time to the production, testing it by every means at his command, and finally, having perfected it to his satisfaction, he made up a small quantity and offered it to the trade. But watchmakers are suspicious of things of this kind, and did not buy readily, only taking small samples on trial. The manufacturer finally became discouraged, gave up business, and in a short time died. He was indebted to his book-keeper some $600 or $700, and this person finding nothing else to satisfy his claim, took possession of what watch oil he could find. He ultimately sold it to Mr. Willard, of Boston, who, after keeping it for a long time, induced Mr. Frodsham, the celebrated watch and chronometer maker of London, to test it on some of his chronometers. In fitting up some ship's chronometers for the Arctic regions, this oil was used as a lubricator. The vessels were gone several years, having been caught in an ice pack, and during all that time the chronometers gave the most complete satisfaction. On the return of the ships to England, the watchmakers were astonished at the results obtained, the oil being apparently as fresh as when first used. About the same time the oil was used on the chronometers of ships bound for India and other tropical climates, and the results were fully as satisfactory as with those that sailed to the North. The London manufacturers endeavored to obtain more of it, but Mr. Willard refused to sell it, he having all that was ever made, the manufacturer being dead, and the secret of its manufacture buried with him. Mr. Willard finally, on retiring from business, gave all that was left of it to his old apprentice, Mr. F. Kemlo, the well-known expert watchmaker of Boston. Mr. Kemlo fully appreciated the value of an oil that would withstand all climates, and perform the functions of a perfect lubricator under all conditions, so he divided it up for safety into four equal portions, and these were stored in four different parts of the city. At the time of the great fire in Boston, two of these portions were destroyed. Of the other two portions, one he still retains, and the other was recently purchased by the American Watch Company. There is about one quart of it, and for this small quantity the fabulous sum of $200 was paid, a greater sum than was ever before paid for a single quart of oil. But the American Watch Company has the satisfaction of knowing that it has an oil for use as a lubricator to their watches that will withstand the effects of climate, and will remain limpid and fresh under the most adverse conditions. It is by attention to little details of this kind, and a liberal expenditure of money to obtain the best of everything that enters into the construction of their watches, that has given to the goods of this company a world-wide reputation for superior excellence. No amount of time, labor or expense is considered too great an expenditure provided a greater degree of excellence can be attained for their watches.

The Jewelers' League.

We devote this column to the interests of the League and its membership. Letters or inquiries pertinent to its business or purposes, and which might interest the trade or inquirers, will be herein answered. Address *Jewelers' League, Box 4001, P. O. New York*, or the office of THE CIRCULAR.

The following gentlemen have been admitted to membership in the League since the last official report appeared in these columns:

Dec. 5th, 1879.—Benjamin F. Siegert, of McNeal & Siegert, Easton, Pa.; Peter J. Smith, with Tiffany & Co., N. Y.; Barton A. Ballou, of B. A. Ballou & Co., Providence; George H. Bassinger, East Springfield, N. Y.; Joseph Dinkelspiel, of Dinkelspiel & Nordman, San Francisco, Cal.; Hoffman S. Dorchester, of Brown & Dorchester, Providence; Frank B. Dodge, Woburn, Mass.; William W. Middlebrook, with Haywood & Briggs, N. Y.; James L. McPhail, with A. E. Warner, Baltimore, Md.; James M. Murphy, Saugerties, N. Y.; Stephen Preston, Jr., N. Y.; Thomas H. Wheeler, with Illinois Watch Co., Sprinfield; Marshall B. Wright, Kansas City, Mo.

Jan. 2d, 1880.—George H. Kniffen, Brewster's, N. Y.; Otto Ludwig Draesemer, with Tiffany & Co., N. Y.; Hermann Lange, Maysville, Ky.; John Frick, of John Frick & Co., N. Y.; Charles W. De Coudres, with J. A. Brown & Co., N. Y.; William S. Wilkinson, Chicago; John E. Downes, with George E. Sherwood, Waterloo, N. Y.; Walter G. Smith, of Smith & Powers, Youngstown, Ohio.

Jan. 16, 1880:—William R. Fuller, with Robbins & Appleton, 9 Bond St.; J. Christopher C. Justis, of Justis & Armiger, Baltimore, Md.; Henry P. Sanford, Jr., with S. Adams & Co., New York; Charles H. Seaman, of Baldwin & Co., St. Joseph, Mo.; James F. Townley, with McCarty & Hurlburt, Philadelphia; Hiram A. Bliss, with Gorham Manufacturing Company, Union Square, N. Y.; Isaac Cole, of Sexton & Cole, N. Y.; Herbert Cockshaw, with Cox & Sedgwick, N. Y.; David V. P. Cadmus, with A. Bernhard & Co., New York; Albert E. Jeaneret, with C. A. W. Crosby, Boston, Mass.; George F. Kunz, with Tiffany & Co., N. Y.; Joseph R. King, with Durand & Co., N. Y.; Henry M. Potter, with Adams & Shaw Co., N. Y.; Samuel Pinover, with A. Pinover & Co., N. Y.; James V. Rockwell, with Tiffany & Co., N.Y.; Robert Reussner, John Street, N.Y.; Harvey L. Street, with George O. Street & Son, N. Y.; Augustus McHenry, Hornellsville, N. Y.; Gustave Willimen, with Courvoisier, Wilcox & Co., Brooklyn, N. Y.; Alonzo S. Adams, with A Stowell & Co., Boston.

Meeting held Feb. 6, 1880:—Henry Abbott, Maiden Lane, N. Y.; Charles L. Abry, New York City; John G. Apsey, Marion, Alabama; Fred. Bayerdorfer, with Tiffany & Co., N. Y.; Sumner Blackinton, Maiden Lane, N. Y.; William R. Brainerd, New York City; William A. Buchanan, New York City; Henry Carter, New York City; Emanuel Cohen, with Clapp, Brothers & Co., Chicago; Charles Grandjean, San Francisco, Cal.; Charles C. Harnsler, John Street, New York City; William Cohn, with Tenner & Baum, New York City; William S. Heller, Grand Street, New York City; Charles M. Hoffman, White River Junction, Vt.; Samuel L. Howland, of D. M. Fitch & Co., N. Y.; Solomon Kaiser, Maiden Lane, New York City; William C. King, with Durand & Co., Newark, N. J.; Charles M. LaRue, Danbury, Conn.; Frank Bigley, with J.T. Scott & Co., N.Y.; Jesse T. Little, Cumberland, Md.; F.W. Martini, with C. C. Harnsler, John Street, N. Y.; Lucius H. Mattison, with William Moir, New York City; John Henry Morch, Williamsburg, N. Y.; Charles V. Peyn, Maiden Lane, New York City: Henry C. Ruff, with W. F. Best & Co., Dayton, Ohio; David A. Sayre, with Mabie, Todd & Bard, New York City; Fred. Schwarzwaelder, with Cox & Sedgwick, New York City; Joseph Seeley, with T. M. Ward, New York City; Edwin C. Taylor, with Tiffany & Co., New York City; Emil A. Lehmann, with A. Bernhard & Co., New York City; E. F. Miscally, with James Allan, Charleston, S. C.

The League now numbers 600. Death fund amounts to $1,150. No death last year from the membership of the League.

Six applicants for admission at the last meeting of Executive Committee were presented all together by Mr. Fred. Steck. An example worthy of imitation by other members.

The new Chairman of the Executive Committee is Mr. R. A. Johnson. Mr. Woglom could not be induced to accept the position.

It was resolved by the Executive Committe that on and after May 1st, 1880, all applicants for membership residing or doing business in New York City or Brooklyn shall be required to be examined by the Surgeon of the League.

The annual report for 1880 is now in press and will shortly be ready for distribution. The following named gentlemen have been appointed by the Executive Committee as members of the Advisory Board for the ensuing year:—Albany, Henry J. Rowlands; Baltimore, R. J. Walton; Boston, G. H. Richards, Jr.; Edward L. Libby; Buffalo, Austin M. Edwards; Booklyn, A. A. Jeannot; Chicago, S. H. Hale, Caleb Clapp; Milwaukee, W. S. Stanley, Jr.; Newark, N. J., Theo. Shaw; North Attleboro, E. E. Farrows; Paris, France, Wm. Herrick; Philadelphia, John F. Simons; Pittsburg, W. C. Hodge; Providence, F. J. Marcy; San Francisco, S. McC. Miller; Springfield, Ill., Charles E. Mason; St. Louis, Mo., August Kurtzebonn.

Obituary.

LOUIS JACKSON.

NOW and then death breaks the private ranks of life in a manner peculiarly and painfully touching, and the sad news that Louis Jackson is dead will come to many as a great grief.

The sight of a young man suddenly taken from life, with all its glowing and exciting prospects, is always sad, and in the case of Mr. Jackson, the circle of warm friends with whom he was a favorite was a large one.

Louis Jackson was born in Boston in 1852, lived for some years in Philadelphia, and finally settled in New York and held a position in the house of Tiffany and Co., one of the original members of which —Mr. G. F. T. Reed—was his uncle.

During the Centennial Exhibition Mr. Jackson was associated with a member of the firm in representing the house there, and his painstaking action and uniform courtesy caused him to be selected for a similar position at the late Expedition Universelle at Paris. Whatever Mr. Jackson undertook he did conscientiously and well, and few men were ever more entirely devoted to their duties. He was an active member of the Seventh Regiment, and during the late Fair he worked hard for the Eighth Company, and contributed materially to the success of the enterprise.

Indeed he worked too hard for his always delicate phisique, and it finally broke him down. A few weeks ago he was at his business as usual, and was then seized with a hemorrhage of the lungs. The next day he kept his bed, and during the three days that followed his young life gushed forth in a crimson stream more than a score of times.

Then he gradually sank, and notwithstanding the unremitting care of his physician, family and friends, one of whom almost lived at his bedside, he continued to sink until death finally released him from his earthly sufferings.

Louis Jackson was highly strung and noble in nature. He was reticurn to strangers, but to those who enjoyed his friendship he revealed a keenly sympathetic and sensitive disposition which was sometimes misunderstood by those of coarser fibre.

In devotion to duty Mr. Jackson was almost an enthusiast, and he exemplified in the fullest sense the character of an honest man, to be which, "as this world goes, is to be one man picked out of ten thousand."

Practical Hints on Watch Repairing.

By Excelsior. No. 60.

PROPER FORMS FOR TEETH AND LEAVES.—*Continued.*

(944.) *Drawing the Curves of the Addenda.*—There are a number of methods commonly praticed for drawing the epicycloid curve for the addenda of the teeth and leaves. As it is described by a generating circle whose diameter is determined by the size of the pinion into which the wheel gears, every change in the size of the pinion, relatively to that of the wheel, requires a change in the size of the generating circle, in order to mark the proper curve for the addenda of the teeth, to secure a perfect gearing in that particular case. A shape of tooth which would be right for a pinion $\frac{1}{10}$ the size of the wheel, would not be correct with a pinion $\frac{1}{8}$ that size, and *vice versa*. We therefore require some method or means for drawing the curves, which can be changed to suit the proportions in each particular case. One method is by actually using circular pieces or rollers, of suitable proportionate sizes, to describe the curves as shown in section (938) and Fig. 48. Another is by drawing the generating circle in its different positions, as it is rolled along the base circle or pitch line, and, having marked the position of the point D in each circle, draw a line through the different marks. This line will of course be practically the desired curve. A common, but only approximate, method is to draw the faces of the addenda as arcs of a semi-circle which includes the external faces of either two or three teeth, according to the size of the pinion.

(945.) *Reid's Method for the Addendum of a Tooth.*—But the method best adapted for studying the forms and properties of this curve is one we will call Reid's method, for the reason that the main features of our drawings are modeled after the drawing given in his Treatise on Clock and Watch Making, although considerable portions are omitted, and our explanations and comments are entirely different. Fig. 51 represents the method of drawing a curve for a tooth. In

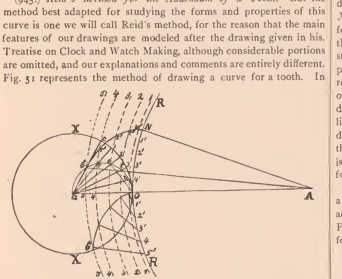


Fig. 51.

order to save room and show the whole operation in the drawing, the wheel is supposed to be only three times the size of the pinion. This gives an unusual form of curve, but the method is the same for all proportions. In practice it is advisable to make the drawing on a large scale, say 24 inches for the diameter of the wheel, or 12 inches radius, and the pinion of its proportionate size. A greater number of points in the curve can then be marked, without filling up the drawing. In this case $A\ a$ is the centre distance, on the line of centers; A being the center of the wheel and $R\ R$ a part of its pitch circle; while a is the center of the pinion, and $X\ X$ its pitch circle, meeting the pitch circle of the wheel at O. The pinion is to have 6 leaves, and the wheel 18 teeth. The pitch of the pinion, or the angular space allotted to one leaf, will be $\frac{1}{6}$ the circumference of the pitch circle $X\ X$, and will reach from O to c. Draw the radial line $a\ c$, which will represent one flank of the pinion leaf, after it has moved from the position of $a\ O$ to $a\ c$. In like manner, get $\frac{1}{18}$ the pitch circle of the wheel, being the pitch of one tooth, and measure it off from O to N, then draw the radial line $A\ N$ for the front flank of the tooth.

(946.) *To Find the Curve for the Addendum.*—The addendum will of course be outside of the pitch circle $R\ R$, and will intersect the pitch circle of the pinion. First draw the semi-circle $a\ b\ r\ s\ t\ u\ O$, on the pinion radius $a\ O$. Divide the pitch arc, $O\ c$, into any convenient number of equal parts, say 5, and mark them 1, 2, 3, 4, 5, or O. Divide the pitch arc $O\ N$ into the same number of parts, and mark them 1^1, 2^1, 3^1, 4^1, 5^1, or O. Now draw the radial lines $a1$, $a2$, $a3$, $a4$, and mark the points where these several lines cross the semi-circle at b, r, s, t, u. Finally draw, from the centre A, five dotted curves, marked 1, 2, 3, 4, 5, passing exactly through the crossings u, t, s, r, b. Now measure with the dividers from O to the first crossing at u, then set one point of the dividers on 1^1, and with the other point mark where it touches the first dotted curve at u^1. Measure from O to the second crossing, at t, and from 2^1 mark the second curve at t^1. Measure from O to s, and mark from 3^1 to the third curve at s^1. With the distance O to r, mark from 4^1 to the fourth curve at r^1. The fifth measurement, from O to b, will of course strike the fifth curve at b. These several measurements are clearly shown by the lines drawn, below O, from 1^1, 2^1, 3^1, 4^1, 5^1, to the several dotted curves, but these lines are omitted above O, in order not to confuse the drawing. In practice, it will be well to also draw lines from O to the different crossings, u, t, s, r, b, to prevent mistakes in the measurements. Only one, O to s, is so marked, however, as an example.

(947.) Now draw a symmetrical curve from N, passing through the points u^1, t^1, s^1, r^1 to b, and you have the correct curve for the addendum of a tooth, for a wheel which is three times the size of the pinion $X\ X$, having 6 leaves. Below the line of centers, another curve is found in the same way, running from O to b^1 as shown, and represents the face of a tooth whose flank is in the radial line $A\ O$. As before stated, the curve may be outlined more fully, by a greater number of points than 5, if desired, by simply dividing the arcs $O\ c$ and $O\ N$, representing the pitch of one leaf or tooth, into the desired number of equal parts, say 10; then drawing 10 radial lines from a to those divisions, and 10 dotted curves through the points where these radia lines cross the semi-circle $a\ b\ O$, thus giving 10 distances from the divisions of the arc $O\ N$ to the 10 dotted curves, and 10 marks through which to trace the curve N to b. As the whole of this curve is never required for use, the number of divisions can be increased for the part needed, leaving the rest as before described.

(948.) *Reid's Method for the Addendum of a Pinion Leaf*, is merely a modification of the preceding, to ascertain the proper curve for the addendum when the pinion is the driver, instead of the wheel. In Fig. 52, A and a are the centers of the wheel and the pinion, as before, $A\ a$ the center distance, $R\ O\ R$ a part of the pitch circle of the

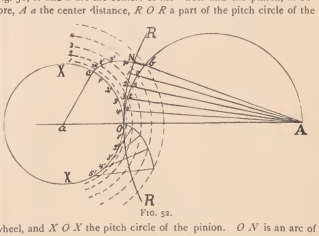


Fig. 52.

wheel, and $X\ O\ X$ the pitch circle of the pinion. $O\ N$ is an arc of the wheel circle, and $O\ c$ on the pinion circle, each representing the pitch, or space given to one tooth or leaf, and each divided into 5 equal parts as before, and numbered as shown. In this case, as we want the addendum for the pinion leaf, we draw the semi-circle on

the radius of the wheel, and also 5 radial lines from *A* to the divisions of the pitch arc *O N*, as *A N*, *A* 1, *A* 2, *A* 3, *A* 4. From *O*, to the crossings of these radial lines and the semi-circle *A b O*, at *b*, *r*, *s*, *t*, *u*, *O*, (or 4), are our measurements as before. Draw the 5 dotted curves through these crossings, from *a* as the center. Then set the dividers to reach from *O* to *u*, and transfer that distance to 1^1 and the first dotted curve, which it will touch at u^1; transfer the distance from *O* to *t*, to 2^1 and the second dotted curve, at t^1; the distance *O s*, to 3^1 s^1, and so on. Then draw the curve *c* to *b*, passing through the several marks u^1, t^1, s^1, r^1, which we have just made on the dotted curves, as directed for the wheel. Below the line of centers, *A O a*, is another curve found in the same way, having lines drawn to show the several measuremcnts from the divisions of the pitch arc to the dotted curves.

(949.) *The Development Method of Drawing the Addendum of a Tooth.*—Fig. 53 shows a simple and easily understood method of

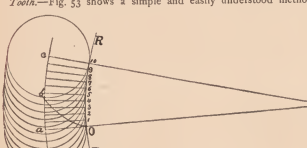


FIG. 53.

drawing the curve, by following out the marking point on the generating circle in its different positions, and connecting its several positions by a curved line. *A O* is the radius of the wheel, *R R* a part of its pitch circle, and from *O* to 10 is the pitch. Continue the line *A O* to *a*, making *O a* equal to the radius of the generating circle we intend to use, or one-half the radius of the pinion. Then, from *A* as the center, draw the arc *a c*, and a line from *A* through 10 to *c*. It is now evident that, as we roll the generating circle along the arc *R R*, its center will remain on the arc *a c*, in all its positions. In order to obtain 10 marks for outlining our curve, we will draw the generating circle in 10 positions at equal distances apart. Carefully divide off the arc *a c* into 10 equal parts, and from each of these divisions draw part of a radial line to the arc *O* 10, which they will meet at the points marked 1, 2, 3, etc. Having set the drawing compasses exactly to the distance *a O*, or *c* 10, set the point exactly on each of the divisions we have marked upon the arc *a c*, and draw the generating circle (one-half of it is sufficient, as shown,) in each position. All of these measurements must be very exact, and all of the lines should be as fine as possible. The same direction is applicable to any other method of drawing the curve.

(950.) We can now trace our epicycloid curve by finding the position the pencil or scribing point will occupy in each circle, supposing the point to be first placed exactly upon *O*, and the generating circle rolled towards 10. As its center reaches the end of the first radial line, the circle will touch the pitch arc at the other end of the line, at 1. But the imaginary pencil point which before touched *O*, will now be carried away from it, and will be found by measuring along the circle, from 1, the same distance as from 1 to *O*. We therefore set our dividers so that they will reach exactly from *O* to 10 in 10 steps,—not lifting the points from the paper, but turning them from *O* to 2, then turning the other point around from 1 to 3, and so on. When set so that they come exactly upon 10, at the last turn, make a slight puncture at each of the divisions of the arc *O* 10, at 1, 2, etc., with the points of the dividers, as they are stepped along the arc. The dividers then must not be changed till the drawing is finished. Setting one point of them on 1, the other point will touch the circle at the present position of the pencil. When the generating circle has rolled along to the next position and touched 2, we place one point of the dividers on 2 and measure 2 steps on that circle. When it touches 3, we measure 3 steps from 3, and we measure off on each circle the number of steps corresponding to the position of the circle on the pitch arc. When the center of the circle reaches *c*, and it touches 10, we measure 10 steps on its circumference, which will come at *b*.

(951.) Drawing a curve through the different points which we have thus marked on the several circles, we get the epicycloid curve *O b*, which is the proper one for the addendum of a tooth, when the wheel and pinion are proportioned as supposed in this figure, and is the same as would have been described by the pencil had we actually used a generating circle and pitch arc of those proportions, and rolled one upon the other, (938). It should be observed that we must not make *one measurement* from 10 to *O*, for instance, and then mark the same distance from 10, upon the circle, but must make 10 separate steps around the circle, from 10, as before stated. It is also advisable to divide the pitch arc *O* 10 into as many parts as can be done without filling up the drawing, as the smaller the divisions are, the more nearly alike will be the arcs covered by the divider points on the pitch arc and on the circle. But if these divisions are large, the dividers will include a greater length of the circle than of the pitch arc, because the latter is straighter,—and this would slightly change the curve *O b*. To find the curve for the addendum of a pinion leaf, we divide off its pitch arc as described, then draw the several positions of a generating circle one-half the diameter of the wheel, and proceed as before directed.

(952.) *The Arc and Roller Method.*—Many workmen unaccustomed to drawing prefer to use circular pieces or rollers for describing the curves of teeth and leaves. The one which represents the generating circle has a hard, fine pointed pencil fastened in it, in such a manner that its point will be exactly in the circumference of the circle, and can be seen, in placing it at the points on the base circle where the curves are to begin. But these rollers are liable to slip on each other, and destroy the correctness of the curve. Some obviate this by connecting the two rollers by a very thin flat spring, one end being secured to each. Then by rolling the generating circle in such a way as to pull endwise on the spring, and keeping the rollers pressed together, slipping is prevented. The rollers should be quite large, so as to draw the tooth on a large scale and clearly exhibit the shape appropriate to the gearing in hand. To follow this method, you should have a boxwood or metal arc some six inches long, with its edge square and filed exactly to the curvature of your standard enlarged wheel circle; and a series of circular rollers of different sizes, representing generating circles corresponding to different sizes of pinions. A good size for drawing the pitch circle of the wheel, is with a radius of 10 inches, or diameter of 20 inches. As only one or two teeth will be drawn on this large scale, only a short section of the pitch circle will be needed, say 6 or 8 inches long, and the whole can be drawn on a half sheet of foolscap paper. Your wooden arc should be filed to this curvature, which will be the standard size whenever drawing a wheel by this method.

(953) Fig. 54 shows the wood or metal arc *A*, whose edge is to be adjusted exactly to the curve or standard arc *C C*, which you have drawn upon your paper, with a radius of 10 inches. *B* is a roller representing the generating circle, with a scribing point *D*, and connected with the arc *A* by

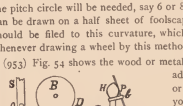


FIG. 54.

the spring *S*, screwed at one end to the arc, and at the other to the roller, at *O*. The rollers can be turned by means of a handle *H*, of any convenient size or length, which can be firmly screwed into any of them. *F* is a pencil resting in a notch *D* in the roller, and another notch in the handle, and held in place by a heavy rubber

band *b*. The lead should be hard and finely pointed, and the pencil so held that the point will come exactly even with the edge of the roller. At the left is the end of the spring *S*, showing an easy way of connecting it to the rollers. The head of the screw slips through the large hole and over the narrow slot, and is then tightened up. At *a* is seen, through a narrow notch in the edge of the arc, the end of one of the radial flanks of the intended tooth This notch is merely to assist in placing the point *D* exactly upon the end of the flank *a*. Sometimes a stout but thin ribbon, which cannot stretch, is used to connect the arc and roller, instead of a spring ‡ In this case, there should be no notch in the arc, as the ribbon would allow the roller to fall slightly into the notch when passing over it, which the spring by its stiffness, would prevent. The other edge of the arc has the same curvature as the outer one, for drawing hypocycloids. But the spring or ribbon is not used on that side.

(954) Having drawn the section *CC* of the pitch circle of the wheel, with a radius of 10 inches, you next draw two radial lines striking *CC*, at such distance apart as will correctly represent the thickness of the tooth. The wheel being drawn on a scale of 20 inches in diameter, its circumference would be $20 \times 3.1416 = 62.832$ inches, which, being divided by the number of teeth, gives the pitch. If the teeth and spaces are to be equal, you can at once divide the circumference by double the number of teeth ; as, if the wheel has 50 teeth, $62.832 \div 100 = .628$ inch, for the distance apart, on the pitch line, of the two radial lines or flanks of the tooth. Now to form the epicycloid curve, you select a roller whose diameter will represent the required generating circle, enlarged as many times as the wheel is enlarged in the drawing. Example : Main wheel, 1 inch ; center pinion, ⅛ inch in diameter. The generating circle would be $\frac{1}{16}$ inch. Then you have this proportion. As the actual diameter of the wheel, (1), is to that of the generating circle, ($\frac{1}{16}$ or .062), so is the enlarged size of the wheel, (20), to the enlarged generating circle, *i. e.*, the roller, or x, or $1 : .062 :: 20 : x$. $x = 1.25$, or $1\frac{1}{4}$ inches, as the size for the rollers; and in the same way we get the roller for any other proportion of the gearing. It is generally not necessary to take the geometrical diameters of the wheel and pinion, but will be near enough for all practical purposes to take the full diameters in selecting a roller. The roller being attached to the arc *A* by the spring, and the arc adjusted even with the curve *C C*, the point *D* is placed exactly on the end of one radial line where it strikes the curve *C C*, and the roller turned towards the other radial line, and one face of the addendum is marked. Proceeding in the same way with the other radial line, the other face is drawn. Care must be taken to keep the spring pulled taut all the time, and the edge of the arc exactly even with the standard curve *C C*.

(955) An assortment of 5 rollers will meet all ordinary requirements. Wheels (in watches) are seldom less than 5 or more than 12 times the size of the pinions they gear into. Allow one roller for each such ratio, which will require the largest to be $\frac{1}{16}$ the diameter of the standard pitch circle, or 2 inches; and the smallest, $\frac{1}{32}$ of it, or $\frac{1}{8}$ inch—giving about $\frac{1}{8}$ inch difference between the 5 successive sizes. If desired, the standard wheel circle can be taken still larger than 20 inches, which will permit of the use of larger rollers for marking out the addendum. Paper can be pasted together to get sheets large enough, and, for drawing large circles, a pair of trammels can be bought, or easily made from a rectangular rod of hard wood large enough to be stiff,—or use a round iron or brass rod. To one end fix a common metal holder, to hold a steel pen vertically. Whenever a pencil is preferable, the pen can be taken out, and the pencil fitted in Make a sliding piece, to slide freely along the rod, with a thumb screw to fasten it at any place, and, underneath, screw or solder firmly in it a metal point, which should project about the same distance below the rod as the point of the pen. To use, slide the point along till the distance between it and the pen point equals the radius of the curve to be struck, and fasten it there. Then put ink on the pen with another one, place the metal point at the center for the proposed curve, which is drawn by swinging the pen around on the point as a center. Such a tool can be easily made a couple of feet long, and will draw circles from 4 feet in diameter, down to a few inches. Trammel points with screws, etc., can be bought at the tool shops.

(956) *The Semi-Circle Method.*—This method, if properly carried out, gives a close approximation to the correct curve. But it seems not to be understood by most of those who follow it, and in their hands it becomes a mere make-shift. They pay no regard whatever to getting the correct length of the addendum, but think it all sufficient if they draw a semi-circle of almost any radius on the pitch line. The curves of the addenda being thus formed to please the eye, or by mere guess-work, they may and generally do bear no resemblance to the epicycloid required. To practice this method correctly, it is necessary to first ascertain the proper *length* for the addenda. Having drawn the curve *C C* at that distance beyond the pitch circle *A A*, Fig. 55,) you next draw radial lines exactly in the center of each tooth, and at *a a*, where these lines cross the curve *C C*, the points of the teeth must be formed. The flanks of the teeth being already drawn, you open the drawing compasses so that, one point being inside of the pitch line, say at *o*, the other will describe a semi-circle passing through the crossings *a a*, but coming just *outside* of the points where the flanks of the teeth strike the pitch line *A A*. Then draw the semi-circle, but *omitting* a small portion near each flank, and finally connect these *ends* symmetrically to the flanks by hand, or by moving the point *o*, up far enough to connect the ends to the flanks with the compasses.

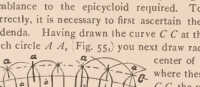


FIG. 55.

(957) Many workmen select a point *o*, for drawing the semi-circle, where it will cause the pen to pass through the crossings *a a*, and exactly over the radial flanks of the teeth. But this produces a uniform *circular* curve,—whereas, the *epicycloid* is only slightly curved at its beginning, being there almost a continuation of the radial line of the flank. By drawing the semi-circle as directed, omitting the ends, which would fall outside of the flanks, and gently curving them by hand to meet the flanks, we change what would be a circular curve into a form closely resembling the epicycloid. The drawing is on rather too small a scale to exhibit this fitting process advantageously, but it will be seen most clearly on the tooth at the extreme right, where the semi-circle is drawn down to the pitch line, and the hand finishing is also shown inside. *When the pinion* into which the wheel works *has less than 10 leaves, the semi-circle includes 2 teeth: if from 10 to 18 leaves, it includes 3 teeth*, as shown. It is advisable to first locate all the points *o, o*, properly with fine pointed dividers, and make slight punctures as guides for setting the drawing compasses, instead of finding the points *o o* with the latter when drawing.

IN the twentieth year of Queen Elizabeth's reign, a blacksmith named Mark Scaliot made a lock consisting of eleven pieces of iron, steel, and brass, all of which, together with a key to it, weighed but one grain of gold. He also made a chain of gold, consisting of forty-three links, and having fastened this to the before-mentioned lock and key, he put them about the neck of a flea which drew them about with ease. All these together, lock and key, chain and flea, weighed only one grain and a half. Oswaldus Northingerous, who was more famous than Scaliot for his minute contrivances, is said to have been made one thousand six hundred dishes of turned ivory, all perfect and complete in every part, yet so small, thin, and tender that all of them were included at once in a cup turned out of a pepper-corn of the common size. Johannes Shad, of Mitelbrach, carried this wonderful work with him to Rome, and showed it to Pope Paul V., who saw and counted them all by the help of a pair of spectacles. They were so little as to be almost invisible to the naked eye. John Ferrarious, a Jesuit, had in his possession canons of wood, with their carriage, wheels, and other military furniture, all of which were also contained in a pepper-corn of the ordinary size. An artist, named Clandius Gallus, made for Sippolytus d'Este, Cardinal of Farrara, representations of sundry birds sitting on the tops of trees, which, by hydraulic art and secret conveyances through the trunks and branches of trees, were made to sing and clap their wings; but at the sudden appearance of an owl out of a bush of the same artifice, they immediately became mute and silent.

Spectacles and Eye-Glasses.

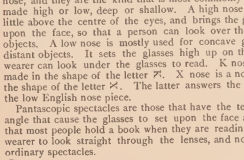
By W. J. Suttie.

THINKING some information about spectacles and eye-glasses would be interesting to many of your readers, I propose to give such as I think will be of use in buying, selling, repairing, suiting the eyes, and some explanation of the technical terms used in the optical trade.

Steel spectacles are made of fifteen pieces or parts called as follows: four joints, or end pieces, two eye wires, one nose piece, two temples, two temple joints, two screws, and two rivets. The parts are soldered together with thin brass wire, and the temple joints are riveted into the temples, but the best spectacles have solid temples. A few spectacles are made in London, England, of three pieces; two temples and one piece of steel make the entire front. The latter is made as follows, and is called a solid front spectacle: a bar of cast steel about four inches long and 3-16ths thick is sawed down each end about 1¼ inch, and bent on an oval mandril; the centre piece is shaped into a nose piece; the joints are filed; in fact, the labor is enormous, and they have but few advantages over well made spectacle frames that are carefully soldered, care being taken not to make the steel too hot. After the pieces are soldered together, they are called fronts; then steel plates are put in, and they are filed and burnished, called in the trade "dressing;" then the temples are put on and the rivets put in—that is called "jointing;" then the joints are finished on emery wheels, and they are ready for coloring, which is done by heating them in a hot sand bath until the required color is obtained; the lenses are then set and focussed, after which they are ready for selling.

How to tell a well made spectacle.—A good spectacle is known first by its even temper, not too hard or too soft; it is better a little softer than spring temper, so that they can be shaped easily, yet hard enough to keep their shape; take the extreme ends of the temples near the loops, open the frame to its full width, then stretch them about one inch further; see that they spring one like the other; the front ought to take a slight bend, not much, say about a thirty inch radius; then see that they come back to their original shape; next let the temples slide between your thumb and fore finger; look out for lumps; they should be a little thicker at the joints and taper gradually thinner to the loops; open the frames and see that the lenses parallel; lay the spectacle on a flat table, and see that the two eyes touch the table and the loops also; then turn over the spectacle and see that it lies equally flat; next see if the joints work smoothly, not hard in one place and soft in another. Single temples are the ordinary straight arms, and are about five inches long. Hook temples, sometimes called riding bows, are the kind that go behind the ears, and are about six inches long. Turnpin temples have a long arm about four inches long, and a short arm about two and a half inches long; they are riveted together in such a manner as to form a joint, and are sometimes very useful for a long, narrow head, and for people that use very thick lenses, so that the weight of the lenses will not pull the spectacles off the face in stooping. Nose pieces are called English nose, and they are the kind that is most commonly used. They are made high or low, deep or shallow. A high nose is soldered on a little above the centre of the eyes, and brings the glasses low down upon the face, so that a person can look over them to see distant objects. A low nose is mostly used for concave glasses or to see distant objects. It sets the glasses high up on the face, and their wearer can look under the glasses to read. K nose is a nose piece made in the shape of the letter *K*. X nose is a nose piece made in the shape of the letter *X*. The latter answers the same purpose as the low English nose piece.

Pantascopic spectacles are those that have the temples at such an angle that cause the glasses to set upon the face at the same angle that most people hold a book when they are reading, and enable the wearer to look straight through the lenses, and not obliquely, as in ordinary spectacles.



How to measure a spectacle frame (see cut.)—From *a* to *a* is equal to the distance from *c* to *c*, measuring from where the lines intersect, and this is sure to give you the correct measure for the centres. B to B is the width of eyes; D to D is the width of nose; E to E is the height of nose; F to F is the width of front, or temple to temple. A person with a very prominent nose ought to have the nose piece of his spectacle set out well to allow the glasses to come close to the eyes. In the trade this is called the "set." I have known it to be necessary to "outset" the nose piece five-eights of an inch. Sometimes the nose piece is "inset" to fit a person with a very low bridge. Oculists measure from the inner canthers to crest of nasal bone. The average measure of a spectacle is *c* to *c* 2⅜ inches; width of nose 1⅛ and ⅜ deep. Many people can see better with one spectacle than with another, although glasses of the same kind and power are used in the two spectacles. This is caused very often by one temple frame causing the glasses to be decentered in one and in the other bringing the centres of the glasses opposite to the pupils of the eyes. Another frequent cause is the nose piece lining the glasses of one pair much closer to the eyes than the other. I shall write more fully upon this at some future time; at present I will say to any man who uses spectacles, try it. Who has not seen a person with their glasses down upon the end of the nose? They will tell you they can see better with them there. It is because the glasses are too weak. These little things are important, for I have seen a seller's patience exhausted, and heard him refuse to bother further with a customer, thinking he was being fooled, when in fact he was fooling (or trying to) the customer.

Many jewelers will not sell spectacles because it takes too much study. This is a mistake. It is very simple to suit ordinary eyes with spectacles, and by learning a few simple rules and facts it will not be necessary to show a customer more than two or three different glasses. I know many men that give a person a pair of spectacles and they know they will suit exactly. How it is done I will try to make clear, and I think it will repay for the trouble of learning.

Repairing of Steel Spectacles—how to take out screws that are rusted.—Oil the joint with kerosene oil, and let them stand for an hour or two; if the work has to be done immediately, put on lard oil and screw the joint, then take a good screwdriver made of 3-inch square steel (it is better than round steel); make on each end a screwdriver, harden and draw temper so that you can just file it with a Stub's file; never sharpen or shape your screwdriver with anything but a file; it is not so likely to slip and run into your finger; fit it into a good sized handle; the reason for making a screwdriver on each end is to have a small one for gold spectacles and a large one for steel; put a block of wood into your vice and hold the spectacle firmly to the block, and push very hard to keep the screwdriver in the slot of the screw, and turn gradually; if it does not come, and the slot is not deep enough in the screw, take a small cape chisel, not too sharp, lay the joint of the spectacle on a block of steel, cut a slot in the screw with the chisel, then try again, and it will most likely come out; if not, take a blunt punch, and with a sharp blow knock out the screw; lay the right hand temple on the table to the right, the glass also; then take off the left and lay it down on the left hand side; if the spectacle is broken in the eye near the joint, bend a piece of thick iron wire the shape of the eye, put on it some oil, then turn off the oil; this is to prevent the solder running upon it; then with fine binding wire tie it into the groove of the eye wire, leaving about ⅛ of an inch projecting; then tie on your joint; before tying on, clean off the edges of the steel thoroughly; have your borax very thick; for steel, take solder made of equal parts silver and copper, and solder with the first heat, because a scale will form, and then if you have misscd, you will find it cheaper to take it apart and clean again; after it is soldered, scrape off some of the scale and make it a little softer than blue, because the steel will be very hard after soldering, and liable to break; clean off, polish, and if necessary blue it over a very small gas flame, care being taken not to get any soot upon the frame or it will not blue; before using binding wire, oil it, and it will come off the work better; if the spectacle is broken at the nose piece, tie it together with binding wire.

How to put new Rivets into a Steel Spectacle.—File the wire tapering, cut off the thin end close to the joint, file it off flush with the joint, cut off the thick end, leave about 1-64 of an inch out, then give it a good blow with a hammer; file it off flush and blue. Never make a bolster rivet or bowl a head on each end of the rivet; if you do, the spectacle cannot be taken apart. To mend a gold spectacle, always use a thick piece of iron wire in the groove of the eye wire, and you will not be so liable to melt the frame in soldering, and for repairing silver solder should be used, unless you know the quality of the gold, and are used to soldering spectacles. If you want to solder a joint of a spectacle, it is well to put a piece of wood into the screw hole; this will prevent the solder running into the hole. If you want to solder a gold eye-glass with a file'd handle, put a piece of wood in the screw hole, cover the handle up well with rouge before soldering.

In my next paper, I will write of spectacle lenses and how to set them.

Proceedings of the Horological Club.

A Distinguished Body of Watch and Clock Makers.

Seventy-first Discussion.—Communicated by the Secretary.

[Notice.—Correspondents should write all letters intended for the Club separate from any other business matters, and headed "Secretary of the Horological Club." Direct the envelope to D. H. Hopkinson, Esq. *Write only on one side of the paper*, state the points briefly, mail as early as possible, as it must be received here *not later* than two days before the end of the month in order to be discussed and reported in the Circular for the next month.]

PHOTOGRAPHIC FORMATION OF COLORED STONES—COMPARING AMERICAN WATCHES TO HALF SECOND.

Mr. Lapidary referred to the letter of Mr. Freeman, read at our last meeting, but not discussed owing to the lateness of the hour. As to Mr. F's theory of the formation of the figures in colored stones by photographic influence, he could not answer unless Mr. F. would kindly name the particular stone or stones to which he referred. He would then be pleased to give his own views on the subject.

Mr. Freeman was unquestionably correct in his remarks on the general method by writers who give instructions for doing jobs of repairing, &c.,—that they seem to suppose that the workman has a shop full of tools, and is up to the times on all points. These writers do not even inform the workman what tools are necessary, in most cases, but leave him worse off, if anything, than he was before. But such observations could not be made regarding our own favorite writer, "Excelsior," for his instructions were certainly all that could be desired, and all that were possible within ordinary and necessary limitations as to time and space occupied. He not only tells how to do the work, but also what tools are required, how to make them, and how to use them. For instance, the directions given by Excelsior in his book for doing the job discussed by Mr. Freeman, comparing time to within ½ or even ¼ second, requiring nothing besides the regulator except *a piece of tissue paper*, which was certainly within the ability of any workman to obtain. This was a good illustration of the difference between the instructions given by most writers and those of Excelsior. No matter how difficult or complicated the operation to be performed might be, Excelsior would make it as plain and easy, to understand, and describe process and tools so minutely, that even the most ordinary workman could "tumble to it."

NEW COMBINATION LATHE, SCREW HEAD TOOL, AND HOLLOW TWEEZERS.

Mr. McFuzee then brought forward some new tools sent in for the examination of the Club, by Mr. Louis Hoefer, of Keokuk, Iowa, and which he pronounced well worthy of their commendation.

The lathe is indeed a *combination* lathe, being adapted for use either on a special stand, on the bench, or in the vise, and can be run by the foot, by a hand wheel, or with the bow, forming a combination of the features of both the live spindle and dead centre lathes. It had extra tail stocks, slides and rests, with centres or arbors and chucks of all sizes, and for almost every conceivable use. There was an ingenious lever arrangement for feeding up the back center for drilling, etc., and clamping the arbors, etc., in position. Also for holding the ordinary T rest, to turn in any direction and up to two inches from the center.

There was a jacot lathe attachment, with centers, etc., for all sizes from the smallest pivots up to jobbing sizes of ½ inch in diameter, and upward. Also an arrangement for centering, drilling, pivoting, and turning, on the jacot or dead center system, also from the smallest pivot up to jobbing sizes, like the other. Also an arrangement for filing true tapering points to centre on all sizes of wire staffs, materials, etc. Also eccentric arbors, etc. Also full sets of split chucks on the plan of the American lathes, for different bores of spindles, in great variety, from the largest to the smallest, including both step and plain chucks, also wax chucks of all shapes. Also a double screw-centering chuck, mills, male and female, and plain face plates,—and, in fact) the list of attachments and conveniences were so numerous that they must be seen to be appreciated. Mr. McFuzee said he understood that Mr. Hoefer would soon have an advertisement in the *Circular*, of this lathe and other new tools for sale by him, and thought that if he should furnish a full list of these attachments to his lathe he would certainly captivate the trade.

Mr. H. also sent in a scroll-head tool, to be held in the vice as usual, which had a solid substantial spindle, made hollow, and holding the screws truly in center by an arrangement of split chucks on the same plan as in the American lathe. By this plan the screws revolved as truly as if held in the split chucks of a lathe. There were a dozen of these split chucks, and the whole was contained in a substantial wooden box.

But the neatest little idea was his hollow tweezers. Every workman has found the inconvenience of holding a tapering object, or even a cylindrical one, in the ordinary flat tweezers, in a line with the length of the tweezers, and with the point of the object outward. Either the jacos would meet on the object and prevent the points of the tweezers touching it at all, especially if the larger end was behind the points and between the jaws, or else it would be impossible to make the object "point right, or prevent it swinging around and pointing every way but where it ought to. The jaws of these tweezers are not flat pieces as usual, but are stamped up hollowing, so that when the folid points touch together, there is quite a hollow space enclosed between the jaws, and an object may be securely held by the points even if it is considerably larger at the back end than where it is held. This large part falls in the hollow space and does not touch the jaws at all. These tweezers will take an ordinary tapering pin, hold it firmly in line, and stick it straight into its hole. The points arc as fine as any tweezers can be made. In short this is a handy little notion that every workman will be sure to buy on sight. Mr. McFuzee expressed the pleasure of the Club in examining and commending new improvements, and that we would be glad to receive such from all, whether manufacturers or workmen, who had something better than the usual run.

BIRCH'S SELF-ADJUSTING WRENCH.

Mr. Clerkenwell then exhibited a very ingenious wrench, made by the Birch Company, on the same plan as the popular Birch's self-ad. justing watch keys, and predicted for them a large sale. This wrench will take in nuts, squares, &c., up to about ½ inch in size, and fits all sizes down to ⅛ inch.

A NEW PLAN FOR REVISING THE WATCH AND JEWELRY TRADE.

Secretary of the Horological Club:

One of the greatest troubles we retailers have to meet, is that the public knows the wholesale prices of watches, jewelry, plated ware, etc., and unless a dealer will sell at those prices, people will send off to the city. The parties guilty of publishing prices are mostly "jobbers," who want to sell to dealers, and to their customers, too. I have a new scheme for getting around the whole trouble. To make the explanation easier, we will, for the present, confine it to the watch trade.

All the manufacturers, importers and jobbers shall sign a contract, or pledge, that they will not sell at wholesale prices to any one who is not known to be either a legitimate dealer in watches, put down as such in a Watchmaker's Directory, or vouched for as such by some other legitimate dealer; or to a jobber who has signed the same contract or agreement. No manufacturer, wholesale agency or branch, nor any jobber, shall sell at retail, *to anybody*,—either in their own places of business, or in others owned or controlled by them, in whole or in part, nor by agents, travelers, or peddlers, nor on commission or consignment, i.e., no such person or concern shall engage in the retail trade, directly or indirectly. Let every one be either a wholesale or a retail dealer, and not call himself a jobber merely to buy cheaper than his neighbor retailers. And if a manufacturer wants the wholesale custom of retailers, let him confine himself to the wholesale trade. Selling to them at wholesale, then competing with them at retail and using his power to cut under, may be called a cut-throat game, that retailers should not submit to.

I think this plan would remedy the whole trouble. It would stop the jobbers sending out circulars broadcast, for they would not be allowed to sell at retail. It would confine all sales by manufacturers and jobbers to the legitimate trade, and cut off all outside parties from getting the watches of good makers. All reputable makers and

jobbers, who mean to do a legitimate business with the trade, would willingly join in such a contract, if the plan was made general. Any one who would not, should be spotted as an enemy to the trade. The names and addresses of all such should be sent in a circular periodically to every legitimate dealer. And if they had proper self-respect, or regard for their own welfare, they would refuse to have any dealings with such self-confessed tricksters and underhanded rivals. I have no doubt that all the American companies, and most of the importing houses, including all the largest and best firms and reputable makers, would join in this, leaving only the small and irresponsible concerns, the "riff raff" of the business, to sell to dry goods stores, corner groceries, gift enterprises, and other outsiders. This would keep all the better class of watches out of their hands,—including all the best known makes, which the public know and prefer to buy—and they could only get cheap trash and refuse to sell. As soon as the public knew this, trade would come back to the regular dealers again, where it belongs.

I think this plan would work. It would not interfere in any way with those who are now doing a legitimate business, but it compels the others to give up their double dealing practices, or cuts them off from the patronage of the trade and confines them to sales to outsiders. All it wants is to be started and carried through by some body or organization having standing and influence enough to induce confidence that the plan would be generally adopted. I suggest that the Horological Club take hold of the matter, and earn the heartfelt and lasting gratitude of the trade. The evil is one of long standing and vital importance. It is in, reality, a matter of life and death to many of us. If something is not done, and that soon, we shall not be able to support our families, or to follow the business. We must unite and crush out the evil, or it will very soon crush us out. What say you, brethren of the trade?

DEALER.

Mr. Clerkenwell, to whom this letter had been handed for consideration, declared himself so much impressed by the value of the plan, that he proposed to become its sponsor in the Club, and to give some details which had occurred to him as essential to its success.

He thought, first, that for the plan to produce all the good it could, the retail dealers should also be required to pledge themselves not to *buy* of any manufacturer or jobber not on the list of signers of the agreement in question. If they did, their names should be struck off the list, and they be denied trade discounts from any legitimate wholesale dealer. As nearly all of the latter would join in the agreement, retailers would have about the same choice of houses to deal with, and the same free competition in prices, as now, and there could be no object in trading with the wholesale guerrillas. If they did, let them be classed with the guerrillas and enemies of the trade, and be allowed to deal with none but them.

Mr. Regulator said that a retailer could buy a large bill of watches, sell them at a small advance on cost, but virtually at wholesale rates, to the gift enterprises, premium newspapers, and other outside concerns.

Mr. Clerkenwell replied that it would soon be found out, and the names of such struck from the list of watchmakers, so that they could no longer get trade prices on desirable kinds of goods.

Mr. Regulator inquired who would strike off the names?

Mr. Clerkenwell thought that to carry the plan into effect, there should be a general or national union or society, to include all legitimate traders, both wholesale and retail, who would join in the agreement proposed. It should be the business of the secretary to make out the list of names, and a copy should be furnished to every member of the Union. It should be the duty of every member to report immediately, to the secretary, any violations of the agreement, with full details, names, time, place, etc. The list should be kept revised, and a corrected copy sent to every member at stated intervals, say quarterly, or monthly, as might be thought best. Members would of course pay a small amount annually, as dues, which would cover cost of circulars, postage, etc. Wholesale dealers should be notified weekly or oftener, of any changes, and their annual dues would be greater. The amount raised should be sufficient to also pay for the services of a suitable secretary, who should be required to give bonds, etc., as usual. The affairs of the Union would be managed by a resident board of directors, selected from the best men in the trade,—or in any other manner that might be thought best. All such details would be arranged on the organization of the Union.

But it was not sufficient that the agreement should be signed. Some men would sign anything, and then pay no more attention to it. In order to make the arrangement mean anything and amount to anything, it should be gotten up and managed in a strictly business manner. There should not only be an agreement, but some punishment for violating it, and punishment great enough to make a violation a serious matter, otherwise it would be perfectly useless to try to do anything at all. He thought that the agreement signed by wholesale dealers should contain a clause binding each one to pay to any member who should prove that he had violated his agreement, and sold a bill of goods to a person not on the current list, three times the amount of the bill sold, and not less than $500, with costs of suit, if the sum is sued for. The amount must be large enough to make it an object for any dealer, who discovers a violation, to prosecute for it, even if he has to leave home to do it. This would incite the whole trade to keep an eye out for such violations. The details of the contract, and especially of this part, should be drawn out by some skillful lawyer employed by the Union, so that it would be binding and would stand litigation. The amount of the forfeit would be no objection to dealers who meant to live up to the contract, as it would not matter to them what it was. Only, they would like it large enough to compel *all* to live up to the contract,—so that *they* would not be merely tying up their own hands by signing it, and leaving unscrupulous dealers free to violate when they saw fit.

Mr. Regulator said that was very true, but would not the jobbers be liable to be imposed upon by sharpers falsely representing themselves as dealers, in order to manufacture a violation of the contract, and give a chance to claim $500 therefor?

Mr. Clerkenwell said that there should be no trouble from that source. Jobbers find it easy enough to tell who their customer is when they are selling a bill on credit. They are not afraid of making any such mistake when it is for their interest to tell. And this forfeit will make it for their interest in this case also. It is as easy to tell in one case, as the other. They can make a stranger identify himself as well as banks in paying checks, the delivery of express packages, or any other of the thousands of business relations where valuables are concerned. Even if the stranger did not ask credit, it would be his business to show, to the satisfaction of the jobber, that he was actually in the trade and entitled to wholesale rates, or not be allowed them, even for cash.

Mr. Uhrmacher thought that was perfectly reasonable, and should be required in every instance. He knew of jobbers who would give wholesale rates to anybody who would buy of them, and if this plan would cure that evil only, it would be valuable. The practice was more common than was generally suspected.

Mr. Ruby Pin suggested that the jobbers could make themselves secure from any loss by having printed blanks, which they could fill out and have the party sign,—stating that the undersigned had this day purchased of so and so goods to the amount of $—, bill No.—, and he did hereby affirm that he was regularly engaged in the retail trade in ———, State of———, and was the person bearing that name, in said place, who was put down in the Watchmaker's Union's list of dealers. This, or something similar, would be legal proof that the man represented himself to be the dealer of that name, doing business at that place, named in the list, and would make the jobber safe, unless it could be shown that he knew the statement to be untrue at the time.

Mr. Clerkenwell thought that would be useless, for they could just as easily tell their man in this case, as when giving credit, and the simpler the plan was, the better it would be.

To be continued in Proceedings of next month

Repairing Swiss Watches.

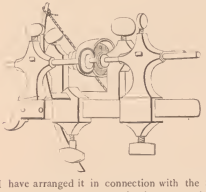
Continued from page 252, Vol. X.

REPAIRS TO BARREL AND BARREL ARBOR.

DOING it in this manner, the barrel is sure to be upright and true; if, on the other hand, both holes are *not* opened together and at the same chucking, it is almost impossible to insure its truth. It may be argued that doing it this way is almost as much trouble as making a new barrel; granted, but, many watches are met with, of good quality, having the barrel holes much enlarged, yet showing no signs of wear in the wheel teeth, and in such cases I think it is much better for the watch than the old barrel (which is most probably much harder than any you could procure from the material dealer's) should be retained.

The barrels to be obtained ready-made are, as a rule, soft, and the teeth are cut hollow; *i. e.*, with a *small* cutter run up *to the teeth*, and not traversed at right angles to the plane of wheel, as it should be. If a really good barrel is required, a blank must be turned and sent to the wheel-cutter to be cut.

The barrel cover may be finished in a variety of ways; it may be polished or spotted, or if it is bright snailed it will have a very nice appearance. Either of these modes of finishing are preferable to gilding it if it is thin, as this method of finishing is applicable to so many pieces in the watch. I give a drawing of the tool used for



snailing as I have arranged it in connection with the Swiss turns. It consists of a pair of small brass pivoting turns without a rest, having a T-shaped piece of brass screwed to the back, which enables you to put in the rest-holder of the turns, and fix it at any required distance from their centres. One of the screws, by means of which this T piece is attached to the turns, has a large flat head, and the hole in the T piece, through which it passes, is larger than the screw; consequently, by loosening this screw, the axles of the arbors carrying the work and the snailing mill can be set at a slight angle to one another; this is necessary to enable the mill to act only on the semi-diameter of the piece to be snailed. The mill for brass may be either boxwood or ivory, and the polishing material rather sharp red stuff, worked up not too fine. The bow is applied to the ferrule of the mill only as shown, the work which is mounted on an ordinary screw-arbor being allowed to revolve freely, the centres being liberally supplied with oil. The mill, as will be seen from the drawing, is hollowed out, except at the extreme edge; its diameter for this purpose should be about ⅜ of an inch. A new nut can be made from an ordinary rough lever roller of large size, the hole being drilled out to nearly fit the arbor; turn the sides flat, and leave it slightly thicker than it is required; drill the hole for the pin and one for barrel hook, and rub down both sides flat on an iron block with oil-stone dust. Harden it, tempering it to a blue color. You will now clear out the hole with a broach, and let it tightly on to the arbor; remove it, and polish the sides of nut underhand on a bell-metal block, perfectly flat; put the cover on arbor, also the nut, and broach out the pin-hole straight—fitting a *hard* pin of the same taper as the broach. If cover is bound, free it by polishing down that side of nut on the polishing-block; great care should be taken that only just sufficient freedom is allowed here. I generally cut a shallow hollow in the boss of cover to reduce the friction and retain oil, and a deep hollow in the nut on the underside to supply the lower pivot. The hook having been put in, and the corners of nut sloped off with a polished graver, completes the job.

One not unfrequently meets with barrel-arbors whose teeth having been stripped off, in places the "workman" has filed fresh ones in a very irregular manner; and, in order to allow the click to engage with this smaller ratchet, the notch in the bar is deepened, thus weakening it. Such a method of repair cannot be too strongly condemned. If teeth are broken out, a new arbor is an absolute necessity; and the difficulty of making a new one is certainly not such as to deter any real workman from doing so. Arbors can be procured from the material dealers already screwed, hardened and finished; but, as it is nearly impossible to find one of the correct size in the ratchet, and of the right height, they are useless to the workman for this purpose. The ordinary soft arbors having the teeth already cut are, therefore, the only ones available for this purpose; the workmen will do well to avoid those in which the teeth are much undercut—like saw teeth—such being very liable to strip or break.

To be Continued.

Views of Correspondents.

ARTIFICIAL DIAMONDS.

Ever since the scarcity of certain substances endowed them with a particular value, it has been the ambition of man to discover the secrets of nature and find out how the substances are made, or failing to do this, to produce substitutes for them, with which he might deceive his neighbor and swindle his fellow creature. If many lives have been spent in searching for the philosopher's stone which was to turn base metals into gold, many have also been wasted in trying to make diamonds. The discoveries of science give a plausability to this last research which has certainly an attraction, but even the most skilful chemists have failed to reconstitute a diamond of any size, though many have been destroyed in experiments.

Newton first gave the opinion that the diamond was combustible, but it was not till long after his death that it was proved that the diamond was composed only of pure carbon in a crystallized form. Scientists then tried to find a dissolvent for carbon, but when that was found it would not crystallize. In 1853, a French chemist, Despretz, using the very large galvanic battery then at the college of Sorbonne, sent an electric current through the vacuum made in a glass receiver; an arc was produced, and at the point when the light was red he placed a small cylinder of carbon made from burnt sugar, and as pure as possible; in the purple part of the light he placed some fine platinum wires. After letting the experiment go on for several months, he found that the platinum wires were covered with a black powder which contained some black crystals of microscopic dimensions, which proved to be true diamonds, but of no commercial value, though it had cost an important sum of money to produce them. The same result has been attained by decomposing a mixture of chloride of carbon and alcohol by weak galvanic currents. Thus far and no further has science gone, yet every now and then the trade is startled by the revelation that somewhere somebody has made a diamond. Some inventive genius says that glass or paste can be covered with a thin deposit of real diamond, just as brass can be plated with gold or silver. If such was the case, he must have found a dissolvent for his diamonds, and a way of precipitating them; it would be far more remunerative to him to deposit his diamonds inside large moulds, and to make real stones, than to plate bits of glass with them. Whatever the names may be, glass will never be but glass, and diamonds will always retain their place as the first of the precious stones. It is true that very good imitations have been made, but none of them attain the hardness of the real stone, though some, when well set, produce nearly the same effect. White quartz found in France, near Alencon, and in the Rhine, are often used to imitate diamonds, and a smoked crystal found in Canada is used for cinamon or dark stones.

Imitating precious stones with glass has been a lucrative employment, and was not unknown to the ancients if we believe Pliny and Tichellius Pollion. Thebes was the centre of manufacture, and the colored pastes were distributed by the Carthageniens and Phoeneciens. In the middle ages, judging by the quantity of imitation stones we find set by the side of and with real ones, in church jewelry, the art must have flourished nicely, and in modern times it has improved

like many other industrial arts. The best glass made to imitate the diamond and other precious stones bears the name of its inventor; it is called Strass, and was first made in 1819; it is composed of silicate of potash, oxide of lead, of borax and arsenic. Doublets are also often used; the lower part of the stone, that is from the girdle down, is made of a piece of Strass properly cut, over which is stuck a table of quartz, the edges of which are also cut. The quartz gives the requisite hardness to the part of the stone that is exposed, while the Strass gives the brilliancy; these stones are set so that they are held well together at the girdle. Doublets are also extensively used to imitate other stones; the table or top is often made of a thin piece of the real gem, and the cullet is made of paste.

An old French method of imitating a rose cut stone is interesting; it consists in having a piece of Strass cut about one-third smaller than the stone is to be when finished. This piece is stuck in the setting on a piece of silver paper, around this piece are then stuck as many little pieces of polished silver or steel as there are facets in the stone; the top is then covered with a table in quartz. The effect, says the writer, is very brilliant, but it lacks solidity, for the pieces of metal may easily get unstuck. The hypothesis of the physician mentioned in the last number who looks for diamonds in the intestines of antidiluvian animals, has a flavor of novelty about it, which, if not correct, is nevertheless clever. Though the diamond crystals are generall found in ancient allurium beds, they come from rocks of quite a different formation, from which they have been washed. In Brazil, it has sometimes been found in the original rock, and near Golconda it is found in a kind of pudding stone with quartz, silex, jasper united by a cement containing iron. The diamonds to be found among antidiluvian bones will probably be classified near the stones found in the heads of toads and serpents, and other fabulous gems.

FREDERIC VORS.

Editor Jewelers' Circular:

The Guild Stamp letter in your last issue evidently indicates a programme for the forthcoming Iowa State Convention, but it may prove to lessen the interest in our association instead of increasing it. The original and direct aim of our compact was to unitedly refuse to deal with wholesale houses that solicited retail patronage. That was a platform broad enough to hold all the retailers in the country, and if even a small majority of the best men in two or three of the northwestern States would subscribe to it in good faith, our object would be accomplished. Certainly the new policy urged with so much confidence by the president of our organization merits and will receive respectful consideration, but a subject so problematical as the results of a Guild stamp will naturally encounter a great diversity of opinion including much adverse criticism.

The first and great objection that occurs to me is that it is not necessary.

United States contain manufacturers who are not only honorable in every sense of the word, but who furnish prompt paying retailers with merchandize, the quality of which admits of no question, and which in point of elegance and cost of production is unequalled elsewhere in the work.

A following objection is that we might get tired out trying to build up a new set of producers to give us the same advantages afforded by those already so solidly in the field. And finally what would a man who had by years of hard work and strict integrity built up a good business and made his word and judgment valuable in a community, gain by virtually going into partnership with every other dealer.

The fact, unpalatable as it may be, is, that the great mass of retail jewelers did not at all realize the condition in which the past few years of financial depression placed as in relation to other branches of merchandizing.

If we had unloaded stock faster and cut prices quicker and deeper we would have repelled to a great extent the invasion from dry goods, clothing and dollar stores, as well as the illegitimate jobbers.

The shaking up we received has taught many a man what seems so hard for a practical watchmaker to learn—to look sharper after sales, large and small, a lesson that in future will result in poorer pickings for intruders and less theorizing among ourselves.

Very truly yours,

Des Moines, Feb'y 4. HENRY PLUMB.

Editor of the Jewelers' Circular:

Much interest seems to be taken in the subject of the crystalization of carbon, since the investigations of McTear and Maskilyne. Bisulphide of carbon and carbonic acid have certain analogies. Some ...ince I was endeavoring to find whether the analogy could be continued far enough to substitute the former for the latter in carbonates of the metal. Kolbe states that a lower sulphide of carbon exists in the gaseous state, equivalent to carbonic oxide, which I supposed would be easier to work out. The difficulty of obtaining this nearly pure, induced me to try a different mode of decomposing the bi-sulphide. None of the usual reducers, nor even a strong battery current, would effect this. However I succeeded in doing it by making the bi-sulphide itself one element of the battery. I covered the carbon with water, acidulated with sulphuric acid and sulphate of copper, in which I placed a sheet of copper and a sheet of clean zinc, free from oxide, connected with a wire, in the carbon. Immediately a strong current of gaseous proto-sulphide of carbon was distilled from the zinc. A similar proto-chloride was of carbon can be made by substituting chloroform for bi-sulphide of carbon.

It then occurred to me to place the battery in sunshine, to see whether the decomposition could not be further continued and crystals of carbon (that is, diamonds), could not be formed on the plate of zinc; sunlight being able to effect a decomposition of bisulphide to a crystalline proto-sulphide in certain cases. The effect was as I expected. Beautiful crystals of carbon, minute, but having the usual curved form of facet, etc., slowly formed on the zinc. After forming a coat of sulphide of zinc on the surface, the stream will of proto-sulphide of carbon will gradually diminish. By raising the plate carefully into the acid liquid the action may be continued. A small plate of zinc should be used. These small diamonds cut glass, the shank of a file tempered as high as possible, etc., with perfect facility. They are minute and are difficult to analyze satisfactorily without apparatus, which I do not possess. They withstand any temperature that I subjected them to; are consumed in nitre; burn with red light in oxygen without residue, and have all other qualities that diamonds possess. The experiment is very simple to try, and any one can substantiate these facts who desires.

This is a long step, however, from practically crystallizing carbon and forming diamonds. No lady, therefore, need run off in a panic and sell her jewels. The men who to-day stand at the headers in the tunnels of science, pushing onward through darkness and difficulty toward the eternal light, will surely crystallize carbon in a larger way when it may be necessary for further progress. At present, however, there is much too important work on hand for them to trouble themselves much about crystallizing carbon merely for the sake of doing it.

L. STERLING.

Bridgeport, Conn.

To the Editor of the Jewelers' Circular:

The following notice appears in the Trade Gossip of the February issue of the CIRCULAR, "Complaints are reaching us from all part of the country that the catalogue people of Chicago are again deluging outside dealers with their catalogues and price lists." Now I am not aware that these practical jobbers ever ceased deluging out iders with catalogues and price lists; every dry goods dealer, every hardware and general store keeper in my town has received from one to three copies of these pernicious price lists from every jobber in Chicago and Cincinnati. I think it is about time that the offices of the various State Guilds went to work in earnest to show up these vultures who are destroying the trade of the poor retailer by encouraging unfair competition. A few days since, a drummer of one of these catalogue jobbers called on me, and I gave him an order for quite a nice little bill of goods. The rascal denounced the system of sending out catalogues to outsiders in the strongest terms of condemnation. He said that the house he represented had seen the error of their ways and had reformed; in other words, they had made up their minds to stand by the legitimate trade. They had ceased to publish catalogues, and did not intend to take it up again. He was a glib talker, and seemed so much in earnest that I gave him my order. You may imagine my astonishment when I discovered shortly after this drummer left town that he had sold neatly every dry goods, hardware, and general store in town, and I freely admit I was the worst sold man in the territory. Since this drummer took his departure, I have had a pair of square-toed boots, double soled; if he is wise in his generation, he will keep out of this settlement.

DAKOTA TERRITORY.

THE cradle which the King of Burmah has had manufactured for his child is so magnificent as to cost the State two lacs of rupees. It was first framed with mango wood and then incased with sheet gold inside and out. Over this is ornamental gold work set with diamonds, rubies, sapphires, emeralds, and other precious stones. The cradle is swung from a rod by cords made of gold wire, and the bed or cushion is of embroidered green velvet. The baby's wardrobe cost 5,000 rupees.

The Diamond Trade.

DIAMONDS, so the foreign trade reports tell us, are once more coming into brisker demand, and, in spite of new sources for the gem, the supply does not seem to suffice. One secret that Nature still jealously guards from man is the composition of those exquisite crystals which we call "precious stones." Fairy stories and Eastern legends therefore diligently concern themselves with the diamond and emerald, sapphire, opal, ruby, and amethyst. For these, at any rate, there is still left a fragment of beautiful wild Nature not yet enclosed by science, a common whereon the children of fancy can still disport themselves as they please without any aggravating intrusion of superior authority. Wise men may elaborate a prosaic chemistry, producing crystals which they declare to be the facsimiles of nature's delightful gems; but the world will not accept the ruddy residue of a crucible full of oxides as rubies, or the shining fragments of calcined bisulphides as emeralds. No crucible yet constructed can hold a native sapphire, and all the alchemy of man directed to this point has failed to extort from carbon the secret of its diamond—the little twelve sided crystal that earth with all her chemistry has made so few of since first heat and water, Nature's gem-smiths, joined their forces to produce the glittering stones. They placed under requisition every kingdom of created things, and in a laboratory in mid-earth set in joint motion all the powers that move the volcana and the earthquake, that re-fashions the world's form and substance, that govern all the stately procession of natural phenomena. Yet with all this Titanic labor, this monstrous co-operation of forces, Nature formed only here and there a diamond and here and there a ruby. Masses of quartz, crystals of every exquisite tint, amethystine and blue, more beautiful, perhaps, in delicacy of hue than the gems themselves, were sown among the rocks and scattered along the sands, but only to tell us how near Nature came to making her jewels common, and how, just when the one last touch was needed, she withheld her hand, that man should confess the triumphs of her art were indeed "precious."

Ages ago, when the list of minerals was much less complete than at present, men were admitted merely to the knowledge of the imperfect gems, and, treasured, therefore, stones which, though very beautiful, are no longer among the highest prized. For emeralds they had only malachite, for sapphires lapis lazuli, and jaspers, agates, carnelians, alabaster, onyx, and beryl, all ranked as precious stones. Knowledge, however, advanced with science, and men found that the minerals they had thought so rare abounded in the secret treasures of the rocks. From the crowns of Princes, the painted stones came to pave the palace floors, and instead of being mysterious substances armed with strange powers, were enlisted for the adornment of household furniture. Arabesques of dainty minerals appeared on the temple walls of the East, and in the architectural fanes of every nation the quasi-precious stones of former days lent their colors to give relief and grace to the several beauties of the building. A new treasure trove had then been sprung. Nature, it was found had carried her chemistry further towards the perfection of hue and brilliancy than in her rock masses and pebbles, and so the supreme representatives of wealth came to be the stones which to this day constitute the ideal standards of worth and beauty. But there are surprises yet in store for humanity, and one by one, it may be, the ruby, the emerald, and the rest will decline to the second rank, as the onyx and the turquoise have already done, in the presence of further revelations of the earth's crystals. Again and again, even within the present century, the gem markets have borne witness to sudden revolutions in fashion, and unexpected changes of taste; but a modern writer traces these to the fact of allied crystals depreciating, by their abundant appearance, the worth of their nobler relatives. Diamonds are not now all of one kind—a genius without species, a species without varieties—for there are a dozen sorts, each differing from the other in beauty and in value; but the original "diamond"—of the pure water of the Brazilian or Eastern stone—still commands a universal homage. If, however, the other varieties, which differ from their splendid prototype only microscopically, were any day to be made worthless by their profusion, the king of the gems itself would seem to dim in lustre. If Nature, exasperated by the persistent efforts of men. were in revenge to disclose to the prying pick-axe a solid crag of "Cape diamond," or a load of beryl-emerald, the markets for the true gems would be glutted with a jewel so near the truth, that the truth itself, multiplied in exquisite replicas, would come to be held less precious. Already the fanciful beauties and powers which our forefathers imputed to gems are obscured and discredited. What husband, suspecting an unfaithful wife, would nowadays smuggle emeralds into her food, or what wife, seeking to redeem a drunken husband would secrete amethysts in his liquor? The onyx has lost the latch-keys of the dream-gates, and no oracle now speaks from the opal. We shall have to look very long, indeed, into the aqua-marina before we read another's thoughts in it, and the diamond sparkles as brightly for the knave as for the honest man. Eastern people still venerate, while they delight in the quaint phantasies of the mineral world—the hieroglyphic agate, and luck assuring "cats-eye," the ominous moonstone, the unlucky tourmaline, and the carbuncle all aglow with malignant fire. The jeweled rocks of Ceylon contain within them a mythology of vast extent and wildest exuberance; and the streams of Burmah are strewn with sapphires—white, blue, and black—and bastard and mimic amethysts, to all of which attach the same superstitions and traditions that are claimed by the more splendid treasures of the Indian mountains and rivers. All the human affections and passions are under the influence of gems, and each gem again has its tutelary sprites, who direct its powers for good or evil. From the cradle to the grave, in sickness or in health, in prosperity or adversity, the Oriental may take counsel of a jewel or seek its help, and no circumstance of his life is without its precedent of subjection to the potent agencies of "the precious stones."

In the West, these supernatural potencies of the rarer minerals have been dispersed by ruthless chemistry. Newton spoke profanely of the diamond as "an unctuous substance coagulated," and popularized science nowadays pretends to sneer at the glory of diadems as "only charcoal, after all." Chemists set down paper exactly how many acids and papers, acting upon how many salts and alkalies, would produce, if the elements would all lend their aid in a supreme effort of creative force, a "precious stone" and by their labored explanations bear witness to the dignity of the gems they long to imitate. New influences, moreover, have gathered round the Royal crystals. While the emerald has disclosed to the inquirer after its composition a valuable fact of the action of gases, the diamond has lent itself to boring rocks. A hollow cylinder, edged with diamonds and revolving rapidly, ate its way in a single hour through a rock which by any other known means it would have taken two days to pierce. Had the diamonds that had done it were found to be absolutely unaltered by the tremendous friction—too proud to confess even to the blunting of a single edge on its surface. But it is not for the chemical properties, or their existence in human industries, that precious stones will maintain their hold upon the imaginations of men. In the weakness of our nature, we must have an ideal of beauty from which to deduce our standards of worth, and as yet we have found nothing to excel the twelve-sided crystal we call a diamond. Ever since it was known to man it has reigned supreme over the fancy, and whatever the race, whether in the East or the West, the diamond has never been supplanted as the most beautiful thing vouchsafed to humanity. The historical gems—"the Royal stones," as they are called—of exceptional size and fabulous value may in one claim this pre-eminence, for the smallest fragment that suffices to give a glimpse of the prismatic glories of the larger stones is treasured. With other gems size often—in emeralds, in the East, notably—establishes a claim to value, but the diamond disdains honor for the mere material virtue of bulk. The boasted gem of the Borneo chief, three times the dimensions of the Koh-i-noor, collapsed on inspection to a third-rate stone. It had size and weight, and was a diamond, but the stone had no soul. It was a dead diamond. If all crystals had been in the same way judged, merely by color and magnitude, we should have had no lack of gems, but then neither beautiful legends nor the homage of men would have gathered round the exquisite things, and the mysterious depths of translucency, tones of pure color, and wondrous lustre would have been kown to us in the supreme combination of the perfect gem of modern days.

Workshop Notes.

CROCUS, dried and powdered, when applied with chamois leather to nickel-plated goods, will restore their brilliancy without injuring their surface.

Under the action of ozone, silver quickly assumes a coat of black oxide, but gold and platinum remained unaffected. Mercury is superficially oxidized by ozone.

AN excellent paste for cleaning metals is made of equal parts of benzine and saturated oxalic acid solution, mixed with powdered rottenstone, to the consistency of thin paste, which is to be kept in a covered utensil when not in use.

A GERMAN chemist has invented a preparation which, if applied to mirrors of a certain kind, makes them retain the reflection of what is before them at a certain stage of the chemical action on the surface. It may yet revolutionize portraiture.

TO dissolve the silver off old plated goods, mix 1 oz. of finely powdered saltpetre with 10 oz. sulphuric acid, and steep the plate in this mixture. If diluted with water, it acts on copper and other metals, but if very strong it dissolves the silver only without affecting the other metal.

PRICE OF RARE METALS.—Dr. Theodore Schuchardt, of Goerlitz, Germany, prepares some of the rarer metals, and charges for them the following prices: Cerium, 20 shillings per gramme; lanthanum, 40 shillings; didymium, 30 shillings. These are in globules obtained by electrolysis. Thorium, in powder, is 36 shillings per gramme.

TO SOLDER TORTOISE SHELL.—Bring the edges of the pieces of shell to fit each other, observing to give the same inclination of grain to each; then secure them in a piece of paper and place them between a piece of hot iron or pincers; apply pressure and let them cool. The heat must not be so great as to burn the shell; therefore try it first on a white piece of paper.

A reliable silvering amalgam can be made by precipitating silver from its solution in nitric acid by means of copper. Take ½ an oz. of this powder, 2 oz. of common salt, 2 oz. sal ammoniac, and 1 drachm of corrosive sublimate; add enough water to mix into a paste. Then carefully clean the copper surface of the article to be treated then boil it in a solution of tartar and alum. Rub it with the paste, heat red hot, and polish.

FUSIBILITY OF METALS.—By means of extremely delicate processes, M. Violle has lately determined the fusing points of the more refractory metals. The following are given as the exact temperature for five of these metals in the order of their fusibility: Silver, 1,749° Fah.; gold, 1,863°; copper, 1,890°; platinum, 3,195°; iridium, 3,510°. It will be seen that pure copper requires a higher temperature to fuse it than gold; ordinary commercial copper, however, melts below 1,935°. Iridium is the most difficult of all metals.

COLORING BRASS.—In coloring and lacquering brass work, says *The Engineer*, browns of all shades are obtained by immersion in a solution of nitrate or the perchloride of iron, the strength of the solution determining the depth of the color. Violets are produced by dipping in a solution of chloride of antimony. Chocolate is obtained by burning on the surface of the brass moist red oxide of iron, and polished with a very small quantity of black lead. Olive-green results from making the surface black by means of a solution of iron and arsenic in muriatic acid, polished with a blacklead brush, and coating it when warm with a lacquer composed of one part of lac-varnish, four of tumeric and one of gamboge.

RECOVERY OF GOLD FROM SOLUTIONS.—An easy method to recover gold from solutions, particularly from old toning-baths of photographers, has been made known by FR. HAUGK. It consists in filtering the solution into a white glass flask or bottle, making it alkaline with sodium bicarbonate, and then adding, drop by drop, a concentrated alcoholic solution of aniline red (fuchsine), until the liuuid retains a deep strawberry color. The flask is then exposed to the sunlight for six or eight hours, at the end of which all the gold still present will have been precipitated as a dark violet color, and the liquid will have become colorless. After pouring off the liquid the flask with its precipitate, is kept until a fresh quantity of solution has to be precipitated, and this is continued until the deposit in the flask is sufficiently large to make it worth while to remove it. It is then transferred to a filter, washed, dried, and burned with the filter. The residue, containing the filterash is dissolved at a gentle heat in aqua regia, filtered, and the solution evaporated to dryness. The quantity of impurity caused by the simultaneous solution of the filter-ash is too insignificant to be objected to.

ANALYSIS OF GERMAN SILVER.—A good method of separating copper, nickel, and zinc, is to dissolve the alloy in hydrochloric acid containing a few drops of nitric acid, and precipitate the copper from the slightly acid solution in the form of sub-sulphocyanide of copper. The liquid, after being filtered and reduced, by evaporation, to a small bulk, is treated by excess of caustic potash, and then by hydrocyanic acid, until the precipitate which is the first formed is completely re-dissolved with a yellow color. In this liquid, which contains the double cyanides, the zinc is precipitated in the state of sulphide, by means of protosulphide of potassium (not sulphide of ammonium). After some hours' digestion, and when the precipitate is completely deposited, it is filtered off, and, after boiling the liquid with *aqua regia*, the nickel is precipitated as oxide by caustic potash. This oxide must be calcined after it is dried.

POLISHING VULCANITE.—Remove scratches with a smooth wet water of Ayr stone, and then polish in the lathe with fine pumice and a stiff brush. After washing the pumice off, polish it with whiting and soft brush. The mathematical instrument makers treat it as brass; that is, for flat work they use water of Ayr stone, and then rottenstone and oil. Turned work is polished in the lathe with rottenstone and oil, taking care not to use too high a speed which would heat the work. Some use lampblack and oil to finish with where a very high polish is wanted, or the bare palm of the hand, as in getting up silver plate. Chain and ornament makers use circular buffs for their flat work, made of sea-horse leather, and for work of irregular forms buffs of calico. A number of pieces, twelve inches in diameter, are screwed together between flanges, like a circular saw spindle, and used with rottenstone, always taking care not to heat the work; brushes are not at all suitable for it.

THE difficulty of making small steel and iron articles bright by removing the "scale" or oxide can, says *The Electro Metallurgist*, be readily overcome by the following process, without having recourse to the ordinary one—that of scouring after pickling with dilute sulphuric acid. First, let the articles be plunged into a boiling solution of caustic potash or soda for a few minutes to remove greasy matter. Then rinse in clean water. Next, place the articles in a weak pickle of sulphuric acid—about half a pound of acid to each gallon of water. From ten to twenty minutes' immersion is generally sufficient to loosen the scale. Let the article be again rinsed and afterward dipped by means of a perforated stoneware basket into a strong solution of commercial nitric acid for an instant, when the black oxide will be immediately removed. The dipping basket should have a rotary motion given it while in the acid and then removed promptly and plunged into cold water. The articles may then be coppered, silvered or gilt with ease.

LACQUERING BRASS.—In preparing brass for the colorless or nearly colorless lacquer, the goods, after being annealed, pickled, scoured, and washed, are either dipped for an instant in pure commercial nitrous acid, washed in clear water, and dried from sawdust, or immersed in a mixture of one part of nitric acid with four of water, till a white curd covers the surface, at which moment the goods are withdrawn, washed in clear water, and dried in sawdust. In the first case the brass will be bright, in the latter a dead flat, which is usually relieved by burnishing the prominent parts. Then the goods are dipped for an instant in commercial nitric acid, and well washed in water containing argol—to preserve the color till lacquered—and dried in warm sawdust. So prepared, the goods are heated on a plate and varnished. The varnish used is one of spirit, consisting in its simple form, of one ounce of shellac dissolved in one pint of alcohol. To this simple varnish are added such coloring substances as red sanders, dragon's blood, and annatto, for imparting richness of color. To lower the tone of color tumeric, gamboge, saffron, Cape aloes, and sandarac are used. The first group reddens, the second yellows the varnish, while a mixture of the two gives a pleasing orange, and various tints can be given by suitable mixtures.

WHY GOLD IN JEWELY CHANGES COLOR.—It is well known that the human body contains humors and acids, similar in action to and having a like tendency towards baser metals, as nitric and sulphuric acid have, namely, to tarnish or dissolve them, varying in quantity to different persons. Thousands wear continually, without any ill effect, the cheaper class of jewelry with brass ear-wires, while if others wore the same article for a few days they would be troubled with sore ears, or, in other words, the acids contained in the system would so act on the brass as to produce ill results. Instances have occurred in which articles of jewelry of any grade below 18 carat have been tarnished in a few days, merely from the above-named cause. True, these instance are not very frequent; nevertheless, it is as well to know them. Every case is not the fault of the goods not wearing well, as it is generally called, but she result of the peculiar constitution by which they are worn.

Indian Jewelry.*

As primitive as the twisted gold wire forms of Indian jewelry, is probably the chopped gold form of jewelry worn also throughout India, the art of which is carried to the highest perfection in Ahmedabad and Surat, in Western India. It is, indeed, worn chiefly by the people of Guzerat. It is made of chopped pieces, like jujubes, of the purest gold, flat or in cubes, and, by removal of the angles, in octahedrons, and strung on red silk, is the finest archaic jewelry in India. The nail-head earrings are identical with those represented on Assyrian sculptures. It is generally in solid gold, for people in India hoard their money in the shape of jewelry; but it is made hollow to perfection in Surat, the flat pieces and cubes and octahedrons being filled with *lac* or *dammar*.

The beaten silver jewelry of the Gonds and other wild tribes in the plains of India, and in the Himalayas, is also very primitive in character, the brooches in particular worn by the women of Ladak being identical with those found among Celtic remains in Ireland and elsewhere. Here the form, a flat and hammered silver band, hooped in the centre, with the ends curled in on the hoop, is too artificial to have arisen independently in India and Europe, and must have travelled with the Celtic emigration from the East, westward. Mrs. Rivett Carnac exhibits an exhaustive collection of the aboriginal and peasant jewelry of India.

The silver filigrain work in which the people of Cuttack have attained such surprising skill and delicacy, is identical in character with that of Arabia, Malta, Geneva, Norway, Sweden, and Denmark, and with the filigrain work of ancient Greece, Byzantium, and Etruria, and was probably carried into the West by the Arabs and Phœnicians, and into Scandinavia by the Normans. In Cuttack the work is generally done by boys, whose sensitive fingers and keen sight enable them to put the fine silver threads together with the necessary rapidity and accuracy.

The waist-belt of gold, or silver, or precious stones, which is worn in India to gird up the *dhoti*, or cloth worn about the legs, recalls the Roman *cingulum;* and, as in Rome, when the ceremony of changing the *toga pretexta* for the *toga virilis* were performed, the *aurea bulla* was taken from the boy's neck, and consecrated to the domestic *Lar;* so, in India, at the ceremony of investiture with the sacred thread, an identical ornament, a hollow hemisphere of gold, hung from a cotton thread or chain of gold, is taken from the boy's neck, and the sacred thread, the symbol of his manhood, put on him.

The *nao-rattan*, an amulet or talisman composed of "nine stones," generally the coral, topaz, sapphire, ruby, flat diamond, cut diamond, emerald, hyacinth, and carbuncle, is certainly suggestive also of some connection with the *urim* and *thummim*, or sacred oracle of the Jews, taken by Chosroes II. from Jerusalem, A.D. 615, and probably still existing among the ruins of one of the old Sassanian palaces of Persia. The *tri-rattan* is the "triple gemmed" "Alpha and Omega" symbol of the Buddhists.

The jeweler and goldsmith's art in India is indeed of the highest antiquity, and the forms of the jewelry, as well as of the gold and silver plate, and the chasings and embossments decorating them, have come down in an unbroken tradition from the Ramayana and Mahabharata. In the Ganges valley dawned the first light of Aryan civilization, which spread thence into the valley of the Tigris and Euphrates. The civilization of Egypt was more ancient, but was undoubtedly largely influenced by Assyria and India, influencing them in turn; and from the earliest ages, as throughout all ages, through the Arabs, Phœnicians, and Armenians, the civilization of India, Egypt, Assyria, and that of Greece and Rome, have acted and reacted on each other. But the earliest records, the national epics, and ancient sculptures and paintings, represent the forms of Indian jewelry, of Hindu jewelry, and gold and silver plate, and common pottery and musical instruments, and describe their character, exactly as we have them now.

After the archaic jewelry of Ahmedabad, the best Hindu jewelry, of the purest Hindu style, is the beaten gold of Sawuntwari, Mysore, Vizianagram, and Vizagapatam, which well illustrates the admirable way in which the native workers in gold and silver elaborate an extensive surface of ornament out of apparently a wholly inadequate quantity of metal, beating it almost to the thinness of tissue-paper, without at all weakening its effects of solidity. By their consummate skill and thorough knowledge and appreciation of the conventional decoration of surface, they contrive to give to the least possible weight of metals, and of gems, commercially absolutely valueless, the highest possible artistic value, never, even in their excessive elaboration of detail, violating the fundamental principles of ornamental design, nor failing to please, even though it be an effect of barbaric richness and superfluity. The character of Indian jewelry is in remarkable contrast with modern European jewelry, in which the object of the jeweler seems to be to bestow the least amount of work on the greatest amount of metal. Weight is, in fact, the predominant character of European "high class" jewelry and gold and silver work. Even when reproducing the best Adams designs, they spoil their work by making it too thick and heavy; and so demoralizing is the rage for weight, that English purchasers attracted by the eye to Indian jewelry, directly they find how light it is in the hand, refuse it as rubbish; the cost of Indian jewelry being from one-twentieth to one-fourth in excess of net weight. The jury on jewelry at the Great Exhibition of 1851 actually wrote of Indian jewelry: "It is sufficient to cast a glance on the exhibitions of India, Turkey, Egypt, Tunis, to be convinced that these nations have remained stationary from a very early period of manufacture. Some of them, indeed, develope ideas full of grace and originality, but their productions are always immature and imperfect, and the skill of the workman is called in to make amends for the inadequateness of the manufacturing process." Surely it is better to remain stationary than to fall, as we have in England, from the thin beaten silver of Queen Anne's reign, and the designs of Adams, to the present unseemly dead-weight silver and gold manufactures of Birmingham and London, for which customers have to pay four times and more than the value of their weight. The deceitfulness of its false appearance of richness and solidity, and flaunting gorgeousness, is, in fact, one of the greatest charms of Indian jewelry, especially in an admiring but poor purchaser's eye. You see a necklace, or whatever ornament it may be, made up apparently of solid, rough-cut cubes of gold, but it is as light as pith. Yet, though hollow, it is not false. It is of the purest gold, "soft as wax," and it is this which gives to the flimsiest and cheapest Indian jewelry its wonderful look of reality. Again, you see a necklace or girdle of gems which you would say was priceless, but it is all mere glamour of pearls and diamonds, emeralds and enamel, which "deceitful shine," but have no intrinsic value. The Indian jeweler thinks only of producing the sumptuous, imposing effect of a dazzling variety of rich, brilliant colors, and nothing of the purity of his gems. He must have quantity, and cares nothing for commercial quality, and the flawed "tallow-drop" emeralds, and foul spinel rubies, large as walnuts, and mere splinters and scales of diamonds which he so lavishly uses, are often valueless, except as points, and sparkles, and splashes of effulgent coloring; but nothing can exceed the skill, artistic feeling, and effectiveness with which gems are used in India, both in jewelry proper and jeweled decorations of arms and plate. In nothing do the people of India display their naturally gorgeous and costly taste so much as in their jewelry and jeweled arms, which are not only fabricated of the richest and rarest materials, but wrought likewise with all the elaborateness, delicacy, and splendor of design within the reach of art.

The finest gemmed and enameled jewelry in India is that of Cashmere and the Punjab, the type of which extends across Rajputana to Delhi and Central India, and in a debased meretricious form through-

* From the excellent "Handbook to the Indian Court," Paris Exhibition, 1878. By George C. M. Birdwood, C.S.I., M.D.

out Bengal; tires, aigrettes, and other ornaments for the head, and hanging over the forehead; earrings and ear-chains, and studs of the *sevenli* flower; nose rings and nose studs; necklaces made up of chains of pearls and gems, falling on the breast almost like a stomacher of gems; others, of tablets of gold set with precious stones, and strung together by short strings of mixed pearl and turquoise, with a large pendant hanging from the middle, gemmed in front, and exquisitely enameled, like all the rest of this necklace, or rather collar, at the back; armlets, bracelets, rings, and anklets; all in never-ending variations of form, and of the richest and loveliest effects in pearls and turquoise, enamel, ruby, diamond, sapphire, topaz, and emerald. The bracelets often end in the head of some wild beast, as in the bracelets of the Assyrian sculptures, and the plaques are often enameled at the back with birds or beasts *affronté* on either side of the taper "Cypress" tree, or else some wide-spreading tree, identical, probably, with the *Asherah* or "*Jlom*," the symbol of *Asshur*, connected in the Bible with the worship of Astoreth or Astarte, and translated by the word "grove," or "groves." The long dangling necklaces worn hy the women are called *lalanli*, or "danglers," "dalliers," and *mohanmala*, or "garlands (spells) of enchantment."

The jewelry of Cashmere is the same as that of the Punjab in form, but what I have seen of it has been in gold, and the choicest specimens, in "ruddy gold," combining a good deal of filigrain work.

The gemmed jewelry of Delhi has lost its native vigor under European influences, but although weak, is pretty. The little miniatures, "Delhi paintings," with which some of it is adorned show that the "limners" of the Mogul's capital have lost nothing of their cunning since Terry so highly praised their skill. They paint not with the brush, but with a pen. The *babul* ornament is not only very pretty, but highly interesting, for it proves that the Phœnician art, so long forgotten in Europe, of soldering gold in grains, which Castellani rediscovered some years ago still practiced in an obscure Italian village, has never been lost in India.

The jewelry of Scinde and Baluchistan is similar to that of the Punjab, but usually only in gold and silver. Solid silver torques, and anklets, and bracelets are very common, of a severe style of rectangular construction and ornamentation.

The gold jewelry of Trichinopoly, celebrated among Anglo-Indians, has been corrupted to European taste, but nothing could exceed the technical excellence of the rose-chains and flexible serpent and heart necklets and bracelets.

Scindia's great chain of pearls has been an heirloom in his family for generations. Three of the end pearls in a large pendant of flat diamonds and pearls are worthy of the "triple-gemmed ear-rings" of Juno, as described by Homer (Il. xiv. 183),—

> "Fair beaming pendants tremble in her ear,
> Each seems illumined with a triple star."

And (Od. xviii. 298),—

> "Ear-rings bright,
> With triple stars that cast a trembling light."

Gem engraving is an immemorial Eastern art, as the cylinders of Ninevah and Babylon and Persepolis testify, and Delhi has always been famous for its practice. Among the Prince's arms will be found a large emerald magnificently cut as a conventional rose. The old Delhi work in cut and gem-encrusted jade is priceless. The Chinese had cut jade for ages, but never ornamented it, except by sculpture; but when it was introduced into India, the native jewelers, with their quick eye for color, at once saw what a perfect ground it afforded for mounting precious stones, and they were the first to encrust them on jade. The Indian Museum possesses the choicest and grandest specimens of this work known, of the best Mogol period. They were exhibited at the Paris Exhibition of 1867.

The jewelry of Ceylon in filigrain, chasing, and *repoussé*, is remarkable for the delicacy of its ornamentation in granulated gold, in the style of the antique jewelry of Etruria, and exquisite finish.

Goldbeaters' skins (*jilli*) is prepared in India from the scarf skin of the sheep, in large quantities.

Inartistic English Jewelry.

IN a thoughtful paper—the first of a series on Decorative Art, in the *Magazine of Art*, Mr. Lewis F. Day writes about jewelry as follows:

"Look at the jewelry we wear. There, if anywhere, is an opportunity for the exercise of refined and delicate appreciation of what is beautiful, for in most cases beauty is the only excuse for its existence. If we cannot afford to wear intrinsically beautiful trinketry, we can do very well without it. Not that there is any reason why it should be costly. The jewelry until recently worn by the peasant women of Normandy, Norway, Switzerland, and other European countries, now in imminent danger of being altogether superseded by the attractions of more modern, showier, and altogether worthless Parisian and Viennes manufactures, was strictly peasant jewelry—the metal chiefly silver, and the stones chiefly garnets; but it was good work and well designed, worth transmitting from mother to daughter, and not fit only to be flung under foot when the fashion had passed by. Men of taste have been collecting and buying up the old examples of this kind of work. Will anyone be likely to buy up the flimsy trumpery that has superseded it?

"Even the costly work now found in our best shops will be chiefly valuable for the weight of its gold and the water of its diamonds. There is this to be said of the better class of modern English goldsmith's work, that a certain honesty characterizes. It suggests 'value received.' But this very character shows how little the artistic element in design is considered or sought after. The Indian jeweler, according to Dr. Birdwood, thinks nothing of the intrinsic value of the precious stones he employs. He is an artist, and to him the value is in their color, sheen, effect; he cares as much for them as a painter cares for his pigments, and no more. They are simply a means to his decorative end. The consequence is that he is able to use rich emeralds and rubies as lavishly as if they were enamel, and wherever he wants a point of light, bits of diamond are at hand, commercially of no value, but artistically as valuable as though they were priceless.

"Our idea of jewelry is altogether the reverse of this. We must have fine and flawless stones, and thick masses of heavy gold. At great cost we succeed in producing poor, cold, lifeless rings of gold, more like gilded fetters, studded with isolated stones; or we throw rare diamonds together *en masse*, producing, at fabulous cost, an effect far less gorgeous than the comparatively inexpensive Eastern work. The art among us appears almost to decrease in proportion to the increase of the value of the materials. Sometimes we see a gem that a collector might envy, more than a diamond that is not ill-set, but never a ring that Holbein or Cellina might have been proud to have designed. With regard to diamonds, the greater the quantity of precious stones, the more closely they seem to have been put together, after the pattern of the flaring illuminations which draw attention to the entrances of the theatres.

"The root of all evil here, and in so many other arts, is the innate and seemingly irrepressible passion for display, which finds vent among the poorer classes in Brummagem jewelry, and shows itself in rich ones in the choice of watch-chains, necklets, tiaras, and bracelets, whose sole value and sole interest consist in the number of rare diamonds and the weight of gold. Only in so far as they are beautiful do such things deserve the slightest attention from a decorative point of view. Diamonds may be a valuable investment, a convenient form of settling money on one's wife, a ready means of advertising one's wealth; but this has nothing to do with art. The Indian craftsman is altogether in the right, and every artist among us must sympathize with him. Those who do not, those to whom money value is more than beauty, can lay no claim to any feeling for art. The clumsy ornaments so much in vogue with us are none the less blunders that the blundering is peculiarly British. It is always dangerous to dogmatise, but I dare to say that, in pure luxuries like jewelry, the value of the art expended on an object should invariably be in excess of that of the mere matter on which it is expended. The fact that a thousand pounds' worth of diamonds are thrown together without a thousand pennies' worth of art is conclusive proof in itself that the wearer does not put on jewels for the sake of ornament. The love of show which is here so unpleasantly, steps in everywhere in decorative and domestic art, and leads us astray from the simplicity and modesty that are at the bottom of all good work, and that should especially characterize the art that we live with every day."

CASTING.

Casting is the shaping of metals, by pouring them when in a molten state into moulds. The method of casting varies with the kind of work to be produced and the metal or material of which the article is to be made. To take a plaster cast where the exterior form only, is desired, it is only necessary to pour the liquid plaster into the mould which will give an impression of its interior surface, but in casting in metal, articles that are required to have a definite thickness and weight must be moulded, with a core or inner wall.

Casting is divided into three parts, first to prepare a mould of the work to be cast (assuming that the pattern had been previously prepared) the second part is to melt the metal to the required fluidity, and the third part is pouring the metal into the mould, and allowing it gradually to cool. Silver can only be cast in moulds made of sand or loam, the metal in cooling will not adhere sufficiently close to a mould made of any other substance to produce an exact impression, but Britannia metal can be cast in metallic moulds with perfect success, this causes the manufacture of silverware to be a great deal more costly than that of the softer metal, as the process of making sand moulds is both difficult and tedious, and after the article is cast, the mould must be destroyed, and each cast must pass through the chasing department after it is cast to allow the casting to be taken out, this necessitates the whole process of moulding to be repeated for each piece that is cast.

A figure is usually cast in two or more pieces, a skillful founder not needing to divide the work into so many parts as a less experienced workman will find necessary, but it is not always best to avoid divisions, the chief difficulty in casting figures whole, is the contraction of the metal when cooling, which frequently causes a straining and cracking in parts, but if the figure can be cast very thin in every part without any irregular masses, this difficulty may be avoided to a great extent, but in casting a figure in sections the smaller masses of metal are more manageable and less liable to crack, the parts can be joined together again so skillfully that the seam is quite invisible, and by this means a great deal of tedious labor is often saved.

In making a sand mould for a statuette, the moulder lays his model in a horizontal position upon a bed of loose sand which is held in an iron frame or flask, and in which the statuette is also to be cast, the workman presses his pattern well into the sand, adjusting it so that the sand bed affords a firm support to the model. The sand that is used is of very fine yet peculiar properties being adhesive, yet porous, the best kind is imported from France, and has a proportion of magnesia in its composition; it is ground in a mill several times until it becomes very fine; the moulder after plentifully sprinkling the pattern with potato flour to prevent the mould adhering to it takes small quantities of this sand and presses and hammers it into sections upon the model covering only such a portion of it at a time as will allow of its being drawn or lifted off. Each sand piece is notched and made to fit exactly with the pieces which come next to it. When the upper side of the statuette has been completely enveloped in this way—another iron flask of the same size as that already used, is fastened with bolts to the first one and filled up with sand which is beaten hard, the mould is then turned over the loose sand removed from the model, and the sand pieces beaten on the same as the other side. Each of these sections must fit firmly together over the whole surface of the model making them of sizes and shapes that will be most convenient for drawing from the model, and also for supporting each other after the pattern is removed. After the piece mould is completed, parts of it are taken off and the pattern removed and the founder or moulder commences to make the core forming it within the cavity of the mould. It is made of the same fine sand as the puce mould, sometimes having a little molasses or beer mixed with it; the workman places some loose sand in the cavity hammering it the same as the mould, taking care at the same time not to beat it too hard, as that might injure the puce mould, this is repeated until the whole space is filled and a perfect copy of the model is produced in sand. The core is then taken out and a certain thickness of sand pared off all over, the part taken off being the intended thickness of the metal. In some cases where the shapes are regular as in handles and spouts of tea and coffee pots, the cores are made by pressing sand into boxes made of the required shape and size, giving at once the necessary form. The inner surface of the sand mould is washed over with powderd charcoal and water or plumbago in order to give it a fine texture, after which it must be thoroughly dried in an oven, leaving it quite dry and porous. Vent holes are cut through the mould to allow the air to escape when the metal is poured in, and also to allow any gas to escape that may have been produced from the various components of which the mould is composed. If the air or gases cannot readily escape from the mould when the molten metal is poured in it will cause the work to be porous or spongy in parts, and in casting large works it might even cause the mould to explode.

Britannia metal is cast in metallic moulds which are made in two or more parts, held together by pins or hinges. In casting a figure or any other ornament in Britannia, the molten metal is poured into the mould and that portion which comes into direct contact with the mould cools very quickly and becomes solidified. When the workman considers sufficient metal has adhered to the mould he pours out the remaining molten mass, leaving all the center hollow, when the casting is sufficiently cool the mould is opened and the casting removed.

John Harrison's Tomb.

THE British Horological Journal announces that the tomb of this distinguished Horologist in the south-western corner of Hampstead churchyard, is now completely restored. A suggestion to alter the character of the monument was happily ignored; and although the old stone was found to be so much decayed as to be unfit for further use, an exact reproduction of the form of the original has been produced. The work was taken in hand none too soon, for although the inscription to Harrison's memory has been partly deciphered from the old panel and the remainder obtained from published records—which, by-the-bye, vary in some particulars—another inscription to the memory of his son, which was cut in a similar panel, on the reverse side of the tomb, appears to be past recovery. The following is the tribute to Harrison as it now appears:—

"In memory of Mr. John Harrison, late of Red Lion Square, London, inventor of the timekeeper for ascertaining the longitude at sea. He was born at Foulby, in the county of York, and was the son of a builder of that place, who brought him up to the same profession. Before he attained the age of 21, he, without any instruction, employed himself in cleaning and repairing clocks and watches, and made a few of the former, chiefly of wood. At the age of 25 he employed his whole time in chronometrical improvements. He was the inventor of the gridiron pendulum, and the method of preventing the effects of heat and cold upon timekeepers by two bars fixed together; he introduced the secondary spring, to keep them going while winding up, and was the inventor of most (or all the improvements in clocks and watches during his time. In the year 1735 his first timekeeper was sent to Lisbon, and in 1764 his then much-improved fourth timekeeper having been sent to Barbados, the Commissioners of Longitude certified that he had determined the longitude within one-third of half a degree of a great circle, having not erred more than 40 seconds in time. After 60 years' close application to the above pursuits, he departed this life on the 24th day of March, 1776, aged 83."

The Winchester Observatory at Yale College.

SOME time since Ex-Governor Winchester, of New Haven, Conn., donated to the Trustees of Yale College a tract of land within the limits of New Haven valued at $100,000, for the purpose of building an observatory. The Board of Management, consisting of the Faculty of the College, determined that the best way to realize the greatest good from this magnificent gift was to divide the tract up into parcels and sell it off in city lots. This is now being done, and the lots disposed of as rapidly as there is a demand for them.

Meantime the Faculty has put a temporary building on the College grounds, where is being collected the paraphrenalia necessary to an elaborate astronomical observatory. Already many valuable instruments have been secured, and are being operated by Leonard Waldo, astronomer in charge. Observations are taken twice a day, once at night, for the purpose of determining absolutely correct time. Arrangements for a Horological Bureau have been made, and this is already available to the public. It has been established, as announced by the Board of Managers, "for the purpose of encouraging the higher development of the horological industries, and to pursue researches calculated to aid in the construction of refined apparatus for the measurement of Time. In order to gratify the (expressed) wish on the part of the makers for some proper provision for the rating of their time-pieces, the Board of Managers have made the necessary arrangements with the Safe Deposit Company of New Haven, for the erection within their steel vaults of the proper hot and cold closets, with appliances for controlling the moisture therein, and for the construction of the most recent forms of ordinary temperature closets. They have also provided for this work those appliances of modern astronomical science which can lessen the amount of personal errors or promise to render the service more exact."

The following regulations governing the reception of time-pieces and the issue of certificates of rate, have been adopted by the Board of Managers:

I.—CLASSES OF CERTIFICATES.

The following classes of certificates will be issued with time-pieces which have been deposited at this observatory for trial. The certificates will be signed by the Astronomer in charge of the Bureau, and will contain a detailed statement of the results obtained with each particular movement. In describing the positions of a movement the term "Dial up" indicates that the plane of the dial is horizontal and with the engraved side uppermost. "Dial vertical" indicates that the plane of the dial is vertical. The temperature of the refrigerator is approximately 40° F., that of the oven is ayproximately 90° F., and the ordinary temperature ranges between 65° and 75° F.

1. Class I includes those certificates issued with pocket chronometers or watches which have been subjected while rating to the following variations of position and temperature: *Dial up*—Twelve days at ordinary temperature; one day in the refrigerator; one day in the oven. *Dial vertical*—Fourteen days pendant up; two days pendant right; two days pendant left. *Dial down*—To days. *Dial up*—Eight days.

2. Class II includes those certificates issued with pocket chronometers or watches which have been subjected while rating to the following variations of position and temperature: *Dial up*—One day in the refrigerator; one day in the oven; eight days at ordinary temperatures. *Dial vertical*—Eight days pendant up; two days pendant right; two days pendant left.

3. Class III includes those certificates issued with pocket chronometers or watches which have been subjected to the following variations of position: *Dial up*—One day in the refrigerator; one day in the oven; eight days at ordinary temperatures. *Dial vertical*—Eight days at ordinary temperatures.

4. Class IV, Dial vertical, includes those certificates issued with pocket chronometers or watches which have been rated in the position *Dial vertical*—Twelve days at ordinary temperatures.

5. Class V, Dial up, includes those certificates issued with pocket chronometers or watches which have been rated in the position *Dial up*—Twelve days at ordinary temperatures.

6. Class A includes those certificates issued with box chronometers (sidereal or mean time) which have been rated for a minimum period of two months, and have been 24 hours in the oven and 24 hours in the refrigerator.

7. Class B includes those certificates issued with clocks which have been rated for minimum period of three months at ordinary temperatures, and have been tested for compensation.

8. Class C includes those certificates issued with clocks which have been rated for a minimum period of six weeks at ordinary temperatures.

II.—CONDITIONS OF USING CERTIFICATES.

No certificate of the classes I, II, III, IV, V, A, will be issued in the following cases: 1. When the variation of rate with the dial vertical and pendant up in classes I, II, III, and in the positions indicated in classes A and IV, exceeds 2'.0 from one day to the following day. 2. When the variation of rate between the positions of "Dial up" and "Dial vertical" exceeds 10'.0. 3. When the variation for 1° F exceeds 0'.3 between the ordinary temperature and the oven. 4. When the rate is greater than 10'.0 per day.

No certificate in the classes B or C will be issued in the following cases: 5. When the variation of rate from one day to the following day exceeds 1'.0, except there be a barometric variation as great as 0'.7 inches. 6. When the variation for 2° F. exceeds 0'.3.

In the cases where no certificate is issued the movement will be returned to the maker with a statement of its performance.

III.—COST OF CERTIFICATES.

For the purpose of enabling the Bureau to contribute to its own support as far as possible, the following charges will be made, payable on the notification that the sertificates are ready to be issued in the particular cases: For certificates of the Class I, $3.00; for certificates of the Class II, $2.50; for certificates of the Class III, $2.00; for certificates of the Class IV, $1.00; for certificates of the Class A, $4.00. For classes B and C a charge will be made to cover the expenses of mounting the clock upon the piers, and it will be necessary for persons desiring these certificates to confer, by letter, with the Astronomer in charge of the Bureau. In the case of movements returned to the makers without certificates, a charge of five cents per day will be made for rating up to the time of such return.

IV.—MISCELLANEOUS.

All proper precautions will be taken by the Board of Managers against loss or injury by fire, theft or otherwise. The movements will be carefully guarded under the rules which govern the Safe Deposit Company. They will not be opened or in any way tampered with for any reason whatever; and they will not be handled, except by trained observers. If a movement should stop, it will be returned to the sender with an appropriate memorandum; but as it is manifestly inexpedient that a University Corporjoration should be responsible for loss or damage to property in its care for the purposes specified, it is to be understood that all risks are assumed by the persons who enter the time-pieces for certificates.

2. The Bureau will publish, in the annual report of the Astronomer in charge, the detailed rates of such time-pieces in the various classes as may seem to indicate the development of the horological art

3. Blanks to be filled out in sending time-pieces to the Bureau will be furnished on application.

4. All movements will be wound immediately on their reception. When they have run down, however, the rating will not commence until they have been running again for five days. Unless requested otherwise, movements will be wound immediately previous to shipment from the Bureau.

5. The P. O. address of this department of the Observatory is Box 853, and time-pieces may be sent by special messenger or express directly to the safes at 89 Orange Street, New Haven, Conn. The Adams Express Company occupy an adjoining office.

LEONARD WALDO,
Astronomer in charge of the Horological Bureau.

Approved and ordered to be published by the Board of Managers of the Winchester Observatory.

C. S. LYMAN, *President.* H. A. NEWTON, *Secretary.*

New Haven, Conn., January 1, 1880.

The arrangements for the safe keeping of all watches sent to the Observatory are very complete, and no apprehension need be felt that they can be stolen by thieves, or injured by the careless handling of unauthrized persons. The work proposed by the Board of Managers promises to be of great value to manufacturers of watches. It will be noticed that the charge for rating is exceedingly moderate compared to the charges in some of the European Observatories.

Trade Gossip.

Bangle rings and bangle bracelets are the craze.

An International Exhibition will be held at Rome in 1882.

Leroy W. Fairchild will remove to No. 1 John street about April 1.

Six bangles on one arm is not an unusual number for a fashionable girl.

A New Haven factory showered upon the world 22,000,000 fish-hooks last year.

Postmaster James' effort to secure a big Post Office clock is likely to be successful.

An English correspondent suggests an arrangement for winding clocks by electricity.

Henry Fera, importer of diamonds, will shortly remove to No. 4 and 6 John street.

Joseph Welch's jewelry store in Jersey City was recently robbed of a small lot of jewelry.

Joseph A Meyer, of Canton, Ohio, is building a summer Hotel at his lake near the city.

A French scientist has made the discovery that the Apollo Belvedere is the statue of a negro.

Randel, Baremore & Co. have changed their firm name to Randel, Baremore & Billings.

Delancy Kennedy, formerly with D. M. Fitch & Co., is now in the employ of Baldwin, Sexton & Peterson.

Oleomargarine diamonds, however bright, will never be appreciated like the real, natural twinklers.

Gentlemen's watch chains for full dress are of the plainest possible description of either plain or enamelled gold.

Simpson, Hall. Miller & Co., have established a factory for the manufacture of silver plated ware at Montreal, Canada.

Otis Anderson, diamond merchant, will shortly remove to No. 4 and 6 John, and will occupy part of the office with Henry Fera.

A young lady, whose lover is a diamond broker answering to the name of James, always alludes to the young man as "my Jemmie."

E. B. Dana, well and favorably known on the road, has entered into an engagement with Carter, Howkins & Sloan, as southern traveller.

The Wm. L. Gilbert Clock Co. and G. B. Owen Co., manufacturers of clocks, have consolidated, with Geo. B. Owen as general manager.

Henry J. King, for many years with Enos Richardson & Co., latterly with Baldwin, Sexton & Peterson, is now in the employment of Hale & Mulford.

The firm of Nicoud & Howard have dissolved, having expired by limitation, Dec. 31st. Arnold Nicoud will continue the business and sign in liquidation.

Jesse T. Little, formerly of the firm of S. T. Little & Sons, Cumberland, Md., has purchased the business of the late J. T. Borman, of Williamsport, Pa.

The two young sneak thieves who recently robbed Levi Johnston & Sons' jewelry store at Worcester, Mass., were captured on the cars while on their way to this city.

Some watches in a jeweler's window at Westfield, Mass., are marked "$3; warranted worthless." This is a retaliation upon a dry goods merchant who is selling cheap watches.

The present craze for gilded horseshoes is a big mistake. No horseshoe has any connection with the supernatural or the unseen unless found by chance the usual way—dirty.

Schwed & Newhouse, of Pittsburgh, have failed. The comment excited in the street in consequence of the conditions attending their suspension is in no wise complimentary to them.

William Spence has retired from the firm of Chatellier & Spence Joseph F. Chatellier, senior member of the firm, will continue the business. The San Francisco office has been closed.

The life of a Wisconsin woman was saved by a locket around her neck, the ball her husband fired at her striking it and glancing off. We print this fact in order to start a boom in the locket business.

A novel wine decanter is made with a tiny music box in the bottom of it. It is a thoughtful contrivance, and fills a long felt want. A man can now get drunk at a banquet and roll under the table to the tune of the "Last Rose of Summer" or some selection from a popular opera. It is not calculated to advance the temperance movement, however.

The four-leaved clover has supplanted the horseshoe as a favorite symbol for rings, lace pins and bracelets, and it is used to ornament easels, albums, picture frames, and everything else that can be decorated.

W. T. Gough, book-keeper for Carter, Howkins & Sloan, has taken Geo. R. Howes' place on the road; the latter gentleman, who is still a member of the firm, has been assigned an important department in the office.

Miss Nellie Crocker was a Sacamento belle, worth $600,000. Engaged to a poor young jeweler, and being about to die, she made her will, and remembered him to the extent of $100,000. He may be happy yet.

The watchmaker and jewelers guild of the United States will hold their annual meeting at the Sherman House, Chicago, May 11th; arrangements will be made with the various railroad companies for reduced fares.

Frank Barnum, of Louisville, Ky., who was recently burned out, has been compelled to suspend business. Mr. Olmstead, Secretary of the Jewelers' Association, is investigating Mr. Barnum's affairs, and will report to the creditors at an early day.

Nearly every pawnbroker in Chicago has loaned from $30 to $50 on a watch chain made of a remarkably close imitation of gold. The operators were two young men, who simply offered the chain as security, without saying that the metal was gold.

A beautiful pitcher of hammered silver, ornamented with colored oak leaves in relief, was recently made by Tiffany & Co. It is sent to the Mikado of Japan as a present from a distinguished citizen of the United States who recently visited that country on his trip around the world.

Holmes, Booth & Haydens' electro-plate works at Waterbury was destroyed by fire on the 19th. At the time of the fire, the building contained an unusual large stock of plated ware. The total loss is estimated at $150,000; over $100,000 of this being in finished goods not fully insured.

The plated ware manufacturers met February 19th and advanced prices about 10 per cent. The enormous rise in metals and materials of all kinds make this advance appear small, and a still further increase may be necessary if the cost of present production is maintained or goes still higher.

S. & J. Myers, of Boston, have again failed, leaving numerous admirers of the peculiar methods adopted by them for transacting business. The habit of failing seems to have become chronic with these gentlemen, and it is suggested that, in the interests of the trade, they should retire from business permanently—if they can afford it.

McCall & Newman's jewelry establishment at No. 625 Arch Street, Philadelphia, was entered by burglars between the hours of six and eight o'clock on the morning of the 8th ult., and robbed of some $2,000 worth of filled rings, many of which were in process of manufacture. In a city where the merry burglars go a burgling in broad daylight on a Sabbath morning, "while the watchman lies abasking in the sun, taking one consideration with another, a policeman's lot is not a happy one."

Rich, heavy style of ornament is the prevailing taste, especially for lockets, which are of huge dimensions, either of silver or gold, with thick chains to go round the neck. Lockets of plain blue enamel or pink coral, with one pearl or diamond in the middle, are very beautiful and chaste for young ladies. The solitaire studs for sleeves are made to correspond. Some lockets have the Christian name engraved in pearls or tiny diamonds across the blue enamel or coral ground, or some suitable word, such as "souvenir." Christian names, all in brilliants, form exquisite brooches.

A process for converting common agate into the beautiful-banded onyx stone has been recently invented in Germany. The agate is first colored red by immersion for a week or more in a corrosive solution of iron in aquafortis. The places to be blanched are then impregnated for the same length of time with a corrosive solution of one part carborate of potash and one part caustic potash dissolved in water. After that, the stones are dried for a week at a moderate warmth, and finally exposed in a closed earthenware vessel to the high temperature of a red-hot furnace.

C. C. Adams, formerly of the Adams & Shaw Company, has made an engagement with N. Matson & Co., the well known jewelers of Chicago. Mr. Adams is a gentleman well known in the trade, and has a large number of friends who, while regretting his leaving the East will be glad to learn that he has thereby improved his business prospects. Matson & Co., are to be congratulated on having obtained the services of so able a gentleman, while Mr. Adams is fortunate in associatiating himself with so honorable a house, whereby his sphere of usefulness will be greatly enlarged.

Business Notes.

Everett & Gouldsmith is the name of a new firm of jewelers just started in business at Atlanta, Ga.

The jewelry store of J. Renaud, Keokuk, Iowa, was recently robbed of several gold watches and a quantity of jewelry.

Justis & Armiger of Baltimore are reported to be doing a very satisfactory business, which is gratifying to their friends in this city.

O. E. Zadeck of Mobile, Ala, has a remarkable fine tenor voice and consequently is one of the most popular men with the fair sex in town.

The sneak thief who made a professional call on O. L. Rosenkrans jewelry establishment at Milwaukee, now languishes in the State prison at Waupun.

H. R. Rhodes has one of the handsomest jewelry stores in Lancaster, Pa., and a carefully selected stock of fine jewelry that cannot fail to attract purchasers.

Wittich & Kinsel, of Columbus, Ga., have one of the best appointed jewelry stores in the South. They are substantial business men whose word passes current in this market.

D. H. Buell, of Hartford, Conn., is widely known as an enthusiastic collector of Bric-a-Brac. He is also said to hold a gun with such exquisite grace that it is a real pleasure for a duck to be shot by him.

Geo. E. Strong of New Orleans is suffering from an attack of the gout. Rumor has it that he contracted this disease from shaking hands with a fellow similarly affected while on a visit to Sharon Springs.

Little & Sons jewelry store at Cumberland, Md., is universally acknowledged by travelers to be one of the neatest and best kept stores in the State, whilst their stock of jewelry is remarkably clean and well selected.

Levison Bros., of San Francisco, are said to carry the heaviest and cleanest stock of jewelry on the Pacific slope. The senior partner, Mr. Herman Levison, and his family are now visiting their beautiful home in Hamburg.

Taylor & Bro., importers of clocks, bronzes, etc., are receiving fresh invoices of the latest European novelties, that have been specially selected for this market by one of the firm now in Europe.

Carpier & Wathers, of Chicago, watchmakers for the trade, and dealers in watch materials, tools, etc., pay particular attention to orders for matching goods. They are excellent workmen, and are doing an extensive business.

W. G. Bailey, Helena, Montana, has one of the finest jewelry stores in that territory, and carries at all times a large stock of high grade goods. He is a gentleman of ample means, and of excellent standing in the trade.

H. Muhr's Sons, of Philadelphia, present a neat and attractive illustration of their wares in this issue of THE CIRCULAR. Parties desiring goods of the character manufactured by this house will do well to consult them.

Coggswell & Wallis, of Chicago, successors to the late firm of Coggswell, Webber & Co., continue the business of the old firm. They keep a full line of watches, clocks, jewelry, silver and plated ware, and also of watchmakers' tools and materials.

Burdeck & Otero, of Pueblo, Colorado, have earned an excellent reputation as manufacturers of silver filigree work, for which there is a growing demand in that section. They carry a good stock of medium class goods, and enjoy a good trade in that far away section.

Kosuth Marx & Co. present in this number of the CIRCULAR several new and beautiful designs of rolled plate bracelets that cannot fail to attract attention; they have gone quite extensively into this branch of business, and are producing many new and beautiful effects in these goods.

Hall, Elton & Co., of Wallingford, Conn., manufacturers of fine electro-plated ware, are producing many new and beautiful designs of real artistic merit. The new Eartlake fork, as exhibited in their advertisement in another column, is one of the standard patterns now made.

E. Aug. Nereshеimer, importer of diamonds, is receiving some select packages of fine goods, especially selected for the American trade. It is well known that this market absorbs the finest class of goods of this character, and Mr. Nereshеimer is full alive to the requirements of the trade.

James Fricker, of America, Ga., is what Mrs. Harriet Beecher Stowe would call an "upright, downright, straight up and down good man." He is an excellent workman, keeps a fine stock of goods, and is alderman in the town in which he lives. He has a host of friends in the trade in this city.

T. Parke & Son, of Wilkesbarre, Pa., may be said to be one of the pioneer jewelers of that section, The senior member of the firm came from England some fifty years ago and settled in Wilkesbarre, where he has ever since lead an active business life. Mr. Parke has a fine collection of old English relics of various kinds that he delights to show to appreciative visitors.

The Auburndale Chronograph Timer, designed for sporting, scientific, and mechanical purposes, has achieved a high reputation among the class of men for whose use it was designed. It is substantially made, well finished, and has the virtue of being an accurate timer. It is highly commended by the best workmen in the trade. Messrs. Cross & Beguelin are the agents for its sale.

Hale & Mulford, makers of fine jewelry, are producing a fine line of patented bracelets, which, judging from the busy appearance of their factory, appear to be in great demand. They are made in various designs, the ornamentation of which is protected from wear by the raised edges of the solid portion of the bracelet. Their advertisement containing an illustration of these goods will be found in another column.

C. Leo Abry, successor to J. A. Abry, importer of watches, continues at the old stand in Nassau street. He keeps a full line of Swiss and American watches of the best makers, and is the agent for the Vacheron and Constantine watch, one of most popular and successful watches imported, These latter goods are interchangeable in every respect, a full line of which, cased and uncased, is kept in stock to suit the fancy of dealers.

The old and well-known house of Carter, Howkins & Sloane, with their old-time enterprise, are engaged in the manufacture of a wider range of goods than heretofore offered by them. They are producing some new and attractive novelties suitable to the requirements of all classes of dealers, that cannot fail to elicit the approval of customers. We beg to direct attention to their special card that appears in this number of THE CIRCULAR.

Joselyn & Parks, of Cheyenne, Wyoming Territory, are the pioneer jewelers of of that country. Many years ago they started overland for California, but finally established themselves at Salt Lake City, and subsequently opened a branch store at Cheyenne and recently another establishment at Leadville. They have done more than any other members of the trade to encourage a taste for jewelry among the denizens of the frontier. Their stock is one of the handsomest to be found, and the firm ranks among the largest buyers of the West.

In this number of THE CIRCULAR J. A. Riley & Co., present some beautiful examples of the new style of bracelet recently invented and patented by them. Their invention consists in concealing within the bracelet a spring, by means of which it is kept in place upon the arm, or permits its being opened without difficulty. This arrangement, while very simple, accomplishes the object sought perfectly, secures the bracelet to the arm without annoyance or discomfort to the wearer. The idea can be applied to any pattern or bracelet, but Messrs. Riley & Co., as will be seen from their advertisement, have introduced some new and novel designs, which are attractive from their originality, neatness and excellent workmanship. Bracelets having this new mode of fastening, have already become exceedingly popular, and the manufacturers are pushed to the utmost to fill orders.

Simons Bro. & Co., of Philadelphia, have just issued an elegantly illuminated catalogue, which is devoted exclusively to an exhibit of the various styles of cane heads and canes manufactured by them. There are all sorts of designs, from the plainest to those richly carved and highly ornamented. This is one of the oldest jewelry firms in Philadelphia, and have an excellent reputation for the excellence of the goods manufactured by them. They make a specialty of canes, and in this line are not excelled by any manufacturers in the country. Their new catalogue is highly ornamental, the wood engravings being of the finest workmanship, and and the colors finely blended. The catalogue has the merit of not exposing the prices at which the goods are furnished to dealers, which is a feature that might well be imitated by other manufacturers. It makes a book of 60 or 70 pages, and is substantially and handsomely bound.

The Calligraphic Pen, patented by W. W. Stewart, and manufactured by Mabie, Todd & Bard, is rapidly becoming a favorite with persons who have much writing to do. It differs from the pens recently introduced and pushed by virtue of much advertising, in that it is provided with a perfect gold pen at its writing point, and makes fine or heavy strokes equally well, which is not the case with the single point pens. Mr. Stewart has devoted many years of careful study to bringing the Calligraphic Pen to that degree of perfection that makes it suitable for all writers and for all kinds of penmanship. It serves equally well as a ruling pen, for ordinary commercial penmanship, or for fancy calligraphy, wherein fine lines and heavy shading are required. The Calligraphic Pen is, simply, a gold pen affixed to a hollow barrel, which barrel or handle, contains a supply of ink; by a very simple means of adjustment this supply of ink is made to feed the pen to suit the requirements of the writer. It would be useless for us to attempt to describe the scientific obstacles encountered in the manufacture of a perfect fountain pen, but suffice it to say that Mr. Stewart has met these obstacles and overcome them.

S. M. Lewis & Co., No. 11 Maiden Lane, are the manufacturers of a Patent Seamless Bead Neck Chain that is becoming exceedingly popular. It is made by a process invented by them, and the beads are furnished either in solid gold or in rolled plate 18 karats fine. The beads unlike other gold beads, have no seam in them whatever. They are struck up from the metal in one piece, after which they are placed in steel formers and rounded to a perfect sphere. This process gives the beads an even and smooth surface and an elegant appearance. The beads are then strung upon a strong braided cord, fitting so closely to each other that there is no chance for the cord to show through. An ingenious arrangement for fastening the cord at the end beyond the possibility of getting loose forms part of the patent. It consists of a hollow bead, into which the end of the cord, which is first knotted, is drawn; then a cap having an eye to it, is screwed into the bead, thus holding the knot into position. The eye of the hollow bead is then connected to a solid one having an eye on both sides, together with a snap, to which the two ends of the chain are attached. Thus the necklace is made complete, presenting an appearance of a continuous chain of gold spheres. It is very handsome, and sells rapidly.

THE

Jewelers' Circular and Horological Review.

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THE

JEWELERS' CIRCULAR AND HOROLOGICAL REVIEW,

The recognized organ of the Trade, and the official representative of the Jewelers' League and the Watchmakers' and Jewelers' Guild of the U. S.

A Monthly Journal devoted to the interests of Watchmakers, Jewelers, Silversmiths, Electro-plate Manufacturers, and those engaged in the kindred branches of art industry.

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Manufacturers and Jobbers.

A CORRESPONDENT writing from Chicago complains that THE CIRCULAR is rather severe on Chicago jobbers who are in the habit of issuing catalogues, and intimates that we have a prejudice against all Chicago dealers. As his premises are wrong, he very naturally comes to an erroneous conclusion. We do not condemn the practice of issuing catalogues, but, on the contrary, very highly approve of it when confined to its proper limits. Catalogues afford retail dealers an opportunity to study new styles and to keep pace with the improvements that are constantly being made. It is the abuse of the catalogue plan that we have condemned, and our condemnation has not been confined to Chicago dealers—the cap was designed for whatever head it would fit, be he a jobber in the East or West, or a manufacturer in New England or New York. This abuse of the catalogue system consists in jobbers sending their catalogues and price lists to persons not in the trade, and offering to sell goods by retail at wholesale prices, thus robbing the retailer of his legitimate opportunity to dispose of his stock. Another phase of the abuse lies in manufacturers who claim to sell to jobbers exclusively, sending their catalogues to retailers or outside dealers and offering them goods at the same prices they sold them to jobbers. In both these cases deceit, was practiced and an undermining process entered upon that has resulted in great demoralization in the trade. The rules of commerce demand that a manufacturer who sells to jobbers shall sell to no others, leaving the jobber to supply the retail trade; and the jobber in turn is expected to sell to none others than retail dealers. When such manufacturer seeks the retail trade, he robs the jobber of his legitimate custom, as the jobber who sells to outsiders robs the retailer. It is these abuses of the catalogue system that we have denounced, regardless whether the offenders resided East or West. Unfortunately for Chicago jobbers, many complaints came to us from the West wherein they were exposed and denounced in most vigorous terms by retailers. They asserted that the jobbers sent their catalogues broadcast through the land, and after stocking up the retailers, undersold them by retailing in their own towns. So great was this abuse, the retail dealers organized associations for their protection, declaring that they would not buy of these retailing jobbers. We naturally espoused their cause, and denounced the abuse they were suffering from. If any Chicago dealer was hurt by our comments it was his fault, not ours. It is our business and our intention to denounce abuses in the trade wherever we find them, and of whatever nature they may be, regardless of who is hit. We have no prejudice against Chicago dealers, as such, but we have against the unbusiness-like and unfair practices that they, in common with some of their Eastern brethren, have indulged in. So far from entertaining a prejudice against Chicago members of the trade, we recognize the fact that some of them are among the most enterprising men to be found in the guild, and have done much to maintain the standard of its integrity. There are high-minded honorable men in the jewelry business in Chicago, as elsewhere, and it is in the interest of such that we have denounced the abuses that some of their competitors have introduced into the business. Only those who have felt the sting of our condemnation can object to the course THE CIRCULAR has taken in these matters.

The Chainmakers' New Departure.

WE recently announced in THE CIRCULAR that the chainmakers were discussing means for securing needed reforms in the trade and improving the standard of their goods. It is a well known fact that for sometime past there has been so much cutting of rates among rival chain manufacturers that not only has the trade been demoralized, but the quality of the goods materially degraded. Indeed, it is safe to say that a large proportion of the chains sold during the past five years were not of the quality represented. When gold has a fixed price in the market, the price of gold chain should correspond thereto; but, as a matter of fact, there has not of late, been any bottom price for gold chain that retail dealers could depend upon. Every traveler that visited them offered them chain at four or five cents less per pennyweight than his predecessor, and there was no standard price for goods equal in quality offered by different manufacturers. This of itself was an admission that the chains were made of degraded metal. The trade grew so demoralized that there was no regular price for goods equal in character, and little character in the goods themselves. Retail dealers were afraid to buy, lest the next traveler who came along would sell to his neighboring competitor for a less price and so give him control of the local trade. The workmen had to bear a goodly portion of the burden resulting from this unbusiness-like competition, as their wages were reduced from time to time to enable the manufacturers to keep up the warfare. Many of the best workmen were driven out of the business by this course, and forced to seek employment that was more lucrative.

We are pleased to announce that, after protracted negotiations, the majority of chainmakers have agreed upon a schedule of prices for standard goods that will, if observed, do away with this suicidal rate-cutting and at the same time, enable them to improve the quality of their goods. It is not intended by this move to impose extortionate prices, but to raise the standard of quality, and to exact prices to correspond, such prices to be maintained by all manufacturers. Most of the prominent manufacturers have entered into this agreement and there is no reason why it should not be maintained. The best

interests of the trade demand that goods purporting to be of standard quality should be so in fact; that 14 carat chain should be made of 14 carat gold and not of 10 carat gold. Retailers prefer to handle genuine goods, and not be made a party to a fraud for deceiving the public. They also want some assurance that their competitors will not get goods on better terms than they do. A standard price for standard goods will tend to greatly improve the trade as well as the morals of the dealers. One of our leading firms has adopted the plan of marking chain made by them with the initials of their firm, thereby pledging the honor of the house that the goods are precisely of the quality represented. This is an admirable plan and might be followed with advantage by other manufacturers. Goods thus stamped by firms of recognized standing in the trade cannot fail eventually of obtaining proper recognition from the public, and taking the place of those goods that have neither godfathers nor godmothers to vouch for their integrity. Such a stamp is an indication that the manufacturers are proud of their work, and are willing it should be subjected to the severest tests. We hope to see such individual endorsements of wrought goods come into more general use.

Another Case for Compromise.

THE investigation that has been made in the case of F. D. Barnum, of Louisville, Ky, who was recently burned out and subsequently made an assignment, exhibits some curious methods of doing business. It also shows that the manufacturers and jobbers in the jewelry trade are the most credulous and confiding set of men that ornament any calling. The amount of Mr. Barnum's indebtedness is set down at $146,386; there are a few cents over, but we will confine ourselves to dollars in this statement. This indebtedness consists of merchandise, $82,443; money borrowed of kinsmen, $63,943. He claims that $25,000 of this latter sum is due his father-in-law, Mr. Woodruff; another sum of $10,000 is due Joseph Werne, whom Barnum bought out, but Mr. Werne is fortunate in being secured by Woodruff's endorsement aud also by a mortgage. Woodruff is virtually a creditor for all the other borrowed money, and, apparently, has no security.

Barnum's assets are put down at $59,563, consisting of stock, $36,676; good accounts, $1,887; cash on hand, $17,000; bills receivable, $31,500; fixtures $2,500. An inventory taken in October 1879, values the bills receivable at $30,000 and the good accounts at $22,000. There is a shrinkage in these two items, it will be seen of $48,673. On investigation it was shown that the bills receivable, consisted of town bonds, and "cats and dogs" generally. In October 1879, Mr. Barnum valued his stock at $30,976, since which time he bought goods of the value of $87,872, making a total of $118,849. From this stock he sold goods to the amount of $26,293, has on hand $36,676, and received for insurance $17,360, leaving a shrinkage of stock equal to $38,519. He claims to have sent $30,000 worth of goods to Memphis to be sold at the Bessac assignee sale, and states that about $10,000 worth were sold, the remainder being returned to him in time to be consumed in the fire. It is a singular fact, however, that not a vestige of these goods can be found in the *debris* of the fire. The total absence of any fused metal in the *debris* can only be accounted for on the hypothesis that the goods were made of celluloid, or some other highly inflammable substance, and were totally consumed "leaving not a wrack behind." In October 1879, Mr. Barnum opened a new set of books, carrying forward his balances from the old ones. Strange to say, the old books cannot be found. The newspaper accounts of the fire stated that the safes containing goods were precipitated into the cellar, yet investigation shows that Mr. Barnum's safes was really a vault built on a pier some distance from where the floors fell through and was not destroyed.

Mr. Barnum has now placed his affairs in the hands of an assignee with the understanding that the assets are to be turned over to the creditors in case a compromise is agreed upon. From a moral standpoint this is not a case for compromise. There is so much that is unsavory about the whole mess that, in the interests of commercial honor and morals, it should be thoroughly investigated. From a business standpoint, however, it is a case that must be compromised if the creditors are to realize anything. It would be worse than folly for non-resident creditors to enter upon a prosecution of Mr. Barnum in a community, where he is at home, where he has his creditor's money to defend himself with, and where sectional feeling as well as local pride would be arrayed against his prosecutors. It is highly probable, therefore, that a compromise will be effected, and Mr. Barnum reestablished in business and in credit. All the barnacles of indebtedness and insolvency will be scraped from the ship's bottom, and she will be once more placed in commission, with a clean bill of health and the same captain in command. And there will be men in the trade who will regard Mr. Barnum, freed of all his indebtedness, as a most excellent customer to sell to for some time to come. By the inventory taken by Mr. Barnum in October last he must have ascertained the fact that he was then insolvent. If he did not, he is lacking in those business qualifications that entitle him to confidence. If he did make such discovery, and then deliberately bought over $87,000 worth of goods on credit, he was guilty of a criminal transaction.

But the question may well be asked "Was Mr. Barnum alone responsible for this disaster that has fallen upon the trade?" What had he ever done to show that he was entitled to credit to the extent of $100,000 and upwards? When his kinsmen and neighbors loaned him money, there is no doubt but they took good care to secure themselves, but his distant creditors appear to have let him have all the goods he wanted on open account, without inquiry as to his financial condition or his business circumstances. If this severe lesson would teach the trade that the credit system is greatly abused and that its privileges should be curtailed, it will not be without its value. But we have no idea the lesson will be heeded. On the contrary, we expect soon to see Mr. Barnum again under full headway, with new goods added to his compromise stock bought at 25 cents on the dollar and running an active competition with those dealers who pay 100 cents on the dollar.

P. S.—Since the above was written, Mr. O. G. Holt, the assignee, has qualified, giving ample bonds, and is now in charge of the stock. Investigations that have been made lead to the belief that Mr. Barnum had been systematically robbed by his employees for several years. A diamond of great value belonging to his stock has been traced to a pawnshop, where it was placed by a colored man. This colored man has been arrested, and confesses that he received the diamond from one of Mr. Barnum's clerks with instruction to pawn it. How much more of the stock has gone the same way it is impossible to conjecture. A thorough investigation may solve this mystery, and, possibly, place Mr. Barnum in a better light before the trade.

Obituary.

WILLIAM KENDRICK, OF LOUISVILLE.

William Kendrick, a well known jeweler of Louisville, Ky, died March 16, in the 70th year of his age. Mr. Kendrick was born in Paterson, N. J., but located at Louisville when about twelve years of age. He became identified with the jewelry interest, and was a large buyer in this and other eastern cities. At one time he became embarrassed in business, and was forced to go into bankruptcy. He subsequently reestablished himself in business, was prosperous, and voluntarily paid off all his former indebtedness, from which a discharge in bankruptcy had relieved him. Mr. Kendrick occupied a high social position, and had filled various public offices with honor to himself and credit to his adopted state. He was beloved for his many charitable bequests, and for his high and honorable personal character. His death was sincerely lamented by the entire community, of which he was a distinguished ornament.

The Iowa Convention.

THE Iowa Retail Jewelers' Protective Association held its thlrd annual convention at Cédar Rapids, March 19, Henry Robinson, of Council Bluffs presiding.

Charges were preferred against five wholesale houses of Chicago, setting forth that they were sending out catalogues indiscriminately to outsiders to the prejudice of legitimate retailers. The charges were investigated, and the testimony was sufficiently strong against one firm to induce the Association to resolve to withdraw its patronage from the offenders. The other firms complained of were warned to be more careful in the future. The Executive Committee was authorized to co-operate with the United States Guild, and requcst the manufacturers to protect the retailers in the sale of goods, either by cutting off the offending jobbers or by selling to the retailers at rates that would enable them to compete on an equality. The year's work of the Association was reviewed and satisfaction with the result expressed. W. N. Boynton was chosen a delegate to the Chicago Convention in May. Ottumna was designated as the place for the next annual meeting of the Association. The following gentlemen were chosen officers for the ensuing year: W. R. Weld, President; Will Beck, 1st Vice-President; O. Starkman, 2d Vice-President; W. F. Bingham, Secretary and Treasurer; W. N. Boynton, Henry Robinson, and C. H. Taylor, Executive Committee. A vote of thanks to the retiring officers was passed, and the Convention adjourned.

QUITE an excitement has recently been caused in London by the discovery of large amounts of "forged" silver plate. This plate purports to be genuine silver ware of the time of Queen Anne, and consists mainly of spoons and forks. Queen Anne silver and *bric-a-brac* is much sought for by collectors of antiques, and hence, it is stated, "tons" of bogus Queen Anne silver ware has been disposed of. Recently a banker sent 650 pieces to Goldsmiths's Hall, every one of which was pronounced to be "forged." The goods have been impounded by the Association, which is seeking to recover £6,500 in fines from a well known silversmith. This gentleman, however, appears to have been innocent of the forgery, having simply sold the goods. Silver forks were not used in Queen Anne's time, but the forgers have used the handles of genuine spoons as a model to make their forks from. It is singular that such quantities of these forks should have been sold under the circumstances. The daily and weekly press is very severe on the silversmiths, and intimations are made that hitherto reputable dealers have been implicated in the matter.

OUR advices from the west are to the effect that the jewelry houses in Chicago are now doing a larger and more profitable business than they have enjoyed at any time since the panic. Many large buyers have visited New York within the past few weeks, and have stocked up with valuable and well selected assortments of goods. It is noticeable that their selections include an unusually large proportion of the higher grades of goods. The buyers who have already visited the east are to be commended for their excellent taste and good judgment in making their purchases, and for the energy they display in disposing of them. Our manufacturers obtain many valuable hints from the Chicago dealers as to the styles that are likely to sell, and hints as to new designs for goods.

THE jewelers' of Hartford and New Haven have recently been swindled by sharpers who palmed off upon them guard chains, Geneva pattern, that are made of a composition formed of platinum and copper. This composition, which is very hard, will test 10 carats, but after melting it will only assay 2 carats. The substance is very hard, difficult to melt, and is well calculated to deceive. Some of the jewelers and pawnbrokers of Chicago and other western cities, have been victimized by the same means.

The Jewelers' League.

We devote this column to the interests of the League and its membership. Letters or inquiries pertinent to its business or purposes, and which might interest the trade or inquirers, will be herein answered. Address *Jewelers' League, Box 4001, P. O., New York*, or the office of THE CIRCULAR.

At the regular monthly meeting of the Executive Committee, held March 5th, 1880, the following applicants were admitted to membership in the Jewelers' League.

M. J. Mahoney, Jr., with A. Stowell & Co., Boston; Henry Ellean, San Francisco, Cal.; John Lindauer, with Tiffany & Co., New York; John Rose, Bay City, Michigan; Eden Bormey, with N. Grant & Co., New York; D. De Witt Brokaw, New York; Thomas B. Brown, New York; David Davidsburg, Wilkesbarre, Penn.; Chas. H. Dimmick, Norwich, N. Y.; George H. Gardiner, with Tiffany & Co., New York; Henry Goeltz, Morrisania, New York; George A. Harris, Norwich, New York; Louis S. Hodge, Attleboro, Mass.; George A. Hollis, with Theo. B. Starr, New York; Willis H. Howes, with Hale & Mulford, New York; William Hurd, Mason City, Iowa; Everett E. Isbell, Cincinnati, Ohio; Ludvig Larsen, Elbow St., Providence, R. I.; Robert Leding, with Wilcox Silver Plate Company, New York; William A. Lee, with Hale & Mulford, New York; Chas J. Leward, with Churchill, Lewis & Co., New York; James H. Messinger, Norwich, New York; Henry C. Payne, Goshen, N. Y.; Fritz Wm. Pleister, with Tiffany & Co., New York; Richard Prensser, Wilkesbarre, Penn.; Frederick Leroy Smith, Brooklyn, N. Y.; Chas. E. Spencer, New York; Ernst Wm. Weidert, with Eisenmann Bros., N. Y.; Albert M. Weir, with Baldwin, Sexton & Peterson, N. Y.

One member proposed for membership, eight of the above applicants.

Full membership now 624.

Benefit fund to date, $1,181.80.

Regular fund to date, $911.99.

The next meeting of the Executive Committee for the accepting of new members will be held on Friday, April 2d, 1880.

The Jewelers' League is an established success. It presents to the trade the best, the safest and the cheapest form of life insurance ever devised. All prudent men will avail themselves of its benefits by becoming members.—[EDITOR.]

Removals.

Marx & Weis have removed from No. 6 to No. 5 Maiden Lane.

Krementz & Co., have removed to 192 Broadway, Room No. 1.

H. Muhr's Sons have removed from No. 11 to 1½ Maiden Lane.

Henzie & Carter, will occupy rooms in the Whiting Building, No. 694 Broadway.

W. N. Walker, diamond broker, will remove from No. 18 to No. 14 John street, about May 1st.

R. M. Tripp & Co., manufacturing jewelers, will remove May 1st from No. 12 to No. 4 Maiden Lane.

L. & M. Kahn, importers of watches, will occupy about May 1st the store of No. 10 Maiden Lane.

Leroy W. Fairchild, gold pen and pencil case manufacturer, will remove to No. 1 John street, about May 1st.

A. J. Hedges & Co., manufacturers of jewelry, will remove from No. 9 to No. 6 Maiden Lane, about May 1st.

Lissauer & Sondheim, manufacturing jewelers, will occupy about May 1st the store floor of No. 12 Maiden Lane.

Charles Glatz, watch case manufacturer, will remove May 1st to the office formerly occupied by L. & M. Kahn, No. 10 Maiden Lane

E. G. Webster & Bro. have leased the large four story building corner of 5th Avenue and Atlantic street, Brooklyn, for factory purposes.

Morgan & Headly of Philadelphia, have removed from 611 and 613 Sansom St. to the new building erected by the Mutual Life Insurance Company, on the corner of 10th and Chestnut Sts.

Practical Hints on Watch Repairing.

By Excelsior, No. 61.

PROPER FORMS FOR TEETH AND LEAVES.—*Continued.*

(958) *The Advantages of the Epicycloid Curve.* A good deal of ignorance and humbug are shown in both writing and speaking about the properties of this curve and its practical advantages. For instance, one eminent writer gravely asserts that "the teeth really *roll* on the leaves, avoiding entirely the friction caused by sliding, there being no more sliding motion than in two plain wheels or rollers revolving on each other." A glance at Fig. 51 will show the fallacy of this statement, when the curve $N b$, of the tooth, commenced to act on the pinion leaf, the points N and c were together at O, on the line of centers. The tooth and leaf have remained in contact till reaching the position shown. If the tooth had simply rolled on the leaf, the point b would now reach far beyond the center a. But the fact is, that the whole of the curve, from N to b, has acted upon the pinion flank between c and b, and consequently must have slided upon it as well as rolled in forcing or driving the leaf up. The same thing will be evident on inspecting Fig. 60, or any gearing. This sliding becomes less as the number of teeth in the wheel increases.

(959) The real advantages of the curve are that it transmits the motive force and the motion of the wheel to the pinion uniformly—*i. e.*, it enables the wheel to drive the pinion with a uniform velocity and force, it applies the force to the pinion in the most advantageous manner, it reduces the friction and wear to the least possible amount, and enables the sliding of the tooth on the leaf to take place at the best mechanical advantage, and with the least loss of force therefrom, under all circumstances, of any practically available curve. There are other curves which would lessen the sliding, etc., but they are not available in watch work, on account of the difficulty of securing accuracy of form on so small a scale. The epicycloid curve is the only one which is mechanically practicable, both from its own form, and from the fact that it admits of the use of straight radial flanks for the pinion leaves, while the other curves for teeth require that the *pinion leaves* also should be suitably curved, rengering such a gearing too difficult and costly for ordinary uses. While friction and sliding are not entirely prevented by this curve, it reduces their evil effects as far as is practicable, and enables the wheel to drive the pinion (of not less than 10 leaves) as uniformly as if both were two plain rollers like their pitch circles. Its real value is therefore too great to need any exaggeration, either purposely or ignorantly.

(960) With pinions of high numbers, where the driving is all done after the line of centers, and very near to it, and also when the pinion approaches the wheel in size, an error in the curve (on the teeth) is of less importance; but its correctness becomes more necessary and valuable the more the wheel exceeds the pinion in size, and the lower the number of the pinion leaves.

(961) *Uniform Transmission of Velocity and Force.* Referring to Fig. 51 for our explanations, suppose the line abc, the flank of the pinion leaf, to be replaced in the position aO, and the line AN, representing the front flank of the driving tooth, to be in the position AO, with its addendum curve Nb in the position Ob^1. Now if the wheel is rotated so that the curve Nb drives upward the pinion radius ac, the wheel will, by virtue of the form of this curve, drive the pinion with a uniform force and velocity. When the point N of the wheel reaches 4^1, the point c of the pinion will be at 4, the leaf ac will be in the position $a\,u\,4$, and the point u^1 of the curve will touch the leaf at u. When N reaches 3^1 ac will be in the position $a\,t\,3$, and the point t^1 of the curve will touch the leaf at the crossing t. When N is at 2^1, ac will lie on $a\,s\,2$, and the point s^1 of the curve will touch the leaf at s, and so on. When finally the point N reaches the position N and ac is in the position abc, the curve will meet the leaf at b. As these divisions of the pitch arcs of the wheel and the pinion are *equal*, $O\,4^1$ to $O\,4$, $4^1\,3^1$ to $4\,3$, $3^1\,2^1$ to $3\,2$, and so on,—the wheel has caused the pinion to move through the same spaces, in the same times as itself, and their velocities are equal; the same as if the wheel and the pinion had been two plain rollers $R\,R$ and $X\,X$, and the former had rotated the latter by mere contact without slipping. By virtue of the form of the curve $N\,b$, the wheel also drives the pinion with a uniform force during all the positions, as will be evident by comparing the lengths of their lever arms in each position (966).

(962) But if the curve $N\,b$ touches the pinion leaf at a point either inside or outside of the semi-circle $a\,b\,r\,s\,t\,u\,O$, in any of the positions, then the wheel will not drive the pinion uniformly, nor with uniform force. If, for instance, the point of the tooth b should drive the leaf $a\,c$ further than is shown, moving upward uniformly along the dotted curve 5, the leaf would move more and more slowly as the point of contact became further from the center a. The force exerted by the wheel would also increase, inasmuch as the tooth would drive by its point and the length of its lever arm would be fixed, while that of the pinion would not remain equal to $a\,b$, but would rapidly increase again. It should be understood therefore that, according to the theory of the curve, in order to drive with perfect uniformity in velocity and force, the point of contact between the tooth and the leaf should always fall in the semi-circle $a\,b\,O$, representing a part of the generating circle, drawn on the radius $a\,O$, in the line of centers. Circumstances may sometimes compel a portion of the driving to be done by the point of the tooth above the semi-circle, and another portion before the tooth reaches the line of centers at O,—but these are conditions not contemplated or allowed by the theory, and our explanations, unless otherwise mentioned, apply only to the positions between the line of centers and the point of the tooth crossing the semi-circle.

(963) *Ratio of the Power to the Resistance.* As we have just seen, when the curve of the addendum is suitable for the proportions of the gearing, the pitch circles of the wheel and pinion move through equal spaces in equal times, and there is a uniform transmission of velocity. Now, in order that the power also may be transmitted uniformly in all the positions of the tooth and the leaf during the driving, it is necessary that the *ratio of the power to the resistance* should remain unchanged throughout all their positions, or, one should continue to act upon the other with the same virtual leverage. A train of wheels and pinions is regarded as a series of levers, each one acting upon the next, and we must consider the action of our tooth and leaf as that of one pair of these levers. As the wheel drives the pinion, the radius of the wheel is the power lever, and that of the pinion is the resistance lever or arm in the present case. Consequently, whatever the ratio between them may be when driving begins,—in this case, as 3 to 1,—it should remain the same throughout the whole of the driving.

(964) Workmen generally suppose that they can calculate the leverage of the wheel and pinion in any position by measuring the distances from their respective centers to the point of contact between the tooth and the leaf. For instance, when contact occurs on the line of centers, as shown in Fig. 51, the ratio between the power and the resistance will be inversely as the lengths of the power and resistance levers $A\,o$ and $a\,O$. And when the tooth has arrived at the position $A\,N$, and the leaf at $a\,c$, with the point of the tooth touching the flank of the leaf at b, as shown, they suppose that the line $A\,b$ represents the length of the lever arm of the wheel, and $a\,b$ that of the pinion. But this is obviously incorrect, for, instead of the ratio between them remaining the same as at the beginning, (as we know it has,) the former has increased considerably, while the latter has diminished to less than one-half, as will be seen by comparing $A\,b$ with $A\,O$, and $a\,O$ with $a\,b$. Nor can they satisfactorily explain it by saying that the leaf makes up in velocity what the tooth gains in length, for, as we have seen, the velocities of both wheel and pinion are the same.

(965) *The Law of Curved Levers.* Their mistake arises from applying the same rule (for ascertaining the ratio between the force and the resistance) to both straight and curved levers. When applied to straight levers, acting on the line of centers, as $A\,O$ and $a\,O$, it is correct. But, in toothed gearing, the lever arm of the wheel is a curved lever, having its acting end formed (in this case) in the shape of the curve $N\,b$, which is not acting in the line of centers, but along the curve $O\,u\,t\,s\,r\,b$. When curved levers are used, the ratio between the power and the resistance is found by comparing the *virtual lengths* of the levers instead of their actual lengths. The virtual length of a curved lever depends upon the direction in which the curve applies the force which it transmits or exerts. The direction of the force, at any point of contact, being marked, a line drawn from the fulcrum of the lever perpendicular to that direction will be the *virtual* length of the lever in that position. Fig. 56 shows an easy method of ascertaining the virtual arms of the

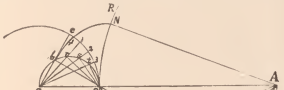

FIG. 56.

wheel and pinion in any position, when a tooth with a correct epicycloidal addendum acts on a leaf with a radial flank, within the limits specified in section (962). Under these conditions the force of the wheel is always applied perpendicularly to the pinion leaf during the whole of the driving, (943).

(966) In Fig. 56, $A\,a$ is the center distance, with the pitch circles meeting at O, as before described; $a\,O$ is the front of one pinion leaf, and $a\,c$ that of the next; $A\,O$ is the front of one tooth, and $A\,N$ that of the next; $a\,b\,O$ is a semi-circle drawn on the pinion radius $a O$, and $O\,B\,A$ is another semi-circle, drawn on the wheel radius $O\,A$. Now in whatever position the pinion leaf may be, between $a\,O$ and $a\,c$; the point of contact between it and the addendum curve $N\,b$ will fall on the semi-circle $a\,b\,O$. When the leaf is in the position $a\,c$, the curve will touch it at the point b, and a straight line from b, through O, to B, will be perpendicular to $a\,c$, and will represent the *direction of the force* exerted by the lever $A\,N\,b$ to turn the leaf $a\,c$ on its fulcrum a. Now draw a line from A to B, and $A\,B$ will be perpendicular to $b\,O\,B$, and will consequently be the virtual length of the curved lever $A\,N\,b$, or the lever arm by which the wheel is acting upon the pinion, in that position; while the resistance lever, or virtual length of the pinion arm or leaf, is the distance from the center of the pinion to b, the point of contact between the leaf and the tooth.

(967) The mechanical effect is the same as if a straight rod $b\,O\,B$ connected the pinion leaf at b, and the wheel radius $A\,B$, at B, perpendicular to both at the points b and B, and conveying the thrust or force of the wheel radius to the pinion leaf. That is to say, if the straight levers $O\,a$ and $O\,A$ were each extended back beyond their respective fulcrums a and A to any suitable length, and weights were suspended from their outer extremities in such a manner that they would be in equilibrium when the straight lever $A\,O$ acted upon $a\,O$, in the line of centers, then they would also be in equilibrium if a curved lever $A\,N\,b$ acted upon another pinion radius $a\,b\,c$ in the manner shown in Fig. 56, and would still remain in equilibrium if the pinion radius $a\,b\,c$ was connected to a wheel radius $A\,B$ by a rod $b\,O\,B$, as drawn. And, in each of these three arrangements, the virtual lengths of the lever arms acting upon each other between the fulcrums a and A would have the same ratio of 3 to 1. When the wheel *appears* to be acting with the greatest length of lever, $A\,b$, it is really acting with its *shortest*, or $A\,B$. But as the pinion lever is shortened in the same proportion as that of the *wheel*, in all their positions, the workman will see that there is no change in the actual amount of the power exerted by the wheel.

(968) On the contrary, the curving of the lever, from N to b, is an arrangement devised specially to *prevent* such changes, which *would* occur with every motion of the gearing if straight levers were used. For illustration, suppose that, instead of the tooth having the form $A\,N\,b$, Fig. 51, it was a simple line $A\,b$, as drawn in Fig. 51, or a tooth with a square corner at b. At the commencement of the driving, the tooth would reach from A to o, and the leaf from a to O, both being on the line of centers. As the tooth carried the pinion leaf upward, it would retain its original length $A\,b$, but the virtual or real acting length of the leaf, which was at first $a\,o$, would become greater every instant, as is shown by the distance from a to the dotted curve 5, at the crossings of the different radial lines $a\,4$, $a\,3$, etc. The corner b would soon wear or become rounded off, and with this continual change of form the virtual length of the *tooth* would also change, the extent of the change depending on the shape of this rounding.

(969) Now suppose that the pinion leaf is in the position $a\,r\,1$, then the point r^1 of the addendum curve will touch the leaf at the point r in the semi-circle $a\,b\,O$, the line $r\,O\,R^1$ will show the direction of the force exerted by the tooth in that position, and $R^1\,A$ will be the virtual length of the wheel lever, while $a\,r$ is that of the pinion. In the same way, when the leaf is in the position $a\,2$ or $a\,3$, $a\,s$ or $a\,t$ will be the virtual pinion arm, and $S\,A$ or $T\,A$ the virtual wheel arm or lever. So, in any position of the gearing during the driving, the distance from a to the crossing of the pinion flank and the semi-circle $a\,b\,O$ will be the virtual pinion arm; and, a line being drawn from that crossing, through O, to strike the semi-circle $O\,B\,A$, the distance from that point to A will be the virtual wheel arm then acting. It can be proved, by geometry, that the ratio between $a\,O$ and $A\,O$ is the same as that between $a\,b$ and $A\,B$, or that between $a\,r$ and $A\,R^1$, $a\,s$ and $A\,S$, $a\,t$ and $A\,T$, and so on. Hence, the ratio between the power and the resistance remains unchanged during the whole of the driving; and a correctly formed epicycloidal addendum, acting on a radial flank, transmits force, as well as velocity, uniformly, (962).

(970) *Driving Before and After the Line of Centers.* In section (961) we followed our tooth and leaf through their different positions to the end of the driving, with the tooth at $N\,b$, and the leaf at $a\,c$, Fig 51. In that position, both the tooth and leaf have passed through the space allotted for them to act on each other, (the pitch arc,—in this case 60°,) and another tooth and leaf should barely have come in contact, ready to repeat, in their turn, the action there described. That is to say, the tooth and leaf come in contact just as their flanks reach the positions $A\,O$ and $a\,O$ respectively, which is termed *meeting on the line of centers.* Should they meet before they reach the line of centers, the flank of the leaf would not reach to that of the tooth, as is shown by the distance between the two pitch circles at those points,—but the addendum of the tooth would act upon that of the leaf, at considerable mechanical disadvantage, and more so as the meeting is further from the line of centers. This is called *driving before the line of centers*, while above $a\,O\,A$ is the *lead or driving after the line of centers.*

971 The friction, loss of effective motive force, etc., resulting from driving before the line of centers will be seen in Fig. 51, if we reverse the situation and suppose that *the pinion drives*, and that the leaf $a\,c$ must carry the curve or tooth $N\,b$ down to the line of centers, which would all be a driving before the center. In the position shown, the leaf could with difficulty move the tooth at all,

but would move it more and more easily as it approached the line of centers, although at a disadvantage even when near to it. The evil is very much greater when the tooth drives the leaf, before the center, as then, instead of a radial flank acting on one addendum, two addenda meet, with butting, wedging, etc., as can be seen below the line of centers in Fig. 60. As usually expressed, the net or available "force transmitted is inversely proportional to the angle of the contact before the line of centers." In driving before the line of centers, there is a minimum transmission of force, and a maximum local resistance, (butting, friction, etc.,)—after the line of centers the condition is reversed, and we get a maximum transmission of force, and a minimum of friction, etc.—so that in ordinary trains economy, efficiency, durability, and certainty of operation are all best assured by doing the driving after the line of centers.

(972) *Arrangement of the Driving, with Recoiling Escapements.* But while it is usually desirable to avoid the driving before the line of centers, as much as possible, an exception is found in the case of escapements which have considerable recoil, such as the verge. In such a case the train must be adapted to facilitate this recoiling, or it will clog the action of the escapement; while an easy recoil is an evidence of a train adapted for the escapement, and especially as regards the 4th wheel and escape pinion. Referring again to Fig. 51, it is evident that, if the driving is all performed after the line of centers, the position of the tooth, at the end of the driving, will be such that the leaf would have great difficulty in forcing it back—*i. e.*, the recoiling would be greatly hampered, if not entirely prevented, the balance would have very little motion, and the watch could not be regulated. As the number of pinion leaves increases, and the pitch becomes shorter, the tooth completes the driving nearer to the line of centers, and the difficulty spoken of becomes less, since the points of the teeth butt against the leaves much less during the recoil. But with pinions of low numbers a greater portion of the driving should be performed before the line of centers, and less after, than would be considered preferable with other kinds of escapements. This, of course, increases the "engaging friction," or that caused by driving before the center, but facilitates the recoiling of the escape wheel, which, with recoil escapements, is of prime importance.

(973) *Avoiding the Driving Before the Line of Centers* is best effected by using pinions of high numbers. *Camus* states that no pinion having less than 11 leaves can be entirely free from driving before the center. More modern authorities claim that contact can be secured on the line of centers with pinions of 9 leaves, (and near to it with pinions of lower numbers), if the wheel teeth are properly formed. But on examining the forms of teeth which they employ for the purpose of removing or lessening the driving before the line of centers, we find that they have been formed, away from the correct curve, and lengthen the addendum, in order to increase the amount of driving after, and lessen that before, the center. This method is further considered in section (987).

(974) *Action of Pinions of Different Numbers.* With pinions having 16 to 20 leaves, the driving is not only after the line of centers, but is all done very near to it, and any deviation from the correct theoretical form for the addendum of the tooth becomes of less importance. But this advantage is attended with the objection that the engagement is so short and close that a very slight wear or error in the placing of the pivot holes greatly affects the action of gearing with high-numbered pinions. Any inequality of the teeth or leaves is also likely to result in catching and stoppage, and gearing with high numbered pinions must be very accurately finished and kept in good condition. For these reasons it is considered desirable that the pinion should not have over 18 nor less than 10 leaves. But even with a 10-leaf pinion, there is very little freedom, and if not well made and properly fitted there will be catching, etc., as before stated. So that, practically, a 12-leaf pinion is the lowest number which always drives after the line of centers, has ample freedom, and does not require such extreme accuracy in the gear to perform satisfactorily.

(975) Pinions having less than 10 leaves are longer in action with the teeth, and the intersection is proportionately deeper, making the engagement more certain and safe. But on account of their long engagement and driving before the line of centers, they are troublesome unless properly selected. A 6-leaf pinion, for instance, requires great care to have it of the correct size for the wheel it works into, perfect and true in shape, equality of division, etc., and concentric with its pivots; and attention must also be given to insure that the addenda of the wheel-teeth have sufficient length, and the proper curve corresponding to the proportionate sizes of the wheel and pinion. The amount of the driving before the line of centers increases as the number of leaves on the pinion diminishes, and diminishes as we increase the length of the addenda of the teeth which drive it. The greatest amount is stated in section (980).

The Seven Metals of the Ancients.

THE ancients had a knowledge of seven metals, viz., gold, silver, copper, tin, iron, lead, and mercury or quicksilver. They were each sacred to some ruling deity. Homer has mentioned all these except mercury. Mercury was common in the century next before the Christian era. Gold, indestructible, malleable, the richest in color, in its lustre, and its property of not being altered or even affected by the air, has been known from the remotest times. It is the Sol or sun of the all chemists, who represented it by the circle, the emblem of perfection. There are drawings of gold washings on Egyptian tombs as early as 2,500 years before the Christian era, and fine gold wire was made into ornaments—often found on mummies—*circa* of Persia, and woven into delicate threads that enlivened the flowered stuffs of Babylon. In the earliest days of Greece gold existed in great abundance in the Levant. Cœsus, B. C. 560, coined the golden *stater*, and about B. C. 207 gold coins were first struck off at Rome and were denominated *aurei*. Copper came into use next after silver and before iron. It was called Venus by the ancients, who gave it the symbol of that planet. The age of copper followed the age stone. Homer wrote in the copper age. His famous shield of Achilles is made of gold, silver, and copper, a small quantity of tin being put in to harden it. The shield is itself a proof of the art of design, and the working in metals having attained a very high degree of perfection among the Greeks at a period believed to have been B. C. 962. In a mine near Lake Superior there was found, in 1858, a mass of copper forty-eight feet long, twenty feet high, and calculated to contain 150 tons. Brass, which has often been confounded by ancients with copper, is merely an alloy made by mixing one-third of zinc with two-thirds of copper. Brass was made by the ancients without discovering zinc. Iron, the most important of metals, came into common use long after copper was well known. It was regarded by the ancients as a symbol of war, and received the name of Mars, the god of arms. Homer mentions a mass of iron as one of the prizes at the funeral games given by Achilles in honor of Patrocius:—

> Then buried the hero, thundering on the ground,
> A mass of iron, an enormous round,
> Whose weight and size the chiefs Greeks admire,
> Rude from the furnace, and but shaped by fire.

In 1537 B. C. the Lacedemonians coined iron into money. At Babylon the huge stones of the bridges were held together by lands of iron fixed in places by molten lead. Thucydides tells us that the walls of Piræus were fastened in the same way. In preparing the stone for building the Pyrimids iron was used, Herodotus affirms; and iron must have been employed in engraving the beautiful old gems which now are so valuable. The Ninevites made tools of iron, the ancient Britons made spears and lances of it, and the Romans, during their occupation of Britain, smelted iron to a considerable extent. The iron mines of Elba are said to have been worked from the time of Alexander the Great; and Pliny speaks of this region as "inexhaustible in its iron." The mines of Aragon and New Castile in Spain are supposed to have been worked from the times of the latest Jewish kings, successively by the Tyrians, the Carthaginians, and the Romans. Through all the nations of high antiquity iron is mentioned almost always in a way that shows it to have been a partially common but always highly esteemed metal. Indeed, from the difficulty of working it with the primitive means at the command of men just emerged from barbarism, it was held at a high price. Only 153 years ago, Batachoff, in Russia, bartered iron for an equal weight of copper coin. Lead, a bluish-grey metal, was known to the Egyptians at an early date, and is mentioned by Homer; it was used in Rome in pipes to convey water, and in thin sheets for roofing purposes. The powder (cyrussa) used by the Athenian ladies to tint their complexion, was our white lead. Lead owes its usefulness in the metallic state chiefly to its softness and fusibility. In ancient times tin was scarce, and the chief supply was from India, Spain, and the celebrated mines of Cornwall, England, which have been worked uninterruptedly from the earliest historic periods. Tin was used by the Egyptians nearly 4,000 years ago.

Cameo Shells and Cameo Cutting.

THE word *cameo* is derived from the Arabic, and is equivalent in signification to bass-relief. It was originally restricted to hard stones, such as onyx, sardonyx, etc., engraved in relief, but the term has since been extended to include gems cut on shell, lava, and other substances. Certain descriptions of univalve shells are well adapted for cameo cutting, from their substance being made up of different colored layers, and also from a difference of hardness and texture, and the various layers—some approaching more nearly to the nature of a nacreous than of a porcelanous material. The good workman always carefully puts his work on the shell in such a manner that the direction of the laminæ of the central coat is longitudinal. In cameos the central layer forms the body of the relief, the inner layer being the ground, and the outer the third or superficial color, which is sometimes used to give a varied appearance to the surface of the figure. The cameo cutter selects from the shells which possess the three layers : (1) those which have the layers strongly adherent to each other; (2) those in which the middle layer is thick; (3) those in which there is a good distinction of color between the layers; and (4) those in which the inner layer is of the color suited for his purpose.

The kinds of shells now employed, and which experience has shown to be best for the purpose, are : The "Bull's Mouth" (*Cassis rufa*), which has a *red* inner coat, or what is known as a *sardonyx* ground; the "Black Helmet" (*Cassis madagascariensis*), which has a blackish inner coat, forming what is called an *onyx* ground, and which shows up white on a dark claret color; the "Horned Helmet" (*Cassis cornuta*), which has an *orange-yellow* ground; and the "Queen Conch" (*Strombus gigas*), with a *pink* ground. The latter shell is about ten inches long, with a rose-colored aperture and an extremely broad lip rounded above. The bull's mouth and the black helmet are the best shells, for the horned helmet is apt to separate from the ground, or to "double," as the French workmen express it. The queen conch seldom has the two colors distinctly marked from each other, and the pink of the ground fades on exposure to light. The red color of the bull's mouth extends but a short distance within the mouth of the shell, and becomes palcr as it proceeds inwards. Hence this shell affords only a single cameo large enough for a brooch and several small pieces for shirt studs, etc., while the black helmet furnishes on an average about five brooches and several stud pieces. The queen conch yields only a single good piece. *Cassis flammea*, which is about six inches long, and *C. decussata* and *C. tuberosa*, which are white upon a dark claret color, are also occasionally used. The bull's mouth shells are derived from India and Ceylon, and the black helmets and queen conchs from the West Indies.

Genoa and Rome are the seats of the best work in cameo cutting, although many common ones are cut in France. In Rome there are about 80 shell cameo cutters, and in Genoa 30. The art of cameo cutting was confined to Rome for upwards of 40 years, and to Italy until the last 26 years, when an Italian began the practice of the art in Paris, and now over 3,000 persons are employed in the industry in the latter city. In the practice of cameo cutting the shell is first cut into pieces the size of the required cameo by means of diamond dust and the slitting mill, or by a blade of steel fed with emery and water. It is then shaped into a square, oval, or other form on the grindstone, and the edge finished with oil stone. It is next cemented to a block of wood, which serves as a handle to be grasped by the artist while tracing out with a pencil the figure to be cut on the shell. The pencil mark is followed by a sharp point, which scratches the desired outline, and this again by delicate tools of steel wire, flattened at the end and hardened, and by files and gravers for the removal of the superfluous portion of the white enamel.

The careful manipulation necessary in this work can only be acquired by long experience; the general shape must first be wrought, care being taken to leave every projection rather in excess, to be gradually reduced as the details and finish of the work are approached. Throughout the cutting great caution must be observed that in removing the white thickness the colored ground is not damaged, for the natural surface of the dark layer is far superior to any that can be given artificially.

In order that the finished cameo may posses a distinct outline at all points of view, it is desirable to adopt the system followed in antique cameos, viz., to leave all the edges of the figure quite square from the ground, and not gradually rounded down to the dark surface; for should the latter practice be followed the outline would be found to be undefined in many places, owing to the color of the white figure in relief gradually merging into that of the dark ground. The surface of the cameo is finished as nearly as possible with the cutting tools, as all polishing with abrasive powders is liable to remove the sharp edges of the figures and deteriorate the cameo by leaving the form undefined. When, however, the work has been finished as smoothly as possible with cutting tools, the final polish may be given by a little putty powder used dry, upon a moderately stiff brush, and applied with great care, and rather to the dark ground than to the carved surface. This is the concluding process, after which the cameo is ready for removing from the block prior to mounting.

The various styles in which these works of art are mounted depends a great deal upon the country where they are to be worn. There are tricks in this business as well as in most others; a fraud is frequently practiced by cutting away the engraved part of old shell cameos, and attaching this to a basc of agate, by means of which an appearance of onyx is obtained.—(*Read at the Saratoga meeting of the American Association for the Advancement of Science.*)

The Corundum Mines of North Carolina.

The name "corundum" is applied to all crystallized alumina. It is the hardest mineral in the world, except the diamond, and when in the crystalline form and transparent constitutes the Oriental gems, the sapphire, ruby, emerald, topaz, etc., which are of great value, some even exceeding the diamond, because they are more rare. It is used for abrasive purposes, but as yet a sufficient quantity has never been found in this country to take the place of emery. It is much harder than emery, performing the work in less time.

Corundum occurs in the great chrysolite belt extending from the southern part of Virginia to middle Alabama, passing in a southwesterly direction through the mountainous portion of North Carolina. In the southwestern counties in the Nantahala range of mountains (one of the spurs of the Blue Ridge), and lying on either side of Buck Creek (a tributary of the Tennessee), at an elevation of from three to four thousand feet is the so-called Cullakenee corundum mine, which has been considered the largest deposit of corundum in this country. It covers an area of three hundred acres. This mine was purchased in April, 1879, by Herman Behr & Co., and has been worked since May, with what success is not reported.

In Macon county, N. C., on the western slope of the Blue Ridge, at an elevation of about twenty-five hundred feet, is Corundum Hill, formerly known as Cullagagee mine. This mine was discovered in 1871; it was afterwards purchased by E. B. Ward, and worked for eighteen months by Col. C. W. Jenks, of Boston. Rumor says that gems of exceeding great value were taken out. In July, 1878, this mine was purchased by Dr. H. S. Lucas, for the Hampden Emery Co., of Chester, Mass. They commenced mining August 20th, and up to the present time have taken out two hundred tons of corundrum; also, in washing some of the dumps left there when worked by Col. Jenks, were found many fragments of the Oriental gem, perfectly transparent and of very great brilliancy. Among these is an emerald weighing 30½ carats, and several rubies of the finest color.

In the eastern part of Jackson county, N. C., at the foot of one of the highest peaks of the Blue Ridge, is what is termed the Hog Back mine. This mine was operated for a limited season by the Hampden Emery Co.

Northwest of the Pigeon, in Heywood county, N. C. is still another deposit of corundum, called the Presley mine, which has been worked since one year ago last March.

In Madison and near the Buncombe county line, in the same State, is an outcropping of chrysolite, carrying corundum, which covers an area of seventy-five acres, and has been worked for the Hampden Emery Co. for the past season.

Deposits of corundum are also found in South Carolina, Georgia, and Alabama, notices of which we intend to present hereafter.—*Scientific American.*

Proceedings of the Horological Club.

A Distinguished Body of Watch and Clock Makers.

Seventy-second Discussion.—Communicated by the Secretary.

[Notice.—Correspondents should write all letters intended for the Club separate from any other business matters, and headed "Secretary of the Horological Club." Direct the envelope to D. H. Hopkinson, Esq. *Write only on one side of the paper*, state the points briefly, mail as early as possible, as it must be received here *not later* than two days before the end of the month in order to be discussed and reported in the Circular for the next month.]

THE NEW PLAN FOR REVIVING THE WATCH AND JEWELRY TRADE.

[*The following remarks by the Members were omitted from the Proceedings of last month, owing to our space in the* Circular *being already filled.*]

Mr. Regulator said he wished to ask one more question—not that he was opposed to the plan, for it seemed to be quite a good one—but for information. Suppose some speculator comes to the jobber, represents himself as So-and-so, on the list, and asks the lowest cash price for a bill of goods specified, buys and pays for them, and takes them away. When it is found that he is not the person he said he was, what can be done? The jobber has got one of Mr. Ruby Pin's certificates, and is not liable for the forfeit; the purchaser has not injured the jobber, for he paid for the goods. This gave outsiders an opportunity to employ some irresponsible person to go, under a false name, and buy whatever they wanted, at wholesale prices, provided they could pay cash. And who would know anything about it?

Mr. Clerkenwell thought that this case showed Mr. Ruby Pin's certificate to be rather an aid, than a preventive, of imposition. Leave the jobber to satisfy himself that the man was what he represented himself to be, in the ordinary business manner, or take the consequences of being mistaken,—and he would seldom be mistaken. But even if the jobber had a certificate, and so on, it could be provided in the contract, that for the third such "mistake" within a year, he should be liable for the forfeit, and should also be struck off the list. It would be known soon enough. The very fact that an outsider had goods kept and sold by regular dealers would prove that some house was "crooked," and would set the whole trade on the *qui vive* to find the offender. Put $500 as a bait, and somebody would soon find out all about it.

Mr. O'Lever asked what forfeit retail dealers would pay for breaking contract, and buying of houses not on the list?

Mr. Clerkenwell thought it better not to impose any money forfeit, but only to take their names off the list of reputable dealers. If they were not willing to stand by the trade in fighting its enemies, they did not merit its protection or advantages, but should be cut off from it, and compelled to deal altogether with the outside houses and their inferior goods.

In conclusion, he said that the only thing required to make the plan a success, was that all the reputable members of the trade, both wholesale and retail, should unite in it, for their mutual good and protection. If a large share of good houses stood out, of course the plan could not succeed. But he saw no reason why they should stand out, for the interest of the trade was certainly in working together, and assisting each other to make business good. And any concern which would refuse to join in a general movement of the kind, would be justly suspected of a desire to dabble in the custom of outsiders, and would as justly be considered treacherous to the trade, and deserve to be treated as common enemies. As success depended on the plan being satisfactory to the majority, he would like to know the opinions of our readers, and would ask any person who saw advantages or objections not mentioned in this debate, to write their views to the Club.

Much more discussion was had, but the foregoing presents all the essential parts. It seemed to be the general feeling that the proposed plan came nearer to a practical solution of the difficulty than any other yet brought before this body, and we lay it before the trade at considerable length, for their consideration, and for such action as they may deem proper. Any steps taken towards its adoption will have our hearty co-operation.

JOBBER ENDORSES THE PLAN.

Secretary of Horological Club:

The "Plan for Reviving the Watch and Jewelry Trade," which Mr. Clerkenwell advocated so ably at your last meeting, is in my opinion just *the* thing! You have hit the nail squarely on the head, this time. That plan is what we want, and there can be no doubt whatever but that it would *work*. I am with you, heart and soul, and I believe every square dealing jobber will feel the same way.

I approve of Mr. Ruby Pin's idea, of printed blanks for jobbers to use. We should by all means use them, and I will tell you why. I am a jobber myself, and I feel some interest in the matter, and think I know how jobbers generally will feel about it. The reason for using the blanks is not merely to have a paper to show for our own protection, in case we are charged with selling to outsiders. That is important, and it would save us the trouble of bringing any witnesses, or going to any expense, to prove our innocence. But there is another reason, still more important, viz:—It makes the man who bought the goods of us on such representations, *guilty of a fraud*, if the representations were false; and we could send him up for it!

That is why I say we jobbers will want to use the blanks. There will be very little of that kind of imposition going on, after this plan is adopted,—you may rest assured of that! But the blank should be so worded as to read that we allow him trade discounts, etc., *in consideration of those representations*. Don't you see the point? He *pays for the goods*, when he pays his bill, and so far he is safe. But he gets the *discounts* by the false pretenses,—and the discounts are equivalent to so much *cash money*. *That* is where we get the grip on him.

And we not only want these blanks, to *keep* in our own possession, but I think we should also have a clause printed in our bill-heads, etc., on the bills that we give to the purchaser, saying that "in consideration of the above named purchaser having affirmed, over his own signature, on the Union blank No. —, that he is regularly engaged in the watch and jewelry trade, and is the person (or firm) of the above name, on the Union's latest list of dealers, we have allowed him trade discounts from regular prices, on the following bill of goods,"—or something to that effect. In this way, he could not show where he got his goods without showing the proof of his fraud. And for the protection of the buyer, he might require the jobber to also have a clause in the bill head saying that the purchaser buys in consideration of the seller representing that he is a jobber in good standing, and is on the Union's latest list of jobbing houses. That would make it all right for both parties.

Now then, gentlemen of the Club, you have got the right plan,—go ahead with it, and put it through. Speaking for my own class, I believe every respectable jobber in the trade will go with you. Why not? Any one who refuses might as well say, right out, that he don't want to lose the trade of the outsiders. There could be no other reason for refusing. Put every one of them on the black list, let us stick to the regular jewelers sell, we buy from the same houses as they do," etc. No, it is not only just to us jobbers, but is for the dealers' own interests, to ostracise the guerrilla houses, and refuse to have anything to do with them or their goods, in any shape.

As for the amount of the forfeit, we should not object if it was put at $1,000—for we should be perfectly safe. We could not be proved guilty of selling to an outsider, unless we *had* done it. That would be the last thing to trouble us. All we care about is to have all the "straight" jobber's and manufacturers joined in the agreement, together with all the legitimate retail traders. Nothing could suit us better, and nothing could be better for the whole trade, than just that state of things. That is the opinion of one "straight"

JOBBER.

Mr. Clerkenwell remarked that there was a good deal of force in "Jobbers" ideas about using printed blanks. But all such details would of course be duly canvassed and decided on, when the Union was organized. Another correspondent, "Northwest," also advanced a very important idea. As he observed, it would be difficult to get

the speculators out of the business, if they once got in; and *now*, when the trade was comparatively free from that class, was the proper time to take such action as would *keep them out.*

Secretary of Horological Club:

I think "Dealer's" plan for reviving our trade, proposed last month, would certainly have that effect, for it would put the business on the proper basis, excluding outsiders from it, and stopping the flood of circulars and price lists sent out by "respectable" jobbing houses. Or, if they continue to be sent, we could then truthfully say that those firms were mere parasites and speculative concerns of no standing, and not recognized by the legitimate trade. We cannot say that now, for many of us, (to our shame be it said), buy our goods from the very same firms who sent out the most circulars, and the public knows it, and people very reasonably conclude "we may as well buy what we want at wholesale, as to go to the jewelers and pay them retail prices for the same things." As long as the "corner groceries" can buy from the same houses as we do, so long they can get the public custom, cut under us on prices, and take the bread and butter out of our children's mouths. This plan would stop all that, and for that reason alone we ought to adopt it.

Our trade has been at a very low ebb for a long time, and consequently most of the mere speculators have left it. But better times are coming, and just as surely as they come, so surely will the business again be flooded with these outside intruders. We regular dealers stick to the business, and keep it going through dull times, even at a loss,—but as soon as there is any money to be made, these outsiders rush in, and take the profits themselves. Having no reputation at stake, they will lie, and blow, and misrepresent, and use any means to make sales, then leave the cheated and disgusted public to vent their rage upon *us*, and say that *all* jewelers are scamps and swindlers.

Let us nip that little game in the bud *now*, while we yet have it in our power, by getting this "Union" plan at work, and preventing these outsiders from getting a foothold in the business. If they once get started, with large stocks of the best goods, and established connections with the leading jobbers and manufacturers, it will be utterly impossible for us to expel them. They will *stick* in spite of us, till they have ruined the trade again, and then they will go into something else, and leave *us* fast in the mire, as usual.

We of the Northwest are specially interested in this, and I do hope that our State Associations and the National Guild, which are soon to meet, will take hold of this plan with a will, and make it a reality and a success. If they do not, they will lose the confidence and favor of more than one retailer in these parts.

NORTHWEST.

Mr. Clerkenwell hoped the trade would consider the "plan," and give us their ideas and suggestions about it.

NEW MINUTE CHRONOGRAPH.

Mr. O'Lever then exhibited a new and ingenious chronograph watch introduced by Messrs. Cross & Beguelin, of this city, and sent to the Club for their inspection. This chronograph differs somewhat from the split seconds chronograph, inasmuch as it is not designed to register either seconds or split seconds, but only minutes. The chronograph or fly back, and the regular time hands are entirely independent, the latter not being disturbed at all, while the former will either travel with them or can be caused to fly back to figure XII, by simple passing the crown or push pin.

This watch can be used for a variety of purposes, such as timing a conversation, pedestrian exercise, catching a boat or train, and many other uses in which seconds and split seconds time is not required.

The movement is simple in construction, sure in operation, well arranged and durable, and remarkably cheap considering its quality.

THE WATCH WILL ONLY RUN 12 HOURS.

Secretary of Horological Club:

I have an Elgin movement, (B. W. Raymond make), which has only been out of the shop something over 2 years, and is apparently perfect in every respect; but while carrying, it will not run but twelve hours. Hanging, it will run the usual length of time, and is a close time-keeper. I have changed main springs two or three times, and examined it *thoroughly*, but I cannot get it to run the full time. Will some one of your honorable body give me the reason of this, and tell me plainly how to remedy it. Trusting you will, and at the same time assuring you that you will confer a great favor upon a reader of the REVIEW and your young fellow craftsman.

M. E. C.

Mr. Horologer said the trouble was probably somewhere in the escapement; jewels too loose, holes too large, or some defect which would cause friction or catching in one position and not in another. But there were so many things which *might* cause it, that it would be impossible to give any definite opinion without seeing the watch. The best thing Mr. C. can do is to get the back numbers of the JEWELERS' CIRCULAR which contain "Excelsior's directions for examining American watches; and if Mr. C. would faithfully follow Excelsior's instructions and did not discover the trouble before he got through, he, Mr. H. would agree to fix the watch for nothing.

MERCURIAL PENDULUM WANTED.

Secretary of Horological Club:

I see an article in the Feb. No. of the CIRCULAR on 16th page—"Changing the Pendulum of a Regulator." Now, I have a good regulator with the gridiron pendulum which does well, but I have for a long time thought that I would like to get a mercurial compensating pendulum for my clock, so I just thought I would write to you and ask where I can probably get one that will be good and reliable at the most reasonable price. My clock has a long (sweep) seconds hand, and the pendulum beats second. Please answer at your earliest convenience, and oblige A. L. MILLER.

MALTA, Ohio, Feb. 18th, 1880.

Mr. Regulator replied that Mr. M. could get a pendulum of almost any manufacture of regulators who advertises in the CIRCULAR. The price would of course depend on the construction, and on *how perfect* a pendulum he wanted. All first-class makers furnish good pendulums. In order to enable manufacturers to correspond with Mr. M. we give his name and address in full.

The Secretary then read the following communication:

Will you be so kind as to inform me through the columns of your paper how to lap old gold of different karats so as to refine it suitable for rings. Also please inform me what materials and what kind of laps to use to get this nice gloss on steel. I can gloss it now, but I want to see some better way.

Can you inform me where I can obtain nickel for making watch plates of about ¼ of an inch thick and ⅛ sheet.

CHAS. H. LUCAS.

Mr. O'Lever thought that the question had been answered once or twice before; he had noticed several articles in THE CIRCULAR on alloys treating the question fully. He, however, with his accustomed readiness to impart information gave the Secretary the following written instructions which we here present.

When you have gold of different qualities and you wish to refine it, you must melt it with saltpetre, putting in a little at a time; using enough to have it boil while you are melting. When you think it has been melted long enough, let the crucible get cold enough to handle; break the crucible when you will find the gold in the bottom. If all the copper and base metals are destroyed, the gold will look clean; if your old gold was at low quality it will look white; you must now test it with nitric acid by something you *know* the quality of, to see how good it is; you will have to bring it up to the standard you wish by adding pure gold, putting enough copper to make it the desired color. If your old gold was very good, you will only need to add copper to bring it down to the desired quality. Suppose your gold *after* being refined is ten karat, every dwt. will have ten grains of pure gold and fourteen grains of alloy. Now you wish to make it sixteen karats, to do so, you wish to know how much pure gold to add to it, you will proceed as follows; take one dwt. of your gold that is ten karats fine, and deduct the quality from the quantity; 24—10=14; then multiply the quantity by the alloy 24×14=96+24=336 by the quantity of alloy there is in the quality you want 336÷8=42, deduct the original quantity 24 grains of pure gold to be added to each dwt. of the gold you have.

Proof: add together the amount 24 grains you had with the 18 grains you have added, making 42 grains multiply by the quality, 16 karats, divide by the original quantity, the product will show the

amount of pure gold you have added with that which was in the original 24 grains, which you will find is 16 grains to each dwt.

24 grains the original dwt.
18 grains added.

42
16 quality,

252
42

24)672(28 grains pure gold in the 42 grains.
672

This rule will apply to any quality you can buy of the dealers in jewelers tools. Laps already made of any size diameter you order. After you get your lap you will have to rub into it from emery, which is done by mixing the emery with oil and putting it on the lap while in a horizontal position; then take a perfectly flat piece of steel and rub the emery in using a rotary motion; after being sufficiently charged with emery, put the lap on the lathe, and while in motion hold against it a hard piece of stone such as onyx or agate; this will polish the lap. You can now cut your work with that part of the lap that is not polished, and polish it with the part of the lap that is bright. Any material dealer can supply you with nickel silver of any width and thickness; it varies in quality; what you want is the best, which has the most per cent. of pure nickel in it.

R. O.

Metals and Alloys.

(*Continued.*)

TWENTY-TWO karat gold articles, such as a wedding ring or keeper, or anything small and plain, may be colored by a very simple plan, as follows:—Place the article upon a pumice coke or piece of wood charcoal, and make it red hot by blowing upon it the blow-pipe flame from a gas jet, and afterwards boiling it out in a mixture of sulphuric acid and water, tolerably strong, say in the proportion of one of acid to four of water, in a copper or other suitable vessel. If the color is desired to be dead, simply washing in a hot solution of soap and water completes the process. If bright, it may be scratched or burnished, rinsed in the usual manner, and dried in boxwood sawdust. A little potash added to the washing-out waters improves the tone of color as well as completely neutralizes the acid that may accidently remain upon the article through imperfect rinsing in the washing waters.

This method can only be successfully employed when a deep, rich color is a special requisite to the finish of the work in hand, and then that only can be effected with 22 karat gold alloys. Therefore, inferior alloys of gold to the one above named must not be treated with this recipe if an intense color is aimed at by the operator in charge of the process.

The color effected upon 18 karat gold, however deep it may be alloyed, when submitted to the above *modus operandi*, is always very pale. Nevertheless, a certain richness is imparted to it, which sometimes makes it very effective looking; but it does not, in any case, produce a sufficiently deep, rich-looking color for general commercial purposes, and therefore it cannot be safely recommended to the practical gold-worker.

A mixture such as the following may be applied with advantage, and if a moderate amount of skill be employed during the operation, certain success is sure to follow the process when red 18 karat gold jewelry is treated with it. The ingredients employed are as follows, when small work is to be heightened in color:—

Saltpetre	6 ozs.
Common salt	3 "
Alum	3 "
	12 ozs.

A color-pot or crucible is provided with straight sides, into which is put the salts, which should have been previously well pulverized and mixed together with the hands. Now place the color-pot upon the fire (a gas jet is by far the best substitute, as the power to heat can be regulated at will, without the removal of the color-pot from the position in which it was first placed), and dissolve the mixture very carefully and slowly so as not to burn the coloring composition. Stir occasionally during the dissoltuion of the salts. When the latter have dissolved the mixture will rise up somewhat in the pot, and then is the time to place in the work, which must be superseded by a wire of platinum of suitable dimensions to the work in hand. The work should be gently moved about while in the pot, and now and again withdraw to inspect the color of it. Dipping in acid water removes any color that adheres to the surface of the work, and which occasionally prevents a proper and satisfactory inspection of it. The acids used mostly for the purpose are nitric, muriatic, and sulphuric; either one may be used in the proportion of one of acid to twenty of boiling water. Be careful in adding the sulphuric to the water, as it will fly about and scald or burn, if it comes in contact with the flesh or clothes of the operator. The water hanging to the work after each rinse should be well shaken from it before re-dipping in the color-pot. The time occupied in the process, if the alloy and other particulars absolutely necessary to the true performance of it are in accord, will be about four or five minutes.

After the dissolution of the coloring salts, the heat kept up should not be too intense during the period occupied in coloring; if so, the paste or composition is not at all unlikely to become devoid of the necessary moisture before the allotted time has expired, which, practically, is required to the termination of the treatment. A very slow fire, or still better, a gas jet, is best for the purpose of accomplishing the common object in view, viz., the highest and richest color to the work under treatment, and that in the simplest and easiest manner possible.

This coloring mixture may be employed for 16 karat, and also for as low as 15 karat gold, if the alloys are red gold ones. But for such a purpose its preparation and application are somewhat different to that just described, as well as to the length of time occupied in the process.

For a small batch of work the quantities may be the same as those already stated, although larger quantities can be used with the same success that attends the smaller ones, taking extra work in proportion to increase of color. The best relation between the work and the color would be as one to three, four, and five; that is, the mixture given will be sufficient to color four ounces of solid work, such as chains, three ounces of hollow work, or two ounces of light work, with large surfaces. Always remember that it is in proportion to the surface of the work that you have to provide a coloring mixture, and not to its absolute weight, to be accurate and correct in your results.

In coloring with the two inferior qualities named above it is necessary to add water to the salts in the pot, in order to keep them moist during their period of action, which takes a much longer time than the one we have already given the details of to produce a color intense enough for the trades. Two ounces of water will be sufficient to put to the mixed salts, which must be allowed to boil. When this takes place, take the batch of work encircled with a wire of platinum or silver, and put it in the mixture, and there let it remain for about fifteen minutes, when it shall be withdrawn and instantly plunged into boiling water provided in a pan for the purpose. The work during the above period may occasionally be withdrawn and rinsed in order to inspect its progress, and sometimes this is found to be an advantage, as the right color is produced more quickly at times than others. At the expiration of the above time it is a desirable plan to well scratch-brush the work in the usual manner, after which process it must especially be well rinsed when it is desired to re-dip it; and this is often the plan adopted by a good practitioner, when the color is not deep enough, to give another dip of five minutes, when a beautiful color is invariably the result. Scratching the articles, rinsing in plenty of clean water, and finally drying in boxwood sawdust completes the operation.

The Manufacture of Porpoise Oil.

Our esteemed contemporary, the *Scientific American*, publishes the following paper on Porpoise Oil, from the pen of Capt. Caleb Cook, of Provincetown, Mass.

About the year 1816, sailors and fishermen having caught a porpoise on their voyage, would sometimes extract the oil from the jaw bone and give it to carpenters and those who used oil stones for sharpening their tools. Finding in this way that it did not gum or glue, suggested the idea that it was just what was wanted for a nice lubricator. It was noticed that the weather at zero would not congeal it, neither would it corrode on brass.

Watchmakers' were then using olive oil as the only fitting oil for watches; but by experimenting with the porpoise jaw oil they found it superior to the olive or any other oil, consequently the sailors and fishermen found a ready market for all they were able to obtain.

This state of things continued until the year 1829, when a shoal of blackfish, about forty in number, was taken at Provincetown, Mass., being the first in many years. Solomon Cook, of that town, took from the jaws of those blackfish a few gallons of oil, and sent it to Ezra Kelley, of New Bedford, Mass., a skillful watchmaker to be tested for watch oil. Mr. Kelley soon found that this oil was superior to the porpoise oil, as it had more substance and less chill. He contracted with Solomon Cook to supply him from year to year until 1840, when Solomon Cook died, and his oldest son supplied Mr. Kelley until the demand was so great that the jaws of the blackfish were not sufficient to supply the market.

Porpoise jaw oil can be refined a little by exposure to the cold at zero, and in that state, with the atmosphere at zero, it is strained through a cotton flannel strainer made in the shape of a cone, but when filtered through paper it is so limpid that it has no lubricating properties whatever, and becomes useless. This oil is called porpoise jaw oil, but is taken from the blackfish, belonging in the family of whales, by a method known only to myself. It is warranted not to congeal with cold at zero, though it will thicken and turn a little milky in appearance. It is warranted not to corrode on brass, or rust on steel, and it will not glue on the finest watch. Ezra Kelley, of New Bedford, Mass., has made it a business for many years to put it up for watch use, and has led in the market, while B. H. Tisdale, of Newport, R. I., and I. M. Bachelder, of Boston, are getting quite popular in the European market.

Caleb Cook, youngest son of Solomon, from scientific experiments, did discover, about the year 1842, that the melon oil of the blackfish was far superior to the jaw oil in every respect—so much so that Mr. Kelley, who had about this time become very popular in preparing this oil for the trade, would not buy it until he was told what it was produced from; and from that time to the present, 1876, Caleb Cook's blackfish melon (watch) oil has been refined by Kelley, of New Bedford, Bachelder, of Boston, Tisdale, of Newport, and many others on a smaller scale, for the world's use. Since the year 1842, Caleb Cook, of Provincetown, Mass., claims to be the only person who understands the art of producing this oil free from all glutinous matter and fit for use. This, he says, is done by a process known only by himself—not by mixing other oils or liquids with it, but by extracting all the gluten from it, and leaving the oil pure for the finest and most delicate machinery. This, he says, cannot be done by the chilling and straining process; for when it becomes perfectly transparent at zero, the lubricating properties are all gone, the oil runs off the pivots, spreads on the plates, dries up, the pivots cut, turn red, and the oil is worse than worthless, for the valuable time-keeper is no longer what it was once for the want of oil with more substance and lubricating properties.

Porpoise jaw oil and blackfish melon oil are worth from $5 to $15 per gallon, according to supply. These oils are sold under the above trade names, and also under the names "watch oil" and "clock oil." They are used largely by manufacturers of firearms, watches, and philosophical apparatus. Smith & Wesson, of Springfield, Mass., the Ethan Allen Factory, at Worcester, Bye & Johnson, of Worcester, the Howard Watch Company, the Elgin Watch Company, the Waltham Watch Company, and the clock factories in Connecticut, use them constantly. The philosophical instrument makers use them for air pumps, as they keep the leather always soft and pliable. Telegraph instrument makers use them when they can get them. They are used in government lighthouses for the clocks of revolving lights. The color of the oils is very light, and can be made very white by placing in the window, where they will bleach in a short time. One drop of water in one pint of oil will injure it very much.

It may be interesting to know how those fish or whales are taken. They make their appearance about the shores of Cape Cod and Barnstable Bay from early in the summer until early in the winter; and when it becomes known that a shoal of blackfish is in the bay, the boats are manned and proceed at once to get in their rear; and, as the fish are at the surface of the water the most of the time, it is easy to tell how to manage to keep them between the boats and the shore. While in this position the men in the boats will make all the noise with their oars they can, and that will cause them to go in the opposite direction from the boats and toward the shore; and when the fish find that they are in shoal water, by seeing the sandy hottom, they become alarmed, and go with all their might till they run fast aground on the sand. The boats then row in their midst; the men with lance in hand jump out of their boats into the water, and butcher them as a butcher would a hog, and it becomes one of the most exciting occasions that it is possible to imagine, for the water flies in every direction, and the blood flows freely until death puts an end to the great tragedy. When the water ebbs and leaves them dry, their blubber is taken off, cut in slices, and the oil tried out. About thirty gallons on an average is what one fish will make, and the melons will average about six quarts. The melons are taken from the top of the head, reaching from the spout hole to the end of the nose, and from the top of the head down to the upper jaw. When taken off in one piece, they represent a half watermelon, weighing about twenty-five pounds. When the knife is put into the center of this melon, the oil runs more freely than the water does from a very nice watermelon—hence the name melon oil.

About the same time that the blackfish made their appearance in our waters, another of the whale species made its appearance, also, called by the fishermen "cowfish" and by the historian "grampus." These whales are very much in the shape of the blackfish, only smaller, not so fat, and not so dark colored. The oil from the melon of this fish is thought to be superior to anything yet found in the blackfish or the porpoise. It is of a very yellow color, and when reduced by the chilling and straining process, it appears to have all the body and lubricating properties that are wanted for the very best watch oil; but as it will take one year to determine it by practical experiments, it is thought best to keep it out of the market for the present. This fish has made its appearance in our waters but three or four times in the last forty years, or about once in ten years. The method of taking it is the same as for the blackfish.

Our venerable and esteemed friend, Ezra Kelley, who is known throughout the world as a manufacturer of a famous watch oil, takes exceptions to the above story of this "ancient mariner," and sends us a communication on the subject, which we herewith present.

MR. KELLEY'S LETTER.

To the Editor of the Jewelers' Circular:

My attention has been called to an article, published in the *Scientific American*, by Captain Cook, of Provincetown, relative to the introduction of porpoise and blackfish oils as a lubricator for fine machinery. The historical part of his article may, in the main, be correct, but when he sets up the claim that there is no one but himself who understands the art of producing these oils free from gluti-

nous matter and fit for use, he taxes the credulity of his readers beyond what the facts seem to justify.

In 1820 my attention was first called to the value of the porpoise jaw oil as a lubricator for watches and clocks by Captain Browning Kelley, of Dartmouth, Massachusetts. After testing the oil, and finding it superior to the sperm oil which we had been using, we commenced its manufactory. As regards the blackfish oil and its introduction as a lubricator, the Captain tells us that his father, Captain Solomon Cook, in the year 1829, procured a few gallons of oil from the fish driven ashore on Cape Cod, and sent it to me to be tested. Whereas, we had used the blackfish oil several years prior to this, and knew of its qualities as a lubricator. The first oil obtained by me was brought here by a New Bedford whaler. Again, we think the Captain is mistaken when he tells the readers of *Scientific American* that oil filtered through paper has no lubricating qualities. Sixty years' experience has taught me to the contrary. Lubricating oils for machinery must be adapted to the purpose for which they are used. If for course machinery, where the friction is great, the body of the oil must be great; if the machinery is fine the body of the oil must be correspondingly fine. Again, we find a difference in the quality of the oil taken on the coast of Africa and around the Bermuda Islands and that taken on the shores of Cape Cod. Since we give to the former the preference, probably the difference is caused by the feed of the fish, as I find the oil taken from the porpoise of the St. Lawrence river is worthless, or nearly so, as a lubricator for watches.

After all, we find it is with oils as with nearly every other article of merchandise, the quality of the thing manufactured depends upon the skill of the artisan and the material he uses, although it is possible sometimes to get a bad garment out of good materials.

I would advise those who are about to engage in the manufacture of watch and clock oils to be careful in the selection of stock as well as its manufacture, if they would have oil of the best quality.

New Bedford, Mass. EZRA KELLEY.

Views of Correspondents.

A GROWL.

To the Editor of the Jewelers' Circular:

May we call your attention to one of our grievances? You know we look to THE CIRCULAR naturally whenever wrongs are to be righted. The jewelry trade calls for much memorandum business from the nature of things, and as the receiving of goods in this way is so great an accommodation to the trade, the makers and importers, with scarcely an exception, will, on application, cheerfully send goods for inspection to any part of the country. Is it too much to expect that goods so sent will receive proper care, and will be returned properly packed? The fact is, however, many of the retailers injure goods so much, that in all lines—especially jewelry of Roman finish—a heavy proportion comes back unfit for stock, so that not even time and money will fully restore them. Only a day or two ago a maker of bracelets was heard to use a big, big D, as he took up four pairs of Roman bracelets just returned from memorandum, and found every one scratched by being tried on a lady's arm over a glove, involving expense and annoyance to restore them to a salable condition. But the worst case on record is where fine Roman finished jewelry was wrapped in newspaper, thrown into a box with no packing, and was received with the contents shaking about, and not a scrap of paper to indicate where the package was from, although the man who sent it considers himself a first-class jeweler. Please furnish us with a touching moral to the foregoing incidents—the writer dare not try for fear of growling again—and oblige

New York, March 20. ONE OF THE VICTIMS.

The practice of sending goods on memorandum is one from which retail dealers derive all the benefit there is in it, while the makers stand the losses. It would naturally seem that the retailers would at least take care to return goods loaned to them as a favor in good condition. But cases similar to those complained of above are of such frequent occurrence that some of our largest houses have been seriously thinking of refusing to send out goods on memorandum any more. Not only are the goods abused, but the system itself. Retail dealers have been known to send to a dozen or more different firms for different lines of goods on memorandum, and were thus enabled to make a goodly showing of "new stock just received" for some special occasion. When "the show was over" these goods were returned more or less injured, and would have to be sent to the shop to be made ready for the market again. This is an abuse of confidence that is working very great injury to the trade. Not only are the manufacturers obliged to carry a surplus stock in order to accommodate this memorandum abuse, but often lose sales because their goods have been loaned out for the accommodation of retailers. In few other lines of business does this practice prevail, and in none to the extent it does in the jewelry trade. It would seem as if a practice that has so few advantages might, in these days of many illustrated catalogues, be done away with. So long as it is kept up, the very least the retail dealers can do, in return for the accommodation and courtesy shown them, is to return the goods promptly, and in as good condition as when received. The "touching moral" we are asked to contribute as an addition to the above "growl" is a recommendation to the trade to abolish the memorandum system as soon as possible.—[ED. THE CIRCULAR.

CLEANING THE MOVEMENTS OF TIME LOCKS.

This can be done by any good watchmaker, and is very often a convenience to bankers and others, as being just as a pleasant and profitable piece of work. The first thing to do, after unlocking the door of the movement box, is to remove the large shipping lever (we will suppose that we have a "Howard" movement to deal with) that is in front of and above the movements proper, also the round horizontal bar that carries the two points that serve to mark the time. This bar is simply sprung in, and can be removed by taking hold by the center and giving a steady pull. Next, remove the thumbscrews that hold the movements in position, taking care not to loose the little spirals that are placed between the screw and the movements; take a firm hold of the plates, and draw steadily forward, working the movements slightly to facilitate removal. You will find three more spirals behind the movements on the posts, (these spirals serve to protect the movements from jars or shocks in closing doors of the safe), replace all of the spirals and screws, place loose pieces in the box, and lock up to prevent accidents. We have now got the movements out. The next thing to do is to remove the dial or disk that marks the time (the safest way is to take one movement at a time, leaving the other until the first is cleaned and up again). These dials look rather complicated at first, but a little study will reduce them to a very simple thing,—they are held on to the center-post by a milled disk and thumb screw,—remove the screw, and draw the dial off by working gently. Now take off the stop work, and place a hand vise firmly upon the winding arbor, hold the vise with one hand and remove the scape wheel, let the train run slowly down by permitting the vise to turn in the hand. The movement can now be taken down and cleaned; do this with hot rain water and soap, (a movement will run much longer if cleaned in this way), rinsing in clean hot water, and drying carefully with clean rags and brush; only the best oils should be used, and the greatest pains taken to see that the pivots and holes are first *clean*, and then *well oiled*, (drilling a heavy safe open is an expensive job, and can almost always be avoided by care and attention to these points). He that has followed the above instructions will have no trouble in replacing the parts. Put the stop works on carefully, leave the scape wheel out, and let the train run down once after winding to be sure that the spring is taken up sufficiently. The dials are set to time, after placing in the safe, by loosening the thumb screws, and turning them to the proper hour, as marked by point on horizontal bar. Bear in mind that one movement runs to the right, and the other to the left; also that the *hours* of the *day* are marked in *white enamel*, and the *hours* of the *night* in *black enamel*. The minute hands run on secondary dials, and can be set with an ordinary watch key.

Workmen that travel for safe companies charge from eight to ten dollars for this work, guaranteeing at the same time against a "lock out," by reason of the clock stopping, for the term of one year.

Hoping that all brother pivots will contribute something to the columns of THE CIRCULAR for the good of the order, (there is no question that they can if they will), I am

Theirs fraternally,

JOHN E. BOYNTON.

"Telling the Time."

A LECTURE BY PROF. WALDO, OF THE WINCHESTER OBSERVATORY OF YALE COLLEGE.

PROFESSOR WALDO, astronomer in charge of the Horological Bureau of Winchester Observatory at Yale College, recently delivered the sixth lecture of the annual course to mechanics, given by the Sheffield Scientific School, of New Haven. Many of the College Professors were present with their families, and the large hall was filled with an attentive audience. Professor Waldo was surrounded by considerable scientific apparatus, among others, the necessary appliances for exhibiting upon a screen the various objects his lecture was intended to illustrate. The display upon the screen of the movements of a watch in motion, with the noon plainly apparent; the dropping of the time ball, and the firing of the noon gun—in this case a pistol—both by electricity, with dramatic pauses of expectancy, and various other episodes were highly interesting features of the evening's excellent entertainment.

The subject of the lecture was "Telling Time," and we present the following synopsis of the Professor's remarks:

I feel very much as though this occasion had been contrived as a polite means of calling the Observatory people to account for the radical idea of obliging a literary and a university town to keep a strict regard for time. Exact time belongs to railroads, to express companies, to science. The generous life of literary effort forbids the cramping influences of a day with an arbitrary twelve o'clock. The soul of art rebels against a clock which does not err, or a watch which counts the eighty-six thousand four hundred seconds of a day with precision. The gentle and persuasive owners of those wonderful pieces of ornamentation and bad time-keeping qualities—ladies' watches—feel aggrieved at any precision which their little jewels cannot comprehend. It is to show you how excellent are our motives, how precise our results, how great are the benefits, that we shall address ourselves this evening.

The time-balls dropped from their masts at Deal, at Cape Town, and from the magnificent head of Sydney harbor, are perhaps familiar to you, and it will be to you not an uninstructed thought that even in distant British colonies there exists this thoughtful attention to the needs of every ship, domestic or foreign, which enters their ports. You will reflect, doubtless, that until within quite recently this kindness has not been reciprocated in one American seaport. And you will be gratified to know that the Western Union Telegraph Company now display, at five minutes of twelve, a ball at the top of a mast placed on the highest pinnacle of their Broadway building in New York; and that precisely at noon, as indicated from the U. S. Naval Observatory, Washington, it falls from its conspicuous position. The query of the Cambridge poet rises on your lips—

> "Wall, neighbor, tell us wut's turned up that's new?
> You're youngest in I be,—nigher Boston is;
> An' down to Boston, of you take their showin',
> Wut they don't know ain't hardly worth the knowin'.
> There's sunthin' goin' on, I know."

That the Harvard Observatory drops its signal of Boston noon, and that there is now an effort to have time-balls at the important ports of our coast. I have mentioned the time-ball first, because it has secured for itself a wide recognition as the simplest way of announcing an arbitrary instant of time. But like the newspaper dropped at the door, or the water which flows upon turning the faucet, the simple result attained in the dropping of a time-ball is the outgrowth of the most refined principles of mechanism, and is the product of skillful assiduity of the astronomer. It is our province now to ask these questions, "Where do we get and how do we keep our time?" These questions come with force at the moment when we stand looking alternately at the face of our watch and the rear platform of a departing train; or when the Gold Stock Exchange closes one minute before we thought it would; or when some majestic steamer wrecks in a fog on our coast because her chronometers are at fault.

But we are chiefly to concern themselves to-night with the instruments used to fix observatories for determining time. You are aware that the stars are located on the celestial sphere by a system of co-ordinates, closely resembling our terrestial ones of latitude and longitude. These are called Declination and Right Ascension. Now Declinations the astronomer measures with carefully graduated circles, but in measuring Right Ascensions, the astronomer fixes his instrument in one plane, and notes by his clock how long after one star passes this plane another follows it. But he must be able to measure this interval of time with a degree of accuracy which corresponds to the accuracy reached with the graduated circle. Hence the Observatory continues to be recognized critic of the performance of time-pieces, for nowhere else in the arts or sciences is the exact measurement of considerable intervals of time of such vital importance. The instrument almost universally used in determining the time is the Astronomical Transit instrument. We have before us to-night a very beautiful specimen of this instrument, presented to the college by Dr. Hillhouse. You notice that it has but one motion, simply around this axis which points east and west, and makes a right angle with the telescope tube. Now, as I take hold of the telescope, you see the telescope only moves from the north to the south, that is, in the meridian. If we suppose this axis to be perfectly horizontal,—and this delicate level rests on its pivot and will tell us if it is not so,—I think you will readily see that the astronomer has only to point the instrument so that it will have the same altitude as a star approaching the meridian, in order to have that star visible in the telescope as it crosses it. Now, if we imagine the star to be exactly in the centre of the field of view of the telescope to-night, and if we do not move the telescope, to-morrow night at about this time the same star will reappear, and the interval between its two successive appearances is one sidereal day. The first objection the astronomer has to observing the sun for time, is that it is difficult to get enough stars in the day time to determine the position of the instrument, and another objection is found in the greater uncertainty attending the transit of the sun's limbs, which I think we can see on the screen. We have here a beautiful photograph taken from the sun directly, and for which we are indebted to the skill of Lewis M. Rutherford, Esq. You will notice that the rounded limb of the sun cannot be so nicely bisected as can the image of this star which follows afterwards.

Let us now examine the method of noting the transit of a star across a wire. If I take this chrometer or that clock, I can count the beats as I sit with my eye to the telescope; and as the star crosses each wire, I can note the second and the fraction of a second; and a skilful observer will only on rare occasions estimate this fraction a fifth of a second in error. It is better, however, to lessen the errors which depend upon the personality of the observer, such as his observing too fast or too slow, and to economize the time of writing down the observations, to record them automatically, by means of the chronograph, an instrument first used in this connection by an American astronomer. We have a beautiful one before us, and you see it consists of a metallic cylinder around which a sheet of paper is coiled, which is revolved uniformly by clock work. A fountain pen rests upon the surface of the paper, and as the cylinder revolves the pen draws a line upon it. Now, if you conceive that this cylinder be slowly moved along at the same time it revolves, you will understand that the pen never marks over the same part of the paper. Suppose that the cylinder rotates just once in sixty seconds, and suppose that I cause this clock, by means of an electric circuit, to slightly move the pen at the beginning of each second; this will cause a slight notch in the line, which registers upon the paper the beginning of each second; this will cause a slight notch in the line, which registers upon the paper the beginning of each second, and if we omit the slight notch which would be made by the fifty-ninth second we can thus register the beginning of each minute. This telegraph key which I hold in my hand in the same electric circuit with the clock and chronograph, and as this star is passing over the screen I can register its transit upon the chronograph by simply causing the pen to make a notch in the line by breaking the electric circuit. We have put a telegraphic sounder in the same circuit, so that I think you will be able to hear the beats of the clock quite to the other end of the hall. There comes one star, and as it crosses each wire you will hear the familiar telegraph tick which tells us that we have made the slight notch on the chronograph which records the star's transit. Now, suppose that this slight notch we afterward find occurs six-tenths of the way between the thirtieth and thirty-first second. Then we know that the star's transit occurred at thirty-one seconds and six-tenths of a second of a particular minute. After an evenings observation, the sheet is removed from the cylinder, labeled, and filed away with the records of the Observatory.

Having obtained the error of our time-piece to within a twentieth of a single second, the next question is, how shall we keep the time-piece so that it will have the same error to-morrow night that it has to-night; or failing in this, how shall we preserve the same relation between the errors on consecutive nights? In other words how sl all we know that the time-piece gains or loses regularly? This leads us to speak of the way clocks and watches keep the time from day to day. You all know that the test of the performance of any time-piece is found in noting the regularity with which it gains or loses. Thus a clock which gained ten seconds a day might be a

very much better one than another which gained and lost alternately ten seconds a day. Though at the end of the week the better clock would be a minute more in error than the second one. The point I wish to illustrate is that with an accurate time-piece we can always predict what its error will be, for some days in advance, while with a poor time-piece we can form no idea, from the determination of its error on two nights, what it will be on a third one. Now it is to the elimination of the sources of error in clocks and watches that the attention of the artisan is directed; and the practical form which successive improvements take is in more perfectly protecting our time-pieces from the effects of temperature changes, and from errors resulting from variations of friction in the movement. In the clock we endeavor to guard against the effects of temperature on the pendulum by uniting two metals in such a way that one expands upwards while the other expands downwards, and they are so adjusted that the center of the pendulum stays very nearly in the same position. Now, although the clock is the most perfect time-piece we have, yet it is still liable to the theoretical objection that its pendulum swings in a circular instead of a cycloidal arc. You will be interested to know that the finest clocks for astronomer's uses are so sensitive to external influences that if the barometer were to change an inch in height, it would cause a variation in the clock's rate of about a quarter of a second per day, and I might mention that in some large observatories the standard clock is kept in a cellar vault to avoid changes of temperature and is hermetically sealed in a glass case, from which the air has been partially exhausted. At the Harvard Observatory the clock which distributes the signals to Boston and along the lines of the railroads is placed in the cellar inside of a thick walled room which has a floor of sheet lead, its walls filled with dry sand and its door joints packed with felt. Our own clocks, used in the distribution of the standard time which is soon, we hope, to become the recognized standard over a large area of western New England and the eastern Middle States, are protected in a similar manner, And it is a matter of considerable interest to many of you to know how well a clock can be made to run under these favorable circumstances. I will give you the variations of the mean monthly rates of the clock Howard 191 which is now sending its beats over the city.

1879,	March,	rate varied,	lost 0.16 seconds.
	April,	"	" 0.08 "
	May,	"	" 0.13 "
	June,	"	" 0.02 "
	July,	"	gain 0.20 "
	August,	"	" 0.22 "
	September,	"	lost 0.02 "
	October,	"	" 0.03 "

And you will observe that these variations of rate are expressed in hundredths of a second of time.

Let us examine the parts of a watch as we have them upon the screen. (Here a watch movement in full motion was projected upon the screen and Mr. Waldo explained the various parts.) We are indebted to the Mechanical Superintendent of the Waltham watch factory for this very interesting exhibition of a watch in motion, projected against the screen. The chronometer either marine or pocket, is superior to any other form of watch made, if we consider only its performance when it is kept in one position; but it is inferior to almost any other well made form of watch if it is constantly exposed to the jar of the person in walking or running. The precision obtained in the very finest of pocket chronometers is surprising; thus, the mean daily variations in the rates of the two best chronometers exhibited by the American Watch Co. at the Philadelphia Centennial Exposition were twelve and fourteen one-hundredths of a second, respectively. Quoting from a recent report of the Neufchatel Observatory on the annual competition of Swiss chronometers for prizes awarded yearly by the Observatory, the two best pocket chronometers had an average daily variation in their rates of thirteen and seventeen one-hundredths of a second respectively. These rates would not discredit an astronomical clock. We have now considered the methods of determining exact time, some of the precautions necessary to keep it, and our last division of the subject will be how to distribute it without sensible error. We have been talking, in describing star transits, of sidereal or star time, and since the stars rise four minutes earlier every day, the sidereal day is four minutes shorter than our common day. Now it is common, in mean time, which we wish to distribute, so first we must convert the sidereal time into mean time.

Let us cause the sidereal clock which is beating in the room beneath us to repeat these beats upon the telegraph sounders about the room. You notice the ticks are now heard each second until we get to the fifty-ninth. which is omitted to tell us the beginning of the next minute by its absence. But the sidereal time is to be transferred to mean time before it is ready to go out over the telegraph lines to regulate our affairs in every day life. If we attempt to compare the sidereal clock directly with the mean time clock, we shall be liable to the error of estimating fractions of a second by the ear; but if we remember that the sidereal clock gains on the mean time clock a whole second in every six minutes, we can wait until the sidereal clock beats exactly with the mean time clock, and then by noting the time of each clock we have a very exact means of comparing the clocks. Here we have the familiar beats of the mean time standard, beating every two seconds except at the beginning of the minute. You will notice, by careful listening, that the sidereal beats are gradually catching up with the mean time beats, and they are now beating exactly together. Let us note the times by each clock. Now, you will see by the short calculation I have just made to reduce our sidereal time to the true mean time of the standard we adopt that our clock is now eight hundredths of a second slow. An amount so small that I hope none of our good friends the jewelers and railroads will take us to task about it. We shall reduce this error to nothing by altering the clock. Thus we have a meantime clock set perfectly to mean time, and by means of an electric circuit ready automatically distributes its beats over as long a circuit as we choose. We have about the hall a miniature telegraph line with telegraphic instruments at two or three points, which, if you please, we will imagine to be Hartford, Springfield and New York. We have only to switch the clock into this circuit, with some precaution to avoid the strong battery power used, and you hear immediately the beats of the clock registering themselves at each station. In order to distinguish the beginning of the minute the last five seconds are struck. In addition to this omission in our Observatory system, the clock omits twenty seconds immediately preceding each five minutes. For a single signal it is customary to resort to the time-ball, or the time given, both of which require considerable mechanism which shall act automatically from the clock. I think we can illustrate the first of these methods by means of the simple ball you see suspended before you. It should be electrically released the instant the second hand of the clock reaches the beginning of the minute. In regard to the gun the Astronomer Royal for Scotland observes: "You would do well, if you can, to pull the trigger of a time-gun, for there are no means under heaven equal to a gun for speaking to human nature and obliging it to attend."

The gun we have extemporized will be discharged at the commencement of the next minute. I cannot speak to you to-night of the many other methods communicating time by means of electric clocks or the display of the time regulated from the Observatory. Nor can we speak of the plans of our Observatory for the encouragement of a higher excellence in the great and growing horological industries of our country. We have left untouched, great divisions in the art of measuring and disseminating time, but a regard for the subject of my lecture reminds me that I must close. Much of the pleasure in the experiments of the evening is due to the kindness of Prof. Lyman in arranging some of our experiments, and to Mr. William Beebe. I thank you for your patient attention.

A NEW GLYCERINE BAROMETER has been invented by Mr. James B. Gordon, of the *London Mining Record* office, and is being tested at Kew. The cistern is a cylindrical vessel of copper lined with tin, five inches deep and ten inches in diameter, fitted with a screwed cover, the air having access through a small hole in the cup attached to the cover, which has a recess holding cotton wool for filtering out the dust. The main tube, twenty-seven feet long, is connected with the cistern by attachment (with a soldered joint) to a projecting piece of tube which enters the cistern through the bottom, and is fitted at its opening with a screwed plug. The tube is an ordinary piece of metal gas pipe, five-eighths inch in diameter, furnished at the top with a gun-metal socket, into which is cemented a glass tube four feet long, with an inside diameter of one inch terminating in an open cup, and fitted with an India rubber stopper. The fluctuations of the level of the column of glycerine are observed and read off on brass scales placed on either side of the tube and fitted with indices and verniers moved by mill heads at the bottom of the scales. One of these scales gives the length of the column of glycerine, the other the corresponding length of a column of mercury. A variation of a tenth of an inch in a mercurial column is shown by a change of more than an inch in the glycerine column, and the latter is therefore expected to show minute variations which are imperceptible in the former. Glycerine absorbs moisture freely when exposed to the air, but this is prevented in the new barometer by covering the exposed surface in the cistern with a layer of heavy petroleum oil specially prepared.

Repairing Swiss Watches.

[CONCLUDED.]

In selecting an arbor one should be chosen having a ratchet nearly as large as the sink in bar will admit; having seen that the ratchet runs true to the centres, proceed to turn the top of ratchet flat (the squares are usually cut to these arbors), and cut a slight hollow at the root of square to prevent the oil being drawn up. Reverse the piece in the turns, placing the ferrule on the square, and turn the under side of rachet flat, leaving it slightly in excess of the thickness it will be when finished, to allow for polishing; the height for the nut is now marked, and the arbor turned down to size to fit the hole in screw-plate. A barrel-arbor plate is the thing to use for this purpose, the ordinary plate having too coarse a thread. The diameter of the part to be screwed should be such that a barely full thread is formed; if it is left larger the thread will probably strip off. That part of the arbor which will ultimately be cut off should be turned slightly tapering, so as to form a guide to start the plate, thus avoiding a drunken thread. The arbor is now screwed, holding it by the square in the pin vice. The shoulder which passes through the bar is now turned down, leaving it very tight in the hole; the height of this shoulder is measured from the upper side of the ratchet with the tenth measure. Next the pivot on which the barrel revolves is turned, leaving it very tight to the hole; finally, the lower pivot is turned, leaving it also very full to the hole. The length of this pivot marked, using again the tenth measure, the square for the stop-finger is cut, the finger put on, and the place for the pin-hole marked and drilled. The arbor is now ready for hardening. A piece of binding wire is twisted a few times round the body of arbor, and some common yellow soap plastered all over it. The whole is then held in the flame of spirit lamp until red hot, and then plunged vertically into the water. Care should be taken that it is not overheated, the lowest heat at which it will harden being used. If made too hot it may go out of truth. The object of the soap is to prevent burning; it also improves the steel which comes out of the water without any scale on it, or, if any, it is easily removed, and the piece is white and clean. The arbor is now placed over the lamp, in a spoon filled with oil, and held there until the oil ignites; it is now ready for polishing. The tool described last month for polishing centre pivots is used for this purpose, a pair of laps rather larger than these described being employed. By this tool the whole of the pivots and shoulders are polished perfectly square and flat, first with the steel and oil-stone dust, and finished with the bell-metal and red stuff.

The nut, having been roughed out, the centre hook and the two turnscrew holes drilled, it is tapped and turned to thickness on its own arbor, leaving it slightly thick. It is now hardened and tempered in the same manner as the arbor, the sides rubbed down smooth, and polished flat. The arbor is now inserted in the barrel, and the nut screwed on. If the barrel has too much end shake, the shoulder against which the barrel nut bears can be turned back a shade. If care is taken in measuring the heights, no difficulty will be found in this respect. The squares are now rubbed smooth with the steel polisher and oil stone dust, shortened, and the ends polished off either on the cement chuck in the balance tool, or in a lantern, and the Swiss screwhead tool. Finally the corners of the squares are taken off with the oil stone slip. If the end of square is required *dead* flat, the fuzee-end tool must be used, which is, I think, so well known as not to require description.

I have been induced to describe thus minutely the process of making a barrel arbor from the fact that many watches pass through my hands, having arbors that have been replaced in such a manner that they entirely fail to answer their purpose, *i. e.*, to support the barrel truly parallel to the plane of plate, and to allow it to revolve truly and yet with no shake. If some such tool as that described is not used for polishing the shoulders and pivots, it is impossible to make a really true and accurate arbor.

MAIN SPRING.

Workmen usually, when replacing a broken spring, send the old one as a gauge for the new one, and if the old spring is correct of course it does very well; but frequently one finds springs in foreign watches which have been placed there either because they are the nearest the workman has to the correct strength, or because the watch, from some fault in the escapement or train, did not vibrate sufficiently, and which are, therefore, much too strong when these faults are corrected. A far better plan being to send the barrel to the metal dealer's, and have a spring applied of such a size that it just drops into the barrel as if it coiled up by the maker; such a spring will be found to give a sufficient vibration if the train is correct, the balance of proper weight, and *the cylinder not too open.* (See *Horological Journal*, June, 1877, p. 135, Jacot Gauge.) Too strong a spring not only causes an increase in the wear of train and escapement, but is much more liable to break and expand the barrel, throwing it out of truth.

REPLACING PENDULUM SPRING.

Having selected a spring of from eight to twelve turns, near the strength required, cut out the centre to about one turn *smaller* than the collet, and remove the old spring from its collet, replacing the collet in its position on the cylinder. Place the cylinder on a pinion riveting stake, and the spring with its centre over the collet, pressing the centre over the collet close down to the balance, the centre being too small for the collet keeps it in its position sufficiently firm for the purpose. Invert the cylinder, and place upper pivot in its jewel hole in cock; note the turn which passes between the curb pins, and remove it, that pivot which passes between the curb pins being taken up by a pair of rather broad-pointed tweezers, held lightly by the right hand, perfectly vertical. The thumb and first finger of the left hand is now applied to the end of tweezers, and a series of short impulses communicated to the balance through the spring; the lower pivot should rest on an inverted watch-glass. By the means described, such a motion is communicated to the balance as to cause it to vibrate from one and a half to two turns. Now if the right hand is slightly lifted, and again quickly depressed, the balance, in addition to its vibratory motion, will rise and fall each vibration, and the lower pivot, coming in contact with the glass, will render it distinctly audible, thus avoiding the necessity for watching the balance, leaving the eyes at liberty to look at the seconds hand of regulator. If the spring is nearly right you can at once proceed to attach it to its collet, or pin in it. The centre of spring having been cut to size, and the curve bent to shape ready to pin in, a piece of the waste outer turn is passed through the hole in collet, and a pin carefully filed to fit it; about one-third the diameter of this pin should be flaked off. Having marked the pin for length, take it out, and nick it half through with a sharp knife. Now place the collet on a blunt cutting broach, one angle of such broach being in the slit of collet; carefully place the end of spring in the collet, and press the pin into its place. Remove the broach, placing the collet on an arbor, and the arbor in the callipers. See that it runs true in round and in flat, correcting it carefully if necessary. The collet can now be put in its place on the cylinder, and the pivot in its hole in the cock, and the outer turn pinned into the stud.

Before placing it in the watch, you can again cause it to vibrate, and get it very close to time, afterwards placing it in the watch, and working at it by the seconds hand; but if has been carefully counted but little is left to do. Should there be no seconds hand to the watch, a small dot of red stuff is placed on the fourth wheel, and another on the plate close to the edge of sink. This answers the same purpose.

I have, I believe, now touched upon all the *most* important points in the repair of a foreign watch; within the limits of a paper like this it is impossible to treat every part in detail, and in conclusion I must crave the reader's indulgence for its many shortcomings; should it have been the means of pointing out to some better methods of working than they have been in the habit of using, and thus advancing the art of horology by ever such a little, I shall feel that the time spent in writing it has not been utterly wasted.

ALFRED GRAY.

Reminiscences of an Apprentice.

MAKING PINS.

I was not a precocious boy, and was slow to learn anything good; still the solicitude of earnest parents and the labors of faithful schoolmasters, which were sometimes of a decidedly physical nature, instilled or developed something within me, and the day I left school I chanced to be at the head of every class that I was learning in. However, this circumstance may be partly explained by the fact, that although the school was a large one, I was the only pupil in some of the classes.

The minds of the boys in our town wandered mostly on a seafaring life, but my father and the leading watchmaker of the town arranged that I should go and be a watchmaker. The watchmaker wanted an apprentice and my parents desired to see me learn a respectable trade and be at home. At first, when it was proposed to me that I should learn to be a watchmaker, I did not care much about it; I wanted to go to sea; but after a time I was persuaded to give the watchmaker's place a trial, and I was taken down to "our maister" and duly installed as his apprprentice. I certainly thought "our maister" to be the most wonderful of men. He could turn brass and steel into beautiful shapes in the lathe, and make the chips fly off as easy as I could cut wood with my knife. He could bore a hole in a piece of iron as quick as the blacksmith could do by heating it and driving a punch through it, and he could even saw a piece of brass or iron in two with the same ease as a carpenter could saw a piece of wood.

"Our maister" commenced operations on me by trying to initiate me into the mysteries of making iron pins for clocks; but, although it was pins that I was making ostensibly, the real object was to learn me to turn the hand vice regularly, and file articles round. The ordeal that I went through in mastering the operation, I can never forget; and probably "our maister" never will either. First of all, I was too little and could not reach up to the bench; but "our maister" got a stool made for me which raised me high enough, and it suited very well, except when I stood too near the end of it, it would fly up and I would tumble down.

In making pins, I had first to cut the wire into lengths all the same, then they had to be straightened with a hammer; and although the wire had to be filed all over, "our maister" would not allow a deep hammer mark to be seen in the wire, and it had to be made so straight that you might twirl it round in your fingers without seeing it move. The wire was held in a hand-vice in the one hand, and the file worked with the other. I had to lay the hand-vice in the palm of my left hand and catch it with my fingers a little above the middle, lay the wire on the wooden block, and turn my hand backward and forward, and in twisting the hand-vice forward I had to let it slip round in my hand a little each time. Then, with my right hand, I had to hold the file and press on it with my fore-finger. I had to push the file slowly from me at the same time that I turned the hand-vice towards me, and while I had to press hard on the file in pushing it from me, I had to pull it back without any pressure, and I had to push it out and in perfectly straight; and all these things "our maister" insisted on my doing without any deviation whatever from his established modes of procedure. I tried my best, but made but little progress at anything, except tumbling off the stool, and bruising my fingers. Making pins seemed little less than persecution to me, and sometimes, when "our maister" would be displeased with the manner I was handling the tools, and when he would come to show me the right way, if the wire would slip from the block, as sometimes it would, I felt a savage delight at seeing "our maister" knock his fingers up against the vice or the block, which was an inward pleasure to me at the time that compensated for a whole week of making pins, although now I am sorry that ever he hurt his fingers on my account. After many week's labor, with but little intermission, I could turn the hand-vice and handle the file to please him, and the pins I made were round and of a gradual taper; but my troubles were not yet at an end as I thought they were, for I had to learn to smooth-file, draw-file, and burnish them. This was not so difficult to learn, although they had to be burnished with an oval burnisher till they looked like silver; yet, in small pins, this was not a matter of much difficulty to me except that I very frequently pricked my fingers with the pins.

At length, after all the coils of iron wire in our own town, as I thought, were exhausted, I was put to making brass pins for watches. After the severe drilling I had got in learning to make the larger iron ones, I found making watch pins a comparatively easy matter. I soon learned to turn the pin-vice with my finger and thumb in a regular manner, and although I could never do it as well as "our maister" could, I did it to please him, and that was about as much as, at that time, I cared about.

I now think the same as "our maister" did, that it is a great acquisition to a workman to be able to make pins as they ought to be made. The pin itself is of greater importance than is often attached to it; besides, the ability to turn the hand-vice regularly is a great advantage in doing other work necessary to be done about a jobbing watchmaker's bench. Apprentices, learn to make pins! I do not wish to persecute you, but you will never regret it if you learn to make pins thoroughly, although you do begin with large ones first.

Victoria's Crown.

Described by Her Majesty's Mineralogist.

This was made by Messrs. Rundell & Bridge in 1838 with jewels taken from old crowns, and others furnished by command of her Majesty. It consists of diamonds, pearls, rubies, sapphires and emeralds, set in silver and gold; it has a crimson velvet cap with ermine border, and is lined with white silk. Its gross weight is 39 oz. 5 dwt. troy. The lower part of the band above the ermine border consists of a row of 129 pearls, and the upper part of the band of a row of 112 pearls, between which, in front of the crown, is a large sapphire (partly drilled), purchased for the crown by his Majesty King George IV. At the back is a sapphire of smaller size, and six other sapphires (three on each side), between which are eight emeralds. Above and below the seven sapphires are fourteen diamonds, and around the 8 emeralds 128 diamonds. Between the emeralds and the sapphires are sixteen trefoil ornaments, containing 160 diamonds. Above the band are eight sapphires surmounted by eight diamonds, between which are eight festoons consisting of 148 diamonds. In the front of the crown, and in the centre of a diamond Maltese cross, is the famous ruby said to have been given to Edward, Prince of Wales, son of Edward the Third, called the Black Prince, by Don Pedro, King of Castile, after the battle of Najera, near Vittoria, A. D. 1367. This ruby was worn in the helmet of Henry the Fifth, at the battle of Agincourt, A. D. 1415. It is pierced quite through, after the Eastern custom, the upper part of the piercing being filled by a small ruby.

Around this ruby, in order to form the cross, are seventy-five brilliant diamonds. Three other Maltese crosses, forming the two sides and back of the crown, have emerald centres, and contain respectively 132, 124 and 130 brilliant diamonds. Between the four Maltese crosses are four ornaments in the form of the French fleur-de-lis, with four rubies in the centres, and surrounded by rose diamonds, containing respectively eighty-five, eighty-six and eighty-seven rose diamonds. From the Maltese crosses issue four imperial arches composed of oak leaves and acorns; the leaves contain 728 rose, table and brilliant diamonds; thirty-two pearls form the acorns, and in cups containing fifty-four rose diamonds and one table diamond. The total number of diamonds in the arches and acorns is 108 brilliant, 116 table and 550 rose diamonds. From the upper part of the arches are suspended four large pendant pear-shaped pearls with rose diamond caps, containing twelve rose diamonds, and stems containing twenty-four very small rose diamonds. Above the arch stands the mound, containing in the lower hemisphere 304 brilliants, and in the upper 224 brilliants, the zone and arc being composed of 33 rose diamonds. The cross on the summit has a rose-cut sapphire in the centre, surrounded by four large brilliants and 108 smaller brilliants.

Pinions—Their Shape and Diameter.

INTRODUCTION—PITCH CIRCLE EXPLAINED—REASONS THE SIZES OF PINIONS VARY FOR WHEELS OF DIFFERENT NUMBERS OF TEETH—THE SHAPE OF THE LEAF.

Watch and clock-making, or the art of constructing and executing time-keepers, seems not to hold that rank among the mechanical arts which its connection with the sciences, particularly that of astronomy and navigation, and also which the many ingenious improvements it has undergone, by the help of scientific men, entitle us to expect. The custom now so prevalent of working piece-meal from established models, which, it must be allowed, contributes greatly to expedition and cheapness, has, no doubt, conduced to exclude calculations and geometrical principles from the workshops of the present day.

The practical departments of our profession being frequently confined to the obscurity of a garret, it is no wonder that a dexterity at performing certain manual operations, such as hammering, filing, drilling, turning, soldering, tempering, polishing, etc., should be considered as the perfection of the art, and that the reason is frequently not understood by the workman himself, and seldom by his employer, why the numbers of his wheels and pinions, and the shape, size and disposition of the different portions of his mechanism, are deemed preferrble to others, which he might have adopted as easily, if, in his apprenticeship, he had been so instructed.

We have not as yet in the English language, or in any other language that we are aware of, any regular instructions for all the successive portions of work to be performed in the construction of a good time-keeper, whether it be a watch or a clock; which want is much to be regretted, for until the workman can proceed in his work on scientific principles, he must be content to be a mere slave of imitation in an art which is capable of affording him genuine pleasure, from the opportunities it affords of calling in science to his aid in every step that he takes through an infinite variety of practical constructions.

The question of calculating the number of teeth in a wheel, or leaves in a pinion, so that the one will make a given number of revolutions more or less than the other, has already been noticed in the columns of the JOURNAL, and for the present we will assume that the desired numbers in the wheels and pinions have been made out, and noted down. The next stage of the work will be to ascertain the proper diameter of the pinion in relation to the size of its wheel, or the proportioning the diameters of the wheels and their respective pinions, so as to transmit the power from the barrel or fuzee to the scape-wheel, in a uniform manner, without the leaves of the pinions butting against the backs of the teeth, or the teeth dropping from off the one leaf of the pinion on to the next; both of these defects causing an irregularity, and a waste in the power that is transmitted through the wheel-work; and on this special subject we would add a few remarks in addition to those we have already published.

If a wheel and pinion were to be made like two rollers, without any teeth in them, pressing their edges against one another, and by the aid of friction producing a rotary motion, it is plain that their diameters ought to be in geometrical proportion, exactly as their calculated number of teeth; as for example, a wheel of 96 teeth, working into a pinion of 8 leaves, would, if it could be made in the above manner, require to be exactly 12 times larger than the pinion, because 12 revolutions of the pinion to one of the wheel are desired.

But it is evident that to rely upon friction as a means of causing two rollers, or plain wheels, to revolve with precision, would be impracticable, and would prove a certain failure if applied to watch and clock work; therefore we must make teeth on the wheels. Let us imagine the points of contact of two wheels without teeth, and made to turn each other by the aid of friction. The points of contact of these wheels, or what we will call the pitch circle, is exactly the size of the diameter of the respective wheels, and is the circular pitch line. From this pitch line let us conceive a number of small projecting levers or teeth, fixed at proper intervals from each other, around the circular pitch line of each wheel, and then we shall have a true idea of two wheels properly proportioned to act together, when of the same diameter. When they are of unequal diameters, they cannot be in geometrical proportion to each other, by reason of the little levers or teeth of equal length that have, in both cases, been added to the diameter of each wheel separately, after they were in exact geometrical proportion; and the greater the difference between the size or number of the wheels, the greater will be the deviation from the originally accurate proportion, when they were in the condition of plain wheels or rollers; for the pinion of eight leaves, which we referred to in the last paragraph, will have had an addition made to its diameter exactly the same as the wheel of 96, which is 12 times larger in diameter. Hence it will be readily conceived that the due proportioning of wheels and pinions is an important object in Horology; for, supposing the teeth of the wheel and the leaves of the pinion to be of the true epicycloidal form, unless their respective diameters be properly adjusted the transmission of the power, and communication of motion, will both be unequal, and the mechanism subject to rapid destruction.

One method of proportioning or sizing wheels and pinions, as it is often called, which still lingers in practice at the present day, is, first to make both a little too large for the proposed calliper, and then having rounded all the teeth of the pinion, and a few of the wheel, to reduce the diameter of the latter gradually, until, by successive trials, they are found to act correctly. This mode we reprobate as calculated to destroy the due practical proportions, and hope to see it banished from every workshop by the adoption of better methods.

In proportioning wheels and pinions, after the numbers of their teeth and leaves are determined upon, two particulars are to be attended to: the coarseness, or solidity, and the shape of the tooth. The former may be expressed by the number of teeth per inch in the circumference of the wheel, and the latter by the term epicycloidal. If a tooth were rounded in a circular shape, which we do not recommend, but only suppose the case, the pitch line would be considered as at one half the breadth of the tooth from the extreme edge; but when it is rounded, as we shall hereafter recommend, in an epicycloidal shape, or, as some workmen call it, the *bay leaf* form, it has been found from numerous experiments that the depth or distance of the pitch line from the circumference of the wheel will generally be .75 of the breadth of the tooth in any wheel or pinion.

We have just stated that when an epicycloidal tooth is used, the distance of the pitch line from the end of the tooth is equal to .75 of its breadth; and if we suppose the tooth and space cut to be reciprocally equal, we shall have the true *acting* diameter of any wheel or pinion greater than the geometrical diameter, which we call the pitch circle, and which *Camus* calls, also, the *primitive* diameter, by .75 of a tooth or space on each side of the centre, or 1.50 in the whole diameter. Let now a space or a tooth be called a *measure*, and there will be double the number of measures there are teeth in any wheel. Also let these measures of the circumference be reduced into measures of the diameter, by the usual ratio of 3.1416:1, and then 1.50 added to such geometrical measures of the diameter, will give the proper acting diameter, and which may be expressed in inches and parts when the measures per inch are known.

For instance, let a wheel of 96 teeth, and a pinion of 8 leaves, be taken at 12 teeth per inch at the pitch line; the number of measures of the wheel is 192, namely, 96 teeth and 96 spaces, each measuring $\frac{1}{24}$ of an inch; then as 3.1416 : 1 :: 192 : 61.1; therefore, if to the geometrical diameter or pitch circle expressed by 61.1 measures, there be added 1.5, the sum 62.6 or $62\frac{6}{10}$ will be the acting diameter in the same denomination, which are so many 24th parts of $\frac{62.6}{24}$ and $\frac{24}{24}$ gives 2.6 inches for the full acting diameter of the wheel in question. Again the pinion of 8 has 16 similar measures, to which if 1.5 be added the acting diameter will be 5.09 + 1.5 = 6.59; or, with sufficient accuracy, $6\frac{6}{10}$, which divided by 24, as before, will give the same .27 of an inch, or somewhat more than a quarter of an inch for the acting diameter of the pinion.

In the use of the sector for sizing wheels and pinions, the practice of its inventor was to add $2\frac{1}{2}$ measures of the geometrical diameter to the wheel, and $1\frac{1}{2}$ to the pinion, in watch work, when the wheel is the driver; and $1\frac{6}{10}$, *to each* when the pinion is the driver, which does not often occur in watch work or clock work of any description.

The reason why a wheel or a pinion ought to be somewhat larger than according to its calculated proportion when it is the driver, is, that in those cases where the teeth are actuated both before and behind the line of centres, the impulse of the tooth before line of the centres takes place later than it otherwise would do, as well as occasions a smaller shock at the commencement of the impulse.

Hatton, of London; *Berthoud*, of Paris; *Ried*, of Edinburgh, and all the old writers, make a distinction in the size of a pinion when it is used in a clock and when it is used in a watch. We never supposed that this distinction was made solely for the reason that the pinions were to be used for a clock or for a watch; but from the fact that the relative geometrical diameters, or the pitch circles of a pinion in a watch differed from those in a clock, from the fact that the numbers of the wheels were not in the same proportion to the numbers of the pinions in both cases; and therefore the pinions had to be sized accordingly, agreeable to the explanation we have above given in regard to the geometrical diameter of a wheel and pinion.

We think it was a Danish astronomer and mechanist who first pointed out the utility of the epicycloidal curve when applied to delineate the shape of a tooth, which we presume our readers are familiar with. Others took up the subject after him, and demonstrated that if a tooth of either a wheel or pinion be formed by portions of an exterior epicycloid, described by a generating circle of any diameter whatever, the tooth of its fellow will be properly formed by portions of an exterior epicycloid described by the same generating circle; which curious circumstance allows of an infinite variety in the two corresponding curves that form the teeth of the wheel and pinion, if they were practicable. Further, it has been shown that if the teeth of any wheel be triangular, circular, or of any regular figure, a uniformity of force and velocity may be mutually imparted, provided the teeth of the corresponding wheel or pinion have its teeth or leaves formed compounded of the epicycloid and said figure, which has further been shown to be the method of effecting motion in a variety of cases, not however adapted for practice.

Whether the workman may choose to use his exterior and interior epicycloids jointly in the same tooth, or separately in different wheels acting together, this practical rule never ought to be lost sight of, namely, the outer end of the interior, and also the inner end of the exterior epicycloid, should universally commence in the primitive or geometrical circle of the wheel of pinion.

The reader is already prepared to be told, what otherwise might have appeared a contradiction, not only that the same pinion, of eight leaves for instance, will require the teeth of a wheel of thirty to be somewhat differently rounded at the ends, from those of a wheel of sixty, or any other number, in order to have the same action in both cases; but that, however accurately the teeth of wheels are rounded, all numbers are not equally good to be used indifferently for wheels and corresponding pinions. This latter part of our subject has not been much attended to in practice, but is curious, and may contribute to great utility in horological instruments, where an equable transmission of force and velocity is desirable.

The whole of what we have hitherto said respecting the action of epicycloidal teet, has been upon a supposition that the impelling force begins at the line which joins the centres of a pair of wheels, or of a wheel and pinion, and is exerted onwards always on one side of this line, until the teeth escape one another, which mode is allowed to be the best, when it can be effected; but there are many ratios, and those in common use between a wheel and its pinion, which will not admit of that kind of action, however good the shape of the teeth. Indeed *Camus* has shown that no pinion less than one of eleven leaves, will entirely answer the purpose of acting always on one side of the line joining the centres, and consequently the common pinions of six or eight leaves are very ill calculated to effect an equable transmission of velocity and force, by reason of their leaves acting alternately before and behind the line of centres.

It is impossible for a wheel of 50 to move in a uniform manner; a proportionate pinion of seven leaves impelling them only behind the line of centres. A wheel of fewer teeth than 50 will be still less proper, and one of a greater will not leave space enough for sufficient thickness of a leaf in a pinion. Hence it appears, that when a pinion of seven leaves is used, it will be impelled by its wheel, partly before and partly behind the line joining the centres. If a wheel of 57 were made to drive a pinion of eight, the whole arc for both the tooth and space would be 6° 18′ 57″, of which 5° 7′ 40″ would be occupied by the tooth of the wheel, and only 1° 11′ 17″ by the space or by the leaf the pinion, which quantity is not enough for an acting tooth; therefore, if the teeth of the wheel are made nearly equal to the spaces, they will drive the pinion of eight both before and behind the line of centres. Also, if a wheel of 64 were to drive a pinion of nine leaves in such a way that the impulse might be only behind the line of centres, the arc of the pitch line of the wheel, for both tooth and space, will be 5° 37′ 30″, of which the tooth will occupy 3′ 45″ 42‴, and the space only 1° 51′ 48″, which will not leave room for a leaf sufficiently thick for a pinion.

Likewise, where a wheel of 72 drives a pinion of 10 leaves, behind the line of centres, the arc of the wheel tooth is 2° 47′ 16″, and of the space between two teeth 2° 12′ 44″ only; therefore here the tooth and the space cannot be equal.

In pinions of 11, 12, etc., the action may take place entirely behind the line of centres, and the extreme ends of the teeth might be taken away, and in those cases where the pinion is always driven by an impulse made only behind the line of centres, the addition to its tooth beyond the geometrical diameter may, as we have said, be nearly dispensed with; that is, the acting and the geometrical diameters may be almost the same, provided the angular points be a little rounded to prevent their catching or scraping the teeth of the wheel, though it is safer to give a little addition for the curves.

THE famous diamond necklace presented by the Khedive of Egypt to General Sherman's eldest daughter on the occasion of her marriage to Lieutenant Fitch, has at last ceased to have any public history. It will be remembered that the necklace, estimated by the custom house authorities at $200,000, was greatly in excess of its real value, and held some time for the payment of $20,000 duties, which Lieutenant Fitch, not being rich, could not pay. Congress finally passed an act authorizing the custom house officers to deliver the diamonds to him free of duty, which was done, and they were sent to Washington for safe-keeping in the Treasury. After this Lieutenant Fitch ascertained that the yearly taxes on the diamonds in St. Louis County, Missouri, where he lived, would be much more than his salary, and he once more found them an elephant on his hands. His father-in-law, General Sherman, took pity on the boy, and returned the necklace with thanks to the donor in Egypt. Upon receiving them the Khedive wrote to the General, saying that it was not his desire that the diamonds should be given to any one member of the family, and having learned that he had four daughters, it was his wish then that the diamonds should be mounted in sets, and divided equally between them. These daughters are Mrs. Fitch née Minnie Sherman, Ella Sherman, Lizzie Sherman, and Rachel Sherman. The necklace was then returned to the Sherman family, and mounted in four magnificent pendants, four pairs of splendid solitaire ear-rings, and eight rings. These four ladies are now the happy possessors of four complete suits of diamonds.

THERE are so many curious clocks nowadays that one must be very curious to be worth mentioning, but there was one belonging to a native prince in Upper India which hasn't been beaten so far. In front of the clock's disc was a gong, swung upon poles, and near it was a pile of artificial human limbs made up of the full number of parts for twelve perfect bodies, but all lying heaped together in seeming confusion. Whenever the hands of the clock indicated the hour of one, out of the pile crawled just the number of parts needed to form the frame of one man, part joining itself to part with metallic click, and, when completed, the figure sprang up, seized a mallet, and, walking up to the gong, struck one blow that sent the sound pealing through every room and corridor of that stately castle. This done, he returned to the pile and fell to pieces again. When two o'clock came, two men arose and did likewise, and so through all the hours of the day, the number of figures being the same as the number of the hour, till at at noon and midnight, the entire heap sprang up, and, marching up to the gong, struck one after another his blow, making twelve in all, and then fell to pieces.

ONE of the freshest bits of intelligence from Paris relates to the use of pneumatic clock, which removes the odium so long cast upon the gorgeous credibility of French time-pieces in general. During the past week large illuminated clocks have been set up in the principal Parisian thoroughfares, and by communication with the works of the new pneumatic clock company in the Rue St. Anne, tick with a simultaneous pulse. The Observatoire is the central point from which the time is distributed, so to speak, every morning, by means of subterranean tubes. The principle can be applied to any clock, so that in process of time the clocks of creation may be expected to beat in unison. It is easy to understand how winding may thus become unnecessary; but when the cable informs us that repairing is also rendered superfluous, one subsides into a condition of amiable wonder.

THERE is very little yet published regarding the process by which Mr. J. B. Hannay produced the small crystalline particles which Prof. Story Maskelyne says are diamonds. Pressure equal to several tons to the square inch and a very high temperature had to be employed. Prof. Maskelyne does not appear to have employed the acid test. Whether the crystals are real diamonds or not, they cost much more than natural diamonds. A gem so small as would be worth only a dollar in the market takes about $25 to make it.

Trade Gossip.

The Ansonia Clock Co. are about to establish a branch house in Chicago.

The great American $1 watch is no nearer completion than it was a year ago, but it is coming.

It takes only 1,000 of the Hannay manufactured diamonds to make one large enough to be salable.

The merry burglars are again burgling city jewelry stores, while the finest police force lie basking in the sun.

Wm. H. Vanderbilt will soon receive from Dresden a set of china, made to order, of over four hundred pieces.

The windows of the Philadelphia jewelry stores are much sought after by artists for the display of new pictures.

There are quite a number of new styles of watch charms in the market this Spring, some of them unique and elegant.

Since Miller Bros. commenced suit for infringement of patents, profanity has increased in Providence to an alarming extent.

If the price of white paper continues much longer to increase, we shall be compelled to print the CIRCULAR on plain white silk with a gilt border.

Thieves complain that if the country is going to be flooded with $3 clock watches, they will have to go out of business, as trade won't be worth a cent.

Congress is discussing the tariff question, as usual, but what the country is suffering for is an honest 14 carat gold chain that will assay more than 10 carat.

Cameos have advanced 33 per cent. since the first of January and 100 per cent. within a year. There is a great scarcity of fine goods of this class in the country, and their value is constantly advancing.

A new badge has been designed for the detective squad. It is composed of base metal, and is of little intrinsic value, consequently, the detectives will run no risk in having it stolen from them.

Uranium, which is worth $1,000 per ton, has been discovered in Sacramento, Cal. But it will not be long before MacTear and Hannay have produced a better article out of old umbrellas.

In the suit of Miller Bros. against Albert J. Smith and Dutee Wilcox, the defense has been taking testimony for some time in New York before a referee. The suit is to be tried in Providence, and is attracting much attention in the trade.

The jewelers are meeting with competition from street peddlers. On almost every corner of the street sleeve buttons, scarf pins, watch charms, etc., are hawked by loud voiced peddlers. They run an active competition with the 13–14–15 puzzle.

There is to be an international exhibition of earthenware, chalk, cement, and gypsum industry at Berlin this year from June 29 to Aug. 10. The United States is now quite able to make such a display at this exhibition as will surprise some European countries.

The Adams & Shaw Manufacturing Company have disposed of their sterling silver department, together with the machinery, tools, and entire plant, to Dominick & Haff. Mr. Mills, who has been long with the Adams & Shaw Company, has transferred his service to the new firm.

Three confidence men recently entered the store of W. Smith & Co., makers of gold chain, and while examining some goods, one of the gang was detected stealing a chain. The thief was captured, and now languishes in the Tombs, the rest of the gang succeeded in making their escape.

Dr. Sydney Marsden, says the *Nature*, has discovered a substance in which carbon is soluble, and from which it crystalizes out partly in graphitoidal and partly in adamantine forms. The adamantine crystals exhibit beautiful octahedral shapes under the microscope and scratch sapphire readily.

Crowds still gather on the street corners every day about noon to watch for the falling of the time ball on the Western Union building The ball slides down the pole in a flash of time, yet it is shown by statistics not yet made, that New Yorkers lose 10,500 hours every day watching that ball. Such is the importance of having correct time.

We hear from all sections of the country that business is steadily improving, and that the prospects of the holiday season are likely to be fulfilled throughout the year. Buyers from the west and south are enthusiastic over the improvement in all kinds of business, and represent that the jewelry trade is getting its full share of the general prosperity.

The show windows of jewelers are the most attractive features on the street, and are objects of studious contemplation by our country cousins and city ladies "out shopping." Much taste is displayed in the decoration of show windows, and some of the clerks devote their whole minds to studying how to produce the most striking effects in displaying goods.

A permanent exhibition has been established in Geneva, Switzerland, for the display of watches, jewelry, and kindred articles. The list of exhibitors published in the exhibition paper, *L'Industriel Suisse*, indicates that the affair is a success. A lottery in connection with the exhibition forms one of the attractions, the prizes to be selected from among the exhibits.

In the iron treasure box in the Custom House are a large quantity of unset diamonds valued at 41,000 francs. They were received through the Post Office, in a registered package from Holland a few days ago by Mr. Hartog of Wall street. He at once took them to the Custom House to have them appraised and the duty collected on them. The oldest Custom House officers know of no similar case.

A report from Portland, Oregon, says that John R. Gardiner, of Gardiner & Dorrance, has left for parts unknown. It has since transpired that during the four months' sickness of Dorrance, Gardiner appropriated the receipts of the business, and disposed of the stock at ruinous prices. The money, it is said, was lost on cards and squandered on wine and women. The remaining stock has been attached by the creditors.

Robert A. Johnson was married March 4th to Mrs. Sadie E. Christie, and has just returned from his wedding tour. Mr. Johnson is a gentleman well known in the trade, and highly respected. His friends had recently noticed some little eccentricities of manner in him, and were at a loss to account for them. The secret is now out—he was in love, and has been and gone and done it. He will receive a hearty welcome to the grand army of Benedicts.

A presentation was made to Samuel B. Mann, of the Rockford Watch Company, by his associates in the office. It consists of a copper plate about three inches across, the plate being substantially riveted on a solid foundation of sole leather. The plate bears the following inscription: "Presented to Samuel B. Mann by the office employees of the Rockford Watch Company, March 1st, 1880. Eureka." The presentation should have been delayed till April 1st.

The Providence jewelers are said to be full of business, with a large accumulation of orders on hand. An unusually large quantity of rolled plate goods will be made this year. It is noted that pirated designs from fine gold goods are still freely used, but it is a fact that some of the best Providence houses are leading the fine goods manufacturers in new designs ready for their elegance. These houses will, of course, take the cream of the trade in rolled plate goods.

The Illinois Retail Jewelers's Association, will hold its third convention at Springfield, April 7; O. E. Curtis, the Secretary, has issued a vigorous call to members of the trade, setting forth the good already accomplished by the Association, and urging all dealers to be present at the convention. This organization is thoroughly organized, and as it has the best interest of the retail dealers in view at all times, it should have upon its roll of membership the name of every dealer in the State. We wish it great success.

That gold crosses are often hollow is well enough known, but perhaps few persons have discovered what a French writer has—the use to which this vacant space is put by English ladies. It is filled, he says, with cordial, or sherry, or brandy, for sipping in public places; and thus the religious symbol is made to administer to creature comfort. "This custom can be observed nightly at the opera, where a charming young English lady is in the habit of pressing to her lips at the most pathetic passages an enormous gold cross." If this story is an invention, it is at least ingenious.

Chicago dealers have been suffering largely from peripatetic peddlers, who go about the city peddling clocks, and doing a thriving business. A meeting of the retail members of the trade was recently held at the Sherman House, when an agreement was drawn up whereby the signers pledged themselves not to sell goods to peddlers, but to limit their sales to the trade. This agreement was signed by the representatives of the following named firms: Giles, Bro. & Co.; New Haven Clock Co., G. A. Harmount, Western Manager; Waterbury Clock Co., H. S. Peck Agent; E. N. Welch Manufacturing Co., F. E. Morse, Western Manager; Wm. L. Gilbert Clock Co., J. Quincy Walker Agent; B. F. Norris & Co., C. H. Knights & Co., Chas. Wendell & Sons, H. F. Hahn & Co., Seth Thomas Clock Co., W. F. Tompkins, Agent.

Business Notes.

Bloch Bros. present a large and attractive line of watches, suitable for the requirements of all classes of trade.

Buckenham, Cole & Saunders have just received an invoice of select diamonds to which they invite the attention of buyers.

L. Hanmel & Co. announce that they have been appointed sole agents for the sale of the celebrated "Gravier" main springs.

C. V. Mount, formerly of Marshalltown, has bought out Scott & Barger, of Vinton, Iowa, the latter firm retires from business.

Van Houten, Sayre & Co., manufacturers of rich jewelry, are making a series of beautiful designs that cannot fail to attract buyers.

Hamilton & Hunt, manufacturers of fine plated chains, have a large and comprehensive assortment of these goods always in stock.

Joslin & Park have closed their branch house in Cheyenne, W. T., and have opened a new establishment in Leadville, Colorado.

Ripley, Howland & Co. are introducing many new and beautiful designs in diamond mountings, engraved rings, etc., of which they make a specialty.

A. Friedenthal has recently added to his stock a line of rolled plate and gold jewelry, and has also increased his optical and material department.

Courvoisier, Wilcox & Co. have discontinued the sale of American and foreign watch movements. They will henceforth devote themselves to the manufacture of gold cases.

W. Rogers & Son, manufacturers of silver-plated flat ware, etc., have opened an establishment at No. 100 Chamber street, this city, where a full line of their goods are on view.

J. H. Purdy, of J. H. Purdy & Stein, is now calling upon his friends in Iowa with one of the most complete stocks of watchmakers' and jewelers' supplies that goes out of Chicago.

A. W. Magerhans and D. De Witt Brokaw have formed a copartnership under the firm name of Magerhans & Brokaw for the purpose of conducting a manufacturing jewelry business.

J. A. Riley & Co's. new patented bracelets attract considerable attention, and are rapidly growing in public favor. These goods are made only in fine 14 carat gold and are designed for high class trade.

Celluloid watch cases are rapidly growing in public favor. Colby & Johnson, the patentees and manufacturers of these goods are running their factory to its utmost capacity to keep up with their orders.

The New Haven Clock Co. have leased the building No. 62 Reade St., and will occupy the first and second floors for show rooms and offices. Increasing business having crowded them out of their old quarters.

Auguste Nicoud, a son of Frederick Nicoud, the well known maker of the celebrated watch bearing his name, has established himself in this city as a nickel finisher and stoner of watches; his office is at No. 14 Maiden Lane.

J. A. Brown & Co., manufacturers of the Ladd patent stiffened gold watch cases are doing a very satisfactory business in these goods. They are constantly introducing new designs that cannot fail to attract attention.

A. Schwencke, manufacturer of artistic hair jewelry is introducing many beautiful designs in hair goods. Mr. Schwencke is well and favorably known throughout the trade, and all goods of his manufacture may be relied upon.

W. C. Green & Co. are making an attractive line of jewelry, embracing a wide range of popular goods, such as rich sets in taper wire coral, eardrops, studs, crosses, sleeve buttons, brooches, engraved and enameled sets, coral cameo, etc.

B. & W. B. Smith, the well known builders and show cause manufacturers are constantly introducing the most ingenious and artistic designs in show cases, that for originality, workmanship and finish, are not excelled by any other maker.

The attractive advertisement of Mulford & Bonnet to be found elsewhere in the CIRCULAR, presents at a glance the style and character of goods in which they deal. A select assortment of new and attractive designs is kept constantly in stock.

The American Silk Guard Co., No. 39 Maiden Lane, have succeeded in producing a cheap line of silk guards that enters successfully into competition with those imported, and will favorably compare with them both in quality, finish, and price.

P. W. Wallis, of Cogswell & Wallis, has just returned to Chicago with a line of goods that cannot fail to attract purchasers. Their new stock has been selected with care and discrimination, with a view to meet the especial requirements of their customers.

W. W. Childs, of Jackson, Mich., is regarded as one of the best workmen in that State. He combines much research and study with a thorough practical knowledge of the business, and an ambition to excel in all he does. He is, consequently, a competent judge of the goods he handles. He has an attractive establishment, well-stocked with standard goods, which include all the latest novelties.

Samuel C. Jackson, the well known manufacturer of fine cases for jewelry, watches, silverware, etc., is constantly introducing new and artistic effects in goods of his production. His latest fancy is a series of beautiful design in water colors, painted on silk and satin, and used in ornamentation of the interior of the boxes. These goods are very effective and contribute greatly to the attractiveness of their contents.

Otto Wettstein, of Rochelle, Ill, has one of the largest jewelry establishments in that section, well filled with a carefully selected stock of goods in every branch of business Mr. Wettstein is devoted to the welfare of the trade, and a great student of the literature pertaining to it. He is also a student of philosophical subjects, and an earnest debater on these topics. As a jeweler he enjoys the confidence of the community in which he resides.

J. Milton, of Eufaula, Alabama, is noted in the trade as being a skillful workman, and having an establishment well stocked with the choicest goods in the trade. He is an Englishman by birth, but has been a resident of Alabama for a number of years, and has built up a valuable trade in the section where he resides. His reputation as an expert is such that goods purchased of him can be relied upon as being what they are represented to be.

H. Buker & Son, of Rockford, Ill., is a firm well known in that section for its reliability and fair dealing. They are among the most trustworthy jewelers in the State. The senior member is a careful and conscientious workman, and the son has imbibed from him a technical knowledge of the business that is of great value to him. The firm carries an excellent stock of goods, carefully selected, and that is deserving of the attention of buyers in that vicinity.

Morgan & Headly of Phiadelphia, have removed to larger and more commodious premises in the new building erected by the New York Mutual Life Insurance Company, corner of 10th and Chestnut Sts. The office is filled up in a style becoming to a diamond, fine jewelry, and optical business, and with every convenience that taste and culture can devise. Morgan & Headly have also erected a building for manufacturing purposes, corner of 11th and Mifflin Sts., and hope to have their new factyry in running order by the 24th inst.

Holmes, Booth & Haydens have rebuilt their silver-plating factory at Waterbury, Conn., which was recently destroyed by fire, and are again under full headway with their accustomed enterprise and energy. They were fortunate in saving the most important part of their machinery, dies, etc., so that all orders will be filled with usual promptness. One of their latest and most taking design in forks and spoons is called the "Japanese pattern, shown in their advertisement. It will be noticed that it is finished with equal care and exactness on the upper and under side, and is quite a popular pattern with the trade.

THE

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THE

JEWELERS' CIRCULAR AND HOROLOGICAL REVIEW,

The recognized organ of the Trade, and the official representative of the Jewelers' League and the Watchmakers' and Jewelers' Guild of the U. S.

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Abuse of the Credit System.

WHILE it is true that the business of this country is mainly conducted on credit, there is no one industry wherein credit performs so important a part as in the jewelry trade. Nor does credit in any other trade or industry, suffer the abuse to which it is subjected in the jewelry business. Buying goods on credit is the rule, not the exception in the jewelry trade, and the ease with which comparative strangers can obtain credit constitutes one of the abuses that frequently bring disaster to those who become willing victims. But the particular abuse of the credit system we have in view at present is the apparent indifference with which reputable dealers will see their business paper go to protest without an attempt to prevent it. Retailers come to New York to buy goods, get credit for them, and give notes at three or four months in payment. With many this apparently ends the transaction. Like Micawber, they seem to think that when they have given their note of hand they have performed their whole duty by their creditor. The note goes to protest, but the debtor is wholly indifferent, or, if he takes any notice of the matter, gets angry at his creditor for not "taking care" of the note. This is a matter of such frequent occurrence in the trade as to lead to the belief that many retailers are ignorant of the nature of a note, and, indeed, of the first business principles. When a creditor asks his debtor to give him his note for an amount due, he does not want it simply as evidence of indebtedness—an open account is almost as good as a note for this purpose—but he wants it to convert into cash for the maintenance of his own credit. He deposits the note in bank and it is credited to his account, less the discount; he draws against it, and by this means a note becomes to him ready cash which he uses in his business. But if the note is not paid at maturity by the maker, the one who deposited it must make the amount good in bank forthwith. No delay is permissable; the sum must be paid at once or the depositor's credit is ruined. Yet the distant debtor views the matter with entire indifference, caring little for the trouble and embarrassment he has caused; when pressed in the matter, he coolly responds that it was inconvenient for him to take care of the note, and encloses a renewal note, which is quite as likely to go to protest as the first. Country retailers do not seem to appreciate the necessity city merchants are under to keep their credit unimpaired. A protested note with them means destruction of credit and ruin. Their dealings are through the banks, and a note that is not paid by 3 o'clock on the day it is due is at once protested and its maker's credit destroyed. In country places the banks are not quite so exacting, and some arrangement may be made with the bank for postponing the day of payment. Not so in the cities, where the rule is cash down or go to protest. Country dealers should bear in mind how exacting all business transactions in the city are, and strive to protect their paper. As the day of maturity approaches, and they find they are unable to meet their notes, they should so inform their creditors in ample time to enable them to provide for them; send on all the money they can scrape together to pay as much as possible, and a new note with interest for the balance. Give the creditor some chance for his life and his credit, and not embarrass him by your utter indifference.

As we said before, the credit system predominates in the jewelry trade more than in any other. A hardware or dry goods merchant can do five times as much business on one-half the capital that a manufacturing jeweler can. And this additional capital is rendered necessary in order that the manufacturer may accommodate the retailer by giving him liberal credit. While the manufacturer is obliged to provide money to carry on his business, and to keep his credit good at all times, the retailer buys all his goods on credit, and strains accommodation to the utmost limit. After buying goods on four months time, affording him abundant opportunity to convert them into cash, the least the retailer can do in return for the accommodation extended to him, is to promptly meet his notes and save his creditor from the embarrassment which is necessarily the result of their going to protest. If they have a proper sense of their obligations, they will constantly bear in mind the fact that at a specified time certain notes of theirs fall due, and make provision for them. They have no right to put off making such provision, as they do their prayers, or their repentance for their sins, till the last moment, and trust to chance to getting out of the difficulty, or, failing in that, to throw the burden upon their creditors, but they should keep their obligations constantly in mind, and daily contemplate their position with a view to meeting them promptly. Manufacturers should not be expected to carry the entire burden of the credit system while the retailers abuse the accommodation it confers upon them. It would, undoubtedly, be better for all concerned if the credit system could be abolished entirely, but the conditions of trade preclude that. Capitalists are comparatively few, while every man wants to do business for himself. So long as this continues to be the case, there must be creditor and debtor classes. This would not be so bad if the debtor class conscientiously respected its obligations and fully realized its responsibilities. Good notes are in demand in the market, but when a man's paper has once gone to protest it becomes thereafter of little value to himself or any one else. Good notes are as good as cash to the manufacturer, because he can always convert them into cash; notes given by retailers, therefore, constitute a part of the capital of the manufacturer; when their notes are protested, not only is he deprived of so much capital, but he must draw

upon his other resources to make up the deficiency. If he discounts a note for $1,000 and the note is not paid, he must find another $1,000 somewhere to take up the note with; thus he has weakened his resources by $2,000, all he has to show for it being the $1,000 protested note. Let the retailers "put himself in his place" and see how much he would be embarrassed were his debtors to permit their notes to go to protest. Promptness in meeting obligations on the part of the debtor class is the only way the credit system can be made tolerable. We commend these suggestions to the careful consideration of the retailers in all sections of the country, and hope they will in future have a little more consideration for the necessities of their creditors.

Jealousy Among Retailers.

ONE great reason for the bad feeling to be found in the jewelry trade is the excessive jealousy that exists among retail dealers. Some dealers seem to regard every competitor in business as a personal enemy, and to look upon every sale his rival makes as an injury done to himself. He seems to forget that he stands in precisely the same light to his competitor that his competitor does to him. There is no reason why business rivalry should breed personal hatred. Every man has a right to earn a living if possible, and to do it in any honorable way that may to him seem fit. But jealousy of rivals is a disease with some men, and they resent honest competition as they would a deadly insult. They abuse their rival personally, disparage his goods, traduce his character, and seek to give out the impression that he is defrauding the public. These jealous men do not realize what is a fact that misrepresentation and vituperation are boomerangs that inevitably return to wound the head of him who projects them. By abusing their rivals they excite suspicion regarding themselves; by calling them tricksters they disparage the entire trade; by denouncing a competitor's goods as fraudulent, they discredit jewelry in the abstract and invite criticism of their own wares; if they cut prices to injure a rival, they are suspected of not dealing fairly with the public when there is no competition. It is an old saying that "competition is the life of trade," and so it is if fairly conducted. It stimulates all parties in interest to extraordinary exertions to secure trade, gets the public interested, and results in bringing good fish to all nets that are judiciously spread. It frequently occurs that a retail jeweler in a small place does just business enough to keep body and soul together; he grumbles because his sales are small, and falls into a dismal routine, dragging along wearily, without sufficient ambition to improve his condition or to get away from it. Presently, some young active man comes along and opens a rival jewelry store; he pushes out among the people, sets new ideas afloat, shows new styles of goods, and by his own vitality and energy, forces the old fogy into activity and brisk competition. The results prove that while under the previous condition of things there was scarcely business enough to keep one man from starving, the new life infused into the community by the lively new man has made business enough to give two men a comfortable living. Honest rivalry and generous competition never yet hurt any one; it is only dishonorable practices that can drive true merit to the wall, and that is not permanent.

Jewelers should be too self-respecting to indulge in jealousy of competitors, or to resort to cheap abuse and vituperation to injure a rival. Their trade is an honorable one, and a jeweler should rank in his community with the members of the learned professions, with the clergymen, the physician, the banker, and this position certainly will not be accorded him if he resorts to the tricks and abuses that are found in trades that are less pretentious. The jewelry trade deals in the fine arts, and a jeweler is supposed to possess a higher degree of intelligence than is expected of the shoemaker or the blacksmith. Above all, he is expected to be a gentleman, and gentlemen never exhibit petty jealousy, or amuse themselves by traducing their neighbors. To be respected one must be self-respecting, and not indulge in the slang of Billingsgate or th profanity of a fishwoman.

Art Work in Jewelry.

IT is a matter of frequent complaint among manufacturers that retailers do not sufficiently inform themselves regarding the historical or romantic characteristics of the goods sent them. Fashion in jewelry is everything, and fashions sometime demands jewelry of one period of civilization and sometimes of another; sometimes the fickle dame abandons the classical and historical styles, and seeks in Egypt, Japan or China, for picturesque designs. When manufacturers attempt to conform to the requirements of fashion, it is essential that retailers should comprehend the intention, and be able to present to his customers the claims the goods he offers have to their consideration. There are some retailers who take pride in being thoroughly well posted in matters of styles, and appreciate mosaics, cameos, and all fine jewelry, as works of art. Others there are who, after spending a life in the business, have no more knowledge of the truly artistic in jewelry than they have of heaven, and wouldn't know a mosaic from a cameo unless the difference was noted on the manufacturers' bill. Such men have no ambition beyond tinkering a cheap watch and getting a dollar and a half for their labor; they have no ideas above the bench, and in their manual labor no originality. They are the drudges in the business, who are content to be drudges all their lives, satisfied to lounge away their time in saloons and barrooms, smoking strong pipes and stronger tobacco, and swapping indecent stories with other loafers. Men of this class have no business to call themselves jewelers; they should set up as cobblers of watches, and leave the more elevated branches of the business to gentlemen of taste, culture, and intelligence. It would be better for the public if such men were weeded out of the business, and better for the manufacturers. "Casting pearls before Swine" is not a pleasant or profitable business for the manufacturers to engage in. It is little satisfaction for them to devise new styles of goods to fall into the hands of clods who can neither appreciate nor sell them. The retail dealer should keep himself so well informed regarding his profession as to make him an authority in his community in matters pertaining to the fine arts; he should have a nice discrimination regarding both his goods and his customers, so as to be able to display his wares to the best advantage. It is the retailer who comes in direct contact with the people, and it should be his ambition to educate them up to a just appreciation of art in jewelry. If he has no pride in his profession, no ambition to give it rank and to see it honored and respected, he might as well be a day laborer or a street sweeper. The retailers have important functions to discharge, and upon their intelligence, energy, and enterprise, the success of the trade is largely dependent.

A Chance for the Jewelers.

SENATOR CAMERON has introduced into the United States Senate a resolution providing for a joint commission of Congress to consider and report what legislation is necessary for the better regulation of inter-state commerce. It is proposed that three Senators and three members of the House shall constitute the committee, and that they shall be empowered to sit during the recess, to investigate the conditions governing commerce generally, and report such recommendations for improving these conditions as may seem to them just and reasonable. This resolution is the outcome of a demand that has been made by various callings for relief from oppressive state laws, and from abuses that have sprung up within the trades themselves. The only authority under which Congress can consider the subject at all is that section of the constitution which empowers Congress "to regulate commerce between the States." That body has never been called upon to define what is meant by the term commerce, but the Supreme Court has held that by this clause of the Constitution, Congress has a right to regulate all the

factors that go to make up commerce. If Congress shall adopt this definition, then it will clearly have the right to legislate against all frauds perpetrated in the name of commerce. Here, then, will be the opportunity for the jewelers to protest against the wholesale frauds committed by dishonest men and charged generally to the trade, much to its discredit. The integrity of goods entering into commerce is certainly a proper subject for legislation, and it will be pertinent to the question this committe will have in hand to inquire to what extent wrought gold is debased and still sold as pure gold. Having ascertained that extensive frauds are committed upon the people by means of debased gold goods, it will then be strictly in order for the committee to recommend as a remedy for these frauds the adoption of a standard for wrought gold, and to provide penalties for the infringement of this standard.

It is an unquestioned fact that the trade is suffering every day by reason of the barefaced swindles perpetrated in its name by unscrupulous manufacturers of imitation and debased goods. Jewelry, so called, is sold as 14 or 18 carats fine when it will not assay 10 carats, and fine goods are so closely imitated in this base metal as to defy even experts to distinguish it from the genuine without resorting to the melting pot. This is, of course, impracticable in every day commerce, and, as a consequence, respectable dealers are made *participes criminis* in swindling the deluded public. It is not only the general public that needs protection from these manufacturing swindlers, but the retail dealers, who desire to do an honest and legitimate business, but who are constantly betrayed into selling debased goods for genuine. Many thousands of dollars are paid annually by the public for jewelry represented to be of excellent quality that in reality possesses scarcely any intrinsic value. If this be not a fraud upon commerce that Congress should have power to regulate, then that power should be conferred upon it forthwith.

The legislation necessary to prevent such frauds is not much. First, let Congress declare that pure gold shall be 24 carats fine; second, that when gold is debased so that it is less than 12 carats fine—or to a point where the baser metal predominates—it ceases to be gold, and can only be sold as the baser metal; third, that misrepresentation regarding the quality of wrought gold goods shall work a forfeiture of the goods and subject the manufacturer to severe penalties; fourth, that every bill of sale of wrought gold goods shall specify in carats the quantity of gold of which they are composed, and such bill of sale shall be held as a guarantee on the part of the seller that the goods are of the quality named, any deviation therefrom to work a forfeiture of the goods, fine and imprisonment. Desperate diceases necessitate desperate remedies. Unscrupulous manufacturers have introduced such grievous abuses into the trade, and they have so flooded the country with spurious goods, that they have brought a stigma upon the entire guild. Debased goods have become so common that the people look with suspicion upon everything in the line of jewelry offered them by other than well known houses. In England this is not the case. There a standard is established, and the Hall mark upon goods is a guarantee of their integrity. Congress can do as much for the American people by the simple process we have outlined. It is probable that the joint committee Senator Cameron asks for will be appointed; if so, we trust the jewelers will take measures to present their grievances, and suggest the remedy for them. If commerce is to be regulated in accordance with constitutional provisions, it would seem essential that the first thing to be done is to secure the integrity of the thing to be regulated—to be sure that the factors that go to make up commerce are not themselves fraudulent and an imposition upon the people.

A National Bankrupt Law.

DURING the present session of Congress there has been some talk of presenting the country with a new bankrupt law. The feeling among the business and commercial community is decidedly in favor of such a law, provided it avoids certain objectional features of the old one. Existing State laws fail to meet the necessities of business because of their lack of uniformity, and because they permit of frauds being practiced to the great prejudice of the creditor class. In order that the sentiments of the business community may be fairly expressed on the subject, the various Boards of Trade in different cities, and the official organizations of special callings, should take the question under consideration and forward the result of their deliberations to Congress. Boston merchants took such action sometime since, and presented their views in a sensible and forcible manner. A special committee of the Board of Trade was appointed to report upon the subject, and the result of their labors is put forth in a vigorous manner, the practical ideas of practical business men for the guidance of our law makers. The committee insists that the great defect of the national bankrupt law, lately repealed, was in its administration by registers who received fees for their services. While the law did not contemplate that those registers should exercise judicial functions, they were, nevertheless, in practice, judges rendering decisions that were binding upon the parties in interest. It being conceded that the payment of judges by fees is opposed to public policy, the committee recommends that the judges in bankruptcy proceedings should be salaried officers, that one should be appointed for each district, and that they should be invested with the same authority as a United States District Judge. They furthermore recommend that assignees be elected by creditors, subject to the control of a committee of creditors, substantially as provided in the late law regarding trustees, the assignees to receive one per cent. of all moneys received as compensation. The former distinction between voluntary and involuntary bankruptcy the committee would have abolished; they recommend that the proof by one creditor of an act of bankruptcy as defined by statute should be sufficient to throw a debtor into bankruptcy. A compromise with an insolvent debtor is allowed if made within a reasonable time, providing three-fourths of the creditors agree to it, and if payment is made in net cash. The committee recommends that the transfer of property by an insolvent debtor be made illegal for a period of four months preceding actual bankruptcy. The committee did not pretend to prepare a full bill for the consideration of Congress, but simply to make certain suggestions, that they deem essential to a uniform bankruptcy act. What is desirable now is that other organizations of business men should agitate the subject until such an outside pressure is brought to bear on Congress as will compel that body to take definite action.

No class of business men is more deeply interested in such a law than the jewelers. They belong largely to the creditor class, and if their experiences with insolvent creditors since the repeal of the bankrupt law could be made public, no stronger argument could be made for the enactment of a national law that would give them adequate protection from the rascalities perpetrated by dishonest debtors. The trade loses hundreds of thousands of dollars because of the inadequacy of the laws for the collection of debts and the legal facilities afforded scheming rascals to evade their honest liabilities. Fraudulent debtors, with the aid of unscrupulous lawyers, armed with every imaginable technicality provided by diverse State laws, have found little difficulty in evading their obligations. The fact that this can be so readily done has been so impressed upon the jewelers that they are ready to compromise for almost anything with whoever asks a compromise rather than attempt to collect, under State laws, the amount justly due them, and which might be obtained under a uniform bankruptcy law. This state of things is discouraging to legitimate trade, and should be remedied without delay. If proper efforts are made by business men, Congress will, unquestionably, concede what they require for the protection of trade, and give them a bankruptcy law that shall be uniform in its operations in all sections, and that will tend to discountenance the dishonest practices now in vogue.

A Training School for Artisans.

All persons familiar with manufacturing in this city understand the increasing difficulty of procuring new supplies of skilled labor. The unions discourage apprenticeship, the boys and girls are restless and change from one occupation to another, or they remain in one kind of employment and have no taste or ambition for anything higher. The consequence is, in many branches, what has been so fatally experienced in England, a want of skilled and artistic labor, and a consequent falling behind in competition with more artistic and experienced workmen abroad. It is true that the gap may be temporarily filled by importing skilled labor, as has been done, for instance, in pottery in this city, as well as in other trades, but this is only a temporary supply, and leaves the market mainly in the hands of foreigners of taste and experience. We need fresh and constant supplies of skilled and artistic labor, trained in "technical schools" at home. The importance of such labor is well shown in a recent and valuable report of English artisans on the Paris Exhibition of 1878, published by the London Society of Arts. The intelligent artisan reporters are struck with the immense superiority of the French and Swiss over the English in "technical schools." They believe that, as one result of these schools, the Swiss tool-makers absolutely annihilated the English watch-tool makers years ago, and that "no English watch-maker has made repeating movements for the last fifty years." They describe exhibitions of the French and Swiss schools of horology, where working models of machinery on a large scale, with movable parts to show the action and the angles were presented. "Standing before these objects," they say, "one could not, as an Englishman, but envy them, and carry back his thoughts to his own land with regret that there are no corresponding institutions for technical education there." In one horological school (at Besancon) they speak of one pupil, who had been under instruction only 34 months, and "had completed with his own hands nearly 50 watch movements," and the writer adds that an English workman would have been as many years in learning this, and that in the whole English trade there is probably not one trained workman who could accomplish such a variety of work so well. As a result of this training, the writer notes that the English trade only turns out some 150,000 watches per year, while the American produces nearly 500,000, and the Swiss and French some 6,000,000.

In different portions of this country the manufacturers themselves have opened technical schools, in order to be preparing skilled workmen for the future. It is in this way, and owing to the stimulus given by American education, that our extraordinary success in this country in "machine tools" has been gained. It was admitted in both the Philadelphia and the Paris Exhibitions that no nation even approached the wonderful ingenuity and novelty of the American automatic machines for making tools. This report of the English artisans confirms this. There are trades, however, where technical instruction is obtained with great difficulty, particularly those requiring artistic training. A number of gentlemen in this city, who know practically the obstacles in securing trained and artistic labor, have united to procure the necessary training for such boys and young men as may desire a technical school. They will, perhaps, put up a building for the purpose, employ skillful mechanics, and then open a course of instruction, requiring, it may be, an annual payment from the pupil to meet the running expenses. They would naturally choose some of the more difficult and artistic trades in which to train the lads. There is an increasing demand for a high class of decorative house painting, for old and picturesque styles of furniture, for tasteful and original pottery, and metal casting. It would not be difficult to select an art, where a well trained young man or woman would easily secure remunerative employment. Such a school would be an incalculable blessing to this metropolis. A similar technical school—that of art in the Cooper union under Mrs. Carter—is accomplishing an immense good each year among the the young women of the country. Nothing which Mr. Cooper has accomplished will leave behind more blessings than this free school for artistic instruction. The plan proposed, however, by these gentlemen does not include gratuitous instruction, which is, perhaps equally wise, considering the class they would reach. Under a careful school of this nature, why should not New York soon learn to produce artistic pottery or bronzes, or carved furniture or delicate glass, and thus raise the standard of the whole country? The Boston community is awakening to the importance of furnishing free drawing schools for the children of the working classes. Paris has in every quarter free evening schools of drawing and modeling, besides its various technical schools of a high class. New York should not be behindhand.

DEALERS in diamonds are frequently asked by their customers if the process of making artificial diamonds has yet met with such access as to depreciate the genuine ones in value. The *London Photographic News* gives the following description of the process of manufacture and clearly intimates that there is no danger of genuine diamonds depreciating in value at present. It says: "A dydrocarbon gas—such as marsh gas for instance, which is composed of hydrogen and carbon—is put into a stout iron tube of considerable thickness. A nitrogen compound—presumably cyanogen—is also introduced, with a view to the nitrogen combining with the hydrogen, and leaving the carbon free, for a diamond, as our readers are aware, consists of pure crystallized carbon. The gas in the iron tube is subjected to enormous pressure to liquefy it, the tube being heated to aid in this work. The liquefaction of oxygen by Pictet, of Geneva, was effected in this way. The pure carbon passes under pressure from a gaseous into a liquid form, and finally crystallizes, in which condition it is found upon the iron tube being opened. The diamonds are, however, of the most minute character, and Mr. Hannay, of Glasgow, who has thus succeeded in making them, frankly owns that the game is not worth the candle."

THE latest Parisian novelty in jewelry for buttoning on gloves, and that quite does away with buttons sewed thereon, is described as follows: The glove is made with buttonholes as usual down the opening, but on the opposite side there are eyelet holes. At the back of these, inside, runs a slender gold chain, in which as many buttons are riveted as there are eyelet holes. There are two chains for a pair of gloves. When the glove is to be put on the buttons are fixed through the eyelets and have only to be drawn into the corresponding buttonhole. Thus the kid can be stretched and there is no fear of one's buttons flying off at the very minute one's maid declares the carriage is at the door. Instead of buttons there are coral, pearl, strass and lapis studs firmly cast in the gold chain. Brooches in pure gold are again revived; they are elephants, goats, dogs, harps, guitars, shells and castanets set with small pears, small rubies, rose diamonds and encrusted with enamel. The cat's eye is a most fashionable stone, and also immense garnet drops and insects. In fancy jewelry, are "humming bird" ornaments—that is, ornaments made with the plumage of humming birds on metal. Butterflies and pansies are the best models, and at night they are gorgeous mounted on hair pins and as coronets. The ring now worn is *la perle solitaire* in the centre of a diamond hoop.

FLEITMANN has discovered that by adding one-eighth of 1 per cent. of magnesium to fused nickel or cobalt, these metals, whether cold or hot, are capable of being easily forged or rolled into sheets. Cobalt alloyed with magnesium becomes very hard, and when polished, surpasses nickel in lustre and whiteness. Both the cobalt and the nickel, treated as above, remain untarnished when exposed to the atmosphere, and when cast in moulds have the same properties as cast steel.

The Jewelers' League.

We devote this column to the interests of the League and its membership. Letters or inquiries pertinent to its business or purposes, and which might interest the trade or inquirers, will be herein answered. Address *Jewelers' League, Box 4001, P. O., New York*, or the office of THE CIRCULAR.

The Jewelers' League is steadily increasing its membership and rapidly gaining that recognition in the trade that it justly deserves. The principle upon which the organization is founded is beginning to be appreciated. It is one thing to pay grudgingly into an Insurance Company a large amount of money which is immediately lost sight of, amidst doubt as to its economical use and anxiety as to the accomplishment of its intended purpose. It is quite another thing to have the privilege (by many esteemed a pleasure) to contribute directly to the aid of the dear ones of a fellow tradesman, to whom one has perhaps, been bound by business or strong social ties. In the latter case all is certainty, as to where the money is invested, how it is spent and who enjoys its benefits. In the former case everything is hidden and nothing known. The very simple construction and admirable working of the League is commending it more surely as it becomes better understood.

The following applicants were admitted to membership in the League at the meeting of the Executive Committee held April 2d.

Henry A. Barmeier with L. Bauman & Co., St. Louis; S. L. Bauman, of St. Louis, Mo.; Julius Beck, of J. Beck & Son, New York City; John Brendell, with Tiffany & Co., New York City; Chas. C. Champenois, of Champenois & Co., Newark, N. J.; Edwin P. Chapman, Oneonta, N. Y.; John C. Downing, of Downing & Keller, Newark, N. J.; Benjamin B. Freeman, of Freeman & Taylor, Boston, Mass.; Pierre G. Giroud, with Theo. B. Starr, New York City; Eugene Gavard, with Tiffany & Co., New York City; Fredrick Girr, New York City; John N. Hagen, with L. Bauman & Co., St. Louis, Mo.; William Hunt, Uniontown, Pennsylvania; Wm. H. Kaye, with J. B. Bowden & Co., New York City; Adam Keller, of Downing & Keller, New York City; Frank Keller, of Keller & Frey, New York City; Daniel C. Kingsland, with Tiffany & Co., New York City; Frank Lewis, New York City; Daniel F. Myers, with J. Beck & Son, New York City; James D. McAnlis, Beaver Falls, Penn.; Richard G. Peterson, with Baldwin, Sexton & Peterson, New York City; Nils Rose, with Baldwin, Sexton & Peterson, New York City; Cornelius Savage, with Black, Starr & Frost, New York City; C. A. Wilms, with L. Bauman & Co., St. Louis; Chas. F. Wood, New York City; Wm. H. S. Wetherby, Clyde, N. Y.; Frank Brooks Watson, with A. Lounsbury, New York City; George W. Walmsley, with Baldwin, Sexton & Peterson, New York City;—28 in all. Four applications referred back to applicant for correction, etc.

Full membership, 652.

Amount in general fund, $911.99.

Amount in benefit fund, $1,181.80.

From natural causes the majority of the members of the League belong in New York and vicinity, but faithful members may be found in all parts of the country,—notably so in Chicago, where Messrs. S. H. Hale and Caleb Clapp, members of the Advisory Board are constantly on the alert for the welfare of the League. Copies of the Report of the Annual Meeting of January last, have been sent to all of the members of the League, and if any member has not received a copy, it is because his address is not correct on the books of the League. Members will be doing themselves as well as the Secretary an act of kindness by notifying him of any change of address. A misdirected notice may be the cause of a member being dropped from the roll. Avoid trouble of this kind by attention to this matter. Besides providing the members of the League with copies of the Annual Reports, the Executive Committee have deemed it advisable to have enough printed for circulation in the trade, as they are desirous of having them placed where they will benefit the League. Members are requested to send to the Secretary the names of persons in the trade who are not members to whom it would be expedient to send reports. Prompt action in the matter will redound to the welfare of the League.

The Executive Committee desire to call the attention of all who contemplate changing their beneficiaries, to the forms prescribed on the last pages of the copy of Constitution and By-Laws. Quite a number of requests to change are received, but as they are not in shape to be acted upon by the Committee, they have to be referred back to the applicants for alteration.

The month of May is at hand and Hymen who has already chosen several victims among the fraternity, will undoubtedly make still greater ravages among the boys. Under these circumstances nothing more can be expected than that the victims will be petitioning the Executive Committee for the privilege of going back on their "sisters and their cousins and their aunts" for the benefits of their wives. Be careful to send your requests in the proper shape.

As we go to press we learn that a special meeting of the Executive Committee has been called to pass upon the rapidly accumulating applications.

J. R. Richards, of New York, has been stirring up the Western boys, and within a few days has sent from Chicago to the Secretary over thirty applications, indorsed by himself, and by Clapp, Hale, Rich and others. There are now fifty applications awaiting the consideration of the Executive Committee.

Obituary.

THOMAS W. BAXTER.

It was with feelings of profound regret that members of the trade learned of the death of Thomas W. Baxter, in this city, April 10. Mr. Baxter was a resident of Chicago, and had long been identified with the Elgin Watch Company as its business manager, in which position he had inspired among members of the trade a high respect for his business qualifications. The deceased was a native of Ireland, but came to this country with his parents at an early age, and settled in Boston. About twenty-five years ago he went to Chicago, where he engaged in business as a dealer in mill supplies. The firm of T. W. Baxter & Co. did a large trade with the Northwest, and the sterling integrity and high character of the firm were everywhere spoken of. Mr. Baxter was an active member of the old Chicago Mercantile Association, and also Secretary of the first Manufacturers' Association which was formed in Chicago in 1865, and which helped to shape the legislation then being enacted by Congress so as to be more favorable to the manufacturers of the Northwest. Just previous to the fire Mr. Baxter removed to New York, where he labored hard to achieve fame and money, with the aid of some patents of his own which afterwards turned out to be of little practical good, so far as money was concerned. About four years ago he was appointed manager of the Elgin Watch Company, and held that position up to the beginning of the present year, when he resigned. In identifying himself with the Elgin Watch Company, Mr. Baxter took with him little knowledge of the art of watch making, but, instead, good business qualifications, energy, enterprise, and a determination to do all in his power to make the Company a financial success. He proved to be an exceedingly active and pushing man, contributing largely to secure whatever of success has attended the fortunes of the Elgin Company during the past few years. The business methods adopted by any company, individual, or firm, are legitimate subjects of criticism, and THE CIRCULAR has not hesitated at times to criticise some of the methods adopted by Mr. Baxter, but this did not prevent us, however, from acknowledging during his life his business tact and ability, and, now that he has passed away, we cheerfully bear testimony to his business capacity, and to his many admirable personal traits of character. Mr. Baxter's death was sudden and unexpected. We saw him a few days previous, when he complained of a severe cold, but there was nothing in his appearance that seemed to threaten a fatal result. The deceased was 51 years of age. He leaves a wife, and a son 15 years old, who, in their sudden bereavement, can be assured of the hearty sympathy of all who knew the husband and father. We trust the Elgin Company will see the propriety of erecting a fitting monument to mark the grave of one who served its interests faithfully and well, and to whose energy and business tact it is largely indebted.

Practical Hints on Watch Repairing.

By Excelsior, No. 62.

PROPER FORMS FOR TEETH AND LEAVES.—*Continued.*

(976) *The Mode of Driving Determined by the Form of the Teeth.* The tooth *N b*, Fig. 51, having driven the pinion leaf from *a O* to its present position *a b c*, through the pitch arc *O c*, which is 60° with a 6-leaf pinion,) another tooth and leaf are in contact on the line of centers, ready for action. It will be seen that it requires the whole length of the curve *N b* to drive the leaf to its present position, *a b c*, and consequently the point of the tooth must reach to *b*, and the line *A b* will be the central line of the tooth. If we had room enough to add the other half of the tooth, below the central line *A b*, like the upper half, we should be able to avoid any driving before the line of centers, even with a 6-leaf pinion. But we have only the pitch arc, or space from *N* to *O*, for both an entire tooth and an entire leaf, besides some space for freedom or play in the gearing. It is therefore impossible to use a tooth of that length, if it is to have the proper form of curve, as in *N b*, and be made in the usual manner, with similar halves. We might, to be sure, make a tooth of the shape shown,—the front having the curved addendum *N b*, and the back formed in a radial line entirely up to the point *b*, as drawn. This would leave room enough for the pinion leaf, and a little play, and our tooth would accomplish all the driving after the line of centers, even with a 6-leaf pinion. But ordinary train teeth are always made with similar halves. Such a tooth as shown is further objectionable, in that the point *b* would come so near the center of the pinion that the leaves, at their roots, would be too thin and fragile for use. It is therefore impracticable to drive a 6-leaf pinion entirely after the line of centers.

(977) Let us see how wide a tooth we can have. Allowing from *O* to *u*, fig. 57, for the thickness of the pinion leaf, and a little for

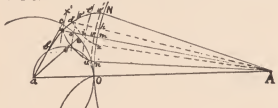


Fig. 57.

play, we have left for the tooth the space from *n* to *N*. Through the center of this arc, at *m*, draw a line *A m* that will cut the curve at *x*, which will therefore be the point of the tooth. To form the curve *x n* like *x N*, for the other side of the addendum, draw several dotted curves across the line *A m x*. Measure, on the first one, the distance from *v* to u^1, then mark the same distance below *v*. Mark on the second curve the same distance below i as i^1 is above it. On the third curve mark the distance $o\,i^1$ from o downward. After marking each curve, at a point as far below the centras line as the curve *N b* crosses it above that line, connect these points thus marked by a symmetrical curve *n x*, and you have your addendum with similar sides. If we follow the usual custom and make the teeth and spaces equal, then *N* to z would be the thickness of the tooth, the dotted central line would cut the curve *N b* at d_1, and the dotted line *A z d* would complete the tooth.

(978) Recalling to mind the action of the curve *N b*, it is obvious that, as we do not use the whole of the curve in our tooth, it cannot drive the pinion leaf into the position *a b c*, because it requires the entire curve, from *N* to *b*, to do that and to perform all of the driving after the line of centers. It is also obvious that the shorter the tooth is, the less of the curve it will utilize, and the shorter the distance it will drive the leaf after the line of centers; and the greater is the remaining portion of the driving, which, of course, must be done by the following tooth, acting on its leaf before reaching the line of centers, (980). In fig. 51, if the point of the tooth reached to r^1, it would only drive the leaf into the position *a r* 1, leaving from 1 to *c*, or rather from 1^1 to *O*, to be performed before the line of centers.

(979) *To Determine the Driving Before and After the Line of Centers.* Therefore, we first draw our tooth, and ascertain its length, then setting the compasses from *A* to the point of the tooth, draw a curve crossing the semi-circle *a b O*. A radial line from *a* through that crossing will show the position of the leaf at the end of the driving, and either measurement or calculation will give the angle or distance above or after the line of centers. That angle or distance being subtracted from the pitch, whatever that may be, the remainder is the driving before the line of centers. In fig. 57, a curve drawn from d_1 the point of the tooth, strikes the semi-circle at e^1, and the radial line $a\,e^1\,e$ is the position of the leaf at the end of the driving, being about 40° after and leaving about 20° before, the line of centers, as the action of that tooth. With a 10 leaf pinion, the pitch would be $\frac{1}{10}$ the pitch circle, or 360°÷10=36°, which would place the leaf at *a s* 2, in fig. 51, when the driving was completed. If the point of the tooth reached from *N* to t^1, the dotted curve would strike the semi-circle at *t*, and the radial line *a t* 3 would show the driving after the center to be 24°, leaving 36—24=12° to drive either before the center or above the point *t*, (980). With an 8-leaf pinion, the pitch would be 360÷8=45°, to be accomplished partly before and partly after the line of centers, in a proportion determined by the form of the addenda of the teeth, and which can be ascertained as already directed,—provided that the driving, in any of these cases, is within the limits specified in the following section.

(980) The driving before the line of centers is limited, as a properly shaped tooth and leaf cannot meet further from the center than about 20° with a 6-leaf pinion, 12° with one of 7 leaves, 8° with one of 8 leaves, and 5° with one of 10 leaves, and the preceding rule is only applicable when the driving before the center would not exceed these amounts, and the addenda have the correct epicycloidal form. Referring to fig. 57, with our 6-leaf pinion, if the tooth reaches just to d_1 contact before the center will occur just as the point d_1 passes off the semi-circle *a b O*, and the driving tooth will part with its leaf at e^1. But if the tooth is shorter than *A* d_1, it will continue to drive, *by its point*, beyond or above the semi-circle, till it has carried the leaf to the position $a\,e^1\,e$, when contact will occur before the center, and the following tooth will begin to drive its leaf. If the tooth is so short that it cannot carry its leaf, through this 40° of driving after the center, to $a\,e^1\,e$, it will carry it as far as it can, then pass off the point *c* of the leaf, and "drop" till the following tooth comes in contact with its leaf. If the addenda are still shorter, then, when the driving tooth passes off, the following tooth may fail to reach its leaf at all, the "drop" will become an unrestrained revolution of the wheel, and the watch will at once run down. The foregoing explanations will render evident the importance of well formed addenda, and the unfitness of teeth with stubbed or rounded points for uniform driving, especially with a 6-leaf pinion.

The workman will of course understand that any rules or explanations about driving before the center refer to pinions of 10 leaves or less, as those of higher numbers drive *only* after the center.

(981) *Thickness and Form of the Addenda.* In fig. 57 is shown a tooth with its thickness from *N* to *n*, and the thickness allowed for the pinion leaf is from *O* to *u*. This gear would do nearly all of the driving after the center, and gives the greatest practicable width for the teeth of watch wheels. But, although possible to construct and use, these proportions are not adapted for ordinary purposes. It is considered by the best makers that the thickness of the pinion leaf, on the pitch circle, should not be less than $\frac{1}{3}$ of the pitch, in order to insure the necessary strength. The only exceptiton to this is with a 10-leaf pinion, (988), in cases where the parts are so designed as to entirely avoid the driving before the line of centers, and even then it is but very little less than $\frac{1}{3}$ the

pitch. It is also customary in those cases to make the teeth of the wheel slightly thicker than the spaces, in order to have the addendum as long as possible. But the general rule is that the teeth and spaces should be equal. When the pinion is to drive the wheel, the thickness of the leaves is equal to the spaces, while the teeth are made slightly less than the spaces between them, sufficiently to give proper freedom. The addenda or points of the leaves are made semi-circular in form, except when the pinion drives the wheel, in which case the teeth have semi-circular ends, and the pinion leaves have epicycloidal addenda.

(982) *Length of the Addendum.* When driving pinions of 10 leaves or under, the point of the teeth is where the two epicycloidal addendum curves meet. The length of the addendum, therefore, depends on the thickness of the tooth at the pitch line, and the curvature of the faces. The curvature is governed by the proportion between the primitive diameters of the wheel and pinion. The curvature remaining the same, the length of the addendum is determined by its thickness on the pitch line, as is shown by the two teeth in fig. 57. And, as we have just seen, the thickness is usually ½ the pitch.

But when driving high numbered pinions, (with 12 leaves, or more,) it would be found that the point where the two addendum-curves met would be further from the pitch line than could be allowed, on account of the danger of the points catching, etc., and the addendum would, moreover, appropriate a greater portion of the curve *N b* than would be utilized in the driving. The surplus length of the tooth being both useless and objectionable, all beyond the acting portion of the curve should be removed, when driving pinions of 14 leaves or more, but with those of lower numbers it will do no harm if left on.

(983) *To Determine the Acting Length of the Addendum.* This is done by drawing the two acting teeth and leaves in the positions when the driving is ending with one pair, and contact is just beginning between the other pair. A 12-leaf pinion is the lowest number with which there will be any surplus length on the teeth which drive it. And with such pinions, contact begins on the line of centers. Fig. 58 shows a 12-leaf pinion, and a wheel of 90 teeth, but omitting

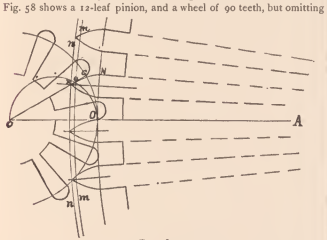


FIG. 58.

the portion of the drawing near the wheel center. *A a* is the line of centers, on which a leaf *a O* and a tooth *A O* have just met, *a c* and *A N* are the leaf and tooth whose driving is just ending, (as contact between the latter pair must cease when the former meet,) and *a o O* is the semi-circle on the pinion radius. From what has previously been said, it is clear that the crossing of the semi-circle and the radial line *a c*, at *o*, is the present point of contact between the leaf and the addendum curve *N x*, and, as contact ends there, all beyond *o* can be dispensed with. Set the compasses from the wheel center *A* to *o*, and therewith draw the curve *m m*, which will be a portion of the circle showing the proper *working diameter* for the wheel, which would reach to the circle *n n* if the points were not removed. Teeth with flat points may seem odd to the young workman, who would perhaps think that the curved faces should be rounded off till they meet at the point. A little reflection will convince him that, as the curve must have the precise form shown, in order to secure a uniform driving, any variation from it, either by making the addendum faces straighter or by curving them towards each other more rapidly, will be improper.

(984) Although the tooth should not be longer than thus prescribed, it may and generally will be shorter, with a pinion of less than 10 leaves. When this method is applied with such pinions, the distance of a curve drawn through the points of the teeth, from the crossing of the semi-circle and the leaf *a c* will show how much the teeth are too short,—as, from *i* to *b* in fig. 59. With a 10-leaf pinion, and the teeth rather thicker than the spaces, the points will reach just to the curve *m m*, obtained as in fig. 58, (983). The epicycloidal form of curve is always strictly adhered to in forming teeth to drive pinions having 10 or more leaves, but with those of lower numbers the curve is often made straighter and the teeth thereby lengthened, to cause them to drive further after the center, as explained in section (987). And even with one of 10 leaves, although theoretically possible to drive entirely after the center with an epicycloidal tooth, in high grade work where extreme accuracy is observed, it is found impracticable to do so in common work without slightly lengthening the addenda of the teeth, as with pinions of lower numbers. (974).

(985) *To Determine the Length of Addendum Required for a Given Mode of Driving*, with pinions of 10 leaves or less. By lengthening the addenda of the teeth we can cause contact to occur nearer to the line of centers than it would with teeth of correct length; and, by drawing the parts in the position where we wish contact to begin, we can ascertain the length of addendum required for securing contact at that point, by the following method. As a 6-leaf pinion is more troublesome than those of higher numbers to drive satisfactorily, we will retain it for our explanations, and also draw a wheel of 48 teeth. Suppose we wish contact to begin at 10° before the line of centers. Fig. 59 shows parts of the pitch circles and line of

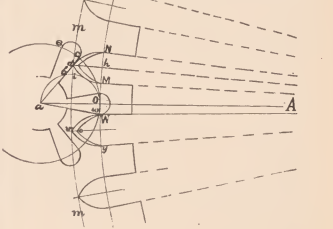


FIG. 59.

centers, and the semi-circle. First draw the pinion flank *a w*, 10° before the center, *i. e.*, 10° below *a O*. As the tooth is to it there, *A W* will be the flank of the tooth. At 60° from *a w* draw the next leaf *a c*. The teeth and spaces being equal, we bisect the pitch arc *W N*, at *M*, and *A M* will be one flank, and *A N* the other, of the driving tooth. Next we bisect or halve the arc *M N*, at *h*, and a line from *A* through *h* will be the central line of the tooth, and will strike the leaf *a c* at *d*. Therefore *d* will be the point of the tooth, and from *h* to *d* is the required length of addendum, to perform 50° of driving after, and 10° before, the line of centers, with our wheel of 48 teeth and 6-leaf pinion. Setting the compasses from *A* to *d*, and drawing the circle *m m*, we have the external circumference of the wheel. The same method answers

for pinions of other numbers, by laying off the proper pitch arcs.

(986) It will be noticed that this tooth does part of its driving above the semi-circle *a b O*, before contact begins at *W*, (980). By drawing a straight line from *a* through *i*, the point where the curve *m m* crosses the semi-circle, to the pitch circle of the pinion, we get the amount of the driving above the semi-circle,—being the distance or angle between this line and the flank *a b c*. The lines inside of the tooth show what the *correct* form and length of addendum would be, as at *W o y*, for such a wheel and pinion; and *such* a tooth would commence its driving at 20° before the center, and finish it as the point crossed the semi-circle *a b t O*. The workman will perceive, from what has been said, that no invariable rule can be given for the length of the addenda of wheel teeth, and those writers who prescribe such a rule show either ignorance or disregard of the principles which should govern their forms. Whether we choose to be guided by correct principles, or by rules founded on them, we must vary the length of the addenda according to the thickness of the teeth, the number of leaves in the pinion they drive, the manner in which we want the teeth and the leaves to meet and act upon each other, and other conditions already mentioned.

(987) *Varying from the Theoretically Correct Forms of Teeth.* As already stated, there will be some driving before the center, with pinions of less than 10, or even with 10 leaves, (973, 974, 988.) When the watch has a recoil escapement, some driving before the center is more favorable to this recoiling than driving too far after the center, (971, 972), and the epicycloid form of addendum is adhered to, even in driving pinions of the lowest numbers, (988).

But in time-pieces having a dead beat escapement, (now principally used,) the lessening of the engaging friction is considered very desirable, and it is usual to vary somewhat from the correct form of addendum, by making it longer, or extending it out beyond the point where the two curves would meet if properly formed, (977, 982). The longer the addendum is, the further it will drive the pinion leaf after the line of centers, and consequently the less will be the amount of driving before the center. This lengthening of the addendum is of course a departure from the true epicycloidal form, and the driving cannot be uniform, especially near its termination, (962, 983). But this is considered to be fully compensated for by enabling the tooth and leaf to approach nearer to the line of centers before meeting, and greatly lessening the engaging friction or "wedging" between them.

Too great a lengthening of the addendum, however, resulting in too great variation from uniformity of driving, and liability to catchings by the point, would be more objectionable than a small amount of engaging friction. As a compromise or medium between these extremes, the best authorities recommend the following schedule of proportions as being the best, all things considered, for practical adoption in watch work. If the proportions are wanted more closely than there given, they can be accurately ascertained by drawing the wheel and pinion in the position stated for the beginning of contact, with each pinion, by following the method described in the preceding section, and comparing the length *h d* to the pinion radius *a O* or *a c*, in each case.

(988) *Proportions for Wheels and Pinions.* Pinions of less than 10 leaves should have the thickness of the leaves ⅓ the pitch,—*i. e.*, the leaf should take up ⅓ of the pitch arc, and the space the remaining ⅔. For a 10-leaf pinion, the leaf should be ⅓ the pitch, except when it is desired to do all the driving after the center, then the leaf is a little less than ⅓ the pitch; in a 11-leaf pinion, the leaf is a little over ⅓ the pitch; in a 12-leaf pinion, ⅜ the pitch; 14 leaves and upwards, the leaf is nearly ½ the pitch.

For wheels, when driving pinions of 11 leaves and over, the teeth and spaces are equal, and the addenda are in all cases formed with correct epicycloidal curves.

When driving pinions of 10 leaves or less, *with recoil escapements* the teeth are a little thicker than the spaces, the addenda have epicycloidal curves, and their lengths will be determined by the meeting of the two curves. The driving before the centre will be nearly, if not quite, the amounts specified in section (980).

(989) *With Dead Beat Escapements.* When driving a pinion of 10 leaves, the teeth are rather thicker than the spaces, in order that the addenda may be formed with epicycloidal faces, yet be long enough to do all the driving after the center, (or else they are lengthened enough for that purpose),—for which their length must be very nearly ⅜ the geometrical radius of the pinion. With pinions of less than 10 leaves, the teeth and spaces are equal, but the addenda are made longer than the correct form, being, with a 6-leaf pinion, a little under ½ the geometrical radius of the pinion it drives; 7 leaves, a little over ⅜ the radius; 8 leaves, about ⅜ the radius; 9 leaves, about ⅓ the radius of the pinion. The length of the addendum spoken of means, of course, from the pitch circle to the point of the tooth along the central line of the tooth. By these proportions the driving before the center can be entirely prevented with a 10-leaf pinion; reduced to about 4°, or ¼ the thickness of the leaf, with an 8-leaf pinion; about 6°, or about ⅓ the thickness of a leaf, with a 7-leaf pinion; and about 10°, or ½ the thickness of the leaf, with a 6-leaf pinion. That is to say, in the last case, contact will occur when the center of the leaf is on the line of centers, as shown in Fig. 59.

Robbins & Appleton's New Building.

THE new building erected by Robbins & Appleton, in Bond Street, near Broadway, to take the place of their old one, destroyed on the same site by fire in 1876, is one of the most elegant and substantial structures to be found in New York City. It is built of brick, with a highly ornamental iron front, and is fifty feet wide by one hundred and eight feet deep, being six stories in height. Throughout every story it is finished with all modern improvements, and wears an air of solidity and substantiality that few modern buildings possess. The basement, first and second floors are occupied by D. Appleton & Co., the well known publishers, who have here more elegant quarters than are occupied by any other book publishers in this country. Ascending the broad staircase to the third story, an elegant view breaks on the eye. A broad hallway runs across the entire width of the building, dividing it into front and rear rooms, while a large skylight makes the passages as bright as the daylight out of doors. Rising from about the center of this landing are winding stairs, leading to the upper stories. This stairway, finished in oak is picturesque and beautiful, reminding one of the stairs that are so much admired in Swiss houses. The first front room is occupied by Thomas G. Brown, manufacturing jeweler, who has here convenient and well lighted rooms, and every convenience for transacting business. Another front room is occupied by Dominick & Haff, silversmiths whose show rooms are models of neatness and elegance. The remainder of this floor is taken up with the private and public offices of Robbins & Appleton. These occupy a space 25 feet wide at the front by 108 feet deep, and, at the rear, extend across the entire floor, where will be located some few workmen and the packing rooms. The private offices of the members of the firm are located in the front on this floor; the cashier's and bookkeeper's desks come next. These consist of a long range of counters, surmounted with an imposing framework of glass. Next to the counter is the desk of the manager, E. C. Fitch, flanked by the desks of numerous employes of the firm. On the opposite side, near the entrance, is the large fire and burglar proof vault, extending from the basement to the third floor.

On the fourth floor in front is located the manufactory of Dominick & Haff, which is furnished with all the modern machinery and appliances for manufacturing silverware. In the rear S. Cottle, manufacturing jeweler, has all the appliances for conducting his business. The remainder of this floor and the fifth and sixth floors are occupied entirely by Robbins & Appleton, and here is carried on the intricate and interesting processes of manufacturing gold cases. These floors are filled with machinery of the most elaborate character with which solid gold bars are converted into elegantly finished watch cases. This proportion of the work we shall describe at length in its proper place in the series of articles we are now publishing upon the the manufacture of watches by the American Watch Company, of which Company, Robbins & Appleton are large stockholders and general agents. The firm is scarcely settled as yet in its new building, in the construction and equipment of which a good sized fortune has been expended, but everything will soon be in running order, when they will have an establishment excelled by no other of its kind in the world in extent, convenience and elegance.

The American Watch Company.

A VISIT TO AND DESCRIPTION OF ITS IMMENSE FACTORY AT WALTHAM, MASS.

The first requisite of a watch is that it shall keep time accurately; or, at least, with such an approximation to perfect accuracy as to make it trustworthy for all business purposes. Perfect accuracy is not attainable without great cost, and not within the compact form required for watches for ordinary use. For astronomical and other scientific purposes, where the greatest possible accuracy attainable is required, elaborate and delicate machinery is employed for marking time, and this has to be adjusted with the utmost nicety. Many thousands of dollars have been expended upon a single clock for astronomical purposes, the machinery of which is so delicate that it has to be excluded from the air, and an even temperature maintained to prevent variations that may be caused by heat and cold. Having this fact in view, the wonder is that such perfection has been obtained in the manufacture of watches, that are subject to all changes of temperature, and to much rough usage at the hands of their owners. Yet, fine watches are made that will exhibit a variation of but a fraction of a second a month, while the watches in general use keep as accurate a record as is necessary for general purposes. For centuries it was supposed that the delicate machinery required for watches could only be made by the hands of the most skillful and careful workmen, and watches, consequently, commanded high prices. They were a luxury to be indulged in only by the rich, while the rest of the people were forced to rely upon the town clock for the time of day.

It remained for Yankee brains and Yankee ingenuity to dispel this idea, and to convince the world that as good watches could be made by machinery as by hand, and afforded at such prices as brought them within the means of the commonest mechanics and laborers. Thanks to the mechanical genius of America, watches are no longer a luxury, but have been brought within the reach of all. The recent introduction of railroads and telegraphs, bringing the business men of the world into direct relations with each other, have added increased value to time, and minutes are now given to commercial transactions that would have formerly consumed days or weeks. Minutes have assumed the relative value of hours, and fractions of seconds even, have to be taken into account in the regulations of our daily comings and goings, and our business enterprises. The movements of railroad trains over hundreds of miles of country are gauged by seconds, and the neglect on the part of an engineer to carefully observe his watch has cost many lives, by precipitating his train into danger. Even our great steamships, crossing the wide expanse of ocean, are so accurately timed that their arrival seldom overruns the hour fixed. In this driving, rushing age, when every one is forced to note the minutes as they fly, watches have become a necessity, and the ordinary man of business feels as much lost without his watch as he would without his pocket-book. As the conditions by which we are surrounded created an imperative demand for many watches, the enterprise and capital necessary to supply that demand were not long wanting. Inventive Yankees, working at the bench making watches by hand, true to their native instincts, cast about for the means of supplanting hand work by labor-saving machinery. First a machine was devised for doing one part of the work and then another, till now American watches made wholly and entirely by machinery have acquired an enviable reputation in all parts of the civilized world, and have driven English watches entirely out of this country. The introduction of machinery has also reduced the price of watches, so that they are within the reach of all. For many years after American watches were made by machinery, it was said that common grades might be so made, but machinery could never be so perfected as to produce a fine watch accurately adjusted so as to record time with the nicest precision. But Yankee enterprise is never satisfied with mediocrity, and would not be content in this branch of art till it rivaled all competitors. As a result, the fine watches made by machinery will compare favorably with hand made watches for keeping time with accuracy. This has been repeatedly tested by scientific experts, and the verdict has always been in favor of American watches.

We recently paid a visit to the great factory of the American Watch Company, at Waltham, Mass., and propose in this and subsequent articles to give a description of the works, and the various processes required to make a watch. Starting from the reception of the various metals in the rough at the factory, we shall follow them through the labyrinth of rooms and almost innumerable processes until it emerges a perfect watch, accurately adjusted and ready for the market. The American Watch Company is the oldest in the country, being the result of the absorption or combination of several similar enterprises. When it was discovered that watches could be made by machinery, several enterprising firms or corporations engaged in the business. For lack of intelligent supervision, of capital, or some essential element, which it is not necessary to detail here, they were only partially successful. The American Watch Company is the outgrowth of these original watch making enterprises. It stands to day pre-eminent in its industrial class, for enterprise, capacity, business standing, and for the high character and integrity of its products. The American Watch Company has done more than all other manufacturers combined to establish a world-wide reputation for watches of American manufacture, to improve their quality, and to maintain the standard of their excellence. The firm of Robbins & Appleton, of this city, are the commercial representatives of the American Watch Company, a large portion of the stock of the Company being owned by this firm. Mr. R. E Robbins has entire charge of the factory at Waltham, and is remarkable for his executive ability. The firm of Robbins & Appleton receive the watches as fast as manufactured, and attend to all commercial transactions.

Waltham is a beautiful little town some ten or twelve miles west of Boston. It is located on both sides of the Charles River, which is here a wide handsome stream, with excellent facilities for boating. There are several handsome parks in the town, many fine residences, the streets are wide and many of them skirted by fine old shade trees. A large cotton factory is also located here, giving employment to several hundred persons. The factory of the American Watch Company is a large, fine brick edifice, occupying a commanding position on the south banks of the Charles River. It is surrounded by spacious grounds, and is, in every way, delightfully situated. The building is two stories in height, and has a high basement, which is lighted from numerous large windows. All the rooms are well lighted, the building being so constructed that each room receives the light from many windows on both sides. An abundance of light is necessary to enable the workmen to successfully manipulate the delicate work they have in hand, and the machinery must also be equally delicate. We will not pretend to give the area covered by this factory, with its L's and recent additions, but that a journey through its numerous workrooms involves a tramp of not less than five miles is a fact abundantly testified to by our weary legs after having made the tour. Recently a new wing has been added to the factory, it being found necessary to increase its capacity in order to supply the demand for American watches. The product of the factory is now 600 watches every day of ten hours—or one watch a minute for each working day. It is proposed by the addition of the new wing and necessary machinery to increase this product to 850 watches a day. This number of watches turned out daily it would be thought would, in the course of a few months, supply the demand, but such is not the case; the Company is now fully three months behind on its orders. These comprise all parts of the world, in Europe especially the American watches being in great demand.

THE SUPERINTENDENT'S OFFICE.

As we have stated, Mr. R. E. Robbins is the manager of this immense factory. His residence is in Boston, and he spends a part of his time at the factory. He is an enthusiast in the work, and, being a practical man, his mind is constantly devising ways and means for simplifying the methods of construction and improving the watches. There are 1,300 persons employed in the factory, 500 of them being females. The scale of wages paid varies from $10,000 a year to $1.25 a day. Upwards of one half the employes are paid by the piece, the amount of their weekly earnings depending on the quantity of work accomplished. The mechanical superintendent is Mr. Charles V. Woerd, a gentleman not only of rare mechanical skill, but possessing as well scientific attainments that entitle him to equal rank with the Professors of Astronomy in our Colleges, with whom he is an intimate associate and co-laborer. He is an inventor of several scientific instruments, and to his genius the American Watch Company is indebted for numerous improvements in its elaborate and complicated machinery. Mr. Robbins and Mr. Woerd possess the brains that keep this factory running, these 1,300 persons employed, and supply the commercial world with 600 watches a day. These gentlemen, with a corps of female book-keepers, occupy the superintendent's office; here a complete record is kept of all work completed or in hand in the factory; from here issue all orders to the various foremen; here all purchases are made, all shipments recorded, and the general business connected with the manufacturing department conducted. On the first of each month, a printed card is prepared by the superintendent and distributed to the foreman of

each department. This card tells the number and kind of watches that are to be made, and designates their numbers. By this means each foreman is informed on the first of the month of the work expected from his department; then is the time for him to estimate the number of hands he will require, the additions to machinery necessary, and such other details as will enable him to turn out the amount of work required. Each foreman makes a daily report to the superintendent's office of the work done; to enable him to do this with precision, and to keep the necessary records of his department, he has a female book-keeper assigned to him. These book-keepers receive their instructions from the superintendent's office, and are only amenable to the foreman in matters pertaining to the actual work of his particular department. When engaged in keeping the records, they assist the foreman in his duties. By this perfect system of book-keeping and reports the superintendent can at any time tell precisely what work is in hand, how far it has progressed, and how long it will take to complete a certain number and kind of watches. When one department has completed its work on the watches sent to it, they are passed to another department, each foreman reporting the transfer to the superintendent. The most perfect system prevails, and every room is a model of systematic order and cleanliness. Superintendent Woerd is constantly in the factory, supervising the work, and devising new machinery. From his office he is in speaking communication with every foreman. He is popular throughout the factory, and his associates speak in unstinted praise of his ability, his inventive genius, and his capacity for management. Some of the most complex machinery saving an immensity of hand labor, is of his invention. Some of these machines are simply improvements upon old patterns, while others are entirely original in design. But wherever Mr. Woerd exercises his inventive faculties the result is an increased saving in labor.

THE OBSERVATORY.

As the first essential of a watch is correct time, so the first requisite of an establishment like this is an observatory and necessary apparatus, by means of which true time can be accurately determined. In a small octagonal building adjacent to the factory, the Company has placed a splendid telescope and other apparatus for determining and recording sidereal time. The building is 14 feet across, in the center of which the telescope is mounted on a solid masonry foundation, which extends nine feet into the ground, and is entirely isolated from the building. This foundation was built from plans made by Mr. Woerd, and the instrument is mounted after his own ideas, being readily adjustable to varying conditions. The roof is divided by slides, operated from within, so that a full sweep for the instrument can be obtained of any part of the heavens. The telescope was made by Alvan Clark & Son, and is similar to the one in Cambridge Observatory. It is 35 inches long, with an aperture 2¾ inches in diameter. It is a regular transit instrument, the same as is used by our College Observatories and the Coast Survey for calculating time. Powerful reflectors are hung at the sides of the room which throw a strong light into the interior of the telescope. By an arrangement of his own, Mr. Woerd has provided a dark field in the telescope, upon which the heavenly bodies appear illuminated. He has, also, a peculiar arrangement for reversing the instrument, by means of which that operation can be performed almost instantaneously. At one side of the room stands a chronograph, which is used for recording observed time. It is electrically connected with the large clock belonging to the Company, which is located in the basement of the factory. Every tick of the clock is sounded on a small gong in the Observatory, and is also recorded on the chronograph. The Observatory is also connected electrically with the Cambridge Observatory, where the time of the Waltham Clock is recorded. Other instruments are at hand as accessories to the telescope, the equipment being as complete for making observations as at any of the College Observatories. When any special heavenly event is about to occur to excite the curiosity of astronomers, Mr. Woerd is requested by them to take special observations with his instrument, and, on more than one occasion he has been fortunate enough to obtain the most satisfactory view of the expected starry commotion of all interested therein. With his appliances, Mr. Woerd is able to compute actual time within four one-hundredths of second.

The Waltham Clock is a famous piece of mechanism that deserves special mention. It is noted among astronomers as being one of the most accurate time-keepers in this country. It was designed by Mr. Woerd, and was made at the Company's works under his immediate supervision. Combining in himself a knowledge of the science of astronomy and the skill of a master workman, he knew precisely what workmanship was required, and he got it. In this fact of superiority of workmanship lies the secret of the great success of this clock. It has a gravity escapement, made after a design furnished by Mr. Woerd. This clock is set upon a masonry pier in the basement of the factory, where the temperature is dry and even. It runs with the nearest approach to absolute exactness that has yet been obtained in a clock movement; its variation in a month having been but the tooth part of a second. Mr. Woerd contemplates putting this clock in an air tight case, with an electrical attachment for winding, thus securing it from variations consequent upon changes of temperature and of the atmosphere.

Mr. Woerd has just completed an elaborate instrument for Professor Rogers, of the Cambridge Observatory, that may be mentioned in this connection. It is called a Diffraction Dividing Engine, and is designed for ruling gratings for telescopes, and for dividing spaces for other purposes. We were shown rulings made by the machine that numbered ten thousand to the inch. Looked at with the naked eye, there seemed to be a single scratch of a diamond on the glass, but placed under a powerful microscope, each line stood out clearly defined by itself, and the intervening spaces were equally distinct. Professor Rogers has published a paper on the first experiments made with the machine, in which he says: "The index of the screw regulating the distance between the steps reads directly to about one-millionth of an inch expressed in the corresponding motion upon the ruling screw. Since these divisions can be estimated to tenths, as small a movement as one ten-millionth of an inch can be given to the screw-plate with entire certainty *as far as the mechanical indications of this screw are concerned.*" The experiments already made justify the hope that when it is permanently mounted upon the firm foundation already prepared for it, work may be done which will contribute something to our present knowledge of wave lengths. In this connection, also, especial attention will be paid to the expression of all measured distances in terms of the standard Meter of the Archives at a temperature convenient for use. With this view a standard decimeter subdivided into 10,000 equal parts will be taken as the unit of comparison."

The American Watch Company, it will be seen, have spared no expense to secure the first requisite for watch making, viz: taking and recording *actual* time from astronomical observations. By these observations every watch made by them is regulated; indeed, every part of a watch, even the most minute, is made with a view to recording the actual time as observed by the apparatus we have mentioned. That these observations may be accurately made, they have obtained the services of Mr. Woerd, who, being both astronomer and skilled horologist, possesses unusual facilities for devising the means to accomplish the end—for making watches to indicate correct time as observed by the astronomer. The Observatory being the starting point, it will be seen that the Company has provided for every contingency, and, in doing so, have not only equipped an Observatory of great value to themselves in their manufactures, but one that has already rendered great service to science and the country at large. Having thus noted the Observatory and its able superintendent, we are prepared to enter the factory and describe in detail the various processes of watchmaking, and the wonderful machinery operating as though inspired by human intelligence, by which the many delicate parts of a watch are made. In entering upon this description we shall, so far as possible, avoid being technical, but will strive to picture forth the numerous interesting operations in a manner that may be understood by the most unprofessional reader. As we proceed, it will be observed that the Company has given the same careful attention to every detail in every department as characterizes the management of the superintendent's office and the equipment of the Observatory. [*To be continued.*]

THE PEARL is the only gem that is reckoned worthy of companionship with the diamond, saphire, ruby and emerald. The opal and catseye, costly and beautiful as they are, are but as dike and marquis to the rovolty of these others. As for amethyst and onyx, jasper and chrysolite, turquoise and topaz, hyacinth and agate and selenite—all these and their like have come to be of scant account. As a diamond, the famous "Braganza" gem, brand-new from Brazil, is worth £52,350,000; white topaz, which it is shrewdly thought to be, it is of no interest at all. It weighs 1,680 carats, and is as large as an egg. But what is it in comparison with the blue Hope diamond, which only weighs 44¼ carats, is absolutely unique and has a legend of its own, like any knight-errand. The periodt, once more valuable than the imperial diamond, is now a mere sectarian jewel, affected by the members of the Society of Friends. As the diamond is superior to all the fashions of the world, and still retains its place at the head of the mineral kingdom, it is not unpleasant to find that diamond-cutting was better done in London once upon a time than anywhere.

Proceedings of the Horological Club.

A Distinguished Body of Watch and Clock Makers.

Seventy-third Discussion.—Communicated by the Secretary.

(Notice.—Correspondents should write all letters intended for the Club separate from any other business matters, and headed "Secretary of the Horological Club." Direct the envelope to D. H. Hopkinson, Esq. *Write only on one side of the paper*, state the points briefly, mail as early as possible, as it must be received here *not later* than two days before the end of the month in order to be discussed and reported in the Circular for the next month.)

How to produce black finish on brass.

Secretary of Horological Club:

Will some member of your honorable body please inform me, through the Jewelers' Circular, how to produce the black finish found on brass optical instruments, and oblige

Improvement.

Mr. Ruby Pin replied that there were different ways of giving brass a black color, but perhaps the best way was to make a mixture of 4 parts of hydrochloric acid, and 1 part of arsenic, and apply it to the cleaned brass surface till the required black coating is produced, then wash it off, dry thoroughly, and give it a coat of good lacquer. "The "parts" may be pounds, ounces, or any other quantity, according to the amount of work to be done,—only observing to get the right proportions, four times as much acid as arsenic by weight.

Sliding rachet or click.—Restoring the color of gold.

Secretary of Horological Club:

A few days ago I had an English lever to clean, made on the same principle as the American watch, that is, with going-barrel. It had a click with an oblong hole for the screw, so that when it was being wound up the click would draw forward, and the back end of the hole came up to the screw. When you take a new turn of key, or let power off, it drops back to forward end of the hole. It is patented by Hasders, England. Please inform me what was the object of said oblong hole in which the patent is, I think, and of what good it is? Also state what will turn a chased ring back to its original color, after being turned with heat;—a heavy chased ring. I have used sulphuric acid and water, but it does not seem to do it.

Long's Peak.

Mr. O'Lever said there might be great advantages claimed for oblong holes in clicks, in the opinion of the maker, but he thought they would be principally "in his mind." Perhaps the pickle used for boiling out the ring might not be strong enough, or the fault might be in the quality of the ring. If it was good gold, the pickle would remove the black, but might not give it the original color. Coloring recipes will be found in the articles entitled "Metals and Alloys," now being published in the Circular. Our correspondent would avoid any such trouble by coating the article with McLane's Anti-Oxidizer before soldering.

Battery wanted for electro-plating.

Secretary of Horological Club:

Please inform me where I can purchase a single two-quart Smee battery for plating with gold or silver. Also inform me how to set one up and work. Could I arrange a common telegraph battery to do plating? If so, how would I have to fit it up, as I have one of the latter. R. W. L.

Mr. Electrode replied that any of the leading material houses in this city would get Mr. L. any kind of battery or supplies he wanted. A "telegraph battery" of almost any kind could be used for plating, but some kinds were better adapted for such use than others. If he had it all, it would need no fitting up, for it would be already fitted up. All he would need to do would be to make his plating solutions, and connect the articles to be plated with the wires from the battery.

The new plan for reviving the jewelry trade.

Secretary of Horological Club:

I have read with great interest the new plan for reviving the watch and jewelry trade, as published in your proceedings in the March number of the Circular. I think it a good one, and am very much in favor of its adoption; and every jeweler ought to give his hearty co-operation to further the success of the movement. I will here make a suggestion that the dues be assessed the same as taxes; each member paying in proportion to the amount of stock he carries.

I think the plan a certain Western watch company has adopted is an excellent one, (?) and will cause their watches to become very popular with jewelers. I wrote to this watch company enclosing business card for prices of movements manufactured by them, and after some days received a letter from them, stating that they had made inquiries, and that my commercial credit was not very good and they could not sell to me. I did not ask credit, I wanted to buy for cash. Now, I would like to hear the opinion of the Club on this subject. Was it right?

Now what injured my credit? I am a small dealer, relying principally upon my bench work for my living. I started with $100 capital, got along nicely for a while, doing well and building a good trade. Then came the hard times. Those who had watches out of repair laid them away in the drawer until they got a little more money, work became scarce; I made no sales. The country was flooded with catalogues and wholesale price lists, every grocer became an agent, every dry goods house, druggist, and millinery store kept jewelry. The postmaster and everybody became opposition. If that was all I might have lived; but no, they even robbed me of my retail trade, and sold to private individuals at wholesale prices. Pay day came, I had my stock of jewelry on hand unsold; was asked for time, but times only became harder; I offered my creditors my goods, and paid as far as my money went, and when I get more I'll pay the rest. I claim to be honest, but poor. How in God's world could I ever hope to get ahead again if my credit was gone, and I could not get goods for cash? What shall a man do? Shall he watch his family starve to death, or blow his brains out and end his trouble? My fellow workmen, we will have to do one or the other, if something is not done soon to crush out these double-dealing jobbers. Let us all unite in a solid union, and it will not be long until we have the same old prices, and the good old times we used to have.

Illinois.

Mr. Clerkenwell said that numerous other letters had been received, but as most of them gave no new ideas about the plan they were not published. He had selected the foregoing as a forcible example, showing what the present state of things tends to. There are doubtless hundreds and perhaps thousands of jewelers who had suffered as severely as "Illinois," but by having some other kind of business to help them along, or spare means to live on, or friends to assist them, they had not become reduced to such extremities as this gentleman. But he thought, if the truth was known, it would be found that nine-tenths of the jewelers of the country had been either living on their principal, or depending on some outside resource to help them keep along,—otherwise they might have been as badly off as "Illinois." The business is so cut up by outside irresponsible competition, that it has been, for years, money out of pocket to keep it going. If things were left to go on as they had been going, it would soon be a question which a great many would have to decide, whether they had not better give it up entirely. Such evils never cure themselves, but always grow worse as they are let alone. He had no doubt whatever that the plan of "Illinois," which he had advocated to the best of his ability, would effect a radical cure. And he was also satisfied, from the letters received, that this opinion was shared by a large body of the trade. The "plan" was now before them, for them to act on as they chose.

He noticed that some correspondents seemed to think that the Club could and should put it through. Now he wished to remind our friends that it can only be carried into effect by the action of the trade itself. This body is not properly organized for any such work. Our efforts are and must be confined to bringing before the trade all new ideas for their benefit, discussing them and keeping the trade informed as to what is being done. But we have no power or authority to form Unions of the trade, for any purpose, or to do the work of such Unions.

He would suggest one way to expedite matters, and that is for the leading manufacturers and jobbers to confer together and themselves start the ball to rolling. It would of course be slow work to get the whole trade in motion,—comprising so many individuals, and so widely scattered. But this combination of the wholesale trade would be a comparatively small body, capable of speedy organiza-

tion and immediate work. If they should take hold of the matter, and bring it properly to the notice of the individual members of the trade, he thought it would not take long to secure the adhesion of the most active, enterprising, and leading spirits, and make the project sure of success. As soon as it was seen that all of the really best part of the trade was not only in favor of it, but were actually joined in it, the accession of the rest would be only a matter of time. And the difficulty would not be to get the trade to join, but to discriminate between them, and keep out those who ought not to be admitted. He threw out this hint for the enterprising and wide awake members of our different trades to think of, and leave the matter in their own hands.

He trusted that our correspondents whose letters were omitted would excuse it, as they will perceive that their suggestions have already been printed. One gentleman in Vermont, however, advances a new idea, about one benefit which would follow the adoption of the plan, who says, among other things,

"BURN UP THE CHEAP TRASH."

"If this plan gets in operation, and gives us dealers the trade that belongs to us, we can inaugurate a long needed reform in the character of the goods we sell. Let us hereafter only keep goods of at least decent quality, that will do some service,—and abjure all the brass and wooden jewelry, and other miserable cheap trash that we have been cursed with so long. It takes just as much time to sell it, and a great deal more to keep it scrubbed up in salable order, there is no profit worth looking at when we do sell, it robs us of just as many sales of better goods, which we might have made in the absence of the cheap stuff, it disgraces our whole stock by being mixed in with the rest, makes the customer think it is *all* shammy truck, he is afraid we are cheating him when we ask a fair price for a good article, and raises the mischief generally.

As he is no judge, and cannot tell the good from the poor, he will buy something cheap, to be on the safe side and run no risk of being cheated. You may tell him plainly that the cheap goods will not give such satisfaction as the better grades, but he will be sure to expect them to do good service, will be sure to be disappointed on that score, be sure to think you have cheated him, and will do you ten times more damage with his mouth than all you made off from the sale. It would be better and *cheaper* for a dealer to advertise that he would no longer keep that class of goods, and make a public bon-fire in the street, and burn up all he had of it in view of the crowd, then tell them when they wanted any of that kind of stuff to go to the dry goods and clothing stores and "corner groceries," where they keep that class of goods, that for himself he should no longer dirty his fingers or waste his time on such trash, but only keep what he could recommend, that would do some service, and not be a disgrace to him to sell it.

It won't do to give it away, for many would take and wear it, who would otherwise buy something. It won't do to *sell* it to the "corner groceries," for they would be sure to say "This is some of Mr. Blank's stock—we bought it of him, and it is just like what he is selling now,—only he charges double what we do for it!" The only right way is to burn it up. and get it out of the way forever.

A. R. G.

WHAT AILS THE CLOCK.

Secretary of Horological Club:

I have a Seth Thomas sharp gothic 6¼ clock to repair, which has run so mysteriously that I am completely non-plussed how to remedy it. I will state how, and if any one of your distinguished body can tell me what is the matter, and how to remedy it, I will be very much obliged. The clock was wound about 9 P. M., it struck 9 and 10, and the strokes were counted; there is no mistake about it, time rolled on, until 5 A. M., when the clock struck 1; thinking it was later, an examination was made, and time compared with my regulator and another watch; the hands pointed to 1 o'clock also. The clock was running all the time as far as is known, but certainly from 5 A. M. to 12 M, no one was at the clock, no one stopped it, and no one started it. It kept correct time after 5 A. M., only 4 hours behind. This is the second time. What is the cause and also the remedy?

E. V. D.

Mr. Uhrmacher replied that the trouble merely was that the carrying spring on the center post was a little loose, and as a consequence the pinion sometimes slips and fails to carry the hands, although the clock keeps going. When it comes to a tighter place the pinion holds, and carries the post around all right. The hands move along properly, but make no attempt to catch up with Father Time, who with scythe in hand is far in advance. In cleaning clocks, this spring should always be carefully tested, for although tight enough or even too tight in some places, it may be quite loose when the pinion is turned a little further around. The spring should give a firm and steady pressure, not tight enough to make the hands set hard, but to be sure to carry them, and even all around.

HOW TO ADJUST PALLET JEWELS—MAINSPRINGS LOSING THEIR TEMPER.

Secretary of Horological Club:

I have just subscribed for your CIRCULAR and would say that I would not be without it for three times its cost. Will you please inform me, through the March number of your CIRCULAR, in setting Pallet Jewels or stones, how to tell when they are the right depth, so that the escapement will be the same length on both sides, or that it will not be too deep on one side. In what way do you hold the lever to tell which is the right or left jewel or stone.

I have found mainsprings that have lost, or seem to have lost their temper, and will not run the movement as in times past, and am obliged to put in a new spring. The only difference I can see between them and a new one is that the finish is worn off. P. C. T.

Mr. Uhrmacher replied that it would be impossible to give our correspondent working instructions for setting pallet jewels correctly within the space which is allowed for the Report of our Proceedings. There are manythings to be considered and attended to, in order to do a good job. The best treatise on that subject, for Mr. T. to get, would be the back numbers of the CIRCULAR, containing Excelsior's Practical Hints on the Detached Lever Escapement. He would find the whole subject fully and practically treated, with drawings, etc.

Speaking in general terms, the lever fork is first made to act properly with the roller table, and the bankings correctly adjusted. Then the "pallets" are moved on the fork so as to make the escape wheel teeth work an equal depth on the two pallets when the fork rests against the bankings. The depth of this working should not be too great nor too shallow, the pallet jewels must not be too near together nor too far apart for the escape wheel, they must not be too thick nor too thin, they must have just the right inclination or "angle," both on their faces and on the locking surfaces, and many other points must be looked after, which could not be briefly described. There is "no right or left stone,"—the one the wheels acts on first is the "entering" pallet, the one the tooth acts on last is the "leaving" pallet. Other like terms are used to distinguish them. Everything will be found explained in Excelsior's articles, in a way so plain that no one could fail to understand it.

As to the mainsprings, they might have been too soft in the first place, in which case they would rapidly lose their strength. The wearing off of the "finish" or surface affects all springs, but it would injure a soft or poor spring a great deal more than a good and properly tempered one.

ABOUT REGULATORS.

Secretary of Horological Club:

I have a Swiss regulator, the pendulum ball of which weighs only 3¾ lbs.; should it not be made heavier? It is an imitation of compensation rod, beats seconds, and is pin escapement. What should be the arc of vibration of such a rod at center of ball? X.

Secretary of Horological Club:

How close time will the Swiss dead beat pin escapement regulator keep! I have an old heavy brass movement not much worn, would it probably work as well as the Swiss by putting Seth Thomas es-

capement wheel and pallet new? I cannot afford to pay $1.50. Can get a Swiss *movement* for $25, and Seth Thomas for $100. How much better time will the Seth Thomas Number 10 keep than the Swiss or my old one repaired.

M. Z. M.

Mr. Regulator thought that the pendulum ball was probably much to light. But Mr. X could determine for himself whether the different parts were of the escapement were in good proportion, by a few experiments. For instance, let him vary the motive power, by adding to the weight of the regulator. If such variations were found, after careful trials, not to materially change the arc of vibration of the pendulum, nor the rate of the clock, Mr. X. had probably better not attempt any alterations; as, in such case, an increase in the weight of the ball would require a corresponding change or readjustment of the other parts of the escapement, in order to restore the former harmonious proportions between them. And that could only be done by one who thoroughly understood the theory of the escapement, and how to modify its proportions to secure any given result.

Directions could not well be given without seeing the clock and testing its performance. Mr. X should remember that the pendulum arch might be increased and yet be isochronal, *i. e.*, occupy the same times as before,—or they might not be isochronal. The usual arc was about 5°, *i. e.*, 2½° each side of the center,—giving a supplementary arc of 1½° on each side.

The pia escapement is capable of keeping excellent time if well made, and even when worn it gives better results than most others. As for repairing Mr. M's regulator, he did not approve of patch work in regulators. Better either buy outright one which could be depended on, or else repair up the old one as well as possible, and not try to mix up two or three clocks in one. A workman capable of repairing Mr. M's regulator could also judge whether repairs would be advisable, or a new clock. But it would be impossible to advise without knowing something about its condition, etc.

TEMPORARY FASTENINGS FOR FITTING HAIR SPRINGS.

The Secretary acknowledged the receipt of a circular from Mr. H. P. Beardsly, relating to his method of temporarily fastening a hair-spring to the balance-staff when fitting a new spring, without using wax, and without pinning, or breaking out the center of the spring, or injuring it for another watch. He states that it can be used with Excelsior's hair-spring tool, or when following the old way of fitting springs. No sample was enclosed, and we cannot state from inspection as to its working, but Mr. B. is well known to the readers of our proceedings as a good workman, by his frequent contributions, and we have no doubt from what he says that he really has a handy appliance for that purpose.

A PUZZLING CASE.

Secretary of Horological Club:

Permit me to relate to your honorable body a singular experience with a Waltham watch. Some time ago a customer brought this watch in for repairs, etc. It was an American Watch Co. movement, in a silver case, which the owner desired changed for a gold one. Fortunately, I had a good second hand gold hunting case that exactly fitted the movement. I cleaned it thoroughly, put in a new mainspring, and for several days ran it out of the case, and succeeded in regulating it down to the very finest time. The movement was originally well adjusted, so that I had but little trouble in getting it down to time. But the moment I put it into the gold case, it seemed to get thoroughly demoralized. The balance seems to have lost its motion, and staggered along in a wild and uncertain way. The movement would keep no kind of time when it was in this case, but the moment I changed it back to the old silver case, it seemed to recover confidence and performed splendidly. I changed the movement from one case to the other several times, with always the same result, viz. The watch would invariably stop when in the gold case. I looked carefully for defective fitting, but could detect nothing that would cause the movement to act so. Finally, a member of your honorable body dropped into my shop just when I was about to give the infernal thing up; I told him my trouble; he picked up the watch, examined it in the gold case, quietly sat down at my bench, took out the lifting spring, put the movement back, and the watch went along without further trouble. The spring had got magnetized. I put in a new one, and the watch kept as fine time as any I ever saw.

Now, gentlemen, I always was a great admirer of your honorable body, and have several times thought of asking to be admitted to membership, but my friend tells me that you are a close corporation and that I shall have to wait until some fellow either dies or resigns. The wisdom displayed by your sagacious body in your deliberation, has aroused my warmest admiration. I therefore hope that you will put my name down on your list of applicants for membership.

C. ELDRID.

The Secretary stated that our young correspondent had been correctly informed as to the exclusiveness of our honorable body. The emoluments of membership were not worth mentioning, but the *glory* of it,—ah! *that* was beyond calculation. To belong to "the immortal thirteen," was the highest pinnacle of honor open to the horological craft, and our young friend shows a commendable ambition in aspiring so high.

We will enrol him as an applicant, but must exhort him to have patience, for we fear he will have to wait some time. So many applicants have already been enrolled that his name stands at the bottom of the 99th page in Liber Z of Applications for Membership. As to vacancies, no member ever dies unless he leaves the fold and backslides from the true faith. And as for resigning, only two cases have ever occurred—those of Mr. Screws-queezer and the Adjuster-of-the-French-School, who both withdrew in a passion because their extraordinary oratorical efforts were not reported for publication at length in the CIRCULAR. Since leaving this honorable body they had rapidly fallen in the horological scale, till now they were no better than common watch tinkers. In fact, it had been reported, although he charitably hoped this was an exaggeration, that they had become so low that they were actually liable to die at any minute. With these horrible examples before their eyes as warnings, no member would hereafter think of resigning, under any circumstances However, while there's life there's hope, and if our young friend can only wait long enough, he may be happy yet.

Musical Boxes.

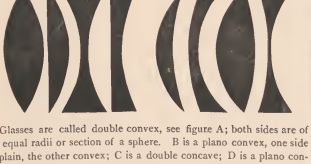
ALMOST from the earliest history of clocks and clock-work, dates also the history and use of mechanical music. Bells upon church towers, from being sounded at stated intervals by ecclesiastics, came to be acted upon by clock mechanism, and which, in the process of time, from striking the hours, was required to announce also the quarters. The lingering sweetness of these tones begot the desire for chimes, a species of music very common upon ancient churches, and which has descended to our time. The ringing of these chimes was a duty which demanded some musical skill, as well as considerable muscular effort. These duties were also, in time, put upon the clock machinery, and hence arose the invention of barrels for ringing these chimes.

From the ringing of chimes by a cylinder revolved by the clock in the hell towers, naturally enough grew the custom of so constructing the cylinder as to play simple airs upon the chime bells. From this beginning sprung barrel organs; that is, those musical machines which depend upon the action of air upon reeds or pipes for their tones. The principles of construction are the same, whether it be a chime of bells in a church tower, a hand organ on a beggar's back, or a music box in a lady's boudoir; each are operated by a revolving cylinder with projections upon it for actuating mechanism that produces musical tones; the only difference being, that in those instruments where the tones are from pipes or reeds, the valves which admit the air must be held open during the continuance of the tone; consequently, the projections upon the barrel must be more than points or pins, which would give only a single explosive note. To do this, a bridge or staple is used for such notes, and of a length proportioned to the time the note is to be prolonged.

Spectacles and Eye Glasses.

BY W. J. SUTTIE.

In my last paper I promised to write of spectacle lenses and how to set them, thinking it very necessary that all who sell spectacles should know the names of the different kinds of lenses, which by the way they seldom do. I shall be as plain as possible, and I hope no one who wants to sell spectacles will think it unnecessary to learn to call the different lenses by their proper names and the proper abbreviations, for it often happens a dealer wants one kind of a lense and orders another, thereby losing the sale or annoying his customer; glasses should not be called near sighted or far sighted glasses, because a near sighted glass sometimes is a convex, and sometimes a concave, and sometimes a patient uses a concave for distant objects, and a convex for near objects, and *vice versa*, which I shall explain in a future paper, when I shall try to explain how to suit the eye with glasses.



Glasses are called double convex, see figure A; both sides are of an equal radii or section of a sphere. B is a plano convex, one side is plain, the other convex; C is a double concave; D is a plano concave; E is a periscopic convex, concave on one side and convex on the other, and of such curves, that if continued they would cross each other; consequently, the convex curve must be greater than the concave. F is a periscopic concave also convex on one side, and concave on the other; but, unlike the periscopic convex, the curves would not meet no matter how far continued; consequently, the concave curve must be greater (more acute) than the convex; G is a convex crossed lense; both sides are convex, but each of a different radii. H is also a crossed lense but concave; there are other forms of lenses used for spectacles, such as cylindrical, plano and compound prisms, plano and compound, but think it best to give them a separate notice, which I shall do in a future paper.

Abbreviation of Double Convex is written thus : Dble C X.

"	"	Plano Convex	"	"	Plo C X.
"	"	Double Concave	"	"	Dble C V.
"	"	Plano "	"	"	Plo C V.
"	"	Periscopic Convex	"	"	Per C X.
"	"	" Concave	"	"	Per C V.
"	"	Crossed C X	"	"	ǂ C X.
"	"	" C V	"	"	ǂ C V.

Oculists and opticians use the following signs to express lenses.

8 in. Double Convex, thus : × ⅛ S which reads plus ⅛th spherical.
8 in. " Concave, thus : — ⅛ S " " minus ⅛th spherical.

The straight line which passes through the centres of the curves or is perpendicular to the surfaces of the lense is called the axis of the lense, and it is there that the focus of the lense is situated.

Spectacle lenses should be as thin as they can be made, consistent with strength, because light loses much of its power in passing through glass; refraction takes place only at the surfaces and not in the interior of the glass, and the thinner the glass, the more rays pass through; for this reason cataract lenses, called cataract because they are generally used after an operation for cataract, and are deeper than 5 in. focus, are best mounted in what they call in Europe visuals; a piece of hard rubber is made to fit the spectacle frame, and a small hole is made in the center varying in size from ⅛ to ¼ in. diameter, and the lense is fitted into this aperture; a glass fitted in this way can be much thinner and the visular rays are rendered more distinct; no lense stronger than 5 in. focus should be made larger than ¾ in. diameter. Smoked glasses are useful to a person who has to work with an artificial light or in a very strong light, but care must be taken not to wear to deep a color, or the eye will be enervated for acute inflamation. Blue is very good, but under no circumstances use or sell pink glasses for any purpose.

I have often been asked by patients what colored glasses shall I wear to give relief to my eyes—this can best be answered by letting the patient try different colors and shades, and giving to them the color that is the most pleasant and relieving to their eyes, and recommend them to have the glasses changed for a lighter shade when they feel that their eyes are getting better especially after using a dark shade of glass, or the eye will get so used to a dark light as to feel uncomfortable when they wish to cease wearing colored glasses. Coquelle or bent glasses are good, but they must be ground and polished on both sides, or they will be so unequal in their thickness as to act like prisms and displace the objects looked at generally; plane flat glasses are the best, and when the side light is disagreeable, use side glasses—called deyes or horseshoe spectacles; goggles are sometimes very good, but prevent the free circulation of the air, and the eyes are apt to become inflamed; the wire guage should be brushed to take out the dust, or the net will become closed.

Formation of Diamonds.

WE do not know in which of her laboratories or by what long processes of distillation nature forms the glittering grains for which souls and kingdoms have been bartered. "Very seldom it is, and thought a miracle, to meet with a diamond in a veine of gold," says Phil Holland, translating Pliny, "and yet it seemeth as though it should grow nowhere but in gold." That was a curious philosophy, not quite exiinct, which supposed itself able to guess where things should grow. In Balzac's novel, "La Recherche de l'Absolu," the same theory survives. The hero is "trying to get the Absolute into a corner" by means of alchemy. He does not quite succeed with the Absolute; but when all his means are exhausted, his crucibles cold, his furnace faded out, his friends find diamonds in the sediment of one of his alchemical messes. Diamonds really were found in gold, or at least in auriferous strata, by gold diggers on the Mudgee, in Australia. In 1829 they were found in the gold washings on the European side of the Ural Mountains. Believers in the old "sympathetic" philosophy would have held that Nature was half consciously putting forth her noblest productive energies and combining her choicest ingredients in these districts. The gold was comparatively her failure, the diamonds (people would have said) her success. And just as alchemists tried to distil out of gold, as the most perfect substance, the elixir of life, so they would naturally have tried to make diamonds out of gold. Not till early in the seventeenth century did people even guess that the diamond was an inflammable substance. "Neither was it known for a long time," says the old translator of Pliny, "what a diamant was, unless it were by some kings and princes, and those but few." As to its combustible qualities, the ancient writer flatly denies them. "Wonderful and menarrable is the hardness of a diamant; besides, it hath a nature to conquer the Furie of Fire; nay, you shall never make it hot, do what you can." Yet the members of the Academy of Florence "made it hot" for the diamond in 1694 in the presence of Cosmo III, and these experiments at high temperature led to the discovery of the essential nature of the stone. Notwithstanding the alleged discovery of a process for making artificial diamonds, fine goods are commanding a higher price than heretofore, because of their growing scarcity. Preference is given to stones having a faint blue tint. Small first water stones from ¼ to a carat are quite scarce, large quantities of them being worked up into fine jewelry. Owners of genuine diamonds need not get stampeded just at present over this artificial diamonds bugbear.

Examining the Lever Escapement.

We have had so many inquiries as to the qualities of the lever-escapement and its performance, that we think can do our readers no better service than to quote the chapter from Grossmann's masterly work on the lever-escapement, on the rules that should guide the examiner when he looks over his work; and the deductions to be made from the different observations will be of value to the watch repairer:

"It is an inseparable consequence of the compound action of the lever-escapement, that, for a good performance, it is not sufficient only to have the separate actions of it correct, each in itself, but a perfect harmony between these separate actions is also necessary.

"Therefore, the careful examining of a detached lever-escapement is by no means an easy task, for there are many points to be tested, on which the good performance and time-keeping depends entirely or partly.

"To begin with the wheel and pallet-action, the examiner has to verify whether the wheel is perfectly concentric and true in its division; for any want of accuracy in these points diminishes the soundness of action, and shortens the mechanical effect, because the amount of drop and locking sufficient for a true and correct wheel, would not offer the necessary safety of action.

"The cut of the wheel-teeth is a matter of some consequence, because the accuracy of division would be prejudiced, if the surfaces of the teeth, and especially the acting sides of them, were not cut even and smoothly, presenting furrows which might, when coinciding with the point of one tooth and not with that of the other, affect the accuracy of division.

"The form of the teeth must be fit for the work to be done; the foreface being sufficiently inclined (undercut) to produce the draw without great friction or adhesion, and the back not more divergent than required for the solidity of the teeth.

"The examiner has to ascertain whether the wheel and pallet are at the proper height to suit each other, and that the end-shake of the escape-pinion and pallet-arbor are equal or nearly so, to avoid the risk of alteration in the soundness of action, arising from the acting of the escape-wheel at another part of the driving planes, than the highest point of their convexity. For securing this point, it is also essential to see the wheel perfectly true on the flat.

"The locking and driving-planes of the pallet must be examined, to see whether the surfaces are well polished and the edges carefully rounded, the drawing-inclination in the right proportion, so as just to draw the pallet in, without augmenting the unlocking resistance by any excess.

"The pallet and its shape must then have some attention, as it is desirable that it be not heavier than is required for solidity. Besides, it is necessary that the part between the arms should allow free passage to the wheel-teeth, without being filed out so much as to cause fear of breaking near the hole in the centre.

"The examiner then ought to try the action of wheel and pallet, to ascertain whether the pallet has been properly pitched. This is very often not the case, and if the pallet be pitched too deep, the effect produced will be an increase of the locking-arc and consequently an addition to the unlocking resistance and to the arc of vibration required for the unlocking. Besides, the drop will not be equally divided, and too little of it outside, and too much inside the pallet, thereby making the action unsafe. This is the reason why a defect of this kind cannot be removed by exchanging the escape-wheel for a smaller one, which would only amend the first deficiency without correcting the inequality of the drop. If, on the contrary, the pallet be pitched too shallow, the locking will not be safe, and there will be more drop outside, and less inside the pallet. It would also not answer to exchange the wheel for a larger one, for the reasons just mentioned. Any alteration of the diameter of the wheel, together with taking away something of that part of the pallet where the drop is not sufficient, would restore the necessary extent of the locking-arc and make the drop on both sides the same; but as the drop on one side was too much, of course there will be afterwards on both sides an excess of useless drop, and consequently a loss of power. Therefore, in all cases where the pallet is improperly pitched, the best way will be to alter the pitch in the direction required. In all cases where the locking is as it ought to be, and the drop on both sides is not equal, the pallet must be considered defective and ought to be replaced, as also a pallet with too much drop.

"The examiner ought also to measure the pallet-arms, to verify that they are of equal breadth, because, if they are not, there is an inequality in the distribution of action between the two driving-planes, the one lifting more and the other one less than it ought to do.

"With regard to the fork and roller action, there are also many essential points to be tested. In the first place the examiner ought to see whether the lever is solidly joined to the pallet (in those escapements in which lever and pallet are two separate pieces). Any shake between these two parts, arising from the pallet-arbor or the steady-pin not fitting tightly into the holes of either of the two parts, would occasion a great insecurity of action and loss of power. A defect of this kind in a completed watch is not easy to discover, though very easy to remove. One of the most essential points is, to examine whether the angles of movement produced by both the wheel and pallet-action, and the fork and roller-action, are exactly corresponding to each other.

"The lifting at the roller is merely dependent on the respective lengths of the two levers or radii, if the angle of pallet motion is given. But when the lever and roller are ready made, the angle of their lifting is in a certain proportion to the angle of pallet movement, and the angle of lifting, for which the proportions of the lever and roller are calculated. If, for instance, the balance be pitched to a greater distance from the pallet than it ought to be, a part of the impulse given by the lever is lost in useless drop.

"Another inconvenience arising from such incorrect pitching is, that the ruby-pin, in both the unlocking and impelling function, does not meet the acting-faces of the notch in the fork properly. In such cases, the unlocking and impulse would take place at the edge of notch and horn, or at the beginning of the horn, and with decided mechanical disadvantage."

[In using a triangular ruby-pin, the notch in the fork may be made slightly larger at the bottom, for it can easily be seen, that when the first corner enters, the other corner is entirely free, and if the notch is a trifle smaller than the pin the angular position assumed by the pin in its rotation will enable it to free itself with the greatest ease.—Ed.]

"If, on the contrary, the balance be pitched too close, the result will be the necessity of setting the banking-pins farther apart, to allow the ruby-pin to perform freely the increased angle of lifting. By this wider banking the pallet will be drawn farther into the wheel than it ought to be, thus increasing the unlocking resistance. At the same time the unlocking function of the ruby-pin will be rendered more difficult by its taking place at a greater distance from the line of centres, not to speak of the liability of the ruby-pin to touch the bottom of the fork, which is not intended for this deeper intersection.

"The effects of incorrect pitching of the balance, though very grave for the performance of the escapement, may very easily be removed by an alteration in the length of the two parts. But as the lever is generally finished when the escapement passes the examination, we will suppose that it must not be touched, and that the above-mentioned defects must be removed by altering the place of the impulse-pin.

"In the first-mentioned case, the impulse-pin must be brought a little nearer to the roller-edge, to establish a sound intersection, and to turn to profit the whole angle of pallet motion.

"But it must be understood that this alteration, at the same time as it restores the correspondence of the lifting angles in the two actions, for the given centre distance, produces a diminution of the angle of lifting intended for the balance. If, for instance, the 10° of pallet-movement were intended to produce a lifting of 40° at the roller, and the lever and roller were made accordingly, but the balance had been pitched at too great distance, the angle of lifting would, by the subsequent alteration of the impulse-pin, be reduced to 36° or 33°; but the angles of the two actions would correspond to each other, and the escapement, though not having the lifting angle formerly intended, would still be correct in itself.

"In the case of the balance being pitched too close, the opposite proceeding will be advisable. The pin must be approached to the centre of the roller, by doing which, the angle of lifting at the latter is increased. If the circumstances admit it, the fork may also be shortened a little, by taking away slightly all along the inner faces of the horns, thereby reducing the acting lever-length a little, in order not to alter too much the intended lifting angle. The acting parts of fork and roller must be finished as smoothly as can be, as well as the outer edge of the table-roller and the inner side of the horns. The ruby-pin must be fixed upright in the roller; any deviation in whatever direction is defective. Care must be taken that the pin is tightly fixed in its hole, and that the notch of the fork be of the right size, just to afford the necessary freedom of action.

"The horns ought to be examined, to see that their length is sufficient to complete the safety action during the period of the guard-pin passing the hollow of the roller. This is tested by bringing the balance into the position which the guard-pin begins to enter the passing hollow. In this position the end of the horn ought to reach at least to the middle of the breadth of the impulse-pin. The horns of the forks in escapements with the double-roller must be longer than those of the table-roller escapement, because the safety-action has to perform a much larger arc of intersection. The eccentricity of the horns may be supposed sufficient, if the balance stands with the guard-pin just out of the hollow, and the end of the horn keeps at a very little distance from the impulse-pin when the guard-pin is pressed lightly against the roller-edge.

"A defect of very pernicious result to the rate of a lever watch with the double-roller in different positions, is an access of length of the impulse-pin, when the end of it comes too near the index, and touches it in any position of the watch. This is very often brought about by a difference of the end-shake between the balance and pallet-staff. These two parts and the escape-wheel-pinion, therefore, ought to have nearly the same quantity of end-shake.

"The examiner must also look carefully at the necessary freedom of the guard-pin at the edge of the detaining-roller and in the passing-hollow. Defects in this direction are very often caused by too much side-shake of the balance pivots in their holes, and, therefore, the holes must be also carefully examined, whether they are not too wide. The guard-pin or index must be shortened a little, if necessary, for the purpose of obtaining the required freedom of action. If, on the contrary, there is too much space between the guard-pin-end and the roller-edge, so that the wheel tooth is not on the locking when the guard-pin is lightly pressed towards the roller edge, and the impulse-pin butts against the end of the horn, the safety action is defective, and must be corrected by insertion of a large roller, or a long guard-pin. It must be observed if the notch in the fork be deep enough to let the impulse-pin pass free without getting too near the bottom of the notch. Care must be taken to ascertain whether the horns of the fork are not too long, so as to rest with their ends against their balance-axis.

"The pallet and lever must be examined as to their equipoise, and if required, they must be carefully poised. A defect in the equipoise of pallet and lever occasions serious differences of rate in positions, especially in those watches in which the lever is in oblique or right angle to the vertical line from the pendant through the middle of the watch.

"Finally, the width of banking must be looked into, which ought not to be wider than just to allow the indispensable freedom for the movement of the acting-parts.

"It is also very essential that the banking-pins are straight and vertical to the plate, for if they are not, and the pallet-staff has a little too much end-shake, the width of the banking will be considerably altered, whether the watch is lying on the back or on the glass, especially when the banking-pins are not standing near the fork-end of the lever.

"Lever watches in which no faults can be found in the escapement in the above-mentioned points, offer very good promise for a satisfactory performance."

How Indians Make Jewelry.

THE California sea shell is a regular article of trade among the wild tribes of Indians on the Plains, as well as among the civilized ones. The shells are about one-fifth of an inch in thickness, five or six inches long and 4 inches broad. They are shaped like a saucer, and the outside is prismatic, the colors often merging into blue, green, pink and gold. Near the edge the shell is very thin and delicate, but hard to break. The Indians saw it into pieces, some round, others square, oblong or pendant, and these they string together by means of wire passed through little holes bored in the pieces. Brass beads are often strung on wires, as a sort of washer, between different parts of the earring, while those suspended on sinew, form the pendants. A large brass ring for the ear generally begins a Sioux earring, and to this are hung five or six pendants, made of beads, supported on wire; to these pendants are attached a cross-piece of green hide or wood, then another column of pendants. To these are hung large and small beads, then another cross-piece and next three large wampum beads, beneath which is suspended the piece of shell that gives the earring its value. A shell will make one pair of rings, and it generally cost two robes, or $6. They are something over a foot long, and from three to four inches in breadth at their widest portion. What the ears of the Indians are made of, to withstand such a strain, is a mystery; but pride and vanity tell the story of the savage as well as the more civilized dwellers in the cities and towns.

A Novel Lecture Experiment.

ACCORDING to *The Journal of the Franklin Institute*, Mr. Holman, the actuary of that association, has constructed a lantern for the oxyhydrogen light, which combines several good qualities. It may at a moment's notice be changed into a lantern for showing precipitations, the action of magnets on iron filings, etc., on a screen. It may be readily converted into a projecting microscope, and with equal facility it becomes a megascope for projecting the images of solid letters. In a recent lecture before the institute by Mr. Outerbridge, Jr., of the United States Mint, on coins and coinage, enlarged images of rare and valuable ancient medals and coins, were by the aid of the lantern thrown upon a screen with great sharpness and brilliancy.

But the cupellation of gold and silver as performed in the assay of precious metals at the mint was the most striking part of the performance. A little cupel or crucible made of calcined bone ash was held in the focus of the condensing lenses of the lantern by means of a ring of thick copper wire, and the image of the cupel appeared upon the scene greatly enlarged. The cupel was then heated to a white heat, by the oxyhydrogen blowpipe. A weighed sample of good alloy, consisting of base metal, was enclosed in an envelope of sheet lead, pressed into the form of the bullet, dropped into the cupel, and immediately melted. As the lead became oxydized it was gradually absorbed by the cupel. A faint sheet of light was noticed moving over the surface of the melted metal, as the gold became exposed. When the lead was completely absorbed, carrying with it all the base metal in the alloy, the purified gold appeared as a brilliant globule, reflecting the light falling upon its surface like a mirror.

Patents.

Containing notes of all Patents, Designs, Trade Marks, Labels, &c., relating to the trades represented by the CIRCULAR, granted by, or registered in, the Patent Office, since the last issue; and also notes of decisions in the Circuit Courts and the Supreme Court of the United States, which involve new and interesting points of law or practice on the subject of Patents.

PREPARED BY CROSS & ADAMS.

PATENTS.

Feb. 3.

224,004. Device for bending wire for Jewelry Manufacture. Analdmo M. English, Providence, R. I. Forcing the material through a slide, provided with a groove having a bent end.

224,080. Molasses Pitcher. Benj. F. Culver, Derby, Conn. Combination of a molasses pitcher, having a turned down lip, with a holding-plate provided with a drip-cup.

224,098. Separable Button and Stud. Nathan F. Mathewson, Providence, R. I.

224,143. Separable Button. Jotham P. Carpenter, Attleboro, Mass.

224,144. Detachable Button. Jotham P. Carpenter, Attleboro, Mass.

224,162. Stylographic Fountain Pen. Charles U. Fisher, Willis, Texas, and Charles U. Downs, Jersey City, N. J. A device by which the act of writing produces a pressure which opens a valve and admits air to the ink reservoir.

224,227. Hair-Spring Stud for Clocks or Watches. Edward Rivett, Boston, Mass. Rivett fastens his stud with a screw and nut.

224,243. Electro-Magnetic Clock. D. Ford Sweet, Hastings, Mich., Assignor of one-half to William E. Upjohn, same place.

224,260. Jewelry Charm. George B. Whitney, Attleboro, Mass.

224,263. Electro-Deposition of Nickel. Joseph Yates, Mott Haven, N. Y. The electro-deposition of nickel by means of a solution of acetate of nickel.

Feb. 10.

224,342. Watch Key. Charles I. Loveren, Malden and Joseph H. Ritz, Jamaica Plain, Mass.

224,386. Separable Button, Stud, &c., Isaac N. C pron, Attleboro, Mass.

Feb. 17.

224,518. Caster. Benjamin F. Culver, Derby, Conn.

224,620. Manufacture of Bracelets. Ernest W. Webban, Philadelphia, Penn., assignor to W. H. Sheafer & Co., same place. Improvement in the art of making Roman Bracelets. Uniting an alloyed gold strip and a strip of inferior metal by gold solder of a high grade; rolling the compound strip to the proper thickness, and forming it into a flanged band, the superior metal being outward, soldering a lining-plate on to the flanges, applying the ornaments or finish, and immersing the otherwise perfected bracelet in the color bath, as set forth.

224,635. Second-hand Attachment for Clocks and Watches. Albert Bronzon, Santiago, Cuba. A perforated ratchet wheel loosely mounted on the second-hand shaft, acted upon by a pin attached to an arm on said shaft and by a locking spring, whereby the perforated wheel beats seconds.

224,670. Watch Case. Ezra C. Fitch, New York, N. Y. A hunting watch case consisting of a body case formed in one continuous shell, inclosing the movement at the sides and back, and jointless and imperforate thereat, but open in front, in combination with a movement or movement-holding ring insertible and removable from said open front, and an exterior lid or cap hinged on the marginal edge of said continuous shell and closing down over and co-incident with the same. An improved hunting watch case, consisting of an inclosing body case formed in one continuous shell, open only in front, in combination with an out swinging movement or movement-holding ring hinged in the opening of said continuous shell, together with an exterior lid hinged on the margin of said shell and closing down over said outswinging movement co-incident with said shell. An improved hunting watch case, consisting of an inclosing body formed in one continuous shell, open in front, jointless and imperforate in its back and sides and provided with a stem-winder, in combination with an appropriate outswinging movement or movement holding ring hinged in the opening of said continuous shell, together with an exterior lid hinged upon the outer margin thereof and closing upon the same. The combination, with an inclosing watch case, open in front, and an outswinging or removable movement-holding ring hinged or equivalently mounted therein, of a crystal-holding bezel fixable on the margin of said ring. A watch case constructed with an outswinging movement holding ring hinged in the opening thereof, and an exterior lid hinged to the exterior margin thereof at right angles to the hinge of said movement or ring.

Feb. 24.

224,768. Striking Clock. William D. Chase, Brooklyn, assignor of one-half of his right to George W. Almy, same p'ace, and Harvey S. Almy, New York, N. Y. A clock having a mainspring for directly actuating the time train, and an auxiliary, less powerful spring for actuating the striking mechanism, and an intermediate train whereby the striking spring is wound by the time spring.

224,793. Hair Spring Stud for Watches and Clocks. Roswell L. Peabody, Thomastown, Conn. A cylindrical stud attached to the balance spring. A cylindrical socket projecting from the plate or frame to receive the stud, socket being provided with a set screw to hold the stud in place.

224,849. Separable Button. William H. Shattuck, Providence, R. I.

224,952. Watch Chain Swivel. John L. Remlinger, Providence, R. I.

DESIGNS.

Feb. 10.

11,652. Coffin Handles. William M. Smith, West Meriden, Conn., assignor to Meriden Brittania Company, same place. Term 14 years

Feb. 17.

11,655. Spoons and Fork Handles. William B. Durgin, Concord, N. H. Term 3½ years.

Feb. 24.

11,657. Spoon and Fork Handles. William Rogers, Hartford, Conn. Term 3½ years.

11,658. Ornamenting Metal Surfaces. John Hewiston, Taunton, Mass., assignor to Reed & Barton, same place. Term 7 years.

TRADE-MARKS.

Feb. 3.

7,811. Imitation Diamond Jewelry. Abraham Steinan, Jr., Cincinnati, Ohio. "Fanciful word 'Lefevre.'"

Feb. 24.

7,838. Chains, Bracelets, Collar and Sleeve Buttons, Pins and Eardrops. F. G. Whitney & Co., Attleboro, Mass. "The elongated outline of a diamond and letter "W" in the center and the three stars on either side thereof."

Formation of Pinion Cutters.

In the article on the Diameter and Shape of Pinions, in the last number of the CIRCULAR, we considered the action of the wheel with its pinion to be perfect, and that the velocity and force at the circumference of every wheel is truly and constantly imparted to its respective pinion; which is supposing not only the wheelwork to be proportioned with the utmost exactness, but also their teeth shaped in the best manner. There are, however, very common causes of bad action. First, whenever the wheel is too small for the pinion, though ever so well set to depth, its teeth will pitch against the ends or tops of the pinion's leaves, and more than ordinary force will be consumed in their motion. Secondly, when the wheel is too large for the pinion, it will impart to it too much velocity during the action, and part of the force will be expended in the drop that will take place before the action commences against each following leaf of the pinion, after it has ceased to act with the leading leaf. And thirdly, if the curve of the tooth be ill-formed, the transmitted force will considerably affect the isochronism of the regulating medium of the timepiece, *with ordinary escapements*, whether the regulating medium be a balance and spring, or a pendulum.

Various methods have been proposed and employed to form the curves on small wheels and pinions with mathematical accuracy; but the whole question resolves itself into the subject of making the finishing cutters so that the desired curve will be produced. For although we have met with workmen who had the natural gifts and the necessary practice to be able to file pinion leaves and the teeth of wheels with great accuracy, the operation is so difficult, and especially so slow, that it becomes desirable, and in this age of cheapness it becomes imperative, that a quick and certain method of forming these curves with accuracy should be practiced. Although filing the teeth with files is a primitive means of gaining the desired end, the work done in some instances in this manner will stand favorable comparison with many engine rounded teeth of greater pretensions to accuracy; and even in some of those that pass for our best time-keepers, the curves of the teeth of the wheels and leaves of the pinions will be found, on being put to the test, to vary more or less from the mathematical curves that ought to be followed. Hence the necessity of having the cutters made so as to produce the desired curve with certainty.

That talented horologist, the late Richard F. Bond, of Boston, was the originator of a very simple and effective method of forming the curves on cutters with certainty. A piece of steel suitable to make a cutter, is selected and prepared, and turned in the lathe to the proper diameter, and to nearly the proper shape. A turning tool having its point of the same shape, and of the same curve, that is desired to be given to the leaves of the pinion, is now fastened in the slide rest exactly square, or at right angles to the centres of the lathe, and the screws of the slide rest are moved till the cutter is brought to a proper position to turn the groove or curve on one edge of the circular cutter that is under construction. The work is then taken out of the lathe to allow the tool in the slide rest to be moved along to a proper position to turn the other side of the new cutter, and the work replaced in the lathe, and the groove or curve is formed on the other side the same as on the first, and the new cutter brought to the proper thickness. At first Mr. Bond fastened a stop on the slide rest, so that in the working of it, the turning tool would only be allowed to move a certain distance towards the centre; but this plan he afterwards abandoned, because it was found that if the tool was moved out or in from the centre at all, even with the aid of the stop, it never could be got so exactly to the position that would make both sides of the new cutter perfectly equal; and afterwards he only used the parallel motion in working the slide rest, and never disturbed the other, after it had been first set, during the entire operation of forming the curves on the cutter.

On reflection, the reader will perceive that if the turning tool that is fastened in the slide rest be made with the same curves that the leaves of the desired pinion are required to have, and that if the tool be set square in the slide rest, and the parallel motion of the slide rest be true with the centres of the lathe, the curve formed in both sides of the new cutter will be exactly the same on both sides, and the reverse of those of the fixed cutter; and when the new cutter has got teeth cut in it, it will produce a leaf in the pinion exactly the duplicate of the shape of the fixed cutter that was in the slide rest of the lathe in the first instance. By this means the process of forming the curves in cutters, and also of making them of the proper thickness, is reduced to a simple operation, which any one possessed of a good lathe can practice. The mathematical part of the operation lies in forming the cutter fastened in the slide rest, and in this part some knowledge of drawing cycloidal curves is necessary.

The proper curves being formed, and the cutter brought to the desired thickness, the next question to be considered is the formation of suitable cutting edges; for at this stage the cutter is simply a steel disk with no teeth. And here we will make a few remarks on the subject of cutting edges. We all have observed that cutting edges vary according to the material the cutting tool is designed to cut.

We do not grind a graver that is to cut steel in the same manner that we grind one to be exclusively on brass; neither do we grind a chisel that is to be used on wood in the same manner as we grind one to be used on a harder material. It is generally acknowledged by machinists that the cutting angle of a lathe turning tool operates best, is most effective, and has the greatest strength, when ground to an angle of about 60°, and which in tools of this kind may be called the angle of strength, and can be used to advantage in all tools which are used to cut iron or steel. The teeth of cutters operate as a series of revolving chisels, and in order that the cutters should work to advantage the cutting edges must be formed according to the same rules that govern cutting edges in general. A cutter to cut a steel pinion, should have the teeth formed at about an angle of 60°; and one to cut brass, from about 45° to 50°, according to the hardness of the metal.

The teeth of cutters are easiest formed by cutting them on a cutting engine with cutters kept for that special purpose. The faces of the teeth of the cutter ought to be in a line with its centre; and in order to give the necessary clearance, and produce a proper cutting edge, the tops or points of the cutter teeth must be formed so that they will make an angle of from 45° to 60°, according to the kind of metal the cutter is designed to cut. This is easily and accurately accomplished by fastening the cutter on an eccentric arbor, placing in a lathe, and working the spindle backward and forward by hand till the necessary clearance be given by the action of a cutting tool fastened in the slide rest. We believe that Messrs. Brown & Sharp, of Providence, R. I., own or control a patent for making cutters after this system. We have practiced the method ourselves for many years, and we know it is a favorite plan used by certain clockmakers both in the United States and in Europe. Mr. Bond had a novel method of giving clearance to single tooth cutters

Instead of turning the cutter on an eccentric arbor he simply bored a new hole a little out of the center, which answers the same purpose when only a single tooth cutter is required. Cutters with only only one tooth are very convenient to use for some purposes, because of the simplicity of making and hardening them; but they possess no other advantage as is generally supposed, over cutters having a number of teeth. When used on steel a single point cutter soon wears out, and they are principally used for small brass wheels, for which purpose that are admirably adapted when a sufficient speed can be given to the cutter spindle, because it is plain that a cutter having only one tooth must move ten times faster than one that has ten.

Business Notes.

The Seth Thomas Clock Co. are making a large and comprehensive line of standard goods.

J. B. Bowden & Co., manufacturers of solid gold rings, of every description, has a large and attractive assortment of the newest designs always in stock.

Aikin, Lambert & Co. are constantly adding new and taking designs to their extensive line of pens, pencils, charms, etc., of which they have an almost endless variety.

J. A. Riley & Co., manufacturing jewelers, have just introduced a very beautiful article of personal adornment called the Bob Scarf Pin. It is elegant and attractive and made in styles to correspond with the ornamentation of the new patent bracelet.

Moore & Horton, manufacturing jewelers, make a specialty of stone cameo, onyx, amethyst, and topaz goods, also pearl rings, studs, collar and sleeve buttons, of which they have a select assortment adapted to the requirements of medium class trade.

The Middletown Plate Company offer a large line of beautiful new goods of exquisite design and finish. Their illustrated catalogue is replete with illustrations of the newest effects in electro silver plate, and will be forwarded to dealers on application.

Max Freund & Co., manufacturing jewelers and importers of watches and precious stones, offer a large line of the stone goods, expressly designed for popular trade. This firm is also the sole agent of the celebrated A. Schneider watch of Dresden.

W. H. Ball, maker of all kinds of bracelets, and patentee of the well known bracelet guard introduced in goods of his manufacture, offers a select line of bracelets in roman, enameled, and engraved, also a full line of bangle bracelets of the newest designs and patterns.

R. H. Knights & Co., wholesale jewelers of Chicago, have just taken possession of their new stores Nos. 185–7 State street,adjoining their old stand. The new store is light, pleasant, and well arranged, possessing every convenience for the accommodation of their steadily increasing business.

Miller Bros., manufacturing jewelers, present many new and artistic designs in sleeve buttons, with rustic ornamentation, and with birds, animals heads, and other devices. This firm also carries a large stock of lockets, sets, ear rings, studs, etc., etc., exclusively of their own manufacture.

The Gorham Manufacturing Co. are constantly producing new and artjstic effects in silver. Their present magnificent assortment embraces the widest range of design and ornamentation. The firm appears to have an almost inexhaustible wealth of novelties that cannot fail to interest buyers.

J. T. Scott & Co., sole Eastern agents for the Rockford Watch Co., importers of watches, manufacturers of jewelry, and dealers in American movements, has always in stock a full and complete line of the above goods, also a large assortment of diamonds, chains, silverware, etc., to which the attention of buyers is invited.

The recent "silver opening" of N. Matson & Co., of Chicago, was a great success. Their exhibit consisted of a well selected assortment of the best examples of our leading manufacturers, all of which were greatly admired. Careful attention given to special displays of this kind is of great advantage to the trade in general.

Chas. P. Herold, manufacturing jeweler and diamond setter of Philadelphia, is well and favorably known throughout the trade. He keeps a good line of jewelry, diamonds and mountings for solitaires and cluster rings, ear rings, lace pins, etc., also crosses, studs, shawl pins, and a large variety of similar goods, especial attention is given to original design work.

C. & S. Owen & Co., manufacturing jeweler, offer an attractive display of novelties in their especial line. Their stock consists of roman and polished goods, box and glass goods, hair chain mountings, etc.; also, black onyx and pearl goods in great variety. This is one of the oldest established houses in the city, and enjoy a high reputation for sustaining the quality of their wares.

Among the removals noticed in our last issue is that of the firm of Le Roy W. Fairchild, the well known gold pen and pencil case manufacturer, who has removed to No. 1 John Street, corner Broadway, and his factory to 694 and 696 Broadway. The high standard of excellence of Mr. Fairchild's productions is world-wide, as the numerous medals awarded him attest, among which may be mentioned the only gold medal, the highest recognition for this class of goods, awarded at the Paris Exposition in 1878. Mr. Fairchild presents this season many new and beautiful designs that cannot fail to attract the attention of buyers of high class goods.

A. J. Hedges & Co., manufacturing jewelers, have recently removed to No. 6 Maiden Lane. They are making a very attractive line of rich novelties in illuminated gold, presenting the most beautiful effects. These goods are rapidly growing in public favor.

Henry C. Haskell, 12 John street, has introduced a plate of ornamental letters suitable for incrusted initials for "marquis" rings. The letters are designed for monograms, are neat and attractive in appearance. Mr. Haskell is constantly introducing new and desirable designs in this class of goods, which makes them very attractive. An illustration pamphlet of designs will be sent to the trade on application.

Carter, Howkins & Sloan present in an advertisement that will be found in this number of THE CIRCULAR, a full page description of the various kinds and styles of goods manufactured by them. The reputation of this firm is so well established in the trade that no word of commendation from us is necessary. They manufacture such an endless variety of goods that it would be impossible to enumerate them.

The Acme eye glass introduced by McCord & Hopkins is a pronounced success. The improvement consists of small adjustable springs, light and safe attached to the nose piece designed for holding the glass securely on the nose. By means of this arrangement, the glasses are readily focused, and being in position are held firmly, The springs are adjustable to any angle, whereby a perfect focus is obtained whether, whether the wearer be in an upright or reclining position.

Cox & Sedgwick, 26 John street, present in this number of the CIRCULAR several examples of their patented onyx bracelets, which style of jewelry has become exceedingly popular with the higher class of trade throughout the country. These goods are made under a patent, and can be readily adjusted to any required size. They are neat, attractive, and very desirable. The firm has been long established, and has contributed largely to maintain the standard of excellence in fine goods.

Pforzheimer & Keller have recently admitted to partnership in their firm J. B. Ettinger and H J. Fink, formerly travelers in theeir employ. The title of the firm in future will be Pforzheimer, Keller & Co. This is a just and substantial recognition of the services rendered by two energetic and competent young men, who have faithfully catered to their employers' interests. The firm presents in this number of THE CIRCULAR a very attractive series of illustrations of chains, rings and chatelaines made by them. These goods cannot fail to commend themselves to the trade.

Saltzman & Vuille, watchmakers, of Chaux de Fonds, Switzerland, have received an elegant bronze medal from the Society of Emulation for specimens of watches recently exhibited by them. The medal consists of a bust, in bold relief of F. Landry, one of the earliest watchmakers of Switzerland, who achieved fame as a horologist in the latter part of the sixteenth century, and who died at Locle in 1741. Messrs. Saltzman & Vuille exhibited twenty-four gold watches and nine movements, all of which did honor to the exhibitors, and bore testimony to the excellence of their workmanship. August Saltzman, 15 Maiden Lane, represents the firm, of which he is a member in this country.

Cross & Beguelin, 21 Maiden Lane, importers of Swiss watches, watch tools, materials, glass, etc., and jobbers in all grades of American watches, have introduced a new minute chronograph, bearing the name of Droz & Perret, of St. Imier. This chronograph differs materially from the ordinary chronograph watch, as it has an independent minute hand, and is not designed to register seconds or split seconds, but only minutes. The chronograph or fly back, and the regular time hands are entirely independent; it is in fact, a double timer, and can be set to keep the time of two separate and distinct places. It is operated in the usual way, with a push pin, and is valuable for a variety of purposes. It is substantially and attractively made, and will commend itself to persons desiring goods of this kind.

The Jewelers' Protective Union has been in existence about a year and a half. It was organized for the protection of jewelers' trunks while in the hands of travelers on the road. Since it was organized the Union has met with but one loss and that was a small bag of cameos, taken from a state room on the Providence boat. This, through the Union, was recovered intact. It is estimated that during the eighteen months preceding the formation of the Union over $50,000 worth of goods had been stolen on the road. The vigorous measures adopted by the Union for the prosecution of jewelry thieves has had a wholesome influence on the "road agents," as can be testified to by three of them who are now langulshing in State Prison.

Trade Gossip.

Eugenie has laid her imperial crown at the foot of the cross.

Newark, N. J., rejoices in a very select gang of interesting young gold robbers.

Louis Kahn, of the firm of L. & M. Kahn, sailed for Europe in the steamship *Gallia* on the 21st ult.

E. Aug. Neresheimer, importer of diamonds, will sail for Amsterdam May 1st, in the steamer *Vechar.*

J. T. Macomber, a pioneer watchmaker of Hastings, Minn., will remove to Minneapolis on the first of May.

J. E. Gladhill has assumed the management of the branch office of the Ansonia Clock Company at Chicago.

Jewelry of California manufacture, made from quartz and mineral ores, mounted in solid gold, is new and odd.

Messrs. Alfred H. Smith & Co. have opened an office at 33 Holborn Viaduct, London, and a branch in Chicago.

James Hedges, of Messrs. Wm. S. Hedges & Co., diamond importers, sailed April 7th for Europe in the steamer *Scythia.*

C. G. Megrew, Jr., formerly with J. Holland, Cincinnati, is now in the employ of Aikin, Lambert & Co., as their Western traveler.

Frohme & Church, of St. Paul, Minn., will shortly introduce a new system of perfect fly cutters to attach to any American lathe.

A tray containing 24 diamonds valued at about $2,000 has mysteriously disappeard from the show case of Ernst Schalls jewelry store in Hartford, Conn.

Traveling men generally admit that Henry Plumb, of Des Moines, keeps as neat a store, and handles as clean and fine a stock of goods as any jeweler in Iowa.

In contradistinction to the "liver pad," a genius in Detroit has invented a "conscience pad." We commend its use to certain Providence and Attleboro manufacturers.

C. F Green, late with Tiffany & Co., is now in the employ of Alfred H. Smith & Co., diamond merchants, and will represent this house on the road in the Eastern States.

D. W. Granbery, of Messrs. Hall, Nicoll & Granbery, left for Europe in the *Celtic* April 24th. Mr. Granbery will visit the principle marts of Europe in search of novelties for his house.

The Society of Watchmakers of Geneva, shows commendable generosity in requesting the School of Watchmaking to place foreign scholars on the same footing as Genevese, and to found scholarships for indigent Genevese pupils.

J. R. Greason & Co., successors to the firm of Greason, Bogart & Pierce, will continue the manufacture of gold chains, lockets, and a gencral line of fine jewelry at the office formerly occupied by Arthur, Rumrill & Co.. 182 Broadway.

Charles A. Reed, of the firm of Tiffany & Co., jewelers, died in Paris on the 17th ulto. He was one of the active managers of the house in the Old World, and owned an interest in it. Mr. Reed was thirty-six years old and was unmarried.

The 1804 dollar, in fine condition, is said to be valued at $1,000 by collectors. There are 12 of this date known—2 in the United States Mint, 2 in this City, 3 in Boston, 1 in Salem, Mass., 2 in Philadelphia, 1 in Cincinnati, and 1 in Liverpool, England.

May & Stern, importers and dealers in watches, jewelry, etc., have taken the offices formerly occupied by Chatterton & Dodd, No. 19 John Street, where they have greater facilities for displaying their attractive line of goods, and transacting their increasing business.

Henry Lefort, of Newark, manufacturer of watch crowns has just moved into a new building, built by himself, where he has much additional room and plenty of steam power. He reports a largely increasing business, his factory now giving employment to twenty workmen.

B. Hall, of Messrs. Hall, Nicoll & Granbery, recently arrived from Europe in the *Adriatic.* Mr. Hall brings with him many new and beautiful examples of articles of vertu and ormolu, leather goods, bisques, and a variety of other novelties never before presented.

David Dodd, formerly of the firm of Chatterton & Dodd, sailed recently for England, with a view to engaging in business in London. He sold his elegant residence and furniture at Orange, N. J., at a great sacrifice. The nature of his new business arrangements has not been disclosed.

We have been anticipating that Edison, the great American inventor, would turn his attention to the artificial production of diamonds, but instead he has drifted into the patent medicine business, and has invented a sure cure for neuralgia. We advise him to stick to patent medicine, for there's more money in it than in patent diamonds.

The large real estate property belonging to the Richards Brothers in Attleboro, Mass., was recently sold at auction by order of the Court. The sale was attended by many of the large manufacturers in town, and much interest was manifested as to the result. The only bidders however, were J. D. and E. Ira Richards, and the property was finally bought by the latter gentleman for $60,000.

The factory of the Benedict & Burnham Manufacturing Company, at Waterbury, Conn., makers of the Waterbury watch was partially destroyed by fire on the morning of the 8th ulto. The loss on the buildings and contents is estimated at $75,000, insured for 45,000, although much of the watch machinery was saved, the loss arising from the necessary detention to business will be very heavy.

A firm of gold chain manufacturers in Nassau street are sending out postal cards on which is printed their price list, with the announcement of a discount for cash. Although this is labeled "to the trade only," not being enclosed in an envelope, it is a "giving away" of trade prices that cannot be too seriously condemned. The postal announces that the quality of the goods is guaranteed, but what is the value of a guarantee of a house that will stoop to this kind of business?

Louis Durr, who recently died in this city, leaving a large fortune and a very valuable collection of old paintings, began life as a working jeweler, he subsequently set up in business with a brother in Ann Street as a smelter and refiner, and the firm soon become known throughout the trade. The deceased was a generous man, giving large sums of money to charity in a quiet way. He leaves a large fortune to relatives, and his vast collection of paintings to this city, to establish an art gallery.

S. C. Howard, the only hope of Hiram Howard, of the firm of Howard & Scherrieble, was married on April 14, at Trinity Church, to Miss McCluskey of this city. The ceremony was imposing, and is described as follows: "He was young, and she was fair, such a tale as this is rare, and they loved each other very, very much; a jeweler was he, and a charming girl was she; at least, he had remarked that she was such; and so they were united in love's golden links, and are now sipping the sweets of their honeymoon."

The most magnificent and costly pearl necklace in the world is now the property of Countess Henckel, a lady well known at London and Paris. It is made of three historical necklaces, each of which has enjoyed considerable celebrity in former times. One of them, valued at $60,000, was sold to the Countess by a grandee of Spain, and it is known as the "necklace of the Virgin of Atocha;" the second belonged to the ex-Queen of Naples, and the third was the famous necklace belonging to Empress Eugenie, and by her lately sold to a London jeweler for $100,000.

The Illinois Retail Jewelers' Association held their annual meeting at Springfield, Ill., April 7th. The following officers were elected for the ensuing year, viz: J. W. King, of Jacksonville, President, John E. Boynton, Vice-President, O. F. Curtis, Secretary and Treasurer. Messrs. King & Boynton were appointed delegates, and they to appoint nine others to attend the Annual Convention of the Watchmakers' and Jewelers' Guild to be held at Chicago, May 12th. Several members addressed the Convention on important subjects, and much satisfaction was expressed at the success already achieved by the several State organizations. We shall give a more extended account of the meeting in our next issue of the CIRCULAR.

Bradstreets report of the failures during the first quarter of 1880 shows an aggregate of only 1,452 a decrease of nearly one-half, as compared with the first quarter of any year since 1874. The liabilities amounted to only $12,777,074, which is less than they were ever before reported in any quarter since the beginning of the publication of these reports, and less than one-fourth the total for any first quarter in the last preceding six years. During the corresponding period in 1879, the failures aggregated 2,524, with total liabilities of $43,112,665, while in 1878 they were 3,355, with liabilities of $82,078,826. The report adds that "as time progresses the figures relating to failures seem to indicate a steady continuance of favorable conditions for the trade of the country."

THE

Jewelers' Circular and Horological Review.

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THE

JEWELERS' CIRCULAR AND HOROLOGICAL REVIEW,

The recognized organ of the Trade, and the official representative of the Jewelers' League and the Watchmakers' and Jewelers' Guild of the U. S.

A Monthly Journal devoted to the interests of Watchmakers, Jewelers, Silversmiths, Electro-plate Manufacturers, and those engaged in the kindred branches of art industry.

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The Business Boom.

WE find occasionally a man in the jewelry trade at this time who complains that business is falling off and predict a reaction from the recent general activity that will be quite as depressing as the time just previous to the business "boom" that commenced last Fall. These belong to that class of men that are never thankful for what they have received, but are only grateful for favors to come. After having enjoyed for some nine months an unusual season of business prosperity—when it has been almost impossible for manufacturers to keep pace with the demand for goods—these croakers growl because this pressure from purchasers is not kept up continuously throughout the Summer. Not satisfied with the good fortune that they have already enjoyed, they complain because the wealth of the nation does not flow into their coffers in a continuous stream. Such men are not deserving of good fortune—they would growl if they were going to a creditor's meeting. As a rule, however, manufacturers and jobbers are satisfied with the present condition of the trade. Retailers have been liberally stocked up, in many cases ordering the second and third time—indeed there has been a continuous flow of orders from retailers since the setting in of trade last fall. Farmers are now busy with their crops and cannot spend time to visit the towns to make purchases. It is in the natural order of things that there should be a lull in the trade, and it is well that it should be so, for it gives all hands time to survey the field of recent operations and provide for the future. Retailers are discovering that the time is at hand when they must pay for the goods they ordered so liberally. As a matter of fact they are doing so with commendable punctuality, sending in remittances freely and asking for fewer extensions than heretofore.

As a general thing manufacturers have little to complain of. The Spring trade, notwithstanding the Lenten season, extended well into April, a thing never heard of before. Every enterprising house has had all the business it could attend to, and many of them were unable to fill all their orders. Indications from all sections of the country point to another remarkable yield of crops of all kinds, and to another season of commercial prosperity. It is better for all concerned to await the issue of a legitimate demand; the croakers on the one side should not attempt to depress the market, and the "boom boasters" on the other should not seek to work up a fictitious demand for goods that has no foundation in the actual necessities of the trade. We have had five years of unusual commercial depression, followed by a short season of extraordinary activity; this latter may have outrun legitimate demand somewhat; if so, it will be better to wait awhile and let the trade free itself than to rush to the other extreme of forcing the market by overproduction. A few weeks spent in reflecting upon commercial conditions during the hot weather will do us all good. The fact that during the past few months there was a liberal demand for the better classes of goods, and that greater quantities of them were sold than in any previous year, is a good indication that the prosperity experienced had good substantial bottom to it, and that, under favorable conditions, a large demand for similar goods will be upon us again before long. Meantime, the hot weather is here, and we shall all be the better for a sport breathing spell at Coney Island, Long Branch, or among the mountains. Let the trade be wise and make haste slowly to push the Fall trade.

Danger of Overproduction.

THERE is much apprehension felt in the trade lest the brisk demand for goods that existed during the winter and spring shall lead to an over production. Manufacturers do not all seem to realize that there is a limit to the demand for gold goods that must be reached at some time, and some of them are keeping up their production beyond the present legitimate requirements of the trade. They argue that the country is prosperous, the promise of an abundant harvest most excellent, and that retailers will require as liberal a supply of goods in the future as they have during the past few months; that they were caught with a short supply once, they will not be again. They seem to forget that with the revival of business last year the retailers were caught with stocks depleted and run down by five years of hard times, and that, as a consequence, they were forced to buy liberally to replenish their shelves. They are now stocked up. Summer trade amounts to little with them, and the opening of the Fall trade will find them with a good general assortment of goods on hand. Those manufacturers who are piling up goods now in anticipation of an extraordinarily active Fall trade, are liable to be forced to carry a large proportion of them themselves. We anticipate a good profitable Fall and Winter trade, but not so large a volume of it as there was last Fall.

Fashion is an important factor to be considered in the jewelry trade, and those manufacturers who are now making up large quantities of old style goods are doing so without regard to the fickleness of the goddess who presides over styles and designs. Styles in jewelry are as changeable as the fashions in dress goods or millinery, and those styles that sold with a rush last year are liable to fall flat on the market next season. Styles that have been hawked about the country year after year, and exhibited to every retailer by every traveler on the road, eventually pall upon the sight and become unsaleable. The first question a retailer asks a traveler is "what have you got that is new," and unless he has some novelty to show there is little use in the "road agent" opening his cases. Fashion is in-

satiable in her demands for novelty, freshness and originality in designs and construction, and those manufacturers who most heed this constant cry for change are the most successful. The public will no be amused with an old rattle, and he who seeks to please must devise novelties. It is not safe, therefore, for manufacturers to keep piling up goods that the public has long been familiar with; they are likely to hang upon their hands and prove a loss. Styles that have been shown two or three years in succession are regarded in the trade as *passé*, and have to be forced upon the market at a sacrifice. This is bad for the complaisant retailer, who submits to be loaded down with goods that he cannot sell, and for the manufacturer, who cannot get his pay from the retailer. The most successful men in the trade are the conservative ones, who do not lose their heads with every spurt of business, but are content to cater to a legitimate demand for goods, without attempting to force sales or overstock the market. It is a peculiarity of the jewelry trade that the demand for goods cannot be anticipated and provided for in advance. It does not deal with the necessities but with the luxuries of life, and is, consequently, more subject to caprices and fluctuations than any other branches of business. Overproduction, necessitating forced sales, has been one of the most prolific evils it has had to contend with in the past, and should be studiously avoided in the future. A manufacturer had better run a little short of the demand, than be caught with a large stock of old style goods on his hands that he can only dispose of at a loss. Another great difficulty the makers of fine goods have to contend with is the pirating of their designs by the manufacturers of rolled plate and gilt goods. No sooner is a new design put on the market than it is forthwith imitated in base metal, and the counterfeit sent forth to compete with the more costly and valuable original. Not even a patent will protect fine goods from being pirated, for the ingenuity of the pirates enables them to devise some means for evading the penalty they justly incur. As a consequence, it is the height of folly for makers of fine goods to push their production of particular styles, which are sure to be imitated in degraded metal.

We trust that the danger apprehended from overproduction is exaggerated. It would be a great pity to mar the moderate prosperity that is promised by the condition of trade in general, by glutting the market with goods that the people do not want and will not buy without they can obtain them at a sacrifice. It is far better for the trade to have the demand in excess of the supply than the reverse. A short supply stimulates trade, while a glut in the market produces apathy among purchasers. Overproduction embarrasses all classes in the trade, manufacturer, jobber and retailer, and entails loss upon all. We caution the retail dealers throughout the country to exercise discretion in their purchases, and to buy no more than they can dispose of and pay for without embarrassing themselves. Do not consent to be made a medium for working off the old stock of manufacturers, but look for the new and fresh styles that the more enterprising makers are constantly introducing. If those who are so fearful that they will be caught by a "boom" without a big stock on hand, choose to indulge in the luxury of overproduction, let them bear the brunt of it. Do not you be made the victims of their eloquence, and persuaded to load down your shelves with their unsaleable goods. Feel the public pulse, and make your orders in keeping with the demand. Let your stock be always fresh, and up with the fashion. Buy light, often and judiciously, and let the manufacturers carry the unsalable stock. By this means overproduction will be discouraged, and the retailers will not be embarrassed, even though some of the manufacturers do overload themselves.

Life Insurance.

A GREAT part of the stock in trade of the average life insurance agent is abuse of trade organizations designed for the benefit of their members in time of trouble or for the support of the widows and orphans of deceased members. It is true that what is termed co-operative life insurance has often proved a delusion and a snare, but where this has been the case, it has been because the officers of such associations followed too closely in the footsteps of the regular life insurance companies, paid themselves high salaries, and ran up expenses out of all proportion to receipts. But, even taking these failures of co-operative societies into account, the record of mutual life insurance associations will still compare favorably with the record of the regular companies. Look at the wrecks of life insurance companies that strew the land, from the Atlantic to the Pacific, with their millions of dollars of assets—composed of the hard earnings of their policy holders—squandered in litigation and gone to swell the plethoric purses of those vampires who are denominated receivers, referees, lawyers, judges, etc. Even in the palmy days of Boss Tweed, no such barefaced robbery was perpetraded as has characterized the management of insolvent life insurance companies. Among the companies gone into the hands of receivers, we may mention the American Popular; the Atlantic Mutual; the Continental; the Empire Mutual; the Globe Mutual; the Guardian Mutual; the North America; the New York State; the Reserve Mutual; the Security; the World Mutual; the Widows' and Orphans', and the Life Association of America. The list might be swelled to interminable length, but these are failures of recent date. These companies held in trust in the aggregate millions of dollars which was the property of the deluded policy holders who had confided in them. They were systematically robbed by their officers until they were finally declared insolvent, when they were turned over to rings of insurance wreckers to plunder still further. Of the millions of dollars of assets possessed by the companies at the time they were declared insolvent, not twenty-five per cent. has been returned to the policy holders. In short, robbery and pillage, extravagance and mismanagement have hung like a pall over life insurance in this country for the past ten years. Indeed, so palpable have been the frauds perpetrated, the Legislature of this State recently called for an accounting from all receivers of insolvent companies that did business in the State of New York. In view of these glaring facts, and of the continued extravagance that characterizes the management of the regular life insurance companies, the persistent abuse and misrepresentation they heap upon benevolent and trade societies come with an ill grace.

We are impelled to speak upon this subject because of a bill recently introduced in the Legislature the intent of which was to force all benevolent societies of the State to deposit $100,000 with the Superintendent of Insurance, and compel them to make reports to him of all their business, as the chartered insurance companies do. Had this act become a law, a burden would have been imposed upon the numerous benevolent organizations; a burden that would have resulted in the disbandment of most of them. The benevolent organizations of the Masons, Odd Fellows, Sons of Temperance, of the Police, Firemen, of all trade societies, including the Jewelers' League would have been compelled to take $100,000 of their funds and deposit it in Albany, in return for which the Insurance Department would have exercised a supervision over them that is neither needed nor desired. But the officers of the Jewelers' League, in connection with the representatives of the other benevolent organizations, instituted such vigorous opposition to the bill that the Legislature killed it. The benevolent societies named have existed for years, disbursing the funds entrusted to them by their members in a perfectly satisfactory manner, without the incumbrance of high priced officers, palatial buildings, or any other of the extravagances for which the life insurance companies are noted. When a member of one of these societies is in want or dies, the sum to which he is entitled is paid without any deductions. In the Jewelers' League, for instance, when a member dies, all the surviving members pay in $2 each, to reimburse the insurance fund from which the heirs of the deceased member have been paid the amount of his insurance. No officer of the League receives one cent for his services, but cheerfully gives his time and labor

without hope of reward. The Board of Officers is composed of gentlemen of recognized standing in business and financial circles, prominent in the jewelry trade, and whose social standing is not second to that of any other gentlemen in the country. If these men are not to be trusted implicitly in any enterprise they engage in, then no men are to be trusted, and life insurance managers need not hope to succeed. The Jewelers' League is purely a benevolent organization within the trade, and no one not identified with the trade can become a member. It regards all persons so identified as forming one brotherhood, whose pursuits are identical, and whose interests should be so. It is the object of the League to bring these into more hearty sympathy with each other, and to divide some of the burdens that must, in the course of nature, fall upon individuals. The League was brought into existence less than three years ago, and now numbers over 725 members. Its membership is limited to 2,500 and this number will soon be reached at the rate applications are now coming in. On the death of any member, an assessment of $2 is levied upon each survivor, and the gross sum thus collected, less five per cent retained to cover the expense of postage, printing, etc., is handed over to the heirs of the deceased member. All new members are required to pay one assessment of $2 in advance, by which means a fund is kept on hand equal to the payment of one or two mortuary assessments. The fund in the treasury is now something over $2,000, and in the three years of its existence the League has been called upon to pay but one death loss. In other words, an average of 500 men have been insured for an average of a year and a half each, in the sum of $1,000 by the payment of $2 each. This is cheap insurance most certainly. In an ordinary life company it will cost a man 35 years of age about $40 a year for each $1,000 of insurance. Experience has proved that trade benevolent societies furnished the cheapest and safest life insurance that can be obtained, for there is an *esprit de corps* in such organizations that makes it a point of honor for each member to keep his obligations. In the jewelry trade there are large numbers of young men, working for limited salaries, to whom the benefits conferred by the League constitute the only provision they can make for the dear ones dependent upon them. The small payments required of them aggregate but a trifling sum, in return for which they have the positive assurance that their loved ones will be cared for when death shall have stricken down him upon whom they depended. By joining the League, they not only have this assurance, but are also certain that the money they pay is not squandered to support a few officers in luxury, on salaries ranging from $10,000 to $50,000 a year, as are paid by some of the life companies to their Presidents. There are some 12,000 jewelers in the trade, and it is estimated that not more than one in ten of these has any provision for his family beyond his salary; to such as these, the League is a blessing that cannot be too highly estimated, and for the sake of these, it should receive the hearty endorsement and support of every member of the trade.

About Apprentices.

It is unfortunate for American industry that the apprentice system has become absoltee. In the watchmaking business, for instance, it used to be that a boy went to learn the trade and was regularly indentured as an apprentice for five or seven years. For the first year he was employed mainly as a chore boy about the shop or house of the "master." He was fortunate if, in that year, he learned the names of the more important tools. The second year he would be set to filing, or performing some of the coarser work, As he showed capacity for it he was advanced by easy stages to regular work at the bench and, by the time he was out of his apprenticeship, he was a thorough workman, competent to do any work presented. If he was ambitious, he generally found opportunity to study the science of horology, and so became not only a skilled but a scientific workman. We have no such apprentices nowadays, and, as a consequence, fewer thoroughly skilled workmen. Boys stray into the workshops by accident, and it is purely a matter of chance whether the workshop is a watchmaker's, a printing office or a blacksmith's shop. The necessity has come upon them to earn something, and they take the first opportunity that promises them a dollar or two a week, without any regard for the future, or any settled determination to master a trade. They retain their places as long as it suits them to do so and no longer. No consideration for themselves or their employer, who has paid them wages when they were virtually earning nothing, embarrasses them, but the boy that has commenced in a printing office, may at the end of the year turn up in a hat shop or a watchmaker's. Not being apprentices, they are free to go and come, influenced by an extra dollar a week, and having no fixed purpose to learn any trade. Thus the majority of boys of to-day get a smattering of some trade, and finally pass themselves off as skilled workmen. Some of them may be experts in some specialty, but comparatively few of them are skilled workmen in all branches of the trade of which they are professed masters. There are hundreds of so-called printers, who know nothing but plain type setting, that any boy of ordinary intelligence can learn in six months; they know nothing of job work, cannot run a press, and could no more impose a sixteen page form than they could reach the moon. What is true of printers is equally true of watchmakers; they have a superficial knowledge of the business, but are not to be classed as skilled workmen, familiar with all branches of the business. The watchmaker of to-day who expects a steady employment at good wages, must be competent to sit at the bench in a retail establishment and do any jobbing work that may be required, from supplying a "missing link" in a fine watch to soldering a pin on a new 10 carat brooch. Such workmen are exceedingly scarce, and, just now in great demand. It would be a great benefit to the jewelry trade, and, in fact, to all others, if the old apprentice system could be revived. The advantages to the present generation of boys, and to the next generation of men would be incalculable. A man with a good trade at his finger's end is comparatively an independent person, and with foresight and frugality, can readily acquire a competence. But a man without a trade or any legitimate occupation is never certain of obtaining employment, and is liable at any moment to become a soldier in the great army of tramps with which the country is afflicted. The apprenticeship system gave us good workmen, and good workmen made good citizens; the abrogation of apprentices gave us superficial workmen and thousands of men without employment.

Decorative Silverware.

In no branch of decorative art is there greater improvement than in gold and silver service for the table. Absence of body color has been the great defect in modern silver as well as pottery; a dead, uncontrasting silver is of the past; now by designs copied from the ornamented portions of Gothic architecture, from Saxon, Mediæval and Irish missals, and from purely Oriental sources a variety of color is given to metal. A tea-set in Indian designs shows great variety of details. The bowl of silver-gilt in repousse, on one side, has an oval of mottled silver; over this waves a branch of gold with sleeping birds in Damascene work—an incrustation of one metal on another. The other side has bamboo stalks in oxidized silver. The pitcher shows a surface of both mottled gold and burnished silver with a bee and furled fan for decoration. The tea and coffee pots show in superb repouse a large chased gold crescent, a crane, bamboo stalks and flowers. A silver tea caddy imitates the Castellani silver; the colors are in mottled cloudy gray; one side is covered by a spider's web in which a fly seems to struggle, and a great spider is travelling toward the web. This decoration is in oxidized silver. A bunch of flowers on the other side are in such colors as copper and other alloys.

The Jewelers' League.

We devote this column to the interests of the League and its membership. Letters or inquiries pertinent to its business or purposes, and which might interest the trade or inquirers, will be herein answered. Address *Jewelers' League, Box 4001, P. O. New York*, or the office of THE CIRCULAR.

Since the last issue of the CIRCULAR the following named applicants have been admitted to membership. At the special meeting, held April 23d.

Chas. F. Aliesky, Brooklyn, N. Y.; Ebenezer T. Baker, Brooklyn, N. Y.; Herman Bakhaus, with C. Hellebush, Cincinnati, O.; Arthur P. Baldwin, Painesville, O.; Chas. M. Ballard, Fall River, Mass.; Sam'l. H. Bauman, with L. Bauman & Co., St. Louis; M. Luther Bowden, with J. B. Bowden & Co., New York City; John J. Heiser, with Lyon & Hardy, New York City; Chas. S. Kingsland, with Tiffany & Co., New York City; Ezra B. Schofield, with E. Bennett, New York City; Chas. F. Duffy, with Enos Richardson & Co., New York City; Frederick A. Folsom, with Shreve, Crump & Low, Boston; Theo. W. Foster, of Foster & Bailey, Providence. R. I.; Wm, M. Hansell, Philadelphia, Pa.; Wm. M. Holt, Wilmington, Del.; George W. Laughlin, Cleveland, O.; Wm. H. Riley Jr. and Gustavus Lenau with S. E. Fisher & Co., North Attleboro; Philip Linton, of P. & A. Linton, Providence, R. I.; A. H. Nierman, Hagerstown, Md.; David Schroder, Cincinnati, O.; Edward F. Seery, Providence, R. I.; Francis E. Knight, with Meriden Silver Plate Co., Meriden, and the following from Chicago: Wm. M. Alister with B. F. Norris & Co.; Morris A. Berg, of S. Hyman & Co.; Edwin Clapp and Thomas Rudd Jr. with Clapp Bros. & Co.; Chas. Henry Knights, of, and Walter S. Cook with C. A. Knights & Co.; Christian Emilson and Joseph Kasper, with J. M. Chambers & Co.; George F. Glaser and Francis A. Hardy, with W. B. Clapp, Young & Co.; Warner E. Jones, Elihu B. Wright, Elias Morris, and James V. Ridgway, with Giles Bros. & Co.; Chas. C. Lamos, of Lamos & Co.; Obed W. Wallis, of Coggswell & Wallis; Emanuel V. Wendell and Maurice Wendell of Chas. Wendell's Sons; Wm. E. Yerbury, with N. Matson & Co.; Adolph Shakman and Isaac Springer.

Three applications were laid over for further investigation. At the regular meeting held May 7.

Ernest D, Barnum, with E. N. Welch Manufacturing Co.; D. H. Brookins, with Cogswell & Wallis; A. P. M. Falck, with Giles Bros. & Co.; Henry W. Fischer, with Chas. Wendell's Sons; Edward Forman, with Matson & Co.; E. K. MacGilliway, with Giles Bros. & Co.; Finlay McKercher, with W. B. Clapp, Young & Co.; Jacob S. Salkey, with Solomon & Weinberg; Clayton B. Shourds, of Hamilton, Shourds & Co.; Moses A. Weinberg, of Solomon & Weinberg, and Joseph Freulich, all of Chicago.

Chas. C. Bowers, with A. Lounsbury; Walter L. Cook, with Tiffany & Co.; Harry B, Livingston, with Saxton, Smith & Co.; Augustus H. Meyerhoff, with Tiffany & Co.; Peter James Smith, with J. H. Knapp; August Trier and William Trier, of Trier Bros.; Henry C. Hadley with Tiffany & Co., all of New York City.

Hugh Byrnes, with F. I. Marcy & Co., Providence; Chas. S. Cook, of A. Stowell & Co., Boston; Chas. H. Cooke, with Chas. Downs, Providence; George E. Cooke, Clarksville, Tenn.; Samuel H. Cowell, of Cowell & Hubbard, Cleveland; Henry S. Eckert, West Troy, N. Y.; Chas. H. Freeman, with Cadding Bros., North Attleboro; James Murphy, with Robbins, Appleton & Co., Boston; Luzerne W. Plant and John B. Gilbert, with Dennison Manufacturing Co., Philadelphia, Wm. H. Pohlman, Nashville, Tenn.; Henry C. Sammis, of Sammis & Oakley, Northport, N. Y.; M. W. Speulda, Springfield, Ill.

Two applications were rejected and eight laid over for further investigation.

Mr. J. R. Richards has been appointed a member of the Advisory Board at Chicago.

Total membership, May 9th, 728. Amount of cash in Regular Fund $997.19. Amount of cash in Benefit Fund $1,318.60.

May 1, 1880.

Official from Sydney

THE following is an extract from a dispatch received by *Secretary Evarts* from *Augustus Morris*, Honorary U. S. Commissioner to the International Exhibition at Sydney:

"The Waltham or American Watch Co. has gained *four highest awards* besides being recommended for a *special mark of recognition* to place it in watches superior to the world. I believe at no former exhibition have so much time, skill and trouble been devoted to the examination of chronometrical objects. H. C. Russell, the Government Astronomer of this Colony, acted as one of the judges on watches, and placed not only his own eminent qualifications, but all the resources of the Public Observatory at the disposal of his colleagues, so that the tests applied might be exhaustive and demonstrative. Each of the five Judges represented a different nationality and the whole are experts. Out of ten *elements of merit*, under which all classes were considered, three of the Judges gave the *Waltham* Company the whole, and the remaining two gave its watches seven elements of perfection, so that, out of 1,000 possible points, they gained, by striking an average, 982. No other watch approached this standard within 300 points.

Until the Sydney Exhibition it was not possible to sell in Australia an American silver watch unless it bore the stamp of the Silver Smith's Hall of London. Now the Company's own guaranty alone is looked for."

"In silver and plated ware, for quality and design combined, the foremost place is conceded to the *Gorham Company*, and to Messrs. *Reed & Barton*. England, France and Germany compete in these classes; but especially in beauty and appropriateness of design the United States win."

Obituary.

PHILO BROWN, OF BROWN & BROS.

MEMBERS of the trade will regret to learn of the death of Philo Brown, the executive head of the firm of Brown & Bros., of this city. Mr. Brown died May 12, at his home in Waterbury, Conn., in the 76th year of his age. He had been identified with the trade for many years as a manufacturer of brass and silver plated goods, and had, by his ability, excellent business qualifications and strict integrity won the respect of all who knew him.

G. B. P. CARPENTER, OF BURLINGTON, IOWA.

In the death of G. B. Porter Carpenter, of Burlington, Iowa, the jewelry trade has lost an active and enterprising member, and the city of his adoption a public spirited and highly esteemed citizen. Mr. Carpenter was born at New Holland, Pa., in December, 1836, and at an early age removed to Burlington, where he became a member of the jewelry firm of W. A. Carpenter & Co. The senior member, his brother, dying, the younger brother assumed the business, recently admitting to partnership his nephew, E. H. Carpenter. The deceased had long been a sufferer from heart disease, and during the past few years had tried the climate of both Colorado and Florida, experiencing considerable releif. In March last his physician again sent him to Colorado, and for a time he found the change beneficial, but a few weeks since he had a severe attack of his old complaint, and his physician ordered him home. He was met at Atchison by friends, but died in a sleeping car before reaching home. Mr. Carpenter was a member of the First Methodist Church of Burlington, and was highly esteemed for his many excellent traits of character. His friends in the trade will be grieved to learn of his decease.

Practical Hints on Watch Repairing.

By Excelsior.—No. 63.

PROPER FORMS FOR TEETH AND LEAVES.—*Concluded.*

(990) *To Plan a Wheel and Pinion, Gearing Correctly.* Having decided how many times the pinion is to turn for each revolution of the wheel, and the number of leaves the pinion is to have, and knowing their exact center distance in the watch, we can from these points ascertain all the others. In the present case, our pinion is to have 6 leaves, and make 3 turns to each revolution of the wheel. Then the wheel must have $3\times6=18$ teeth, (888), and its primitive radius must be three times that of the pinion, (897). Increase the center distance as much as can be conveniently drawn, say 20 times, and mark it accurately on the line of centers. Make the drawing with a hard pencil, sharpened to a fine point, so that its accuracy can be tested and any errors corrected or alterations made before finishing up with ink such parts as are to remain permanently. When the drawing is completed, all the parts will be shown of 20 times their actual size, and the different dimensions will be found by dividing the measurement taken on the drawing by 20. This is easily done by means of good tools and accurately graduated guages or scales, or by proportional compasses. The reduction is greatly facilitated by taking measurements in thousandths of an inch, or by the metric system, when division or multiplication by 10 can be effected by simply moving the decimal point.

(991) The radius of the part which drives is first ascertained from the enlarged center distance, either by direct calculation, (899) or by the fifth proportion in section (915). The exact radius being obtained, it is usual to increase these figures by a small amount, before drawing,—generally by about 1 or 2 *per cent.* or more in coarse work, (926). Having set the drawing compass to such increased radius, and drawn the pitch circle of the wheel therewith, the remainder of the center distance is the correct pinion radius, with which its pitch circle is drawn, just meeting that of the wheel, on the line of centers, as already described. When the pinion drives, this increase is added to the pinion radius, and the wheel radius takes the remainder of the center distance.

(992) *To Lay Off an Arc of Any Angle, Without Drawing the Entire Circle.* It is often very inconvenient to draw on a large scale the entire pitch circle of the wheel, or even of the pinion. Suppose we want to mark the position of the two leaves of a 6-leaf pinion. The angle between them, or the pitch, will be $360\div6=60°$, and is usually found by setting the dividers to go exactly around the pitch circle in 6 steps or 6 turns of the dividers, (950). But we can simply draw a short section of the circle, and mark off 60° thereon, as follows: Referring to Fig. 51, after drawing a section of *X X*, we remove one point of the compasses or dividers from *a* and set it on the circle at any convenient point, say at *O*, then with the other point mark the circle at *c*, and draw the line *a c*, which will be at an angle of 60° from *a O*, and *O c* will be an arc of 60°. This is based on the fact that, in a triangle having three equal sides, the 3 interior angles will be equal, and each angle is 60°. Consequently, if we draw another line from *c* to *O*, the angles *a c O* and *a O c* will each be 60°, also. Having an arc of 60°, it is easily divided into 2 or more equal parts, as may be required.

(993) The same method is followed with the wheel. Drawing an arc of such length that a section of it can be set off having the same distance from *R* to *R* as from *A* to *R*, or *A* to *O*, then *R R* will be an arc of 60° of a circle having *A* for its center and *A R* for its radius. For our wheel of 18 teeth, the pitch will be 360, the number of degrees in a circle, divided by 18, the number of teeth, which will be 20°, which is ⅓ of our arc of 60°. Having set the dividers to ⅓ of *R R*, mark that distance off above and below *O*, at *N* and 5^1, and *O N* will be the pitch arc of the driving tooth. and $O5^1$ that of the following tooth. In the same way, an angle larger than 60° can be laid off, by so dividing the arc of 60° as to get the required additional angle, and adding that distance on beyond the arc of 60°.

In dividing an angle, always divide the curved arc *O c* or *O N*, not the straight lines *a O* or *A O*; ⅓ of the line *A O* would not be ⅓ of the arc *O N*. Nor will it answer to find any required angle, say *O c*, on the pitch circle of the pinion, set the dividers from *O* to *c*, and mark that distance on the wheel circle, for the distance in a straight line from *O* to *c* is not the same as from *O* to *N*, owing to the difference in the curvature of the two arcs, whose actual lengths are the same.

(994) *To Draw the Wheel and Pinion in their Correct Acting Positions*, when we know the length of the addendum, but not where contact will begin. With pinions of 10 leaves and upwards, either this or the following method can be used. But with those of lower numbers, and especially when the addendum of the tooth has the correct epicycloidal form and the driving terminates as the point of the tooth passes off the semi circle, (962), (983), or begins more than 10° before the center, we proceed as follows: Draw the line of centres, (Fig. 60), mark on it the increased geometrical radius of the

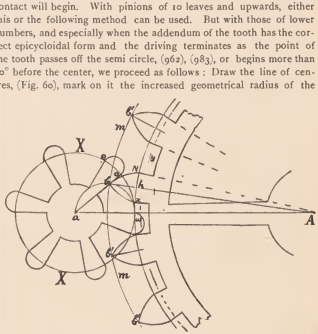

Fig. 60.

wheel, draw the pitch circle of the wheel, then that of the pinion, and the semi-circle *a b O*, as directed in sections (990, 991). Having already ascertained the proper form for the tooth, as described in sections 945, 977),—which we will suppose is *A N d s*, Fig. 57, set the compasses from *A* to *d*, (the two Figs., 57 and 60 being drawn to the same scale,) and with that length draw, in Fig. 60, the circle *m m*, which will be the outside circumference of the wheel, and touch the points of all the teeth. This circle crosses the semi-circle at *b*, which is, of course the point of the tooth at the end of the driving; the line *A h b* is the central line of this tooth, and *a b c* is the flank of the leaf. Having thus fixed the correct acting positions of the wheel and pinion, we can easily fill in the remaining lines from these starting points.

In case the teeth have flat points, (983), set the compasses from *A* to the circle *m m* in Fig. 58, and draw the tooth so that the *acting end* of the addendum curve will strike the semi-circle *b*, instead of the *point* of the tooth. But such teeth are more easily drawn by the following method, (1,002).

(995). Divide the pinion circle *X X*, starting from *c*, into as many parts as there are leaves, in this case, 6—and draw a radial line from *a* to each of these divisions, which will give us the acting flanks of the 6 leaves. As the leaf is ⅓ the pitch, or 20°, we mark off 20° from *c*, at *e*, and the line *a e* will be the other flank of the leaf. Starting from *e*, we again divide the pitch circle into 6 equal parts, draw radial lines to each point, and we have the back flanks of all the leaves. The addendum of a driven leaf being semi-circular, we set one point of the compasses at the center of the pitch arc *c e*, and with the other draw a semi-circular curve whose ends exactly meet the

ends of the pinion flanks $a\,c$ and $a\,e$. The other leaves being rounded in the same way, we connect the flanks at their roots, making the spaces deep enough to give room for the points of the teeth, and our pinion is finished.

(996). To draw the wheel, we commence at the point h, and divide the pitch circle of the wheel into as many equal parts as there are teeth, (in this case, 18,) and through each of these divisions draw radial lines $A\,h^1$, $A\,h^2$, etc., to the circle $m\,m$. These lines are the central lines of the several teeth, whose points will be where these lines cut the circle $m\,m$. From the central lines, mark the distance $h\,N$, each way, and you have the thickness of the teeth. Draw the radial flanks from those points, as far towards the center as will give you ample freedom for the points of the leaves, and connect them by curved lines at their roots. Form suitable curves, reaching from each flank $A\,N$, $A\,z$, to the point at b, as directed in section (998), and so with the other teeth.

(997) In the same way, the wheel and pinion can be drawn in any position desired, by placing the flank of the leaf $a\,b\,c$ in the chosen place, say in the position $a\,t\,3$, Fig. 51. Inasmuch as our curve $N\,b$ is one which drives the pinion with uniform velocity, the front of the tooth will have passed through the same proportion of its pitch arc, as $a\,b\,c$ has through the pitch arc of the leaf; and the arc $O\,3$ being $\frac{2}{3}$ of $O\,c$, the flank of the tooth $A\,N$ must be at a point $\frac{2}{3}$ the distance from O to N, which will be at 3^1. Consequently the curve $N\,b$ will start from 3^1; and the point t^1, where it is cut by the 2d dotted curve, will touch the pinion flank at t, on the semi-circle. Having the front of the leaf, $a\,t\,3$, and that of the tooth, $A\,3^1$, it is easy to supply the rest of the teeth, leaves, etc.

(998). *To Transfer the Addendum Curves.* There are several methods of transferring the curve of the tooth, as found in Fig 57, accurately to the different teeth in Fig. 60. One is to draw around the wheel several circles having the same radii as the dotted curves in Fig. 57, then measure the distance from v to n^1, on the first curves on the tooth, and transfer that distance on the first circle of the wheel, each way from the central lines of the different teeth. In the same way, mark the distance from i to i^1, on the next circle, from o to s^1 on the next, and so on, as described in section (977), then connect the different marks properly, by a curve, and the addenda are formed.

Another way is to draw the tooth of Fig. 57 on card board, then cut it out along the lines $A\,N\,d$, and use this as a pattern tooth. Make the edge or line $A\,N$ coincide with the line $A\,N$ of the wheel, and the curve $N\,z\,n\,O$ of the tooth with the pitch circle of the wheel, then mark along the curve $N\,d$, and you have drawn the curve $N\,b$ on the wheel. Turn the pattern over, make the edge $A\,N$ coincide with the other flank, and $N\,O$ with the pitch circle of the wheel, and draw the other side of the addendum—proceeding in the same way with all of the teeth.

(999) A third way is, after finding the positions for the flanks and the points of the several teeth, as already described, (996), to fill in the sides of the addenda by the semi-circle method, as directed in sections (956, 957).

An improvement on this, is to set the compasses for drawing only one side of the addendum at a time. It is often the case that a curve formed by the semi-circle method will be too straight or too rounding. (1,001). But the compasses can generally be so set that when one point is suitably placed, say at the dot w, Fig. 57, the other will accurately touch the entire curve from d to N, or so much of it as to require but a trifling amount of fitting of the lines at N. Having found the proper opening for the compasses, and the best place for the center, at w, proceed first to mark a point w for each tooth around the wheel in Fig. 60, so that each shall be at the same distance inside the pitch circle, and also from the central point h, as w was from the corresponding parts in Fig. 57. By this means all of the curves $N\,d$ will be drawn alike. Find another similar point y, near N. Fig. 57, for drawing the other curve $d\,z$, and mark suitable points around the weeel as before, for drawing the other faces of the teeth in Fig. 60.

(1,000). This process can be considerably shortened by drawing a circle passing through the first point w, which will of course mark the uniform distance from the pitch circle for all of the other points w. By setting the dividers to go around this circle in 18 steps, the different points are easily marked by a slight prick, deep enough to find readily with the point of the compasses. Having located the point y, at the other side of the first tooth, the dividers, as already set, will at once locate the other 17 points at equal distances apart. To prevent mistakes it will be well to designate each set of points with its letter, w or y. With care, the marking of the points can be dispensed with, merely placing the compasses on th's circle so that the pen will exactly touch the point of each tooth. But it will be found nearly as expeditious, and much safer, to first accurately locate the points w and y on the circle, with fine pointed dividers, using an eye-glass to assure correctness.

(1,001). It should be observed that the addenda will be a little longer and less curved as the number of the teeth in the wheel increases, and shorter and more rounding as the teeth are fewer, even when the pinion remains of the same number and size and the pitching and depthing are made correct in each case, (944). The difference cannot readily be given in figures, or precise directions, but the correct shape in any case will be obtained by drawing out the curve, by either of the first 3 methods described, (945) to (955).

(1,002) *To Draw the Wheel and Pinion in Any Part of the Driving Before, or On, the Line of Centers.* This method is preferable, 1st, when we do not know the length of the addendum; 2d, when the addendum has not the correct epicycloidal curve; or, 3d, when we wish to draw a toothed gear which will do a certain amount of driving before the center. In the 1st and 3d cases, we must draw the parts in the positions where contact commences, as described in section (985), whether before or on the center. Having drawn the line of centers, marked the center distance, and drawn the pitch circles of the wheel and pinion, as in section (990, 991), we measure off, before the center, *i. e., below O*, the angle or distance where the engaging tooth and leaf are to meet, and draw their engaging flanks touching at that point. If the point of first contact is on the line of centers, the two engaging flanks will of course touch at O. Having thus fixed or commenced the wheel and pinion in their correct relative positions, we make all our measurements from this *point of first contact*, instead of starting from the *end of the driving*, as was described in the other method, (904). In the 2d case named above, if we know the correct *length* for the addendum, we can chose any position before the center, from that of the first contact to that on the line of centers; and, in laying off the gear, we place the engaging flanks of the tooth and leaf in contact in the chosen position, then divide off the two pitch circles from that point of contact, as the starting point.

(1,003). Suppose we wish to draw a 6-leaf pinion, and a wheel of 48 teeth, having addenda so formed that contact will begin at 10° before the line of centers. We first lay off the line $a\,w$, in Fig 59, for the acting flank of the engaging leaf, w being 10° from the line of centers. As the tooth is to touch the leaf at w, a line from w to A, the wheel-center, will be the acting flank of the tooth. This will not be strictly correct, however, if the driving begins more than 8° or 10° before the center, as is seen by inspecting the contact in Fig. 60; and in such cases the other method will be preferable, (994). Starting from w, Fig. 59, we divide the pitch circle of the pinion into 6 equal parts, and draw 6 radial lines for the acting flanks of the 6 leaves. Starting from the line $A\,W$, we divide the wheel circle into 48 parts, and draw to these divisions 48 lines for the front flanks of the teeth. Having, or finding, the proper thickness for the teeth, we mark that distance back from W, at y, and the line $A\,y$ will be the back flank of the tooth. The dividers, set as before, and starting from y, will mark off the positions for the flanks of all the other teeth. If we do not know the proper length for the addendum of the tooth,

we now find it, by the method in section (985), then draw the circle *m m*, to indicate the proper length for all of the teeth, and, from the point *d*, mark this circle off for the points of the different teeth, with the dividers. Or, we can divide off the pitch circle from the point *h*, and draw the central line for each tooth, from *A* through each such division to the circle *m m*.

(1,004). We now form the addenda by one of the methods in sections (998) to (999), but generally by either the 3d or 4th methods, (999). If they were to have the correct epicycloidal curve, the 1st or 2d method would be preferable for transferring it to the teeth. They would then have the form shown at *W o y*, and contact would occur at 20° before the center, as seen in Fig. 60, which would not answer our present purpose. In order to make contact at only 10° before the center, we are obliged to lengthen the addendum, (987), and give it the form *N d M*, or *W v y*, having such a length that it will carry the retiring leaf 50° past the center, where it is shown in Fig. 59. Consequently, the point of the driving tooth must just reach to the leaf *a b c* when it is in that position. If we had already drawn the addendum, with a length previously fixed upon, (989), and the point did not reach to the flank *a b c*, it is too short; if it reaches over or crosses the line *a b c*, the addendum is too long, and either must be shortened, or contact will begin less than 10° from the line of centers.

(1,005). The addenda being drawn (or, at least, on the 2 or 3 teeth nearest to the line of centers,) and found correct, we then finish the pinion leaves, etc., as directed in section (995). Should it be found that there is not sufficient freedom between the points of the teeth and the backs of the leaves, as they pass each other previous to engaging, the backs of the leaves must be taken off, *i. e.*, they must be drawn thinner, as the rule is to secure freedom by taking off from the *driven* leaf or tooth, not from the driver. The freedom being sufficient, we finish up the wheel and pinion as already fully described, (995, 996).

(1,006) In the same way, gear can be drawn making contact at any desired point before the center, (980), by first marking out the engaging tooth and leaf in the position selected, and taking the points where their front flanks touch their respective pitch circles as the starting points, from which to lay off first the teeth, then the leaves. Fig. 58 shows a gear in which contact begins on the line of centers. It will be seen that the point of the driving tooth, *x*, does not cut the semi-circle where the flank of the leaf crosses it, at *o*, but the real or *acting end* of the addendum curve *does* cut it there. The circle *n n* is used for locating the central lines of the different teeth, and *m m* shows their acting or effective lengths, (983). Where the central line *A x* strikes the pinion flank *a c*, gives the length of the tooth (985) as it would be if the points are left on. Such a tooth would complete the driving before its point reached the semi-circle, so that the part from *o* to *x* would be useless and could be removed down to the curve *m m*.

The workman will of course remember that, in the drawing, the point *A* is much further from *O* than is shown in the Figs. 58 and 59, the line *O A* being really 7½ times as long as *a O* in the former, and 8 times as long in the latter, so that the converging dotted lines meet at *A*. Only the portions of the drawings necessary to show the driving, etc., are shown in the cuts, in order to avoid too great reduction in size.

(1,007) *Comparing a Tooth With a Drawing.* Moinet, in his *Traité d' horlogerie*, gives a method of comparing a tooth of a wheel with a large drawing showing what the form should be to suit the proportions of the gear in that particular case. Having finished the drawing, on as large a scale as convenient, it is to be fixed in an upright position, with a good light upon it. The workman then stations himself before it, at such a distance that the image of the tooth, viewed through the eye glass with one eye, will appear of the same size as the tooth in the drawing appears to the other eye, when opened. By holding the tooth properly in the focus of the glass, and moving towards or from the drawing till the sizes of the two images are the same, they can easily be brought together and compared, showing at once how the real tooth differs from the correct form, and what changes should be made.

(1,008) Even if the workman is not able to give the teeth precisely the curves which in theory are best, he will be well repaid for the time and trouble required, by drawing the wheel and pinion on a large scale, in their different proportions as to sizes, numbers of teeth and leaves, thicknesses, etc., and also in their different positions, in order to study out the proper forms and proportions best adapted for service in the different circumstances, and what will be the effect of any variations therefrom. This knowledge will not only afford him great satisfaction, in the thorough understanding of his business, but will also be practically useful to him in selecting wheels and pinions for repairing jobs, detecting improper sizes, proportions or forms, when examining finished work, and in correcting the same, for which directions will be given hereafter.

THE manufacture of gold and silver plate in the United Kingdom, if increasing, does so very slowly, despite the growing wealth, of the nation. Whether this stationary energy is due to the duty is a point on which those engaged in the trade differ in opinion. After some changes from duty to a license, the duties were reimposed about a century ago, 8s. per ounce being charged on gold, and 6d. per ounce on silver. Just before the beginning of the present century they were increased in the one case to 16s., and in the other to 1s. There was again an augmentation seven years afterward in regard to silver, the duty on which was fixed at 15d; not with reference to the interests to either buyers or sellers, but simply because the Government needed increased revenues. About 60 years back the duties were fixed at 17s. per ounce on gold, and 18d. on silver; and so they have remained ever since. In Ireland different rates were adopted from those in Great Britian; but in recent years all sections of the United Kingdom have been treated alike in this matter. If the extent of the manufacture be nearly stationary, this is attributed to three causes. First, changes of fashion, which lead to the adoption of other materials as substitutes for the precious metals in several kinds of ornamental and even useful articles. Secondly, the durability of gold and silver plate, which results in a large trade in second hand-goods. And thirdly, perhaps principally, the development of the electro-plate manufacture, which began to be definitely established about 35 years ago, and has been rapidly growing ever since.

THE Berlin *Borsen-Zeitung* says that the Prussian capital has long contained a jewel of quite fabulous value, the news of whose existence was first made known to the general public by the reports of the last session of the Polytechnic Society. This noble stone is a sapphire, and is the property of one of the members of that learned body. It weighs "12½ loth"—a little more than six ounces. The jury of the Polytechnic Society, on the grounds stated in full at their discussion, would have settled its value at the frightful sum of sixty-four millions of marks, or three millions two hundred thousand pounds of English money. It need hardly be said that such a treasure is not very likely to find a purchaser at such a price. It is contended by some of the adepts that the stone is not perfectly pure, so that its price may, perhaps, be reduced; but it can never be so far lowered as to tempt the richest and most eccentric collector in the world to give anything like the sum which must be asked for it. In the year 1872 a Berlin mineralogist offered to go as far as 67,500 marks, but in vain, as the unique jewel had already been refused in 1860 to a German Prince who had offered a far larger price. Its present possessor has placed his treasure in State Custody for the sake of his heir, as the *Boren Zeitung* says: though we imagine that its future owner will not find it easy to realize anything more solid than distinction out of his very exceptional piece of property. All the experts who have scrutinized the sapphire agree that it is a genuine corundum. The "sappir" of the books of Exodus and Ezekiel, like the "sapphires" of Pliny, were probably our lapis-lazuli.

The American Watch Company.

A VISIT TO AND DESCRIPTION OF ITS IMMENSE FACTORY AT WALTHAM, MASS.

Continued from page 70, Vol. XI.

IN the whole range of complicated problems in practical mechanics, there is nothing that so taxes the scientific knowledge and technical skill of the mechanic as the construction of a good watch. The absolute necessity of confining within a limited and convenient space the delicate and intricate mechanism required to accurately record actual time, is a problem that has taxed the inventive skill of practical horologists for centuries. Every one of the delicate pieces of this mechanism must be made with the utmost nicety, with a view to its fitting perfectly into and working harmoniously with its neighboring piece. Even the numerous minute holes with which some of the parts are pierced, must be made with the greatest accuracy, and with a nice regard for their relative positions to others of the same character.

Practical horologists have, at various periods in the history of watch making, devised many forms for watches, some of them being novel and unique, better calculated to interest the seeker after the curious in art than to serve any practical purpose. The form, however, that experience has demonstrated as being the best adapted to watches for ordinary use, is that of a short flat cylinder, varying in thickness and circumference. The works are contained in a case of silver or gold, (baser metals being sometimes used) and these are of various forms and designs. The movements are carefully protected from dust by the case and by other means adopted to prevent obstructions from the outside entering and interfering with the operations of the intricate machinery. In our last article we briefly described the Observatory and Superintendent's office of the American Watch Company's Manufactory at Waltham, Mass. In the present article we shall endeavor to record our observations in various departments of the factory where 1,300 persons, male and female, find employment. Before doing so it will be pertinent to call attention to the fact that the American Watch Company has spared no effort to attract to its service the best talent to be had either in this country or in Europe, and to make its employment so attractive that no desire for a change is felt by the workmen and workwomen. Fair rates of compensation are paid them, their surroundings in the factory are pleasant and wholesome, and their hours of labor not exacting. The Company has, also, an eye to their social surroundings outside of the factory, and has taken care that comfortable boarding places have been provided for the men and women who require such accommodations, while special inducements have been offered to all who desired to procure a homestead for themselves. Some of the most attractive of the many beautiful houses in the vicinity of the factory are owned by workmen in the employ of the Company. It is a noticeable fact that the foremen of the many different rooms have been long in the service of the Company, their employment covering periods varying from seven to thirty years, while some of the "girls" have been employed twelve and twenty years. Occasionally one of the girls gets married, but she ever after has a longing to get back to her old place at the bench, and it not unfrequently happens that she does return. In several instances husband and wife work in the factory, and, in one case, the wife being an expert in her line of the business, earns more wages than her husband. Thus does the true theory of "woman's rights" receive practical demonstration in the American Watch Company's factory.

THE PLATE ROOM.

The foundation upon which the mechanism of a watch is built is the bottom plate. This is the round brass piece, the size of the watch, pierced with many little holes, into which fits all the other mechanism of the watch. The room where the plates are prepared, is called the Plate Room. This is a long, well lighted, and well ventilated room, filled with a great variety of machinery, and presided over by Leonard Green, Foreman. Although a young, active man, he has been twenty-three years in the employ of the Company, and is regarded as almost invaluable in his department. Quick in manner and speech, he is possessed of much intelligence, and an executive faculty that keeps everything in his room moving with the utmost system. The plates are here received in the rough and leave the room in a perfectly finished condition. As received, the plates consist of solid round pieces of brass, of equal dimensions. They are fully double the weight they are when the finished plate leaves the room, the surplus metal being consumed in the process of developing the plate. Each plate here undergoes some 380 different operations, the description of which in detail would be simply impossible. These operations are mostly performed by machines, each one of which has been specially designed to perform a certain operation with uniform nicety and exactness. Many of these machines are lathes, and tend to illustrate what is clearly evident throughout the entire factory, that there is practically, no limit to the capacity of the lathe. The many different operations it is here made to perform, some of them automatically and with seeming human intelligence, excite the wonder and amazement of the beholder. We have said that a bottom plate as received in this room, is a solid cylindrical piece of brass, of uniform thickness. This is turned, dressed, perforated, cut, numbered, engraved, burrowed into and dug out by various machines until it emerges in a perfected form. We have a finished plate before us as we write, and find that one surface has been cut out, leaving a rim rising one-sixteenth of an inch above the general surface, the thickness of the plate including the rim being one-eighth of an inch. Inside the rim, on the flat surface are 28 perforations, varying in size from that of a fine cambric needle to $\frac{1}{8}$ of an inch in diameter; there are two raised points and two circles partly cut through the plate; on the interior surface of the rim there is cut part of a circle, and there are two cuts through the rim; there are five figures stamped on the surface of the plate. On the opposite surface of the plate, which is but $\frac{1}{8}$ of an inch in thickness, a large circle has been cut half through, a groove $\frac{1}{2}$ an inch long, cut to admit of some stem-winding attachment, and three legs inserted on the outer edge of the plate for the reception of the top plate. A portion of the edge of the rim has also been cut away, and three minute holes drilled in it. The legs for the support of the top plate have been turned to handsome proportions, with a shoulder for a top plate to rest upon and holes drilled in their ends for inserting the pins for securing the top plate. As we look at it, the wonder is not so much at the completed work as at the fact that machinery was devised to do it all with such perfect accuracy. The specimen we have before us is the bottom plate for one of the cheaper grades of watches; those for the finer grades are much more elaborate, and involve more operations and the use of other machinery not required for this one.

In this room the top plates are also made from rough pieces of brass, and are cut, stamped, turned, drilled, etc., in a similar manner to the bottom plates, to which every hole and every point must conform. The various operations are substantially the same as those employed for the bottom plates, all being done by machinery. Other portions of the brass frame work are made here in the Plate Room. Some of these pieces are elaborately engraved in a very beautiful and artistic manner. This work was formerly all done by hand, a slow, tedious process, involving the expenditure of much time and money. It is now all done by machinery, very rapidly, yet with the greatest accuracy. The most delicate lines are thus cut into the brass, forming beautiful figures in fine tracery, and giving a highly ornamental finish to the pieces so decorated. The machine that does this work is of itself a mechanical triumph. Each plate and piece receives in this room the number by which the watch is to be identified in all its subsequent history, other parts as they are added in the different departments of the factory being numbered to correspond with the number on the plates. The general appearance of the interior of the Plate Room is of the busiest description. Over

head are long lines of shafting, with belts leading down therefrom to the various lathes, punches, drills, etc., that are mounted on the work benches that line the room on either side. All are in motion, while at the benches are 36 men and 23 girls at work. In one corner, Mr. Green, the foreman, has a private office partitioned off, where, with the assistance of a female clerk, he keeps the records of the department, and the accounts of the employes. At the beginning of each month he receives from the Superintendent a printed card designating the kinds of watches he is to lay the foundation for during the month, the numbers of each kind to be made, and the number to be stamped upon each watch. With this before him as a constant reference, and the requisite material furnished, he proceeds with his labors. As his work is completed upon the plates, they are forwarded to the next department which is the Pinion Room.

THE PINION ROOM.

This room is located on the second floor of the factory, is in the form of an L, and is full of machinery in endless variety. Most of this machinery is nearly automatic in its operations, doing its work with the utmost precision. These machines, however, have to be watched and fed and tended, and girls are mainly employed for this purpose. Out of the 150 persons working in the Pinion Room, but 29 are males. But, while the machinery employed is much of it nearly automatic, it nevertheless requires much skill, and dexterity to manage them, and the girls employed possess this in a high degree. This room is presided over by Martin Thomas, foreman, who has been with the Company 20 years. He was one of the first watchmakers employed at making watches by machinery, having been connected with the original plant at Roxbury, in 1847. In the Pinion Room is made all the inside works of a watch—everything in the way of wheels, pinions, etc. Some idea of the number of pieces it takes to supply the movement of a watch may be gained by the enumeration of the articles made in this room, as follows: patent centre staff; patent center pinion; third pinion; fourth pinion; scape pinion; cannon pinion; minute pinion; barrel arbor; pallet arbor; balance staff; barrel; barrel head; hour wheel; minute wheel; centre wheel; third wheel; fourth wheel; stem-winding wheel; intermediate wheel; winding pinion; push pin; dial feet; second-hand socket; hair-spring collet. The watch plates, balances, etc., made in other rooms are handled more or less in the Pinion Room. Some of the pieces enumerated above are exceedingly diminutive, some of the screws and pinions made here, more resembling fly specks than necessary parts of an elaborate system of mechanism. Of the second-hand sockets, for instance, it requires some 600 to weigh a pennyweight. It may be stated here that all measurements throughout the factory are made in accordance with the metric system, whereby a readier accuracy is secured than by the measurement by inches.

The general appearance of the Pinion Room as one enters is that of a labyrinth of shafts, wheels, pulleys and machinery, all in motion as though endowed with life. On both sides of the room are long lines of work benches, and a third line runs through the center. On the benches are placed the various machines that do the work of the room, while each is watched and tended by a man or woman. As in the Plate Room, the lathe plays a most important part here, and is employed in a greater variety of ways. Without this all important factor, watchmaking by machinery would be impossible. The largest part of the work done in making a watch is done on a lathe, and, in order to accomplish the results achieved, that piece of mechanism takes on innumerable forms. We have before us as we write, pinions and screws made in the Pinion Room that are so infinitessimal that the point of the pinion or the thread of the screw are invisible to the naked eye. As a specimen of the work done, here is a finished piece which, we believe, is called the mainspring barrel (we do not pretend to be technical in this description, and if we get the pieces a little mixed as regards their nomenclature we are ready to be forgiven.) This piece comes into the room in the shape of a solid cylindrical piece of brass, a little more than an eighth of an inch in thickness and 7/8 of an inch in diameter. It is put into a lathe and about one half of the center of it is scooped out till there is left but 1/4 of an inch in thickness; part of the outside of the rim is cut away, a hole is cut in the bottom of it, around which a rim is left, then it goes into another lathe, and the outside rim is converted into a cog wheel, then a thin piece of brass is turned off to fit into the barrel, which is the barrel head, and is perforated with two or three holes; this makes the barrel, the solid piece of brass from which it had its origin having been cut away more than one half in weight, while losing but little of its circumference. Here is a small piece of steel wire half an inch long; it goes through two or three lathes and comes out with a cog wheel in the centre, pivots at both ends, with highly finished square shoulders; here is another small piece of steel wire; it goes into the machinery and comes out a pinion with a finished squared shoulder on one end and a cog wheel on the other. Some of thes pinions are so small that their points cannot be discerned by the naked eye, and much of the work at the lathes is done under magnifying glasses. It does not add especially to the attractiveness of the girls to see them at work with a magnifying glass in the shape of a dice-box screwed into one eye, but it is only by the aid of the glass that they are enabled to do the work assigned them. Here are a number of round pieces of thin sheet brass; being placed under a punch, a number of sectional pieces are cut away, leaving five small arms reaching from a solid center to the circumference; another punch puts a hole in the centre of the hub; then a lot of them are placed together in a bunch in another machine, and in a moment fine cogs are cut in their periphery; thus are the wheels made in the rough; then comes a polishing process, and they are ready to fit into the watch. Much of this ingenious and complicated machinery was invented by Mr. Woerd, the Superintendent of the factory, and all of it is the outgrowth of the intelligence that presides in the various departments. The best intelligence of everybody about the factory is directed to making improvements in the machinery, or devising means for dispensing with hand labor. This intelligence receives every encouragement from the Company, which has expended large sums in experimenting with and developing the ideas of its workmen. The Pinion Room contains some of the most ingenious specimens of machinery that have been introduced into the business, and to see the ease and rapidity with which it operates is to witness a marvel in practical mechanics. Mr. Thomas has quite a large office set apart for the use of himself, and his female assistants. Here are kept the records of the department, the accounts of the employes in the room, and a stock of all articles made in the room. At any time when a wheel or pinion is wanted in any other department, Mr. Thomas can furnish it instantly from stock, the kind desired being specified. It must occur frequently, of course that some of the delicate parts of a watch are ruined in some one of the various operations through which they have to pass. Given the style of watch, and any part can be substituted instantaneously, and, as they are automatically made, they are interchangeable, so that the substituted part may be depended upon to entirely fill the place of the part that was originally fitted to the watch. Many of the employes in the Pinion Room are paid by the piece for their work, being paid a fixed price per hundred for the number of pieces of a given thing that they make. Some of the articles are so small that it would involve interminable labor to count them, so they are weighed, so many hundred being required to make a pennyweight. But the female assistants to the foremen are expert in counting, and, having a quantity of the small pieces spread out before them on a piece glass, will count with great dexterity and accuracy.

THE JEWELING ROOM.

From the Pinion Room the watches are passed to the Jeweling Room. This room is in charge of John J. Lynch, who has been connected with the Company from its incipiency. He was employed at the old factory in Roxbury in 1852, and jeweled the first watch made by the old Company, when it consisted of Dennison, Howard

& Davis. He thoroughly understands this branch of the business and is also a good executive officer. There are forty machines of various kinds employed in this room, and fifty-five persons, one-third of whom are females. The embryo watch having received in the Pinion Room all its works, it comes to the Jeweling Room to have the necessary jewels fitted to it. It also here undergoes the processes of uprighting and end-shaking, manipulations by means of which it is ascertained if the wheels, etc., fit properly, and the Proper distance between the top and bottom plates is secured. The jewels provided for the watches are made on the premises from jewels in the rough state, the processes for doing which are to be described hereafter. Being made, they are sent to the Jeweling Room to be assorted, classified, and fitted into the watches. The jewels are little bead-like pieces of precious stones, garnet or ruby, that are fitted into certain holes in the bottom and top plates for the pinions to ru inn to avoid friction. They are, of course, exceedingly small. Every one has to be guaged, set and trued to the required size. A quantity of them is spread out before one of the girls, who also has in front of her a large card, marked off in squares and numbered. In her hand she holds the guage, which is a nicely adjusted balance, from the end of which protrudes a fine tapering wire. Seizing a jewel with her pliers, she slips it down the wire as far as it will go; then pushing the wire down into the guage, the diameter of the hole in the jewel is registered in metric degrees upon the dial of the guage; it is then removed from the wire and placed upon the figure on the card corresponding to the figure indicated on the guage. That is to say, the jewels so measured and numbered will fit a watch of a certain grade. Then the jewels are passed to the workmen who insert them in the plates of the watches. With the jewels in place, other workmen proceed with the uprighting, carefully trying every pinion and wheel in its place to see that it works smoothly. The time has not yet arrived for putting the movement together permanently, but the trying, fitting, and preliminary work is done in this room. Here a perfect record is kept of the sizes of the jewels that go into each particular watch, and the trains are measured, and a record made thereof. If at any time during its life a jewel in one of the watches made by the American Watch Company should break, or some defect interfere with the working of the watch, a duplicate jewel could be furnished at any time by simply sending the number of the watch. Indeed, the system of recording every part of every watch by its number is most religiously observed in every department of the business, so that duplicate parts can be furnished. This numbering commences, as we have shown in the Plate Room, where the watch is begun. The lathe is a conspicuous feature of the Jeweling Room, as it is of almost every other, and its functions are as varied here as elsewhere. It is impossible to describe them all, but one will get some idea of the work they do if he will take his watch to pieces, examine every piece, and then endeavor to comprehend that each one was made by machinery. He can then put his watch together again—or, if he can't, let him pay some watchmaker for doing it. The process of jeweling a watch is, of course, one of great nicety As the jewels are inserted to prevent the friction that would be occasioned by metal running on metal, the jewels must be of the hardest stone, and set perfectly true, or the result desired is not accomplished. Much of the work in the Jeweling Room has to be done with the aid of the magnifying glass. Many of the girls in this department are very expert in their business, and, as they work by the piece, make good wages. There are certain classes of the work of watchmaking requiring delicacy of touch and much patience, that girls can do to better advantage than the men. Being trained to do a certain thing, and kept continually doing that one particular thing and nothing else, they become very dexterous and accurate. They are seldom changed from one thing to another, but, learning one branch of the business, they stick to that till death or marriage intervenes. Guaging jewels is one of the things in which they are especially adept. As the uprighting and jeweling of each movement is completed in this room, the various parts are carefully laid in a tray—each part of each movement being kept separate from similar parts of other movements—and passed to the Springing Room, the foreman of which receipts for them to the foreman of the Jeweling Room, and each foreman notifying the Superintendent that the transfer has been made. In our next article we shall follow the process of watchmaking through several other departments describing fu lly the more interesting processes yet to come.

As we progress through the various rooms we cannot but note the perfect system that prevails everywhere. Order and neatness are predominant features of every department; there is no loud noise, but little conversation, although it is not prohibited, but every employe seems conscientiously intent upon the work in hand. There are no idlers. Each one has his or her allotted portion of the work to do and seems determined that the amount of work accomplished shall harmonize with that accomplished by their fellow-workers. But above all, one feels that he is in the presence of skilled labor of the highest order; not only the skilled labor that requires dexterity of hand and eye, but that which is pervaded with and governed by a high order of intelligence. A glance at the faces by which we are surrounded, whether male or female, forces this conviction home to the mind, and satisfactorily accounts for the great success of the American Watch Company. Brains are visible in all branches of the work, backed by a liberality of expenditure on the part of the Company, and by Yankee enterprise and push that are determined to achieve the acme of excellence, and that will, when properly exercised, always command success. While we cannot but admire the skill and genius that has developed such wonderful results in the art of making watches by machinery, we must all recognize the fact that skill and genius would have accomplished little without the capital, foresight, business capacity, and unconquerable pertinacity, that have characterized the management of the American Watch Company.

(To be continued.)

Romance of Old Gold.

THERE has always been more or less of reverence attached to old and venerable specimens of wrought gold, and poets and novelists have dealt lovingly with the theme. As a matter of fact, however, from a business stand point, old samples of wrought gold are usually worth just what their value is after emerging from the melting pot. But associations and pleasant memories have, with many, a value that money cannot buy, and in the hands of this class of persons, old samples of wrought gold, that have been heirlooms in families for ages, become inestimable treasures. There is, however, much exaggeration relative to gold workers that the public lends a ready ear to. For instance we have heard the story frequently repeated that an enterprising man once gathered the dirt in John Street, including the sweepings from many jewelers' shops, and on assaying the dirt, recovered over $10,000 worth of old gold waste. The craft must indeed be wealthy when it can throw such a bonanza into the street. Of course the story is absurd, but there are many such in existence to which a credulous ear is lent. A reporter of a daily paper recently published the result of his investigations upon the subject of old gold, and below we give the substance of what he says on the subject:

"Passing through John street, the other day, a glare of a brilliant light blazed blindingly in the reporter's eyes. It was the reflection of the rays of the noonday sun from an eccentric mass of white metal in the dirty little window of a dirty little shop which was sandwiched between two of the handsome silversmiths' stores, like some skulking tramp being taken care of by a brace of stalwart guardians of the peace. How the solar shaft ever pierced the grimed panes with sufficient power to create such a responsive radiance is a mystery. It was as much as the reporter could do to make out that the white metal was a mass of crucibled silver, of the most fantastic and charming filagree structure, its surface fretted like the frosting on a winter morning window in designs which might have been made in fairyland. In trays and heaps all around it was a confused mass of the most heterogeneous articles of ordaments and utility, or rather of bygone ornaments, whatever their present utility might be, of both an-

tique and modern pattern, but all of one of the two precious metals, and all run to one common character of seed. There were long chains festooned all about and coiling in heaps like sleeping serpents, battered bracelets and rings varying in style from the plain wedding circlet to the aristocratic seal strung like dried apples on long wires. A golden sword hilt and a gold arabesqued scabbard, several daggers with tarnished silver grips, ornamental scrolls wrenched from gun stocks and revolver butts with the rivets still sticking in them, brooches without pins, earrings without hooks, watch cases, old coins, medals and badges of every description. A couple of crucibles were crammed with settings from which the jewels had been torn, and there was a bushel or so of the same spoiled jewelers' work in two battered black silver pitchers, whose dinted but portly corporosities bore an engraved crest with a graceful monogram and the date of 1742. These heirlooms, come to a common level with their frivolous companions, and waiting, like them, for the melting-pot, had the air of dignity about them of two gentlemen of the old school, dropped by misfortune among the proletarian paupers of an almshouse. The flaunting sign in the window, "Old gold and silver bought at the best prices," seemed a wanton insult to them, a fling at their hapless deteriorated age.

The shop inside was, if that is possible, more in want of a purification than its exterior. In its gloomiest corner a red-eyed furnace glowed through a vail of blue chemical smoke. The ceiling was black and festooned with cobwebs, which made hammocks for the soot and dust to repose in. The walls were black—a smeary, unwholesome black, like the complexion of one of those toilers in a Siberian lead mine who have forgotten the light of day. There were show cards and price lists gummed to them, but their inscriptions had long since been smudged into illegibility. Over a board counter a bent old man was testing some chains and bracelets with acid, while their vender stood by and awaited the decision of the dumb detective as to the worthiness of his wares. A florid gentleman was tumbling over the chaotic contents of a boxfull of seals, monograms and the like, which had been deprived of their settings. "It's no use," he observed; "it isn't here, that's certain. I must try another place."

"He has been here every day for a month now," explained the man behind the counter. "His house was robbed lately, and among the articles stolen was a seal ring which had belonged to his family for unnumbered generations. He had hoped that he might come across it here, but I guess his chance is slim. If it is worth anything it has long since been sent across the water."

"How do you mean?"

"Simply that the thieves, or rather the deceivers with whom they deal, never try to do anything with that sort of property here; seals, intaglios, cameos and the like, which possess any intrinsic value, are packed off to Europe at once and reset there, while their old settings are melted down. In the same way those stolen abroad find their way to this market. We get a great many valuables of that sort, of course, in the legitimate way of trade. They are brought here by people who are hard up, or who do not appreciate them. We make no allowance for them. It is the settings we are after, and we pay for its weight and fineness. The stones go into a heap, and anybody who wants can buy them. We have regular customers in that line—collectors and dealers who, from time to time, relieve us of our stock. Of course, we don't give the stones away, and when by a rare accident, we get any of exceptional value, we get our own price for it, too. But it is not our regular line, and with the general run we don't haggle over the price, unless we have plenty of time to waste."

"Do you take any precautions against being made the purchaser of stolen property?"

"The ordinary one of common sense. It isn't a very difficult thing to distinguish between an honest seller, who has a right to dispose of what he sells, and the other sort. Besides, the thieves don't get a chance to patronize us. They are generally so entangled with the fences that the latter get whatever is worth getting, at their own prices, and they do their own melting. The mass of settings there, for instance, comes from various jewellers, who have purchased them for the stones and sold the metal to us. The big jewellers either do their own smelting and refining or send it outside to places like this to be done. If, howev, a customer does not turn up whom I think likely to be the off color variety, I simply decline to deal with him. I suppose I have bought stolen property at one time or another. I don't see how any one in this business can very well help it. But ignorance is my best title to innocence, and I guess I won't suffer very seriously for it."

Here, a little faded woman in widow's weeds came in. She had a little package under her decent dolman, and in a little, quivery voice, explained that she desired to find a market for it. It was a silver baptismal mug, of an old, old style, and bore the inscription, worn by zealous polishing, "To Bella, from Her Godmother, Arabella. Matcham, London, 1837." The little woman started as if some one had stabbed her when the mug fell rattling among a heap of silverware tossed from the scale by a careless hand. But she gathered up the few bank notes with eager fingers, and pulled her vail closer about her face as she went out.

"Some people," the dealer explained, "are as shamefaced about coming here as they would be on a first visit to a pawn shop. And the queerest part of it is that they have all generally been to the pawnshop first. Pawnbrokers wont advance anything like its value on such stuff as this any more than they will on anything else. If the owners only need money temporarily, they take what they can get. But if they are so hopelessly hard up that they are constrained to part with their collaterals for good, they generally find their way to some place where they can get more than their value. We don't pay for workmanship, as I need't tell you, and that's the biggest part of the jeweller's bill. But we pay honestly for the metal, and as much as we can afford. There's considerable competition in the business now, and the profits are much less than they were when I commenced to smelt.

The prices paid for old gold vary, of course, according to the quality of the metal. Eight karat gold brings from about thirty to thirty-two cents per pennyweight, twelve karat from forty to forty-eight, fourteen karat from fifty to fifty-five, sixteen karat from sixty to sixty-five, and eighteen from seventy to seventy-five. There is very little twelve karat gold in the market. In such low grade gold ranks as eight karat or less, the price paid depends greatly on the character of the alloy and the difficulty of extracting it in refining. If it is exceptionally difficult to separate the silver and copper, the price is merely nominal. Apropos of this fact fact, it is worth noting that much second-hand jewelry is offered for sale, dating from the first houses of the country, and of a very low grade of metal, indeed, almost on a par with cheap factory work. To sum up in short, English, old gold of good quality brings about ten per cent. less than its intrinsic value, that sum constituting the smelter's profitless expenses.

The gold, when it is refined, is run into bars and either sold to manufacturing jewelers or turned over to the Sub-Treasury as bullion. Very little of it goes that way, though. The ornamental uses to which it can be put claim its full service as a rule. The chief source of supply of the smelters is the jeweling fraternity. They not only have large quantities to dispose of through resetting, but most of them trade new-fashioned trinkets for such as are out of date the latter being rated by weight, and they find their way to the smelter in due course.

Old gold, of course, isn't bought like auction bargains or junk, on the chance of its being worth the purchase. The tests it is subjected to determine its value are extremely interesting. The chief factors in it are the test stone and the test key. The former is a whetstone, which one finds on every smelter's counter. The latter is a contrivance on the plan of an old-fashioned fan toothpick, only, instead of being of ivory it is brass. The various points or picks are numbered 8, 12, 14, 16, 18 and 20, and the figures designate the quality of the gold with which they are tipped. When you bring a ring in for sale, say, it is rubbed on the whetstone, to which a few atoms of the precious metal adhere. Then the key, pointed with gold of the fineness at which your ring is estimated or stamped, is used to make the hurried scrons mark beside it. A drop of muriatic acid and then of sulphuric acid, used *seriatim*, brings out the color of the two marks, and verifies the fineness of the one according to the standard of the test key. When very thick rings or heavy jewelry are offered, the dealers will not venture on a purchase unless they are permitted to cut them and ascertain what they are made of inside.

The most perfet method known for testing coins, it may be interesting to state here though it has no particular bearing on the subject, is that in use in the Bank of England. The bank never circulates a coin that is a thistle-down's weight under the standard. The sovereigns as they come to the test are heaped up on a big table, whence they are swept into tubes which are part of a sort of a delirium tremens of machinery operated by a little steam engine. The rolls of sovereigns pass slowly down these tubes, which traverse the table at a descending grade of thirty degrees, and if they are full weight the coins drop one by one into a box on the floor. But whenever a light piece reaches the lower end of the table a little brass plate pops out of some hidden corner and pushes the defaulter into a compartment of the box where he can't contaminate his honest fellows. Not one is allowed to pass. The light sovereigns are then dumped into a sort of barrel organ with steel blades for pipes, whence a turn of a crank drops them out, cut in half and ready for reminting.

In addition to the smelters who suspend their shingles in Maiden Lane and John Street, and in that block of Chambers Street between Chatham and Centre, there are peripatetic speculators in old gold,

argonauts of the trade who travel all over the country gathering in stock wherever they can find it, and bringing it to New York to dispose of at sufficient profit to make their wanderings pay. These middlemen often pick up some marvelous curiosities in their particular line; historic heirlooms that have spent long generations in country cupboards, and the plate chests of provincial families. But whatever their associations may be, the red-eyed furnace devours them all, and their death incense makes the smelter think hard words as he stirs his pot in the mophitic fumes of a charcoal fire.

The oldest smelting business here is said to be that of G. W. Platt. John Waters' sons continue a business their father founded long before they were born. The Longman establishment is also an old and prominent one. The head of this firm is reputed the greatest expert in metals on the Western continent. His cognizance of his profession is called colossal. His assays in the most delicate and important cases are accepted as final. A reference of a disputed point in practical metallurgy to him is understood to mean its definite settlement, *pro* or *con.*, and no one demurs at his decision. One instance of his fundamental thoroughness in the business is adduced in the fact that he can detect, with rare exceptions, where any article of jewelry which comes under his hands has been made, his knowledge extending not only to the characteristic national styles, but even to the peculiarity of individual workmanship. The gold brick which was donated by California to the Irish Famine Fund, was sent to him for assay. He made his report, accompanied by a receipted bill Some of his assays are said to have been marvels of the triumphs of an anylitical brain, and a practiced intelligence over what had been regarded as Gordian knots in the metallurgical annals.

There are numerous famous "crooked" smelters here, men whom only the thief can reach, who have garnered fortune from their pots of "brown soup," as their patrons familiarly christen them. One of them, a little weasened Hebrew, who has for years been a tantalizing mystery to the police, is a regular speculator on Wall street, where he spends his off hours in company with his daughter. The pair are as familiar to that portion of down town as the Stock Exchange itself. The infatuation of the old man is akin to that of a gambler, who, after fleecing a victim, goes off to be fleeced himself at his own game. Every dollar he makes in one way he loses in the other, and if theft should become a lost art he would inevitably become a client of the Almshouse."

Reminiscences of an Apprentice.

CLEANING CLOCKS—FIRST DAWN OF IDEAS—MY FIRST EXPERIMENT AND THE RESULT.

AFTER the severe and protracted ordeal I, and also "our maister," went through in teaching me to make large pins, and the *art* of turning the hand-vice regularly, and the proper method of handling the files necessary for the operation, I was put to cleaning clocks, which, to me, was a great relief. The clocks were all of the old English type, in tall cases, and when "our maister" had to go to a customer's house he always took me with him to carry the clock back to the shop, should it require cleaning, or any special repairs. On entering the house of the customer we received a welcome, mixed with a respect greater than was given to the carpenter, the blacksmith, or the tinsmith, and not generally accorded to any class of visitors, except it was the doctor, or the minister. The usual salutations being over, the object of the visit was introduced, and I remember the fabulous stories that were told of the going of the clocks up to the time that they had gone wrong, and it was still supposed that there could not be much the matter now, seeing that they had always gone so well before. Every clock was the best in a circle of many miles, in the eyes of the owner, and "our maister" listened patiently to the story of every one, while I stood, cap in hand, at a respectful distance. Generally the clocks were tolerably well made; some were were first-class; but again others were inferior. When they did go, good and bad all went well enough for the ordinary purposes of life, and pleased the owners till once they stopped, and then "our maister" would sometimes spoil one and make it worse than ever it was before. I used to think it strange that such a clever man should spoil so many decent people's clocks; but now I understand the secret.

I remember of an instance that "our maister" ruined an excellent clock, beyond remedy. It belonged to a maiden lady in our town, and was made by her father, who was a watchmaker. He disdained all modern appliances or conveniences to assist him in his work, and he showed his contempt for them in practice, for he had neither used a lathe nor a turning machine of any description in making the clock. The wheels were all divided by using wheels belonging to other clocks, and the teeth he cut in them with a hand-saw. The materials the clock was made from were such as one will find in the scrap box of a tin or blacksmith's shop in a country town. It was a centre seconds clock, too, and it struck the hours; and with such tools as may be found in the shops where he got the materials he actually made this clock, which went for a long time, but finally stopped one day, after its maker was dead. "Our maister" did his very best, but he only made it worse and worse every time he went to it, which showed he did not understand it; in fact it was a proof that he knew nothing at all about it; and the grief and rage of the owner was great at the result of the misplaced confidence in the professional ability of "our maister."

Like all great artists, this departed Horologist had left but few monuments which might be taken as a fair sample of his transcendent genius. True, he had made and repaired many kinds of machines, but the clock that "our maister" had spoiled, was his masterpiece; and the owner believed that even its maker, were he alive, could not produce another like it, which is quite probable. However it was fortunate that there was a duplicate, which was not in use because it had not been quite finished. This one was intrusted to an artist belonging to the same school as its maker, and of course he completed the work satisfactorily. All immediately concerned were delighted at the result, and every one who, from principle, was opposed to the systematic spoiling of time-keepers in order to extract more money from their owners, felt an inward satisfaction at this total discomfiture of "our maister."

But although he was sometimes discomfited and put in the shade, "our maister" would not in the least change his ways, or his manner of doing work. He was as particular about my motions, when he taught me to take such clocks as I speak of, out of the case, as the drill sergeant afterwards was with us when going through the platoon exercise after I joined the Volunteers. He would place his right knee on the front of the case, and slide the head gently off with his hands, first examining if all the wood-work of the head of the case was firm, lest, in the act of taking it off, the head might fall out of his hands. Then he would examine the suspension of the pendulum, and see if the back fork fitted to the pendulum properly. Next he would take the pendulum off, catching hold of it with the one hand a little above the middle, raising it up a little, and with the other hand disengage it from the suspansion, and let slide down and settle comfortably in the bottom of the case, leaning it in a corner at the back, if it had not to be taken away. Then the weights were taken off by catching the pulley with one hand, and unhooking the weight with the other; but before doing so, I had to put my hand on the seat board, lest the clock should tumble down when the weights were taken off, should it be badly fitted to the case. The clock was lifted off and dusted down, in a convenient place, and the cords wrapped around the seat board. The head was put on the case again, the weights put in a safe place, the clock was set in my arm, with the dial towards me, and I was marched off to the shop, while "our maister' was getting his parting instructions to be sure and have it soon back again. I was not allowed, at first, to take the clock to pieces. "Our maister" did it himself, as follows:

He first made me clean down the bench; and when that was done he set the clock upon it, and commenced by taking off the bell, which was made to serve as a receptacle for holding small pieces of the clock, but a piece of paper was first put into the bottom to prevent the very small articles from falling through the hole. After examining the escapement, and taking out the pallets, the back cock was put on again to prevent the frames from getting scratched when they were laying on the bench. The clock was now turned over on its back, and laid on the bench, and the hands taken off; next the dial, and then the seat board was taken off. Then the dial work and the

repeating work was examined, and the pins all taken out, and if it was not a clock that he had cleaned himself, last, he generally threw the old pins all away. I used to feel mad at him for throwing away the old pins, because he had to use the new ones that I had made, and caused me so much unpleasantness; but how dare I remonstrate with "our maister" on the subject? When the pins were taken out, all the loose parts were removed, the front frame taken off, and the wheels inside the frame were exposed and lifted out, the scape wheel put in a safe place, the cords disengaged from the barrels, and put up in a coil, and I was set to work to clean the clock. This was not so difficult as making pins, yet it was a long time before I could please "our maister." I had to clean them over and over again, for he would not tolerate a spot of rust or dirt to be left, and after I had done them as well as ever I could he would do them over himself; and the small holes, that I could see no use in cleaning, he was the most particular about, for after I had done them with a feather, and, as I thought, well enough, he would do them by pressing in small pieces of wood and turning them round in the holes, and then he would scrape the wood and put it in again and again, till the brass did not alter the color of the wood in the least degree.

There is a class of cheap clocks made in Germany that hang up on the wall, and have chains, weights and pendulums exposed to view. I soon noticed that "our maister" had a special antipathy to them, but why, I could not tell. His opposition to them was so strong that he would not allow them to come into the shop for repairs. I had now seen the inside of an eight-day clock, and wanted to see the inside of a German one, and the more "our maister" said against them the more it made me anxious to have my curiosity gratified; and when I could not see one in the shop I made up my mind to see one somewhere else. A clock of this kind was in the house of one of my comrades, and one evening when the folks were out he and I went about examining it. It was a cuckoo clock, and the little wooden bird came out at the end of the hour, flapped its wings, bobbed its head, and made the usual cries. I climbed up, opened the doors at the side, and looked in. This was my first exploration into the wide domains of clock-work, and I soon saw that this class of clocks differed as much in its general arrangement from the eight-day clocks that I had seen befor., as the eight-day clocks differed from "our town clock;" but what puzzled me most, and what was most difficult for me to comprehend, was the mechanism that caused the bird to cry "*cuck-oo*." I noticed that there was a small pair of bellows connected with it, and I suspected that they must have something to do with producing the sound; but I could not wait and look long enough to see the clock strike, for the look into the works was a stolen one. We expected my comrade's parents to come in soon, and it would never do for them to know we had climbed up and opened the door of the clock, for it was too sacred an article, in their estimation, even for a watchmaker's apprentice to meddle with. I had known about the clock about as long back as I could remember, and had seen the bird come out often, but I never thought about how the thing was done till my interest was awakened on seeing the inside. A strong passion to study cause and effect early developed itself in my nature, and I could not rest till I found out what made the little bird cry cuck-oo. I experimented with my mother's bellows in various ways, trying to produce a sound, but could obtain no satisfactory result; still the subject uppermost in my mind for a long time was how to produce a sound like that the bird in the cuckoo clock made.

Here I must digress and mention that there was a traveling musician who made periodical visits to our town. He was a large and powerful old Highlander, and had been a soldier, and had lost both of his legs. He, however, dressed himself in full Highland costume, and was driven about in a small carriage that was drawn by six dogs; and although the martial music of the bagpipes did not sound to the best advantage in the close streets of a town, he was a general favorite, and we all welcomed him when he came round. The boys were fond of the dogs, and gave them bread to eat, and the dogs licked the boys' hands, while their master was making the most noise that he could with the bagpipes.

One summer evening, as I was pondering over the bird in the cuckoo clock, and the relation the small pair of bellows bore to the rest of the mechanism in producing the sound, this musician drove up to the front of our house, and commenced to play. All at once the idea struck me, and I ought to have thought of it before, that the instrument he was performing upon was a pair of bellows of a peculiar shape, and there was certainly plenty of sound issuing from them. The player was squeezing the bag under his arm, as I thought, to serve the purpose of a pair of bellows; still I had a doubt, because he was also blowing with his mouth, and that might have something to with producing the sound. I concluded to test the thing by stopping up a hole in the end of one of the pipes that lead to the bellows. We all looked on the man, his dogs, and his pipes as common property, and although I would perhaps momentarily spoil the music, I did not expect it would be much harm. I got a piece of putty, crossed the street, and, elbowing my way to the inside of the crowd, took up a position at the musician's back, and just as he was squeezing the bellows the most, I put the putty into the end of one of the pipes. The effect was instantaneous, and there was no longer doubt but what sound came from the bellows, and I was delighted. But there is never a pleasure without a pain, for when I took away the putty from the end of the pipe, a piece remained in the hole, and the sound was stopped longer than I had intended. The old man frowned, and then reprimanded me, in language neither complimentary nor polite, for spoiling his music; and to make things worse, the more he tried to take the putty out, the further it went in, and at last his instrument became temporarily disabled. Some of the crowd cried "for shame," others laughed, while the old man became more violent in his language than ever. It was no use for me to offer any explanation that I did not intend mischief. It was plain that I had committed mischief, so I beat a retreat, and got to the outside of the crowd as quick as possible, and at that particular moment I was really glad that the old Highlander had lost his legs.

After this, the mysteries connected with producing the sound from the little wooden bird gradually became clear to me, and I soon discovered that exactly the same principles were involved in the operation as there are in making the sound in boys representing barking dogs, mewing cats and crying babies. In the course of time my comrade's parents had sufficient confidence in me to allow me to clean their clock once when it went wrong, and, of course, I then saw all about it. Upon the whole, I think that there exists too much prejudice among a portion of our craft against German clocks. These clocks certainly have no claim to fine workmanship, but still they have been the means of supplying many poor people with time, who could not afford to pay for a higher priced clock, and who, before the advent of the Yankee clock, would not have enjoyed that convenience.

Notable Vases.

THE Museum of the Louvre, Paris, Paris, has just acquired two vases of large size, and of the utmost importance from the scientific point of view. They are two Etruscan vases of the earliest period, with paintings in white on a red ground. On one is seen a chariot attacked by a lion —a manifest imitation of Assyrian art—and a naval engagement between two very singularly shaped vessels. The other shows two lions rampant in the Asiatic style, and two Greek myths—the birth of Athena and the boar hunt of Calydon. It likewise bears an Etruscan inscription, one of the most ancient known. The representations of Hellenic fables had not been previously noticed on remains of Etruscan painted pottery of such early date, for the two vases may be confidently attributed to the eighth or seventh century B. C.

Proceedings of the Horological Club.

A Distinguished Body of Watch and Clock Makers.

Seventy-fourth Discussion.—Communicated by the Secretary.

[Norrix.—Correspondents should write all letters intended for the Club separate from any other business matters, and headed "Secretary of the Horological Club." Direct the envelope to D. H. Hopkinson, Esq. *Write only on one side of the paper*, state the points briefly, mail as early as possible, as it must be received here *not later* than two days before the end of the month in order to be discussed and reported in the CIRCULAR for the next month.]

CLEANING OFF SOFT SOLDER.

Secretary of Horological Club:

I wish to inquire if there is any way of removing soft solder from gold so that the gold can be remelted. I am quite sure I have seen a receipt for some process. I have expected to get the information through your "CIRCULAR" but nothing has appeared so far.

G. H. M.

EASY FLOWING SILVER SOLDER.

Secretary of Horological Club:

Would you or some of your honorable body be kind enough to furnish me with directions how to make the easiest flowing silver solder, as well as gold? the gold from 8 to 14 k. A. E. K.

Mr. Rolliver replied that Mr. K. could make an easy flowing silver solder as follows: 2 dwt. coin silver, 1 dwt. brass, 3 grains zinc. Any quality of gold you have, that you wish to flow easier, add 2 grains of zinc to each dwt

Mr. M. can remove soft solder from gold by laying the article in nitric acid till the solder is eaten away; but the article should be as good as 14 kt. When you melt gold the lead or soft solder can be destroyed by saltpetre. This is a reliable process and is the one followed by practical jewelers.

He had heard of a new method, but had never tried it and knew nothing about its value. It was said to be applicable to low-grade gold, and even to silver jewelry, either for remelting or to clean off soft solder preparatory to hard soldering.

Take 2 oz. of photo-sulphate of iron, and 1 oz. of nitrate of potassia, both finely pulverized, and boil in 10 oz. of water for a few minutes, then allow the liquid to cool, when it will shoot into fine crystals. Pour off the water, if any remains, collect the crystals, then heat the water again and cool as before. Now take one ounce of this crystalized salt, and dissolve in 8 oz. of muriatic acid, or the whole of the salt can be dissolved at once in 8 times its weight of the acid, and this stock solution preserved in a suitable bottle.

When some is wanted for use, add 1 oz. of this solution to 4 oz. of boiling water in a suitable vessel, and boil in it the articles to be freed from soft solder, and they will, it is said, be entirely cleaned in a very short time.

Mr. M. might try this method, and we would be pleased to hear from him or any of our readers as to the practical result of the process.

BALANCE ARM BENT DOWN.

Secretary of Horological Club:

I have noticed the correspondence of the "Club" in the JEWELER'S CIRCULAR," and wish to refer to it for explanation of an incident which I cannot account for. I had put a fine Swiss watch in order. Some time after, it was brought back, the owner saying it had run all right for a time, then suddenly began to gain very much. I found one of the arms of the balance *bent down and caught under the short end.* I cannot conceive any possible way in which it could have been done, without breaking pivots, (there was no other damage done). It required considerable force to remove it. He said nothing unusual had happened to it, and he is a gentleman whom I would beleive under any circumstances. It would be very difficult if not impossible, to put the arm in that position without breaking, while in its place in the watch. Perhaps you can suggest some way in which it might have been done. J. C. W.

Mr. McFuzee said it was undoubtedly put there by somebody. No fall or knock could bend the balance down on one side in that way, unless the balance cock could spring sideways, which is not often the case. Some one might have done it by "feeling around" in the works, without the owner's knowledge. Sometimes customers have poor memories when they don't want to remember.

TOOLS FOR SHAPING THE TEETH OF WHEELS.

Secretary of Horological Club:

Some time ago Enquirer asked for information with respect to tools for shaping the the teeth of wheels. I beg to suggest the Ingold fraises. I have two sets; I find they do all I had heard of them. I frequently use them in preference to rounding up tool when teeth are unequally spaced; they are also very useful for correcting shape of contrate wheel teeth for carriage clocks, verge watches, &c. For this purpose you run the cutters on live spindle of lathe.

Ingold fraises consist of tool in case with 15 parallel cutters. Retail price here, 35*s.* sterling; this size covers watch work. Larger size, with 50 cutters, 50*s* sterling; name on tool, U. Guye Fleurier.

W. T.

Mr. Horologer endorsed the Ingold fraises for equalizing the teeth when they were unequally spaced. This the rounding-up tool would not do. It would merely take the teeth or spaces as they were made and cut them out wider or of a different shape. We shall be pleased to hear from our English correspondent again. There are doubtless many tools used, or ways of working, over there, which would be new and interesting to workmen in this country.

READY MADE MATERIALS FOR AMERICAN WATCHES.

Secretary of Horological Club:

I work for a store keeper who is not a watchmaker, but who knows enough to read your CIRCULAR in which he has read time and again, particularly an advertisement of the Elgin Co., that their pieces such as staffs, pinions, &c., are all made exact to a gauge, and should such piece be needed in a watch brought in for repairs, all that is to be done is to get it at the Co's., put it in its proper place, and the job is done. My sad experience is that I have very seldom bought a staff, pinion, jewel, or anything else, not even *a whole pallet*, that fitted; either the pivots were too large or too small, the hole of the balance too large for the staff *bought*, or *vice versa*. Now all these things are small in themselves, but it takes time to do them, and my boss finds fault for *wasting* so much time, as he thinks they fit all ready when bought. I have really spent as much time on putting in one of their staffs and then not have a good job as I would turn one in altogether. Favor me by trying one of their staffs on one of their own ballances; their jewels, their *table roller*, &c.

Then please take out a pallet and its staff, out of any American watch, buy one of the respective Co's., and see if any good watchmaker can make it work right in less than 2 hours. They probably have a guage for putting in pallet jewels, but they being only shellaced in they will get loose sometimes, and it is a tedious job to get it just right, for the reason that some are short and others long.

What I complain of is that their materials do not fit as they claim they do, and they ought not to make outsiders believe it so that the workman gets the blame for not doing work quick enough. B.

Mr. Waltham replied that the trouble probably was that Mr. B. did not buy the parts made for the grade of movement which he was repairing. The different grades used different sixes and shapes of parts, and a piece fitted for one grade would not fit properly in another grade. In ordering material, he shoul specify the *name* of the grade it was for, and in many cases it was well to give the *number* of the movement, also. Some parts are different in full plate and three-quarter plate movement, key winder and stem winder, old model and new model, and so on. A workman could not be too particular when sending for materials. But if he gave full information as to the kind of movement the pieces were wanted for, and got the *genuine material*, from the Company's authorized agents or offices, he would seldom have much of any fitting to do.

ALLEN'S PATENT COMBINATION WATCH TOOL.

Mr. Albert Friedenthal, 43 Maiden Lane, having sent one of these tools for the examination of the club, Mr. Clerkenwell showed it, and illustrated its use for taking off second hands, also hour and minute hands; removing dial pins, or turning the screws, and taking off the dial; removing screws generally; holding second hands while reaming them out; removing hair spring collets, roller tables, and many other uses. All agreed that it was wonderfully handy for a good many purposes, and one of those ingenious combination tools which the practical workman delights to have on his bench.

"LIME GLASS" FOR LAPS.

Secretary of Horological Club:

Will some one connected with your honorable body please inform me what "lime glass" is, and where it can be obtained? It was mentioned in one of the articles on making laps for watch and chronometer jeweling. H. B. W.

Mr. Uhrmacher replied that lime glass is simply glass made with lime added to give it hardness—while lead glass is very soft although highly brilliant, and is used for making the finer qualities of cut glass ware, lustres, prisms, &c. Common window glass is a lime glass, as also is plate glass for windows, mirrors, &c. The ambrotype and other plates used by photographers are lime glass, and bottles, &c., are made from a cheap quality of it. Lime glass is used for laps simply because it is harder than other kinds. Watchmakers generally use strips of plate glass, from 3/8 to 1/4 inch or more in thickness,

to make them strong, stiff and *durable*, as a well prepared glass lap is a very useful and highly valued adjunct to a watch jeweler's kit.

LEFT-HANDED APPRENTICES.

Secretary of Horological Club:

Will you be kind enough to favor me with an answer to the query, "Is it a serious objection or detriment to an apprentice to watch-makers trade to be left-handed?" I ask because I have one in view, to learn the trade, and he is left-handed, and not having had such an one, do not know just how much to allow for it. An answer would more than oblige me. W. F. P.

This letter gave rise to much difference of opinion. Some declared that they would not have a left-handed apprentice, as it would be more trouble to keep him from doing things wrong end first than it would be to teach the other boys the entire trade. All agreed that it was a serious objection to be a left-handed *workman*, as a great many tools and machines were only adapted for use by right-handed workmen, and the former would have to alter them over, or get them made so as to be adapted for his use—or else not use them.

Mr. Ruby Pin, however, said it would be a pity to exclude a capable lad from learning the trade simply because he was left-handed, and took the ground that he might be trained to be right-handed in in his watch work although left-handed in other things, if he was still young and not too "set" in his ways. He should consider it but little objection—provided the boy could be closely watched, and made to do things like right-handed persons. If he was right-handed in his shop work, it would be of little consequence how he did other things. Most boys could learn the trade about as readily one way as the other, if they were constantly looked after till their habits were formed. It would be all new work to them anyway, and more or less awkward at first, whichever hand they used. But practice would generally cure that, if they were not allowed to work at all except as they ought to.

The general sentiment, however, was decidedly unfavorable to left-handed apprentices. One member had noticed that a left-handed man's touch was usually heavy. Another remarked that the trade was overrun with inferior men now, and thought it would be better to exclude all but the most desirable candidates, instead of straining a point to take in those manifestly unfit and objectionable.

On the Compensation Error in the Balance of a Chronometer—Its Cause and Theory with the Gas taken out.

MUCH has been written about the cause of the error known to exist in the balance of a chronometer and much that is erroneous has been published concerning it.

I think the following lines will throw some light on the subject: I was acquainted with the cause at the time I invented the auxiliary compensation, and have mentioned it to some chronometer makers, who, however, did not agree with me. Mr. Crisp in his prize essay on the compensation balance has completely erred in attributing it to the expansion of the arms of the balance, carrying with them the timing screws and preventing the weights on the laminæ from moving in a straight line. He might have satisfied himself that the cause of error did not there exist by trying a balance with brass arms. I can see no difference between the action of the laminæ moving the weights and the timing screws when moved with a screw driver. The balance is honest and has the stamp of honesty on its face. It is found that the balance moves through unequal spaces in equal times. Do not the timing screws do the same thing? With a timing screw that alters the rate of a chronometer exactly a minute in twenty-four hours, can we be surprised if the second turn only alters it fifty nine seconds? Why expect the laminæ carrying the weights to do better? The weights have to compensate for a loss of more than five seconds for every degree of temperature which in a range of twenty-five degrees would exceed two minutes and so cause a loss of two seconds with the two extremes. We then have the cause of the error shown on the face of the balance. The late Mr. Dent attributed the error to a loss of elasticity in the balance spring, but that exploded in experiments made by the Astronomer Royal at Greenwich when he found that the loss or gain in a chronometer with a brass balance was exactly in accord with the temperature. Had Mr. Dent's views been correct there would have been increased elasticity in the cold temperatures, thus balancing each other. I will now endeavor to illustrate the foregoing conclusions by showing the ratio of the compensation. It is admitted that a chronometer adjusted to mean time in the temperatures of 50° and 80° will gain on its rate two seconds per day at 55°. Mr. Crisp in his Prize Essay gives the following figures:

For	10	0.3
"	20	1.2
"	30	2.7
"	40	4.8
"	50	7.8
"	60	10.8

He remarks that the error is not in geometrical progression but increasing as the square being at 60° thirty-six times the amount of the first error. The square theory only works in the low temperature, and a theory that does not work well both ways cannot be good. But great as is this amount it is cast in the shade by the elaborate research of Mr. Heinrich, who has just published a table with the subjoined results:

Rate at 40°		65°	90°
0.0	+	3 to 4 Seconds	0.0
Rate at 30°		65°	100°
0.0	+	7 to 10 Seconds	0.0
Rate at 20°		70°	120°
0.0	+	15 to 18 Seconds	0.0
Rate at 10°		70°	130°
0.0	+	25 to 30 Seconds	0.0

The problem to solve is that of a body moving through unequal spaces in equal times. To reduce Mr. Crisp's figures to my theory it would be necessary to assume that the first loss of three-tenths of a second takes place in 10° of temperature, and the next loss of three-tenths in four degrees—a very rapid retardation. I assume a loss of two seconds for twenty-five degrees from 55° to 80° and conclude that the first loss of one second takes place in 14 degrees and the next in 12°. If this be correct it is evident that in the next 12° the loss will be more than a second. The following figures will give the results of my theory. I couple the figures 14 and 12 for the first loss of 2 seconds—11 and 10 for the second loss of 2 seconds—9 and 8 for the third loss of 2 seconds—7 and 6 for the fourth loss and so on. These figures represent degrees of temperature. It will thus be seen that the first loss takes place in 26 degrees of temperature and the last in 13, being one half. This is certainly a slowness increasing with the temperature and the figures prove that the theory is good. I showed them to a mathematician who tried to improve on them, but he said he could not, nor could he find a rule to determine the law that governs it. It has been assumed that the theory of the pendulum and the balance are the same, hence the introduction of the square. But there is a vast difference between them. The oscillations of the pendulum do not depend on the weight of the bob, whilst the vibrations of the balance depend on its size and weight. It has been supposed that if a chronometer be so adjusted as to show the same rate at 55° and 80° it must have a gaining rate at 67° of about half a second. This, however, is disproved in the figures that I have adopted. They are very plain and simple. In the first 14° the ratio is seven-hundredths of a second for each degree of temperature and for the next 12° about eight hundredths. There is no fast point of any consequence between them. Table showing the ratio of the loss.

Rate of a chronometer at		55 = 0.0	
"	"	69 = 1.0	slow
"	"	81 = 2.0	"
"	"	92 = 3.0	"
"	"	102 = 4.0	"
"	"	111 = 5.0	"
"	"	119 = 6.0	"
"	"	126 = 7.0	"
"	"	132 = 8.0	"

Mr. Crisp's theory of the square makes the chronometer slow 10.8 seconds at 115°; nearly double the above amount—yet it will be observed the loss in my theory increases rapidly. It is quite in accord with the loss sustained in moving the timing screws—each weight on the laminæ of the balance losing one second for the first 26 degrees of temperature and increasing its loss with the temperature. Mr. Heinrich, however, makes the loss at 119° as much as from 25 to 30 seconds. Bye the bye he has been trying to make a new coat out of an old garment, making use of my auxiliary compensation for the purpose, but the old garment is as good as the new coat. In the rate published by him of the performance of his chronometer at Washington Observatory, in which he makes a comparison of his with the best chronometers rated at the Greenwich Observatory, he makes a slight omission, however, in failing to state that the figures for his own need to be multiplied by ten.

NEW YORK. ROBT. MOLYNEUX.

The Sydney International Exhibiton.

[SPECIAL CORRESPONDENCE TO THE JEWELERS' CIRCULAR.]

The Sydney exhibition was comparatively well attended by manufacturers of chronometrical apparatus, chronometers, astronomical clocks, watches, chronographs, &c. &c. Among the number of exhibitors, thirteen competed for the awards offered by the Commission. Much interest was felt by the public, but more by the importers and dealers in watches, as to who would carry off the highest award. The Commission were successful in the appointment of a jury of experts, men of energy and perseverance, and of great knowledge in the branch of scientific instruments such as were to be submitted to their judgment. The jury was composed of five members, one of whom served as chairman; we append their names: Mr. John McG. Smith, Sydney, N. S. W.; P. S. Bound, (for Switzerland), Sydney, N. S. W.; H. C. Russell, B. A. F. R. A. S., Astronomer Royal, Sydney Observatory (for England), Sydney, N. S. W.; E. Beckman, (for Germany), Sydney, N. S. W.; Gregory P. Harte (for U. S.), San Francisco, Cal.

Great care was taken by individual jurors in making up their note books during the examination of the watches and in scrutinizing the inherent and comparative merits under the ten different heads unanimously agreed upon as follows: 1—Originality; 2—Invention and discovery; 3—Utility and quality of material; 4—Skill in workmanship; 5—Fitness for purpose intended; 6—Adaptation to public wants; 7—Economy; 8—Cost; 9—Finish and elegance of cases; 10—Time keeping qualities. It was agreed that the jury should use the number 100 as expressing the highest degree of excellence, in each of these ten elements of inherent and comparative merit, and adjudge individually to each of the several exhibits such rating as their respective judgments would warrant after careful examination; these opinions, being handed to the chairman at the end of the examination and the average numbers calculated therefrom, constituted the unanimous verdict of the jury.

The jury furthermore decided to have the competing watches tested at the Government Observatory at Sydney, and upon their request, H. C. Russell, B. A. F. R. A. S., Astronomer Royal, at that observatory, consented to make these tests. Each of the competitors was requested to send three watches of his own selection to the observatory for this trial; but only eight exhibitors availed themselves of this opportunity. It is proper, however, to state here that none of the exhibitors apparently anticipated this test, and that it is possible that some of the watches might have made a better record, if they had been differently attended to since the opening of the Exhibition, but they were in this respect all upon a par. The majority of these watches had been made for exhibition purposes, and especially prepared to that end, and some had been previously rated at observatories before sending. Notably, however, to the contrary of the above, the exhibit of the American Watch Co., was the ordinary and regular product of the factory at Waltham, such as is finished every day.

Notwithstanding the possibility that these exhibits might have been better prepared for observatory time-tests, some of the exhibits as shown by the result of rating, demonstrate the wonderful advances made in the application of Horological Sciences to the manufacture of watches, and that their rating is being made equal to that of the best marine chronometers.

During the test the watches were kept in one position (pendant up) subject to the same conditions of temperature. A diagram submitted by Prof. Russell upon solicitation of the exhibitors and the jury, shows by lines and curves, the exact change of rate of each watch. For convenient reference the barometer and temperature curves are recorded on the same diagram. Although, from the short time at command the watches could only be tested in one position, a glance at the diagram will show that in some degree at least, the temperature adjustments and the isochronal properties of the balance springs were also tested. It may be observed that almost all these watches show a marked response to the change in temperature, some being over others under corrected. The American Watch Co's. No. 690,669 is remarkably free from these defects and shows the best rate of all the watches tested.

Among the cheaper watches tested that Company's No. 1,221,336 (Appleton, Tracy & Co., Nickel Keyless) is worthy of notice; its cost is comparatively small, yet its performance has been better than that of many very expensive and otherwise first class watches of other makers. Such a watch speaks volumes in favor of the system under which it was made, and is the best comment upon the accuracy of the machines that produced it.

RATES OF WATCHES TESTED AT OBSERVATORY, SYDNEY, FEBRUARY 17TH TO 26TH, 1880.

	G. Tribendau		Am Watch Co.			Kullberg.		Lange & Sons.			Nicole & Neilsen.			Thos. Russell & S.		Castleberg.		L. Audemars.		
NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	"24
MAKERS' NUMBER	611	669	2,370	987,271	670,668	1,221,336	3,171	1,035	2,526	11,527	10,967	12,609	1,004	3,632	8,870	70,690	23,496	113,516	2,724	3,588	47,150	12,731	12,483	11,680
	gain. loss. loss			gain loss.		gain loss.		gain loss.	gain loss.		gain loss.		gain loss.		gain loss.		loss.	loss.	loss.	loss.	gain gain		loss. loss.	
	M. S.	M. S.	M S	Sec.	Sec.	Sec.	Sec.	Sec.	Sec.	Sec.	Sec.	Sec.	Sec.	Sec.	Sec.	loss.	M. S.	Sec.	Sec.	Sec.	Sec.	Sec.	Sec.	Sec.
February 18	3 59.8	0 47.1	2 24.8	2.7	2.0	4.8	0.8	1.7	1.4	3.3	0.2	3.0	2.4	2.3	10.6	....	....	21.7	.....	12.0	0.2	3.1	1.2	
February 19	2 15.0	1 08.4	2 57.8	2.2	2.1	5.0	1.5	2.2	1.9	3.8	gain 0.6	2.4	0.3	2.0	5.9	2.4	2 23.3	24.7	0.3	20.7	loss. 12.2	1.9	1.5	gain 2.0
February 20	4 15.0	1 04.1	2 42.2	1.5	1.8	4.5	0.7	1.8	2.2	2.5	0.4	2.2	1.8	6.9	6.8	0.4	2 37.3	34.9	4.7	18.6	16.8	0.3	gain 1.2	loss. 1.2
February 21	2 32.0	1 27.2	2 35.3	4.8	1.9	2.7	0.5	1.4	1.4	3.5	loss. gain 0.9	1.8	0.8	6.9	7.4	4.4	2 44.3	38.3	gain 5.5	11.6	14.0	0.7	1.4	gain 1.1
February 22	3 30.0	1 35.0	2 34.0	5.3	1.3	2.8	gain 0.2	0.4	2.0	4.2	loss. 1.0	2.3	loss. 0.5	5.6	7.9	3.5	2 56.0	41.8	loss. 15.5	12.4	15.8	loss. gain 0.3	gain 0.4	0.6
February 23	1 30.0	1 20.0	2 28.0	3.5	0.0	3.9	0.0	0.3	2.2	4.0	0.2	0.7	loss. 2.9	7.2	7.6	0.0	spring broken	37.2	9.0	14.4	15.2	gain 1.1	1.0	loss. 1.0
February 24	3 45.0	1 51.0	2 51.5	0.0	0.9	4.6	loss. 0.9	0.1	2.1	4.0	0.4	gain 1.3	0.1	5.6	loss. 7.2	4.5	.....	40.3	11.0	14.3	15.1	1.5	0.5	loss. 0.7
February 25	2 45.0	1 14.0	2 25.7	0.6	1.2	4.0	0.7	loss. 0.9	2.3	3.8	0.5	0.7	0.7	5.3	7.9	13.7	.....	30.0	9.2	15.4	10.8	0.7	1.0	gain 0.5
February 26	3 15.0	1 19.0	2 33.8	loss. 0.1	1.1	4.4	0.7	gain 0.5	2.5	5.2	1.4	0.0	0.8	6.3	6.9	10.1	.....	31.2	22.3	15.1	13.8	1.3	1.4	loss. 0.9
Extreme Rates	2 45.0	1 03.9	0 33.0	5.4	1.2	2.3	1.7	3.1	1.1	2.7	2.7	5.3	3.7	5.2	4.7	18.1		32.7	20.1	27.8	9.1	6.0	3.4	4.1	3.2

Much comment was made on the compensating balance applied to the first grade watch of this Company by their Superintendent, C. V. Worcl; the jury expressed their opinion that in this balance every theoretical requirement is more fully met than in any other balance brought before their notice. Owing to some spots of rust on the balance of the only watch exhibited and comprising this new invention—which damage was possibly occasioned by the too critical and continued examination and handling by the jury, or by some other accidental cause, this timekeeper could not be made available for the observatory trial, there having been no time for experimenting with the delicacy of its adjustment.

In the construction and ornamentation of cases the Waltham Company employ some three hundred designs. The finish of the American case, and its substantial construction, commend themseves to the appreciation of all concerned in the dealing and wearing of watches. A dust proof stem-winding case called for special examination; it supplied a perfect safeguard against the intrusion into the watch of dust

and moisture. Apart from this much required quality, it possesses the advantage of a smaller cost, since its manufacture necessitates less material than the ordinary case, without, however, diminishing the strength of the case.

The following tabular arrangement shows the rank given to Waltham watches as compared to the goods receiving the next highest numbers :

Name of Exhibitors.	1 Originality.	2 Invention and discovery.	3 Utility and Quality of Material.	4 Skill in Workmanship	5 Fitness for purposes Intended	6 Adaptation to Public Wants.	7 economy	8 Cost	9 Finish & Elegance of Cases	10 Time-giving qualities	Total.
American Watch Co., of Waltham, Mass., U. S. A.	98	95	95	93	100	100	100	100	100	100	981
A Lange & Sohne	45	33	68	83	86	73	59	79	71	89	686
Louis Audemars	98	24	73	85	80	52	44	58	76	79	671
Victor Kullberg	—	—	73	80	89	53	57	65	73	96	586
Nicole & Nielson	28	22	47	58	70	60	48	58	76	80	527
Castleberg & Co	—	—	29	30	36	41	25	32	42	53	288
International Watch Co	—	—	32	31	37	49	41	63	34	—	287
Thos Russell & Sons	8	—	25	30	36	34	22	26	42	44	267
A. Tribendeau	—	—	10	19	15	15	18	19	20	—	116
A. Backschmid	—	¶—	11	7	15	12	10	10	10	—	76

In consideration of the facts developed in this examination, and the preponderence of elements of inherent and comparative merits adjudged by the jury (each in independent judgment) being nearly equal to fifty per cent. more than the next highest exhibit, the jury awarded the American Watch Co of Waltham, Mass., *a first class award* and such other special distinction, diploma medal or award, as is consistent with the duties and obligations of the International Commission, *for the largest and most complete exhibit of the horological exhibits examined.* Also a *first class award* for the *time keeping qualities of all* grades of these watches. Also a *first class award* for the perfection of the American system of watchmaking and the improvements in the mechanical parts of the watch, being notably : Fogg's patent safety pinion, the perfect epicycloidal form of all the teeth of the train, in every grade of watch alike, and the isochronal adjustment of the balance spring. Also to *Charles V. Weerd*, Mechanical Superintendent of the American Watch Co., a *first class award* for his new mode of compensating balances. Also a *first class award* for the improvements in cases, the number of artistic forms and designs used and the beauty and elegance of their finish.

The jury conferred a first class award also upon Victor Kullberg, chronometer maker, England ; Nicole & Nielsen, watchmakers, England ; A. Lange & Sohne, watchmakers, Germany ; Louis Audemars, watchmaker, Switzerland.

The exhibit of the Gorham Manufacturing Co. was also honored with the highest award and the plated ware of Reed & Barton was equally distinguished. The solid silver ware of the Gorham Manufacturing Co., attracted much attention owing to the elegance of design and the unsurpassed beauty of finish

The American exhibits of watches, Silver and Plated ware, presented a fine appearance, and the throngs who daily visited them much applauded the trophies of medals and awards, which the exhibitors carry off to their own country.

Owing to the difficulties in reproducing the diagrams for printing purposes, we cannot present them to our readers in this issue but hope to present the same in our next number A copy of the diagram may be seen at our office, 42 Nassau Street.

ANSELM.

The Watchmakers' and Jewelers' Guild.

THE Watchmakers' and Jewelers' Guild of the United States met at the Sherman House, Chicago, May 12. There were present delegates from Illinois, Wisconsin, Iowa, Michigan, Nebraska, Arkansas, Missouri, Indiana, Minnesota and Kansas. The President, E. R. P. Shierly, called the meeting to order. The Secretary read the minutes of the last meeting, which were adopted. A special committee on membership reported in favor of the admission of a large number of new members, whose applications had been received.

S. H. Hale, representing the Jewelers' League, of New York, was introduced, and, in a forcible manner presented the advantages of life insurance presented by the League. His remarks were attentively listened to, with marks of evident approval of the purposes of the League. At the conclusion of his remarks the Guild adjourned until 2 P. M.

On reassembling, President Shurly delivered his address, the principal features of which we give below :

PRESIDENT SHURLY'S ADDRESS.

GENTLEMEN : About one year ago the Watchmakers' and Jewelers' Guild of the United States was inaugurated, for the purpose of protecting the retail trade, promoting good fellowship among the craft, also as a senate, if I may so use that expression, of the different associations expected to be formed in the several States. At that session the present constitution and by-laws were adopted, and the machinery necessary to govern such an institution. At that time the State of Illinois had a strong and flourishing association, Iowa an energetic one, and other States were moving in that direction. It may be asked, what has been accomplished by this Guild in furtherance of the good work ? My answer is, all that it has been possible to do with the means at hand. And much good has been done, especially by the State societies mentioned ; in fact, it has been a year of work. What has been the result ? Before these associations came into life the entire Northwest was flooded with circulars from the jobbing houses of Cincinnati, St. Louis, Philadelphia, Chicago, and a few in New York City. Since their organization, and especially in those States where they exist, the wholesale houses use the utmost care in sending out price lists. The question may be pertinent I ere: Are price lists necessary for the trade ? Personally, I must confess they are a convenience, and if it were possible to keep them in their proper channels, all would concede that point. Some of the leading houses in Chicago claim that the utmost care is exercised in the manner in which price lists are sent out, only in sealed envelopes, and to those only known to be in the trade. I certainly can see no objection to their use, if the illustrated books are numbered and a price sheet sent to the jeweler in a sealed envelope. Some of the best houses in this city that invite the jewelry trade do not issue price lists, and seem to be flourishing.

At the last session it was thought to be a good thing to have a watch movement, or a few grades of movements, marked "Watchmakers' and Jewelers' Guild." The Hampden watch Company agreed to make the watches required and furnish them to the retail trade. But, alas ! the "boom" came, the rivulet of trade became a mighty river, and no one or two factories could fill the demand. The wholesale dealer, too, ever alive to his interest, plied the Hampden factory with fat contracts, and the fulfilment of them had to be accomplished. The consequence was that the retailer, with his guild watch, was left far behind. The importation of Swiss watches is rapidly on the increase. I think there are capital, skill and energy enough to produce an American watch to supply the market. Hence, the project of a new watch factory, the products to be sold to the retail trade ; the stock to be taken by the retail trade only ; no one person to have more than ten shares at $50 each. I would also suggest that those in the trade holding stock have a rebate on the movements of say 10 per cent. There has been no company formed as yet, but the commissioners have hopes that the stock will be taken.

I hope that the guild will indorse this project as one of the best yet devised for the benefit of the retail trade.

Before I pass the reins of power into abler hands, I have a word to say in favor of a guild stamp or some device to insure the quality of the gold used in each article. The argument has been ably advanced in its favor by the President of the Iowa Association. It is true that the improvement in trade has taken the minds of many from this subject, but perhaps a lull may come, and then this most desirable object may be accomplished. I see that by some of the advertisements in the trade papers that the idea has taken root with some of the manufacturers, and they advertise their own factory marks. If it is not possible to have a Guild stamp, let us petition Congress to enact a law compelling the manufacturers of wrought gold to stamp the quality of their goods. I call your attention to this matter.

At the conclusion of the above address the following gentlemen were elected by ballot as officers for the ensuing year: President—W. H. Boynton, Manchester, Iowa; First Vice President—J. S. R. Scoville, Morris, Ill.; Second Vice President—John Baumer, Omaha, Neb.; Third Vice President—J. W. Cathcart, Jackson, Mich.; Fourth Vice President—W. H. Thorp, Beaver Dam, Wis.; Fifth Vice President—Joseph P. Angell, Pine Bluffs, Ark.; Sixth Vice President—S. M. Hitchcock, Michigan City, Ind.; Seventh Vice President—A. P. Robinson, St. Cloud, Minn.; Eighth Vice President—A. J. Lawrence, Columbus, Kan.; Secretary and Treasurer—Joseph Baker, Rock Island, Ill.

The President appointed the following Executive committee: Colonel E. R. P. Shurly, Chairman; Messrs. C. B. Shourds and Joseph Baker.

A ballot for the place of holding the next annual meeting, to be held the second Wednesday in May, 1881, resulted in favor of Rock Island, Ill.

A motion authorizing W. N. Boynton and Joseph Harris to travel in the interest of the Guild, and to urge upon the retail trade the necessity of maintaining their State organizations, was adopted, with permission to these traveling agents of the Guild to carry goods for sale in order to defray their expenses.

The retiring President's suggestion with regard to the adoption of a guild trade-mark was unanimously adopted, and Messrs. Shurly, Shourds and Baker were appointed to correspond with Eastern manufacturers upon the subject.

The following resolution was then adopted:

"*Resolved*, That we cordially recommend the Trade Watch Company to the craft, and believe that its success will be of the utmost importance to the trade. We further promise such company our patronage."

Mr. Baker, of Rock Island, presented the plans, and a proposition from the Directors of the Rock Island Watch Company, for the purchase of their property by the Guild. The matter was referred to the Executive Committee. The property is worth $40,000.

A resolution was unanimously adopted thanking Colonel Alvin Hulbert, proprietor of the Sherman House, for his courtesy in furnishing the club room for the sessions of the Guild.

Many able speeches were made by members from different parts of the country upon points beneficial to the trade—the best manner of protecting the community from fraud on the part of unprincipled manufacturers, etc.

Thereupon the meeting adjourned.

THE Gorham Manufacturing Co. have just been notified that their design for the prize to be given at the Eastern Rowing Association's regatta to take place on the Seekonk river near Providence, R. I., June 17th, has been accepted. The cup is of magnificent proportions. It consists of an oblong base, over two feet in length, with an ornamental border and resting on ornamented feet. From the center of this base there rises a column with base and capital complete, ornamented with crossed oars, two flags, and wreath of immortelles. Surmounting this is a large globe supported by flowers. On this globe stands erect an oarsman, holding an oar in his hand and crowned with a wreath of laurel. The total height from base to tip of oar is three feet. On either side of the column are vases one foot in diameter and eight inches high. Engraved on the polished surfaces of these vases are aquatic scenes, one representing an oarsman pul'ing in a beautifully modeled modern shell; another scene presents an oarsman tugging away in an an old fashioned, common working boat. The artist of the Gorham Co. has made the design sufficiently eloquent to speak for itself.

This award is all the more gratifying from the fact that designs were advertised for throughout the country, and nearly all the leading silversmiths were represented in the competition. The order for this prize comes through the well-known house of Messrs. Shreve, Crump & Low of Boston, and when the piece is completed, it will be placed on exhibition at their store.

THE Gorham Manufacturing Co. have just completed and have now on exhibiton the "Travers Prize" for the Saratoga races. This cup has now been made by this Company four successive years, and is said to be one of the most satisfactory and attractive pieces ever offered. The form of the base is oblong, standing on four feet. Springing from the base is an upright standard, round in form but with square caps. From the sides of the standard extend two arms of beautifully wrought design, each supporting a basin for fruit or flowers. On the top of the square cap of standard is the figure of an antique horse and warrior; the pose of their figure is spirited and life like, yet not exaggerated, and the whole piece has the appearance of lightness in design, yet strength that is not often found in pieces of this character, for while this is a Racing Prize it is also worth criticism as a work of art.

The base is of polished silver while the standard is satin finish. The two arms and caps are in oxydized silver, as are also the figures on top.

WE find the following letter in the *Jeweler and Metal Worker*, of London. It is so pertinent that no comment is necessary:

To the Editor, Sir—In a report by a contemporary of a recent meeting of the British Horological Institute, a Vice President, Mr. David Glasgow, is reported to have stated that the Americans "send work that has been bought in Switzerland here to be completed and then call it their own." Mr. Glasgow may think to impose this statement on some as truth; but we very much mistake the intelligence of the members of so distinguished a body, if they put any faith in such absurd nonsense. Mr. Glasgow may be an authority on some matters, and we doubt not is a very good one on the purchase by Englishmen of movements in the rough in Switzerland, finishing them here and calling them their own, but he displays the most lamentable ignorance when he undertakes to give an opinion about American workmen and American watches. We advise him to take a few lessons from Mr. Ganney, and not make himself ridiculous and a laughing-stock in the trade, nor further dishonor the Society he represents as an officer by allusions and remarks members are ashamed of.

Yours, &c.,

ROBBINS & APPLETON.

WALTHAM BUILDINGS, Holborn Circus, London, E. C., May 8, 1880.

LEROY W. FAIRCHILD, manufacturer of gold pens, pencil cases, etc., has one of the most complete and thoroughly equipped factories at 694 & 696 Broadway, to be found in this country. The perfection to which he has brought machinery for the production of pencil cases is something to be proud of and could be accomplished in no other country. He has recently fitted up a show room at No. 1 John Street, where can be seen a full line of his productions.

Trade Gossip.

Alex. M. Hays sailed for Europe in the *Gallia* on the 26th inst.

Hiram Hotchkiss, of Buffalo, is disposing of goods at auction.

Onyx jewelry is quite popular, and many beautiful designs are offered.

J. Bailey, of Bailey, Banks & Biddle, of Philadelphia, sailed for Europe May 22.

Thomas Le Boutillier, of Le Boutillier & Co., expects to sail for Europe June 16.

D. C. Hope, formerly of Sparta, Wis., has removed to Colorado with a view of settling there.

G. F. Vieth, of Messrs. Oppenheimer Bros. & Veith, sailed for Europe May 1, in the *Britannic*.

R. N. Peterson, of Messrs. Baldwin, Sexton & Peterson, sailed for Europe in the *Baltic* on the 15th inst.

Joseph Fahys and wife sailed for Europe May 12, and will spend the summer months in traveling.

Tiffany & Co. announce that their wholesale watch department will be discontinued after the 1st of June.

The principal houses manufacturing jewelry will close at three o'clock in the afternoon of Saturdays during the summer months.

E. O. Reese' jewelry store at Coudersport, Pa., was destroyed in the conflagration that devastated the business portion of that town.

T. B. Shaw, formerly of the firm of M. W. Shaw & Bro., Galveston, Texas, has returned to that city with a view of establishing himself in business.

C. G. Alford, of C. G. Alford & Co., is rusticating in the Adriondacks with rod and reel. Between the trout and the mosquitos biting him, he is expected to have a lively time.

R. D. Kirby, who has for some time been assisting the eloquent French, the distinguished jewelry auctioneer, has entered the service of the Meriden Britannia Company.

The Jeweler's Protective Union is the name of a society of workmen recently organized for mutual protection, etc. They held a mass meeting at Germania Assembly Rooms on the 22d inst,

While A. R. Foxcroft, a diamond cutter on Tremont Street, Boston, while absent from his shop during dinner hour, the door was forced open and some sixty diamonds valued at $2,000 were stolen.

The patent Office at Washington no longer requires or allows the filing of a model in that department unless in the examination attending an application for a patent a model is found to be necessary.

Burglars are spending their vacation in the country, and, having an eye to business as well as pleasure, are raiding the jewelry stores by day and night. Cold lead is said to disagree with their criminal constitutions.

Albert Lorsch returned from Europe in the *Gallia* on the 19th of May, after an absence of eighteen months. He returns with renewed health and vigor, and a line of specialties never before presented to the trade.

Parisian youths are rejoicing in a new style cane. The head is ornamented, and, by pressing a spring, a spray of perfume is ejected from it. Of course, New York "swells" will require these dainty articles at once.

A number of the young men employed in the jewelry stores in Maiden Lane and vicinity have organized a base ball club, and are practicing vigorously, with a determination to make things lively during the ball season.

F. D. Barnum, of Louisville, has effected a satisfactory settlement with his creditors. Mr. Barnum is to be congratulated on his success as the trade is growing reluctant to consider any offers of compromise without thorough investigation.

Charles P. Starr & Co. of Owego, N. Y., are candidates for a compromise. They owe $15,000, have $8,000 of assets, preferred creditors to the extent of $4,000. They offer 25 cents on the dollar. And yet their creditors are not happy.

The New York Jewelers' Base Ball Club and the Providence Jewelers' Base Ball Club are to meet in deadly strife on the diamond field in July It is probable that the game will be played in this city, the Providence Club being guests of the New York Club.

A newsboy with artistic instincts recently painted on the sidewalk in Maiden Lane, an imitation of a piece of lemon peel that looked so natural that several persons tried to kick it away, and one corpulent gentleman in the trade is reported to have slipped up on it.

E. S. Johnson & Co., makers of gold pens, pencil cases, etc., have removed from 44 Nassau Street to their new store which they have recently fitted up and rendered exceedingly attractive on the corner of Maiden Lane and Nassau Street. We wish them continued prosperity in their new business home.

Kearney & Swartchild, of Chicago, have removed to their new quarters, Nos. 133 & 135 State Street. They occupy the second and third floors, which they have fitted up in a neat and substantial manner, and with every requisite for the display of goods and the convenience of buyers.

A. K. Sloan, of Carter, Howkins & Sloan, and E. C. Fitch, of the firm of Robbins & Appleton, have gone into the wilderness on their annual trout fishing excursion. We expect to see them return from their Canadian trip as brown as the Indian guides they have secured as pilots.

The annual adventurer—with a title, of course—has arrived in the city, and is offering bogus diamonds and imitation stones as collaterals for temporary loans. His present address is "care of the Warden of the Tombs," a special detective having recently cut him short in his confidence operations.

Jewelers visiting the city can spend a pleasant afternoon at the Metropolitan Museum of Art, gathering entertainment and instruction simultaneously. No better examples of classical jewelry can be found anywhere. Our manufacturers would do well to place on exhibition there, examples of their artistic work for comparison with that of the ancients.

A little girl brushing her hair with a celluloid brush is reported to have created so much electricity by her manipulations that a great degree of heat was developed, the brush suddenly exploded, and the little girl was deposited in separate pieces over four adjoining counties. At least, this is a story that the insurance papers are printing and seem to believe.

Several of our manufacturing establishments will be closed entirely during the summer months, and others will run on half time. Workmen who get three days employment a week, during the next few months will be very fortunate. Large stocks have already accumulated in the hands of jewelers, and the closing of factories for a time is a wise precaution to avoid overproduction.

Henry Troemner of Philadelphia, has recently built for the United States Assay Office in that city, a pair of gold balances of wonderful accuracy. Their capacity is 10,000 Troy ounces in each pan and indicates the marvelous sensibility of an hundredth of an ounce when loaded. This degree of accuracy can be better appreciated when it is considered that 1500ths Avordupois is to be put in motion.

A mountain of turquoise has been discovered in New Mexico, and the local papers are going into ecstasies over the big find. As a matter of fact, the New Mexico turquoise is of little value, being soft and spongy, soon losing its brilliancy. We have seen some of them and have heard experts pass judgment on them. They will only be used in the cheapest kind of jewelry, and will occupy no place among the arts.

A fine crayon picture executed by Ben. Lander, entitled "From an Unknown Shore" has been photographed, and copies of it may now be obtained in the picture stores. It is a charming picture, representing a beautiful baby resting in a sea shell on the shore of the ocean. Mr. Lander is one of the trade, but has devoted himself to art during the past two years, and has achieved enviable distinction for executing portraits in crayons.

The combination among the gold chain manufacturers has come to grief, and piracy and fraud in the business may be expected to come to the front again. A few manufacturers, noted for their tricky methods of doing business, joined the organization for the sole purpose of defeating it. They have succeeded for the present, but retribution is sure to overtake them in the end. Premeditated and deliberate swindling, by means of debased and fraudulent goods, cannot thrive for any great length of time. Honest manufacturers must take measures for self protection, and it will not be long before these unscrupulous manufacturers will be shown up in their true colors.

Wheeler, Parsons & Hayes have extended their business facilities by annexing the rear office of the adjoining building, which they have fitted up as a packing and shipping room. They have also made numerous changes in their old offices, which contribute materially to their comfort and convenience, while their manufacturing facilities, always large and extensive, have been greatly increased with a view to producing a larger and wider range of fine gold goods. This firm has recently issued a very neat price list of American Watches. It is designed exclusively for the use of the legitimate trade, and may be obtained by enclosing business-card.

Workshop Notes.

A cheap substitute for silver has been found in aluminum made from bauxite, at a cost of 20s the lb.

Dromier has discovered that bronze is rendered malleable by adding to it from ½ to 2 per cent. of mercury.

In bleaching diamonds, Ch. Riballier recommends heating grey or brown diamonds with carbonate of lime and powdered coal in air-tight crucibles, and allowing them to cool slowly.

In drilling glass stick a piece of stiff clay or putty on the part you wish to make the hole. Make a hole in the putty the size you want the hole, reaching to the glass of course. Into this hole pour a little molten lead, when, unless it is very thick glass, the piece will immediately drop out.

Artificial pearls have long been manufactured with the greatest skill and ingenuity, and so close is the imitation that alternate strings of false and genuine shown by jewelers can scarcely be distinguished. Mourning jewelry of black glass has replaced the more expensive jet ornaments among the lower classes.

To harden copper and copper alloys Everett gives the following recipe : Melt together and stir until thoroughly incorporated, copper, and from 1 to 6 per cent. of manganese oxide. The other ingredients for bronze and other alloys may then be added. The copper becomes homogeneous, harder and tougher.

How to give a brown tint to steel. Dissolve in four parts of water, two parts of crystalized chloride of iron, two parts of chloride of antimony, one part gallic acid and apply with a sponge or cloth, and dry in the air ; apply and dry till the color attains the tint required and then rub well with oil. This is said to resist atmospheric moisture.

A material that can be carved, says *The American Machinist*, may be made out of peeled potatoes, which are prepared for this purpose by being first blackened for thirty-six hours in eight parts of sulphuric acid to one hundred of water ; it is next dried with blotting paper, and then pressed. The French now manufacture pipes, in close imitation, it is said, of meerschaum, from this novel substance. A heavy pressure gives a material so hard that good billiard balls in imitation of ivory can be made from it.

Dronier claims to have discovered a simple method of rendering bronze as malleable as copper, iron, &c. This consists in the addition of a very little mercury—½ to 2 per cent. It seems to act mechanically rather than chemically. The mercury may be combined with one of the metals with which bronze is made, before they are combined, by pouring it into the melted metal and stirring well, or it may be put into the melted copper along with tin, or just after the latter has been added, or an amalgam of tin stirred into the melted copper.

A good cement for glass, and one which completely resists the solvent action of water, may, according to Herr H. Schwarz, be prepared by the following process :—From five to ten parts of pure dry gelatine are dissolved in one hundred parts of water. To the solution about ten per cent. of a concentrated solution of bichromate of potash is added, and the liquid is kept in the dark. When articles joined by this cement are exposed to the light the gelatine film is acted upon by the chemical rays, the chromate being partially reduced, and the film of the cement becomes tough and durable.

How to dissolve shellac. Put in any suitable vessel the desired quantity of shellac ; place this in another large vessel containing hot water, and pour upon it rather more than enough boiling water to cover it ; now take liquid ammonia and pour in slowly but steadily, and stir the melted shellac till dissolved. If too much ammonia is poured in, the solution will be very dark and spoiled ; if too little, it will not be sufficiently dissolved. The natural color of the shellac ought to be preserved. When cold it must be filtered, and is ready for use, and will keep for any length of time.

Professor A. Sacchi, who has been for some time engaged in a chemical investigation of the lava products issued from Vesuvius in 1631, has recently made an interesting communication to the Royal Academy of Sciences at Naples, with regard to the presence in those deposits of a new metal. The material he has operated upon consists of delicate yellow incrustations found in the crevices of the lava. This has been named by him Vesbine, while the supposed new metal he has termed Vesbium. As Professor Sacchi has only succeeded in isolating about three grammes of vesbic acid, he is not absolutely certain of the existence of the new element, although all the indications point to it. The supposed metal appears to be allied to vanadium or molybdenum.

In the refinery of Messrs. Rossler, at Frankfort, gold extracted by boiling sulphuric acid from the silver coin withdrawn from circulation in Germany is redissolved in *aqua regia*. The solution of auric chloride is allowed to clear, and is largely diluted with water, when the gold is precipitated in a very pure state by means of ferrous chloride. This gold is met with in commerce under the name of "Frankfurter Scheidegold," and on assay its standard is 999.4. When cupelled with the necessary amount of lead, it was freely maintained in a superfused state, and "flashed" with great intensity.

It is well known that glass acquires remarkable toughness by being annealed in oil and that a high degree of hardness is conferred upon metals by a similar process. It is said that engravers and watch-makers of Germany harden their tools in sealing-wax. The tool is heated to whiteness and plunged into wax, withdrawn after an instant and plunged in again, the process being repeated until the steel is too cold to enter the wax. The steel is said to become, after this process, almost as hard as the diamond, and when touched with a little oil or turpentine, the tools are excellent for engraving, and also for piercing the hardest metal.

Mr. G. P. Girdwood, of McGill College University, Montreal, gives the following as a probably new experiment by which the property of transparency of gold in aqua regia can be neutralized with carbonate of soda, and the gold precipitated by adding a solution of oxalic acid to the hot gold solution, the gold falls down as a yellow powder with bright-colored spangles A microscopic examination of this precipitate reveals triangular and hexigonal plates, which transmit light, the color of which depends upon the thickness of the crystal. When one of the crystals happens to overlie another, the edges are sharply defined by the difference of color.

In reducing size of wedding rings, all first class jewelers have what is called Ring Sizes. A round brass plate ¾ in. thick to about 4 in. dia., with seven or eight starting holes of graduating sizes, and punches of same metal which fit the holes. To reduce the ring it is placed in the widest part of the hole (which fits nearest). Then the punch (for that hole) is driven down by a wooden mallet till the required size is obtained. Sometimes the ring has to be passed through two or more holes, at others not quite through one. To enlarge the ring the punch (nearest in fit) is passed through the ring, using the opposite side of the plate and a larger hole than the punch is in size. To finish the ring, which is very little damaged, it is put on a carrier between lathe centres, and a burnisher used, after which it is polished with rouge in the same manner (between lathe centres). This process will not take off (if carefully done) a grain in weight.

In bleaching or whitening silver jewelry, Mr. Bush in a communication to the *British Horological Journal* gives the following method : "After silver articles have been annealed and boiled in water, acidulated with a twentieth part of sulphuric acid, and made thereby as white as possible, they are covered with a paste made of equal parts of finely-powdered saltpetre and chromal alum, and annealed and thrown whilst hot into a freshly-made solution of sulphuric acid, same as for boiling out, when they will assume the perfect whiteness seen on new goods.—Silver-plated articles are scratch-brushed and otherwise thoroughly cleaned and rinsed, and immersed in connection with a piece of clean zinc, into a silvering solution made of pure silver and the best of cyanide of potash in distilled water, filter and keep for this purpose. This solution must not contain more cyanide than is necessary for the dissolving the precipitated chloride of silver, and may be diluted with a larger quantity of distilled water as ordinary silver solutions."

How to made a good poising tool. A very useful poising tool can be made by adapting to one end of the ordinary depthing tool, two new centres of steel wire, about a half inch of the inner end of each wheel is filed away somewhat beyond the diametrical line. Harden and polish these ends, and they will present when properly fastened in the tool by the set screws a very nice sharp angle on which to poise the balancer. The adjustment for the length of staff is of course made by the screw which opens the tool. Removing the roller from the main-wheel arbor in cases where it screws on, is sometimes troublesome, unless some convenient tool is at hand to do it with. Such a tool may be made in a few moments by taking a pair of old (or new) round nose plyers, and grinding or filing the points to a size and shape that will take into the holes usually made in the roller for the convenience of unscevering it ; the plyers can be opened to any distance, and consequently will fit all sizes. Place the winding square firmly in a bench key held in the left hand, then apply the points of the round plyers in the holes in the roller, and by firm, steady pressure it will be easily unscrewed, with no danger of damage to any part.

THE

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THE

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A Co-operative Watch Company Suggested.

EVERY little while some enterprising person gets up a grand co-operative scheme with which to delude the public. Sometimes it is a co-operative building scheme; then a co-operative insurance company; or a co-operative store, where every member will have the privilege of buying whatever he wants for less than the cost of manufacture; or a co-operative ladies' dress association. All these and various other co-operative schemes, have lived their brief lives and then disappeared, mourned by hundreds of deluded victims. The latest scheme of this kind we have heard of was put forward in all seriousness, and endorsed by sensible men, at the recent meeting of the Watchmakers' and Jewelers' Guild of the United States. Unless we should be accused of misquoting the proposition, we make the following extract from the proceedings of that body:

The President said: "The importation of Swiss watches is rapidly on the increase. I think there are capital, skill and energy enough to produce an American watch to supply the market. Hence, the project of a new watch factory, the products to be sold to the retail trade; the stock to be taken by the retail trade only; no one person to have more than ten shares at $50 each. I would also suggest that those in the trade holding stock have a rebate on the movements of say 10 per cent. There has been no company formed as yet, but the commissioners have hopes that the stock will be taken."

The following resolution was adopted:

"*Resolved*, That we cordially recommend the Trade Watch Company to the craft, and believe that its success will be of the utmost importance to the trade. We further promise such company our patronage."

"Mr. Baker, of Rock Island, presented the plans, and a proposition from the Directors of the Rock Island Watch Company, for the purchase of their property by the Guild. The matter was referred to the Executive Committee. The property is worth $40,000."

This is simply a proposition for the establishment of a co-operative watch company. We do not question the good faith of the gentlemen who submitted this scheme, but they are certainly ignorant of the history of co-operative enterprises if they flatter themselves that the plan proposed can, by any possibility, be made successful. It has been the work of years, backed by unlimited capital, shrewd business tact and the best mechanical skill, to build up the reputation of those American watches now so well known in the markets of the world. Hundreds of thousands of dollars were hopelessly sunk before success was achieved in any instance, and, where one enterprising company survived the trying ordeal and won success, several others failed. To win success required the undivided attention of keen business men and capitalists, who were experimenting with their own money, and who jealously guarded every expenditure. It is easy enough now for outsiders to look over the field and say "so much money put into watch making machinery produces so many watches, and these bring so much money." They overlook the fact that bushels of money were consumed in establishing a business and in building up a reputation for the watches produced. Any new watch company entering the field would have the same difficulties to overcome, enhanced by the active competition of existing companies, and the same money to expend in obtaining that degree of excellence for its watches that others possess, and in establishing their reputation. The Rock Island Company offers to sell its works to the Guild for $40,000. Suppose the Guild buys this $40,000 plant, what is the capacity of such works, and how many members who promise it their patronage could obtain their supply of watches from a factory of such limited capacity? Even granting the capacity of the works to be equal to supplying the demand, experience has demonstrated, both in this country and in Europe, that the co-operative plan of carrying on business is a failure. In a very few instances only has it been successful, and in those cases success has come of the fact that the members were closely bound together in the pursuit of the same industry, and depended upon the work provided them by the co-operative establishment for their support. That is to say, the members contributed their labor to the production of certain articles of commerce, and divided the profits on their productions to compensate them for their labor. But all co-operative enterprises that have lacked this community of industrial interests, combining the personal supervision of each individual over the business and industrial branches of the enterprise, have been failures. The experiment has been repeatedly tried in this country and failed as often as tried. Divided counsels, the lack of personal supervision of those interested, and the machinations of a few who sought to obtain entire control, have been the rocks on which co-operative enterprises in the past have split. And we predict a like fate for any co-operative watch company that may try the experiment.

Suppose the Guild is successful in selling stock of the proposed company, how long will it take and how much capital will be required, to produce a watch equal to those on the market, or that *representative members* of the trade can handle? If it succeeds in making such a watch, for what price can it be sold? How long will it require to make the supply equal to the demands of all the members of the Guild? There is also, the element of competition to be taken into account. The Guild must not expect, even if successful in producing good watches, that the old companies, that have spent millions of dollars in perfecting their machinery and their products, are going to sit idly by and see a combination of dealers monopolizing their trade. The mettle they have shown, in building up their business in the face of foreign competition and native prejudice, is a guarantee that they will not surrender it without a struggle. As the members

of the Guild have pledged themselves to patronize this prospective co-operative company, they have given the cue to the present manufacturers to adopt the same measures. Suppose these should get together and say that on and after July 15 we will not sell our watches to any stockholder in the new company or to any one who has promised to patronize it. Where would these gentlemen obtain goods till such time as the new company can furnish them? If monopoly and combinations are in order as against legitimate trade, it is as fair for one side as for the other. Dealers have not, as we understand it, any complaint to make against existing watch companies—they are satisfied with the goods and with the terms—but they entertain the idea that by going into the manufacturing business for themselves they can realize both the manufacturers' and the dealers' profits. A more mistaken notion was never entertained by sensible men. They cannot hope to make watches for less than the old companies do, and they admit that the manufacturers' margin of profit is no greater than it should be. How, then, can they hope to compete with the old companies and still make two profits? The whole scheme is so absurd on its face that we have no idea that there will be found enough verdant dealers in the country to take one-half the proposed stock in this co-operative phantasy. But there is one question that suggests itself: if the business of watchmaking is so profitable as to excite envy in the breasts of members of the Guild, how comes it that the Rock Island Company is so anxious to sell out its valuable property? Neither men nor corporations are in the habit of letting go of a good thing when they have got it, and we confess our surprise at seeing the Rock Island Company offering to sell on any terms. Can it be that the members of the Guild are deceived as to the profitableness of watchmaking, and that the Rock Island Company is seeking to saddle them with a business that does not pay? Or is there a "ring" in the project, and are there scheming men at the bottom who will exert themselves to sell the stock to unsuspecting dealers and then "freeze them out" afterwards, and so acquire a watchmaking plant at a small cost? This is a game that has been repeatedly played in connection with co-operative enterprises, and its repetition is always to be suspected. Our advice to dealers is to stick to their legitimate business, and not to be deluded into taking part in the visionary schemes of dreaming enthusiasts or speculative sharpers. Above all, beware of all co-operative enterprises. So long as you control your own capital you know where it is; when you trust it to others you know where it isn't, but cannot be certain that it is where it ought to be. In the language of the old adage, co-operation is the thief of time—and money. We would also recommend to the Guild that it adhere to the platform upon which it was organized, viz: the reformation of existing abuses in the trade. In chasing every will-o'-the-wisp presented for its consideration, the Guild is losing sight of the causes that led to its creation, and diverting its energies from its objective point.

The Guild Stamp Fallacy.

At the late meeting of the Watchmakers' and Jewelers' Guild of the United States, the President, E. R. P. Shurly, again brought up the subject of a Guild stamp to be used by members of the Guild as a guarantee of the quality of the goods they offer for sale. The proposition is to have certain manufacturers make goods of standard quality for the Guild, such goods to bear the impress of the Guild stamp; these goods to be sold to no dealers other than members of the Guild. The authors of this scheme appear to think that the public could be induced to put confidence in a stamp of this kind, and to patronize those dealers who sell goods so marked more liberally than those who do not handle them. We do not believe the scheme to be a practical one for several reasons. A manufacturer who introduces a new design is anxious to sell the greatest quantity possible of such goods. Unless the Guild would bind itself to take all he could manufacture, he would only put the Guild stamp on such as the members actually ordered, and would then enter the market and compete with them, offering the same goods, minus the stamp, to whoever would buy. Manufacturers and dealers who are not in sympathy with the Guild, would spare no effort to undersell the goods bearing the Guild stamp, thereby introducing a special competition against such goods. If, for instance, the Guild should select a special watch to be impressed with its stamp, and to be sold by all members of the Guild in preference to any other watches, it would be but natural for the other manufacturers and their agents to stir up a sentiment against the Guild watch, and encounter it with a combined opposition. In other words, manufacturers will not consent to have the Guild establish a monopoly in the interests of its members without vigorous efforts to overthrow it. The same would be true of any other line of goods the Guild might select for its stamping process. Another great objection to the plan lies in the facility with which such a stamp could be counterfeited. The Guild has no power to punish counterfeiting, and if the use of a stamp should be found of any advantage there are plenty of unscrupulous manufacturers who would not hesitate to place it upon debased goods, and so make it aid them in perpetrating the very frauds it is designed to prohibit. Even the laws of the United States are insufficient to prevent pirates from stealing designs that are patented, and they certainly would not hesitate to appropriate a Guild stamp around which the law throws no protection. In fact, whatever advantage there might be in the adoption of such a stamp would simply serve as an additional inducement for unscrupulous men to deceive the public, and furnish them the means for so doing. If the Guild should order its stamp placed upon a certain line of 14 karat goods, what would prevent any dishonest manufacturer making the same goods of 7 or 8 karat gold, and stamping them with an imitation of the Guild stamp? There is no law protecting such stamp, and the counterfeiter, while incurring no penalties, would reap all the advantages of it. It is scarcely probable that manufacturers will surrender to the Guild the control of their business in the manner proposed. They would, of course, put the stamp on goods actually ordered, but they would not consent to give the Guild a monopoly of their styles, but would sell them, unstamped, to all comers. The reputation of individuals is a prominent factor in selling goods. If the public has confidence in the dealer it will buy of him, and ask no other guarantee than his word; if the dealer does not possess that confidence, the Guild stamp would not sell his goods. The dealer of established reputation would sell more goods unstamped than his less trustworthy rival could of stamped articles. This being the case, the advantage of a Guild stamp is not apparent.

President Shurly evidently does not think the scheme entirely feasible, for he says: "If it is not possible to have a Guild stamp, let us petition Congress to enact a law compelling the manufacturers of wrought gold to stamp the quality of their goods." This is a proposition that is feasible, and, if carried into effect, would give to the public and the dealers that protection from fraudulent manufacturers they now stand so much in need of. If Congress can be prevailed upon to establish a standard for wrought gold, to provide methods by which the quality of all goods shall be made known to all purchasers, and also severe penalties for selling goods of less intrinsic value than they are represented to possess, then the evils from which the trade now suffer will be remedied. Congress has the power to do what the Guild has not. With an established standard for wrought gold goods, Congress can provide as stringent laws for the punishment of those who debase that standard as it has already provided for those who debase the coin of the country. With such laws in force, every honest manufacturer and dealer, and every clerk and agent of such, becomes a detective, who has a personal interest in punishing the manufacturers of debased goods and driving them out of the trade. We believe that Congress, if properly applied to, would enact the laws necessary for the protection of the public in this matter, and the Watchmakers' and Jewelers' Guild and the various State associations of jewelers are the proper ones to petition Congress on the subject. THE CIRCULAR has heretofore advocated this measure in the most strenuous manner, and letters we have received from

prominent members of the trade satisfy us that it is looked upon with favor generally. All that is wanted is some authorized agency to take hold of the matter and there is no doubt but such a petition to Congress would be numerously signed by manufacturers and dealers. The Guild seems to be the proper agency to do this work, and its members can do nothing better calculated to advance the interests of the trade than to circulate petitions for signatures covering the ground suggested.

The Exact Time.

FEW people, except philosophers who hold that time and space are merely categories, are aware that a knowledge of "the exact time," for which inquiry is often made, is unattainable. There are no clocks or watches which tell the precise truth. Even the time-ball which is dropped by electricity is always a few seconds fast or slow. One watch or clock may be worse than another, but the time-piece that gives us the exact time has yet to be made.

If this fact were to be generally accepted, a vast deal of anxiety and unhappiness would be saved. As it is, every man who has what he calls a good watch puts implicit faith in it, and as he is constantly betrayed he suffers great mental agony. There is something very remarkable about the fascination which watches exert over their owners. A man who prides himself on his watch identifies himself with it. If he undertakes to tell a friend the time, instead of saying, "It is half-past 12 by my watch," he remarks, "I am half-past 12." The watch becomes a part of himself, and he watches its wheels and springs with the same tender care with which he watches his private liver and lungs.

Of course the victim of a "good watch" never admits that it can be wrong. It is always the other watches and clocks that are wrong. None of those ever agree precisely with his watch, except by accident. When, after remarking, "I don't vary a quarter of a second in six months," he draws out his watch and finds that it differs some seconds or minutes from the watch with which he compares, he boldly asserts that the latter is wrong. There are men who have, in the course of a single day, compared their infallible watches with the time-ball, the City Hall clock, the clock of Trinity Church, and a dozen less notorious time pieces, and unhesitatingly pronounced every one of them to be wrong. No argument can move such men. The infallibility of their watches is the firmest article of their faith, and they would go to the stake sooner than admit that they could be mistaken.

Meanwhile, every man, in his own breast, doubts his watch. He gives an intellectual assent to the doctrine that his watch is infallible, but in the silence of the night he confesses to himself that perhaps it needs regulating. The conduct of all men proves that they are unwilling to risk anything of consequence upon the accuracy of their watches. They profess to believe that "railroad time" is much faster than other time, and hence when they are about to take a train they make it a point to arrive at the station at least five minutes earlier than would be necessary were their watches infallible. This is a practical proof of their secret conviction that watches are not infallible, and though they would die sooner than admit the fact, this conviction renders their lives miserable.

There have been men who have become so infatuated with the desire to have the exact time that they have placed clocks in every room in the house, and give their whole energies to securing concord between them. The result has been uniformly failure and misery. No two clocks can ever be made to perfectly agree; and when the number is increased the confusion and discord increase in geometrical ratio. An estimable citizen of this city some time since provided himself with thirteen distinct clocks, all of which he attempted to keep in perfect agreement with his watch. He spent his whole time going from one to another, putting this one forward and putting that one backward. Every day at 12 o'clock he found that each clock gave him an independent estimate of the time, and all his exertions only succeeded in making their estimate diverge more widely from the other. It is now three months since he was removed to the lunatic asylum, where he imagines that he is an English chronometer, and daily tries to wind himself up with a latch-key.

The only men who really enjoy life are those who carry cheap silver watches, warranted never to tell the exact time. He who owns a watch of this kind always assumes that it is five minutes out of the way, and takes his measures accordingly. He does not attempt to delude himself with the belief that railway time differs from all other time, but by frankly assuming that his watch is untrustworthy, he arrives at the station at the same moment as the man with the infallible watch who believes in the myth of railway time. He never is betrayed through boasting of the accuracy of his watch, and is not compelled to indulge in wholesale attacks on the veracity of all other time-pieces. The only danger to which he is exposed is that his watch may occasionally keep altogether too accurate time, thus rendering unnecessary the five minutes' allowance he habitually makes when keeping an appointment or travelling. In these circumstances the best thing to do is to dip the watch into a bowl of water. This seldom fails to induce it to resume its customary irregularities, and to wipe from it the reproach of suspected accuracy. Much good may also be done by occasionally moving the regulator over the entire arc from "slow" to "fast." In fact with a very little effort, the cheap silver watch can be made to run as it was designed to run, and its owner can thus secure himself against the misery of having the exact time.

Too Much Spring in Gold Cases.

SERIOUS complaints are made in the trade regarding a practice indulged in by makers of gold watch cases that reflects little credit upon them. This practice consists of loading down the cases with heavy steel springs that contain far more of the base metal than is necessary. We have seen a case weighing fifty pennyweights that contained a spring weighing thirteen pennyweights, and we have been assured that some of the thirty pennyweigt cases are loaded down with full as much steel in the shape of heavy springs. Indeed, some case makers seem to make a point of seeing how little gold and how much spring they can put into a case and still sell it for gold. This may or may not be a swindle upon the public, according to the amount of conscience the seller possesses, but if not a swindle, it is certainly a deception. No one wants to be loaded down with an unnecessary weight of steel springs in his watch whether he has paid for them as gold or not. This addition to the weight of the spring has grown out of excessive competition and undercutting in prices. The desire to sell cases at less than the price of the gold they contain and the labor necessary to make them, has led to the scooping out of the gold in the centre and filling the cavity with a spring of greater weight. When the weight of the spring is one-third the weight of the entire case, the proportion of base metal is largely in excess of what is required; and, if the purchaser of a fifty pennyweight case is charged the price of fifty pennyweights of gold when fifteen pennyweights of steel springs are included in the weight, he is badly swindled. This scooping out of the centres has been reduced to such a fine point that some case makers make no charge for labor, but charge for the case as if it were all gold. Of course, if it was all gold, the purchaser would have to pay more for it, so that while he may not be swindled from a money point of view, he is, nevertheless, deceived as to the quality of the case he has bought. Even though no fraud is perpetrated upon the public by this means, the practice opens the door to fraud, and honest manufacturers should have too much respect for their calling to afford dishonest men so favorable an opportunity to practice deceptions.

The remedy for this evil is for manufacturers of cases to guarantee their goods as containing a certain weight of gold of a specified fineness, so that the purchaser of a case marked "50 pennyweights, 18k" may be sure that he has 50 pennyweights of gold 18 karats fine, without the spring being included to make up the weight. With the

manufacturers' stamp guaranteeing these points, the dealers would have a great advantage in selling their goods, for the public will buy more readily any article whose intrinsic value is guaranteed by responsible persons than they will if goods of which they are not judges and regarding which they must take their chances. Robbins & Appleton, makers of their own cases for American Watches, have adopted the plan of attaching a certificate to each watch, guaranteeing the quality of the case, which fact has contributed largely to build up a demand for their goods in excess of what they can supply. If other well known manufacturers would follow the example the public would soon learn to look for such a guarantee. American case makers do not need to resort to any tricks or devices of a questionable nature to sell their goods, for they have established reputations for the excellence of their work—excellence that the public is willing to pay for at fair rates, if the manufacturers will but maintain a scale of prices that will compensate them for material and labor. Every trick of the character mentioned tends to bring the trade into disrepute and reproach upon every one connected with it.

A Presentation Vase.

ELSEWHERE we present an illustration of an elegant Silver Vase, ordered by the Veteran Association of the Thirteenth Regiment of Brooklyn, as a prize for the active members of the regiment to compete for. The vase was made by the conservative house of Wood & Hughes, 16 John Street. These gentlemen, noted in the trade for the excellence of their sterling silverware, do artistic work in gold and silver that is rarely equalled, yet are so modest withal that their work seldom receives recognition in print. The vase referred to, however, having been exhibited in their show window attracted very general attention. Upon an ebony base there is a silver platform, edged with a border of engraved gold; springing from the centre of the platform is a cannon standing upright, finished in gold bronze, which serves as a support for the vase; resting against the cannon are crossed rifles, made in exact imitation of the Remington rifles adopted by the State; pendent from the rifles are two wreaths of laurel, made of silver; on each corner of the platform there is a pile of cannon balls. The vase proper is a finely proportioned bowl of silver, elegantly ornamented with vines and flowers in *repoussé*. In the front of the vase is a gold medallion, on which, in raised silver, is the monogram of the Veteran Association, surrounded by a silver wreath of cartridge shells; on the opposite medallion is a head of Mars in oxydized silver, similarly finished. The lid of the goblet is of silver *repoussé*, with edging in parcel gilt; this is surmounted by a miniature statue of a officer in full uniform of the Thirteenth Veterans, standing at "parade rest." This statue is a perfect likeness of one of the popular officers of the regiment, and is readily recognized by all who know him. The whole piece is an elaborate specimen of the best class of workmanship, is unique in design, and elegant in every respect. The metal workers have caught the spirit that prompted the work, and have reproduced in a most artistic manner the ideas of the designer. It is intended that the active members of the Thirteenth shall compete for this beautiful prize, but the exact terms of the competition have not been determined upon as yet. The goblet does credit alike to the soldierly spirit of the Veteran Association and to the firm that made it.

IN the suit of Daniel Spill against the Celluloid Manufacturing Company, Judge Blatchford has just rendered a decision in the United States Circuit Court for this district, upholding the plaintiff's rights under two patents affecting the use of xyloidine in the arts. One of Spill's inventions relates to the preparation and employment of eight different solvents for xyloidine. The second of these solvents consists of a mixture of camphor and alcohol. It was insisted that the Celluloid Company infringed on Spill's patent by using this solvent, and likewise by employing a bleaching agent in decolorizing the xyloidine. In defense it was asserted that Spill had not been the first to use the solvent of camphor and alcohol, and that the use, for the purpose of bleaching xyloidine, one of the agents ordinarily used to bleach fibrous material was not a patentable matter. Judge Blatchford, however, overruled both defenses, and gave judgment in the plaintiff's favor.

An Important Case.

THERE is a very important lawsuit in progress in Newbern, N.C., which will be watched with interest by the legal profession in all parts of the country. It is the first suit of the kind on record, but in the event of the plaintiff's success it will be by no means the last.

Some time ago Mr. Finch, of Newbern, who is in the jewelry business, exhibited to Miss Waters, a young lady with whom he was on friendly terms, a beautiful set of real jet. The lady was very anxious to own the set, but was not able to buy it. In these circumstances Mr. Finch proposed a novel kind of bargain. He said that he would sell Miss Waters the set for one hundred kisses, to be paid at the rate of one kiss daily on each and every day next ensuing from the day of the date of the agreement, excepting, nevertheless, each and every Sunday thereafter. It was further provided that Mr. Finch was to call at the lady's house every morning, except Sunday morning, to receive his daily kiss, which Miss Waters undertook and promised to duly deliver to him. This contract was not reduced to writing, but it was fully understood and agreed to by both parties, and the set of jet was tendered to Miss Waters and accepted by her.

The next morning Mr. Finch called on Miss Waters for his first kiss, which, as the young lady now maintains, was fully paid. On each subsequent morning for thirty consecutive days—Sundays excepted—the same proceedings were had. On the thirty-first day, however, Mr. Finch made a formal complaint that Miss Waters was not fulfilling her contract, inasmuch as she insisted upon permitting him to kiss her cheek only. He maintained that this did not constitute a legal kiss, and he demanded that he should be allowed to put his left arm around Miss Waters' waist and kiss her in the highest style of art. To this request a firm refusal was returned. The lady professed her willingness to carry out her agreement, so far as her cheek was concerned, and even offered to give Mr. Finch his choice of cheeks, but she insisted that the contract would not bear the construction put upon it by Mr. Finch, and that she would never submit to such a construction. Thereupon, Mr. Finch, in great indignation, left the house, and brought an action for a breach of contract against the lady.

This action raises several new and interesing questions, among the most important of which is, What constitutes in the eye of the law, a kiss? The testimony of several experts is to be introduced by the plaintiff; but, although those experts will probably start out with the assertion that a kiss is that which is impressed by one pair of lips upon another pair, they will subsequently be compelled to admit on cross-examination that one pair of lips alone may imprint a kiss upon any accessible object. This seems, at first sight, fatal to the plaintiff's claim that the defendant did not furnish him with lawful current kisses, but it must be noticed that he sets up the further plea that there is a difference between active and passive kisses; that Miss Waters promised to give him a certain quantity of kisses—not to permit him to take them—and that giving kisses is an act which requires the use of the lips. This is certainly a strong point, and though the court may decide that there is no one variety of kiss which can be held to be the only kiss known to the common law, it may give an authoritative definition of an active kiss which will be of immense service to mankind.

It is maintained by counsel for the defendant that there was no contract between the parties, for the reason that kisses cannot constitute a valid consideration. The decision on this point will be eagerly waited for. That a kiss is something which can be given willingly or taken by force, and that it is commonly reputed to possess more or less intrinsic value, are points which the plaintiff's counsel will eloquently maintain. Hence, it seems that a kiss may be a valuable and sufficient consideration upon which to base a contract. On the other hand, the courts have never recognized a kiss as property capable of being stolen, and that when a kiss has been seized by violence the only remedy of the injured person is an action for assault. It is evident that we have here a question which admits of a

vast amount of argument, and that its judicial decision will mark an era in our common law jurisprudence.

There is still another defense upon which the defendant's counsel is understood to place great reliance. It is claimed that even if there was a valid contract between the parties, and if the defendant did break it, the plaintiff's proper remedy is not an action for breach of contract, but a bill in equity for specific performance. Probably the plaintiff would have been wise had he resorted to the latter course. In case of his success, he would not have received specified quantities of definite kisses of one kind or another, and would have thus gained a substantial victory. As it is his triumph in his action for breach of contract would doubtless bring him only a nominal sum by way of damages, and would render it necessary for him to institute fresh proceedings in order to gain possession of the jewelry. Still, it by no means follows that because he may have a remedy in equity he has no remedy at law, and it is reasonably certain that if there was a contract between himself and the defendant an action for breach of it will lie.

There are many ignorant persons who fancy that the law is a dry, prosaic business. This action, however, proves the contrary. The questions at issue in Finch against Waters come home to every mouth in the country. There is at present a most lamentable vagueness of belief as to what constitutes a kiss, and as to its precise legal status. We shall now have these questions decided, and the social interests of the community cannot fail to be vastly benefitted thereby.

The Jewelers' League.

We devote this column to the interests of the League and its membership. Letters or inquiries pertinent to its business or purposes, and which might interest the trade or inquirers, will be herein answered. Address *Jewelers' League, Box 4001, P. O. New York*, or the office of THE CIRCULAR.

The following applicants were elected to membership at the meeting of the Executive Committee June 4th:

Wm. H. Allen, with Robbins & Appleton, Chicago; Frank W. Annin, Le Roy, N. Y.; Allen C. Bard, with Bowler & Burdick, Cleveland, O.; Benj. A. Bell, New Berne, North Carolina; H. M. Bullwinkle, with S. Hyman & Co., Chicago, Ill.; Russell E. Burdick, of Bowler & Burdick, Cleveland, O.; James Clark, with C. R. Smith & Son, Philadelphia; George Dietz, with H. F. Barrows & Co., North Attleboro, Mass.; E. R. Dulje, with Tiffany & Co., N. Y. City; J. W. F. Ehlers, with Bartham & Straat, New York City; Jno. V. Ellard, with R. N. Hershfield, Leavenworth, Kan.; Charles Fischer, New-Newark, Jersey; Ed. R. Kant, with Joseph Welf, Cleveland, O.; J. M. Kulms, with N. Matson & Co, Chicago, Ill.; Chas. O. Lawton, with N. G. Wood & Son, Boston, Mass.; P. L. Miles, Cleveland, O.; Hans Nordahl, Chicago, Ill.; Chas. Pchellas, Buffalo, N. Y.; Wm. Rose, with H. F. Barrows & Co., North Attleboro, Mass.; A. W. Sexton, Jr., with Baldwin, Sexton & Peterson, N. Y. City; Louis Uhl, Cleveland, O.; R. McMurray Van Wyck, with Giles Bros. & Co., Chicago, Ill.; E. Wiggers, Nashville, Tenn.; George C. F. Wright, New York City. Twenty-four in all.

Four applications were referred for correction.

Mr. George R. Collis, from inability to attend to the duties of the position has been obliged to resign from the Executive Committee. This announcement was received with regret by the members of the Committee, who feel that in losing him they lose one whose co-operation was appreciated by them all.

Wm. B. Kerr was nominated for the position to fill the unexpired term and would have been unanimously chosen, had he not authorized his name to be withdrawn, as his absence from New York would prevent his serving.

George W. Shiebler was unanimously appointed to fill the place made vacant by Mr. Collis resigning.

Messrs. R. A. Johnson and G. T. Woglom have been appointed as delegates with power, to represent the League at the proposed "Union of the Mutual Benefit Associations of the State of New York."

Regular Fund, $1,100.
Benefit Fund, $1,425.

The following extraordinary communication received by the Secretary will speak for itself:

Secretary of Jewelers' League,

SIR: I had about made up my mind to apply for insurance in the Jewelers' League, but a New York Life agent has been laboring with me all day to-day, and had nearly shown up to me the instability of all mutual insurance companies. Now I am but a young man (born March 2, 1855). I don't want to go into any company where there is a prospect of paying fees for ten or twenty years and then have the company disband. We have an example near home; the Home Mutual Aid of Columbus, in which many men of this town were insured.

I don't understand some of the workings of the League. As I can see there is no limit to the age of a man admitted. Any jeweler in sound health can be admitted, even though he be 100 years old. Yet, I, but 25 years old, pay the same fees and dues as he, and have the same benefits. Although I might pay dues for fifty years and he only a year or two. Another thing, I join the League with the expectation of my family receiving $5,000 (if company is full), whereas they receive but $4,750, giving $250 on each death to Secretary, or probably $2,500 per year. This is clear gain to him, as he has all expenses paid by the League. If the League is full: it going to take a man's full attention to attend to the business? I don't see how it can, and look at it as big wages. Even say it does, he does nothing the year round but attend to the business of the League; he receives $2,500 for his services. Why is this money taken from the widow and children? Why is it not taken from the living members? Why not make each member send $2.10? Women generally do not understand business, and if the per cent. is deducted, won't some of them believe that you mean to cheat them out of $250? What can you say as to the success of the League? I would like to know something more of it.

Yours, &c.,
F. L.

THE SECRETARY'S REPLY.

DEAR SIR: Your communication in regard to the Jewelers' League has been perused several times and has afforded more amusement than I can express. Pardon me for saying so, but if you will allow a "New York Life agent" "to labor with you all day," cramming you chuck full of ½'s ideas of mutual insurance as managed by the Jewelers' League, or by any other purely benevolent association; if you will submit to that, I repeat, and then fire yourself off at the League or its representatives, you will only get laughed at for your pains.

It is very evident that "you are but a young man." That being the case, allow me to give you some good advice. It will cost you nothing, as the "big wages" paid by the League enables me to think kindly of, and write tenderly to young men who write and speak *before* they think. If you had read carefully the papers of the League, you would have seen that there *is* a limit to the age of persons to be admitted, and also that the Lesge is composed of young men, all with equally as good prospects for long lives as yourself. They do differ from you though, in this respect, that they do not anticipate a begrudging payment of dollar after dollar for the years to come for their less fortunate brother who may chance to be called from this life before them. My advice to you is to postpone your endeavors to join the League for about ten years, when your prospects for life have come to be more dubious.

No man with any common sense joins the League with the expectation of getting $5,000 for his family if the League is full, because the Constitution says distinctly that the beneficiaries of the member receives the amount of the fund in the treasury, and that the fund never has nor never will include the five per cent. deducted from all receipts for payments of services rendered. I use the words "services rendered" because since the organization was formed, no person interested in carrying out its benificent objects, has ever been awarded in a pecuniary sense. Never was a more noble and unselfish work originated or conducted than that being done by the officers and members of the Jewelers' League. For the year 1870, hour after hour of careful thought were given by the gentlemen of the Executive Committee and the detail work performed by the Secretary. Mr. Lyon was rendered without hope of reward—$66 was the enormous amount paid for clerk-hire for an association whose mutual interests amounted to about $200,000. If you think there is any "clear gain" by any one so far (other than the League as a body), I advise you to start a League of your own and realize the accompanying profit. When the League shall be full of members and the worthy Secretary (whoever he may be) will be receiving an increased renumeration, then the favor bestowed by the officers in accepting will far outweigh the honor conferred by the League in electing them to the said positions.

One more word of advice. Refrain, young man, from even intimating to any woman of your acquaintance that she does not "understand business." If she does't proceed to warm you, then I am much mistaken. Nine out of ten women, after reading the prospectus of the League, would have a clearer idea than you seem to possess of its aim and object.

I would advise you to read carefully and understandingly the annual report of the Association, which will doubtless convey to your mind a clearer idea of its benificent purposes and the stability of its organization.

Respectfully yours,
WM. L. SEXTON, Sec.

Spectacles and Eye Glasses.

BY W. J. SUTTIE.

LENSES are ground in the following manner: pieces of glass are cemented on tools of the requrired curve and ground with emery of different grades until very fine is used, and they are polished on cloth cemented to the tools, rouge or putty powder being used to give them the last finish. The tools are made of any required curve; say a five inch glass is wanted. Open a pair of dividers five inches. draw a curve with them, take a section of the curve, make a wooden pattern like a saucer with a peg on the under part to hold the tool by, then make another tool just the same, but on one you put the peg on the convex side, and on the concave side of the other get two pairs of castings made; get them turned out by a machinist to the shape of the curve, then with emery grind them together. One pair has to be finished with rough emery for roughing down the glass; the other pair finish off with fine emery for finishing and polishing on. Now, if you want glasses of five inch focus: convex pitch on pieces of flat glass until the convex tool is full: fasten to a block your concave tool, and before the pitch is too cold lay the convex tool with the glasses on it upon the concave tool. To get the glasses down even let the pitch get cold, then put on some rough emery in the concave tool and commence grinding. The emery will touch the glass on the edges, and keep on grinding until the glasses are of the same curve as the tool; then wash out all the rough emery and use some finer; then wash that off and repeat the process with fine or flour emery, and after grinding a little while the emery will get finer; then with a wet sponge wipe off half the emery and add a little water, and commence again. Get the glasses so fine and smooth that when you wet them they look like polished glass. Now dissolve a little pitch in turpentine and paint the tool with it, lay on your cloth and by rubbing with your hand you will get the cloth to lay down flat to the tool. Let it dry for a few minutes and add rough or putty powder; wet the cloth a little and commence polishing, which will be very quickly done if you have smoothed the glasses nicely. For concave glasses reverse the process by pitching the glasses on the convex tool and let the convex tool be the grinder. Then reverse the glasses and grind the other side, and when done you will have glasses of five inch focus.

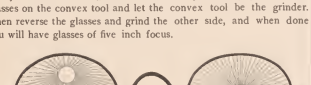

Fig. A.

If you took a ball of glass five inches in diameter, it would be five inches focus. Cylindrical glasses are made just the same way but are ground on cylindrical shaped tools, and the focus or curves are measured in the same way by inches or metres. The latter is a good scale but causes a great deal of confusion and trouble because tools are made in this country and England by the inch scale, and if the English inch was divided by tenths and not by eighths, it would be very simple and convenient. The way of making odd glasses, say five and one-half inches, or any odd number that may be required can be done by grinding a glass on one side on the five-inch tool, and the other on a six-inch tool, which would give you a glass of five and one-half inches focus.

Periscopic glasses are concave on one side and convex on the other, and they are used to give more clearness of vision when looking obliquely through the glasses, and give a larger field of vision. In setting the glasses into the spectacle or eye-glass frame take a piece of thin brass or tin, make it the shape of the frame but a trifle smaller, lay it on the glass, then with a glazier's diamond cut round the pattern, break off the edges with a pair of plyers, and grind it to the required size on a grind-stone, care being taken to get the center of the lens in the center of the frame or the result will be as that seen in Fig. A.

And this is very often the cause of a great deal of trouble to the seller and pain to the wearer. Be sure that your glasses are of exactly the same focus, and they vary considerably. Take a five-inch French glass and it will be different in power to a five-inch English glass; and this is not the worst of it, but glasses of first quality will be different in power to second, second quality will be different from third, and so on. Therefore in matching glasses, except you keep a large stock of glasses of all qualities and numbers, it is better to put in a pair, if not, you can never match a glass, and the wearer will complain of not seeing as well with his spectacles since he had a new glass put in, and give him pain caused by seeing sometimes two objects, or seeing one like a shadow and the other one clear and sharp, as shown in Fig. B.

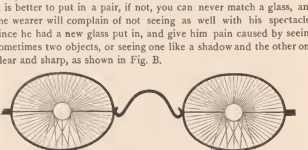

Fig. B.

Periscopic glasses are sometimes called meniscus, and the focus is determined by the following rule:

Divide twice the product of the two radii by the difference of the radii.

Thus: say a glass is ground on one side on a six-inch convex curve, and on the other side it is ground on a fifteen inch concave curve, the focus would be

$$\times \tfrac{6}{1}\text{s} = -\tfrac{1}{12} \qquad 9)90(10$$
$$-\tfrac{1}{15} = \times \tfrac{1}{1} \qquad \overline{}$$

Glasses are numbered as follows: 5, 6, 7, 8, 9, 10, 11, 12. 13, 14, 15, 16, 18, 20, 22, 54. 30, 36, 42, 48, 60. Some English opticians call 60 inch focus No. 1; 48, No. 2, and so on. It is a very arbitrary rule for some to commence at 48 and call it No. 1, others again to commence at 42 and some at 36, and only use fourteen numbers, as follows:

Numbers	1,	2,	3,	4,	5,	6,	7,	8,	9,	10,	11,	12,	13, 14.
Inches,	36,	30,	24,	20,	18,	16,	14,	12,	10,	9,	8,	7,	6, 5.

A new scale is being introduced into opthalmology, and is giving to opticians no end of trouble. By the following rule it will be seen that one dioptric is equal to about a 36-inch focus:

Dioptrics—	0.5,	0.75.	1.,	1.25,	1.5.	1.75,	2.,	2.25.	2.5,	3.,	3.25,	3.5.
Inches—	72.	48.	36.	30.	24.	20,	18.	16.	15.	13.	15.	11,
Dioptrics—	3.75.	4.	4.5.	5.	6.	7.	7.5					
Inches—	10,	9,	8,	7.	6,	5½	5					

It is a very good scale, and calculations can be very easily made with it. One meter is the unit and it is called one dioptric.

Burgess' Portable, Mechanical Blow-Pipe, introduced by J. Elliot Shaw, of Philadelphia, is rapidly finding its way into the leading jewelry manufacturing establishments. It can be used with equal facility in both heavy and light work. The pressure of the flame can be regulated at will and is under the absolute control of the operator. This is one of the most useful mechanical blow-pipes ever introduced and is useful to every dealer.

Practical Hints on Watch Repairing.

By Excelsior.—No. 64.

THE PRACTICAL EXAMINATION OF TOOTHED GEARING.

(1,009). We are now able to examine, understandingly, our train of wheels and pinions. We know what the proportionate size of a pinion and the wheel which drives it should be, how deeply they should intersect or work into each other for a good action, the proportionate numbers for the teeth and the leaves, the thickness of each, the proper lengths for the addenda or points in each particular case, the proper shape for the addenda of the driver or wheel, and, best of all, we know *why* each of these points should be as it is. If we are in doubt on any point, we can at once make a detailed scale drawing showing exactly what is most desirable in the supposed conditions, then compare the actual with the ideal, find their correspondence or their difference, and apply the proper correction to the proper point.

(1,010). But this is not all the learner needs. To leave him here would be like presenting him with the necessary tools, telling him what they are for and how they operate—then leaving him to apply his tools as best he could, to whatever work might come to his hands. Knowledge, of course, is valuable: without it we can never be intelligent workmen, or really understand our business. We may learn how to do jobs mechanically, by dint of reiterated instructions, but it will be merely working by rule-of-thumb. On the other hand, mere knowledge alone would be like having the tools without the training. The learner needs both. It is not enough for him to know how a gearing should be and why it should be so, but he must be taught to apply his knowledge practically, to examine the action of any gearing, to perceive whether it is right or wrong, to detect the "symptoms" or evidences of error, to know what defects they indicate, where they are, and how to remedy them in the best, quickest, and easiest way.

(1,011). The very best way of learning is, of course, by personal explanations from a competent and pains-taking instructor. The next best way, and the only one available in these articles, is by having the descriptions accompanied by full and clear illustration to the eye, both of perfect gearings and of others defective in the pitching, the depthing, the shapes of the teeth, &c.—showing at one view the action of each in its different successive positions throughout the whole of the driving. In this way, we can see, even more clearly than by inspection of a real wheel and pinion, the actual results or effects of different faults, and the action of the same gearing after applying the different corrections which may seem most suitable. Such studies will qualify us for watching real wheels and pinions, and we shall then know what their action means, every peculiarity will be seen, and will almost speak, to tell us what is wrong. Such illustration is something which has never yet been done. The great amount of time and labor required for preparing the necessary drawings, and the expense of engraving them, might well dissuade both writer and publisher, notwithstanding the acknowledged need for it, and its value when done. In the present instance, its accomplishment is owing solely to the liberality of the editor of The Circular, whose open-handed public spirit in all matters calculated to benefit the trade is well known—and to whom, I would say in passing, the trade are under greater obligations than they are are aware of.

(1,012) Before examining our series of illustrations of faulty gearings, we will briefly review the different faults, and the different ways of correcting them, so that our further attention may be confined to the actual searching after the defects and the consideration of what corrections will be most desirable or practicable in each case. A faulty gearing may be corrected by fitting in new parts, moving the pivot holes, or altering the wheel and pinion. Which should be done, will of course depend entirely on the circumstances of the particular case. An alteration of the size of a pinion or the shape or thickness of its leaves should seldom be attempted, except by an expert. And even he who has the skill and facilities for doing it properly might about as well make a new pinion, just as he wants it. It will generally be advisable for most workmen to reject a faulty pinion at once, and fit in another of the right size and shape. A wheel, however, can be made larger or smaller, either as to its geometrical or its full diameter; its teeth made thinner; the addenda made longer or shorter; and the curves made more flat, or more full and round.

(1,013). *To Change the Depthing*, or the depth to which the wheel intersects or "meshes" into the pinion, the only proper course is to change the position of the pivot holes of one of the parts, to bring the two closer together or further from each other. Whether the pinion should be moved towards the wheel or the wheel towards the pinion, will depend on which can be moved most conveniently and with the least disturbance of the surrounding parts. Sometimes two poor depths may be corrected at once by moving the central piece. When only one depthing is faulty, the correction of that must be effected without injury to the depthing on the other side of the part which is moved. And in all cases the pinion must be upright after the moving is finished. Often a pinion is "out of upright" to start with, and the depthing may be corrected by simply uprighting it—moving either the upper or lower pivot hole, according to the case. The methods of changing or moving pivot holes have already been sufficiently described in sections 670, 678, 752, 760, and others, and need not be here repeated.

(1,014). Many workmen correct a depthing by stretching or dressing off the wheel, to make its intersection deeper or more shallow. But this course should not be followed, because the effect is to change the *pitching*, or relation between the *sizes* of the intersecting wheel and pinion. If the pitching was correct before the operation, it will certainly be got wrong by the same means which were used to change the depthing. But when both the pitching and the depthing are faulty, and in the same way, *i. e.*, the depthing too shallow and the wheel or pinion too small, or both are the reverse of this, then enlarging or "smalling" the wheel or changing the size of the pinion may correct both faults. Whether the wheel or the pinion should be thus changed, will depend on the conditions in each case, as will presently be explained.

(1,015). *To Change the Pitching* can only be done (aside from fitting in new pieces) by enlarging or diminishing the pitch circle of the wheel or pinion, *i. e.*, causing the straight radial flanks of the teeth or leaves to reach further, or not so far, from the center of the wheel or pinion, before meeting the curves of the addenda or points.

Many workmen think that the pitch can be increased by dressing off the back flanks of the teeth and so increasing the *spaces* between the teeth. But a little reflection will convince them that, no matter how much the backs of the teeth may be cut away, it will produce no change whatever in the pitch, which is the distance on the pitch circle allotted to one tooth and one space, or the distance from the front of one tooth to the front of the next. What was taken off the teeth would increase the spaces, but evidently could not affect the pitch.

(1,016). The pitch of a wheel can be increased in two ways, first, by "stretching" the wheel—which is generally the proper course, (1,019, 1,023); second, by filing or cutting back the *front flanks* of the teeth, (1,024). The pitch can be lessened by altering the shape of the points of the teeth so as to make the front addendum curves reach further down towards the center of the wheel, before they join the straight flanks.

The pitching of a pinion can also be increased by cutting back the front flanks of the leaves and causing their straight radial surfaces to extend out further from the center. This should be done in a suitable cutting tool, as it must be so performed as to leave the surfaces, when repolished, at exactly equal distances apart, for any inequality of division would render the pinion worthless.

The pitch of a pinion can be lessened by turning off the points of the leaves in a lathe and again rounding up the stumps as before—in effect, making a smaller pinion of it. Of course, the polish must be always restored as good as before, or better.

As before stated, if these operations are performed with the exactness required, it would be as well or better to have fitted a new pinion at once. I therefore shall not give any directions for these operations, nor recommend their adoption, although so high an authority as M. Saunier, in his *Traité d' Horlogerie Moderne*, speaks of scraping the pinion leaves into shape by hand, with a graver.

(1,017). *Enlarging both the Geometrical and the Full Diameters of the Wheel* is done by moving the teeth bodily outward, called "stretching the wheel." This is the most common change made, as it applies to all cases where the lengths of the addenda and the shape of its curves are correct, but the pitch circle is too small, so that, as placed in the watch, it does not reach to the pitch circle of the pinion. If much enlarging is required, it will be better in good watches to fit a new wheel.

It must be remembered, however, that a scant depthing may arise not only from a wheel pitch-circle too small, but also from a pinion too small, and, third, both the wheel and pinion may be adapted for each other but erroneously planted too far apart in the watch. In the first case, stretching the wheel will at the same time enlarge the pitch circle and correct the scant depthing, as before stated. But in the second case above supposed—a pinion too small, stretching the wheel is not the proper remedy, but fitting a new and larger pinion, as its pitch circle is already too small for that of the wheel, causing too much "drop" as the teeth act on the successive leaves. Although enlarging the wheel would correct the scant depthing, it would also make the difference between the *pitch* of the wheel and that of the pinion still greater than before, and very likely result in the leaves catching on the teeth. Changing the pivot holes, to bring the wheel and pinion closer would be better, as that would correct the scant depthing without making the pitching any *worse* than it is. In the third case—the wheel and pinion correct but planted too far apart, the right course is to move the pivot holes closer. If this is not practicable, then enlarge the wheel. But *never* correct a scant depthing by fitting in a larger pinion, if the old one is suitable for the wheel; for it is much safer to have the wheel a trifle too large for the pinion, than the pinion too large for the wheel.

(1,018). The old fashioned way of enlarging a wheel was to lay it over the edge of a vise or some convenient block, then hammer on the teeth, or the teeth and rim or web, according to the amount of enlarging required, and "stretch" the teeth. When this was done, they would be flatted out of shape, and required to be filed up into form, with such resemblance to the original shape as the knowledge, skill, eyesight and patience of a "workman" could attain to. Of course, correctness or uniformity in shape was out of the question. Not only was it a "big job" to enlarge a wheel, but the wheel was practically ruined when done. The thinness and roughness of the bearing surfaces, with more or less steel fragments from the file teeth left sticking embedded in the metal, caused rapid wear, great friction, and frequent stopping. Making a wheel smaller was only one degree less in the scale of botching than enlarging it. The points of the teeth were either turned or filed off, and the sharp corners of the stumps rounded off a little. But it is to be hoped, now that tools for doing such work correctly and uniformly are so cheap, that even the most indifferent tinker who assumes to be a workman will no longer be guilty of butchering watches in such a horrid style.

(1,019). *Stretching the Wheel* should always be done with the aid of a good wheel-stretching tool, of which there are several in the market. They generally operate by a sort of punch, having one vertical and one inclined side. Its edge should be smooth and slightly rounding, *i. e.*, not sharp like a chisel, as it would be apt to cut through the web. The corners should also be rounded off.

In using them, the position of the crease which will be made by the punch must be carefully chosen, especially when the web of the wheel is narrow or very thin, else you may drive the metal the wrong way, or merely *stretch the whole web*, and make it bulge out between the arms, and, instead of being round, the wheel will have as many humps as there arms. The crease must not be in the center of the web, but nearer to the outer edge of it, so that the metal inside of the punch will have substance and strength enough to support the punch while forcing the metal outside of it still further out. It must not be too near the roots of the teeth, as there may not be metal enough outside of the crease to firmly support the teeth, especially if the material is at all brittle. Besides this, the metal will be more distorted and racked by the action of the punch.

(1,020) It is necessary, therefore, to move the metal outward but little at each blow, as the risk of deforming the wheel will be less. The teeth are then tipped over but little, and are more certain to be restored exactly to their upright position when the punch has passed them. We can also see the effect of what we have done, before going further, and have a chance to alter the punch if necessary. With a thin web, or heavy blows of a punch, the teeth would be left in anything but uniform uprightness and distance apart, and if the metal is brittle it might be disintegrated or the teeth actually crumbled off. Even when the stretching is well and uniformly done, it is always advisable to finish off with the Ingold fraises, (1,033), in order to be certain that the teeth are of equal length and inclination, and evenly spaced off, as a single unlucky blow on the punch may leave one or two teeth a little inclined, and cause no end of trouble when placed in the watch.

(1,021). If the wheel is not staked concentrically on the pinion, or the teeth were not cut concentrically with the web, it is difficult to stretch the wheel evenly, as the punch will come nearer to the teeth on one side of the wheel, or else one part of the rim will be narrower If the eccentricity is much, it is well, in the former case, to make two operations of the stretching—one for the full, the other for the scant side. Adjust the tool anew for each side, so that when done the crease will average the same distance from the roots of the teeth, on each half of the wheel. It is still better, (but more difficult to perform the stretching evenly), to adjust the distance of the punch from the roots of the teeth as you go around, so as to keep it constantly at an equal distance from them, all around the wheel.

(1,022). But, in all ordinary cases, it should be the rule to make a single, continuous operation of going round the wheel. Even when the wheel is perfectly true, it is important to give the same force to each blow, and to give the same number of blows in each section of the wheel, *i. e.*, feed the wheel along uniformly, under the punch Get into an easy position, with everything convenient, arrange not to be disturbed or stopped till you have gone once around the wheel, fix your hand so that you can turn the wheel at a regular, uniform speed, and strike at a uniform rate. Make no false blows, but, whatever the force of the blows you commence with, give that same blow all around the wheel. Be careful, of course, not to strike too heavily, but rather go several times around—trying your wheel frequently, to be sure not to get it too large, as then you may have an extensive job on hand to reduce it properly. With a little practice and care in following the above hints, you will be able to do a good, even job of stretching, in a few minutes. As this is one of the most common, as well as important, operations in watch repairing, no pains should be spared to learn to do it perfectly.

(1,023). *Enlarging the Pitch Circle, or Geometrical Diameter* of the wheel can be done in two ways. The best is to stretch the wheel (1,019) till the pitch circle is large enough, then, if the full diameter is too great, dress off the points to a correct shape and length, *i. e.*, corresponding to the relative sizes of the wheel and the pinion it drives. If the teeth are any too thick, and the point has the correct curve, only is too long, this dressing off of the points and the reduction of the thickness can be done together, by using a cutter which will dress off the *backs*, only, of the teeth—the other side of the cut-

ter being smooth or "safe," thus leaving the acting surfaces undisturbed. This can be done in the rounding up tool—or, with care, in the cutting engine. But when both sides of the points are to be dressed off, it is better done with Ingold fraises, (1,033).

(1,024). The other way of enlarging the pitch circle is by cutting back the straight flanks in front, (1,015, 1,016) so that they strike the curve of the addenda further from the wheel center. This will be understood by supposing that we should take a thin slice off our tooth in Fig. 60, so that the radial line *A N* would be, say $\frac{1}{64}$ inch lower, or nearer *b*. It is evident that dressing off the flank in this way would also take off considerable of the curve, *N b*, and, as the pitch line passes through the junction of the flank and the curve, the pitch circle would be moved so much further from the center, *i. e.*, enlarged.

(1,025). Now let us see what the effect of this change will be on the operation or properties of the remainder of the curve *N b*. Referring now to Fig. 51, we see that the front flank of our tooth is no longer in the radial line *A N*, but will now strike the curve *N b* at the point i^1, cutting off all of the curve between *N* and i^1, and the pitch circle will be at 2, 2, instead of *R R*. There will now be an abrupt change of shape at i^1, where the flank joins the curve. It will be remembered that the curve *N b* is shaped specially to secure a correct transmission of power and velocity, from the moment that the flank of the tooth strikes the line of centers, to the end of the the driving. The parts of the curve reaching from *N* to u^1, and u^1 to i^1, were provided and formed for driving the pinion flank from the position *a O* to *a* 4 and *a* 3. But *now* the curve begins at i^1, and the portion between i^1 and i^2 has to raise the pinion flank from the position *a O*. This it was never intended to do, but it was *formed* for driving the pinion leaf from *a* 3 to *a* 2. As its form is very different from that of $N u^1 i^1$, it is evident that it cannot properly perform the duties which the latter was properly shaped for doing. In the same way, every other part of the curve on the point of the tooth would be misplaced, would act upon the pinion flank in positions that it was never intended or shaped for, and would be entirely unfitted for its changed sphere of action. The wheel therefore could not drive the pinion uniformly, even if we should ignore the sudden change of form at i^1.

(1,026). Workmen generally think that after the "corner" at i^1 is passed, the remainder of the curve will act on the pinion leaf precisely as it did before, and they cannot see what should make any difference. Their idea would be correct if the wheel and pinion had the same depthing as shown in Fig. 51. But they overlook the fact that the pitch circles must never intersect, but only meet, at *O*. Consequently the pitch circle or curve *z z*, would be in the position *R R*; and the curve $i^1 i^2$, instead of moving the pinion flank from *a* 3 to *a* 2, which it *could* do correctly, will have to raise it from *a O* to *a u* 4, which it *cannot* do properly—and so with the rest of the curve. Not only is a part of the curve gone, but what is left is out of place, and has to perform duties for which it is entirely unadapted.

It is therefore evident that the cutting back of the front flanks of the teeth, although very much practised, is a course that should not be followed, except when stretching cannot be effected, or the workman has not the facilities for afterward dressing off the points of the teeth, and cannot get a new wheel. It may then be allowable, as irregularity in the driving is at least preferable to stopping.

(1,027). Some workmen are so entirely ignorant of all the principles of gearing that, after cutting back the front flanks, they proceed to *rou d off the corner* a little, at i^1, thus actually undoing what they have just done, or making it worse than when they began. Not knowing that the whole object of the operation is to extend the straight surfaces further from the center, after they have successfully enlarged the pitch circle they directly turn around and make it smaller than before. Even many workmen who are excellent finishers, or adepts in most branches of watch work, have absolutely no idea whatever about gearing, and the simplest defect in the action of a wheel and pinion will defy all their efforts to find it, except by twisting the bridges one way and the other and fussing around until they are lucky enough to "hit it"—or give it up in despair. They can hardly be blamed for this ignorance however, as the opportunities for learning, or the number of masters really competent to give proper instructions on this subject, have been very few. It is hoped that these articles may, in some degree, fill the long felt want of practical instruction on the subject.

Views of Correspondents.

REFORMS IN TRADE NECESSARY.

To the Editor of the Jewelers' Circular:

In behalf of the Jewelers' trade I beg to represent that a little more harmony is needed to make the trade more profitable. The manufacturer, the importer, the jobber and the retailer—each and every one of the four classes—have rights which must be respected, and I say frankly that the rights of the retailer are most seriously encroached upon. The manufacturer, importer, and jobber, all three violate the good character of our business, when they place the goods belonging to our trade legitimately, into the hands of other trades too numerous to mention, and into the hands of pawnbrokers in particular. You will say "they all do it," and ccho answers with sorrow, "they all do it." How in the world can an honest retailer run a jewelry store successfully when he has to compete with all this pernicious traffic? No competition is more ruinous to him than that of a pawnbroker, and in my mind that manufacturer and that importer who places his goods simultaneously—and many do—into the hands of panbrokers and first class jewelers, do not deserve the patronage of any respectable dealer. A pawnbroker can and will undersell anyway, where he sees no other way to make the sale, and perhaps the next man will suffer for it. The retailers should at least so far harmonize that they will not patronize any manufacturer, importer, or dealer who sell to pawnbrokers.

ROCHESTER, May 27. RETAILER.

Editor of the Jewelers' Circular:

Upon looking over the by-laws of the Jewelers' League, of which I am a member, I notice in article V. section I. that "there shall be paid to the Secretary and Treasurer, five per centum on all moneys coming into his hands as compensation, &c., &c.

Now, I do not doubt that the Secretary's labor is but imperfectly remunerated at that rate on the regular fees and assessments, but I would learn through the columns of your journal if one of our wealthy tradesmen should bequeath, or during his life give to the League ten thousand dollars, as doubtless will be done and repeatedly, would the Secretary be entitled to his five per cent. on such bequest or gift.

June 17th, 1880. DUMMY.

THE *New York Times* has the following paragraph relative to popular and erroneous use of the term "manufacture:"

To one who looks with enough care to words as he passes them to and fro to recognize the "fossil history" which they have been cleverly pronounced to be, the word "manufacture," with its other forms, is interesting as a mark of important changes. It was framed when things were literally manu-factured, *i. e.*, hand-made, and was then a correct description of the articles to which it was applied. But by the development of machinery so far there is probably not an article of use into whose production some processes by machinery do not enter, has made the word a gross solecism, because its etymological meaning and its application flatly contradict each other. When we speak of the manufacture of common pins or nails, we really speak of "hand-made machine-made" pins. There are no more "manufactured" articles in this country; the homespun of 1776 was such, and so was the horse-nail which the blacksmith laboriously hammered out, but the fabrics and nails of 1876 are hardly touched by the hand until finished. The word has lost its significance with its correctness, and retains only its cumbrousness. It should be amended and corrected by dropping the first half, leaving "facture" to denote things made or the making of things; "factor" could then stand for the doer or maker, being relieved from its present use as being a commercial agent, in which latter use it is not necessary, there being good substitutes.

The American Watch Company.

A VISIT TO AND DESCRIPTION OF ITS IMMENSE FACTORY AT WALTHAM, MASS.

Continued from page 90.

In two previous articles we have attempted to convey to the reader some idea of a portion of the works of the American Watch Company, at Waltham, Mass., and now proceed with our pleasant task. We realize how utterly impossible it is to convey by words to the unprofessional reader an adequate idea of the vastness of an establishment that turns out on an average 750 completely finished watches a day that are unexcelled in point of workmanship or accuracy as timekeepers; or to give him a true conception of the great variety and delicacy of the machinery used; of the skill of the workmen; of the system and order that prevail in every department; or of the enterprise, capital, pluck, and business capacity involved in the successful operating of such a stupendous industry. We do hope, however, by these articles, to impress upon the public, and the trade especially, the great lesson taught in every room in this great factory, that thorough workmanship and conscientious attention to details are the keystones of success. In no department of this establishment is mediocrity tolerable; while perfection in mechanics cannot be expected this side of the millenium, yet the American Watch Company is not satisfied with any work or workmanship that is not the best of its kind at present known. Indeed, it goes beyond this, and is constantly stimulating the genius and inventive faculties of its army of experts to further improve either upon their products or the means required for their production.

Our second article concluded with a description of the Jeweling Room. The next in order is

THE SPRINGING ROOM.

This room is presided over by Thomas Gill, foreman, who has been in the employ of the company since 1866. He is a thoroughly skilled watchmaker, and everything in his room betokens that he possesses executive ability in a high degree. The work in this room consists in setting up the watches in the gray—that is, before the several parts are gilded—correcting any imperfections that may be discovered in any of the parts, adjusting the springs and timing them. Adjusting the balances is one of the most delicate operations connected with the manufacture of watches, requiring great skill and patience. A balance that we have before us consists of a thin rim of fused steel and brass, with a thin arm of steel crossing its centre; on the periphery are sixteen small gold screws, which are placed irregularly; the gold screws in the rim of balance are used to adjust the balance for temperature. The rim of the ring is drilled for other screws, and a greater or lesser number are inserted as required to secure the desired accuracy; their positions are varied according to the necessities of the case, and gold is used for the screws as this metal gives the desired weight in the smallest possible compass. A workman takes up one of these balances in a pair of delicate calipers, so arranged as to enable him to give the balance the same motion that would be imparted to it by the train of a watch. With a magnifying glass he carefully observes the movement, removing the gold screws from one position to another, adding to or taking from the number as may be necessary. The hair springs are also inserted here, and, in fact, the watch entirely put together. The watches are also adjusted to heat and cold, being allowed to run a certain length of time in a refrigerator, and a similar length of time in a heated temperature. The variations observed under these different conditions are provided against. The hair spring is a marvel of workmanship and beauty. It is simply a coil of fine steel wire, having a pinion at one end and an eye in the centre, by means of which it is made fast in the watch. Being highly blued, a bunch of them are beautiful to look at, resembling a bunch of brilliant fish scales. A lady of taste would covet them for dress trimmings. These delicate springs have to be adjusted by accurate weight and measurement for the work they are required to perform. After having been frozen and baked to Mr. Gill's satisfaction, the movements are again taken apart, the various parts restored to their respective trays, and, in this condition, are forwarded to the gilding room. In the springing room comparatively little machinery is used. Skilled and careful hand labor and trained eyesight being necessary to secure the proper adjustment of the parts. The number of employes in this room is 72, of which 21 are girls. The same stillness and neatness are observed in this room as in the others, and intelligence and industry are the all-pervading characteristics.

THE GILDING ROOM.

This room is located in the basement of the building, and is under the supervision of C. B. Hicks, foreman, who has been connected with the company 17 years. There are 38 persons employed here, of whom 14 are girls. In this room are received all the brass parts of the watch to be gilded, the train wheels, the top and bottom plates, cock, or balance bridge, etc. The pieces are first rubbed on an Ayre water stone to bring them to a perfectly even surface, and to remove from the surface any marks they may have received in the various operations through which they have passed. After stoning they are oxydized to remove all traces of oil or dirt that may have adhered to them, after which they are sent to be frosted or matted. This is done by subjecting the pieces to the action of brushes made of brass wire, that revolve rapidly in a bath of beer. While this gives to the surface of the various pieces a frosted appearance, it would seem to the average citizen to involve a shocking waste of good beer. However, for the consideration of lovers of the Teutonic beverage, we can inform them that it is not lager beer that is used, but a compound partaking somewhat of that nature. After undergoing this luxurious and invigorating bath of beer, the various pieces are carefully rinsed and sent to the gilders. Here they are subjected to two gold baths, whereby a thin coating of gold is evenly deposited over their surfaces. They are afterwards dried with alcohol and sawdust, and, after careful inspection to ascertain that the several baths they have enjoyed have not disagreed with them, the pieces are wrapped in tissue paper and sent to the setting-up room. The work in the Gilding Room does not require machinery of a delicate nature, but the various operations performed are interesting. The rapidly revolving brushes in the beer bath evokes an aroma from the beer which pervades the room and causes one to leave it with lingering regret.

THE FINISHING ROOM.

Henry M. Haines, foreman of the Finishing Room, has been with the Company 17 years. He is a skilled workman, and brings to his profession a rare intelligence. There are employed in this room 109 persons, one-half of whom are girls. Here are assembled all the constituent parts of the watch movements, and here these parts are finally put together, and made to form a completed timekeeper. All the other rooms make their contributions to the work, and in the Finishing Room these contributions are assembled in one compact whole, an American watch, the brightest jewel in the crown of American mechanics. The first thing done to the several parts in the Finishing Room is to give them a thorough cleansing, to remove from them even the faintest suspicion of dirt or oil. Next they are passed to what is denominated the "screw job," where the screws, jewels, and main springs are adjusted to their positions. This being done, they are passed to girls, who put all the parts together. To an uninitiated outsider, the putting together of a watch seems to be an intricate problem, requiring the highest order of specially trained intelligence to accomplish. Most men will remember, when they were boys, what an easy thing it was to take their watches to pieces, and how they subsequently labored in vain for days to put it together again, and then had to send it to the watchmakers and pay a round sum to have the job done. Ever since we attempted this feat we have had the highest admiration for the genius of the man who could put a watch together. We were somewhat astounded, therefore, on being informed by Mr. Haines, that in the Finishing Room of the American Watch Company, the work of putting the watches together is all performed by girls. The work requires a delicacy of touch and dexter-

ity of manipulation that the female sex naturally possess, and, as the operation is purely mechanical, they do it with rapidity and precision after they once acquire the "knack of it." The running movement having been set up, the stem-winding attachment is affixed, and the watches forwarded to the finishers. These are skilled watchmakers, and their duty consists of setting the watch to running. As it comes to them, the watch is a mass of distinct and separate parts, fitted together as designed, but without life—a being without a soul. The finishers complete the work of those who have gone before them, and infuse into this mass of metal the needed qualifications to make it keep time. Not until it reaches the finishers have all the parts been assembled together. The train, and every other part has been tested, and, in the Spring Room, the movement as there completed, was set to running, but subsequently the parts were gilded, and various portions, independent of the train, added. These are brought together in the Finishing Room, and it is the crowning work of the finishers to see that they constitute a harmonious whole—a perfected watch, that may be relied upon to regulate the rising and setting of the sun, or to announce the dinner hour. The watch having been endowed with life by the finishers, it is forwarded to the inspector to pass upon, where it is subjected to the closest scrutiny, and corrections in its running made. Being now a responsible watch, endowed with life, it is the inspector's duty to see that its life is a correct one, and that no deviations from the line of duty observed by all respectable and first-class watches occur. The inspector passes it along to the timer, who observes it still further, and attends to the regulation of it. This completes the work on the watches in general use, after which they are packed in little tin boxes and are ready for the market. But watches of the higher grades undergo a special adjustment beyond the Finishing Room, of which we shall speak hereafter. We have said nothing about watch cases as yet, for a watch is considered to be complete without its case, the movement being of first consideration. The movement is a work of science and art combined, while its case may be but the odd conceit of its eccentric owner. Movements are sold either with or without cases, and cases are put on them to suit the fancy of purchasers. So when we say the watches that leave the Finishing Room in little tin boxes are ready for the market, we refer simply to the movements, the cases being a secondary consideration.

In the Finishing Room there is kept in stock a supply of parts of nearly every description, so that if anything is wrong when the final work is being done, the defective part can be supplied. Some of these parts are so small that their character is not discernible with the naked eye. For instance, there are screws, perfect in every detail, so infinitesimal that it takes 150,000 of them to make a pound. We have Mr. Haines' word for this statement—we didn't stop to count them, life being altogether too short for such an operation. The trays used for passing the watches about the Finishing Room, differ somewhat from others we have described. The tray is a long wooden box-like structure, having ten large holes in it, each large hole being surrounded by four smaller holes. In the largest holes are placed the plates of the watches, and in the smaller ones the various parts. A second small tray contains the balances, jewels, etc., corresponding to the numbers of the various movements. Each tray is secured by a cover, fastened down with clasps, to prevent dust from reaching the parts, or the pieces being separated from each other. The packing of the movements in the little tin boxes provided for them is an interesting operation that is performed by girls. In the New York and Boston offices of Robbins & Appleton, the general agents of the American Watch Company, there are immense vaults in which are stored hundreds of these movements in their tin boxes. These look like so many boxes of ointment or patent pills till the lids are taken off, when in each is disclosed a watch movement in full operation. When orders are received from their customers for watches, they select the kind of movement desired, and place it in a gold or silver case of the pattern ordered, according to the fancy of the purchaser. It thus happens that as high an order of movement is often found in a silver case as in a gold one.

Although we have traced the manufacture of watches through various departments till we have seen it in its finished state, there are many other rooms in the factory, where work incidental to the business is performed, that we have not mentioned. In others, some special single part of the watch is made which we did not make note of in passing. One of these is

THE BALANCE ROOM.

J. L. Keyser, who has been 16 years with the Company, is foreman of this room. There are 67 employes in this department, of which number 37 are males. Much machinery of delicate construction and performing intricate operations is also used. To us, the making of the balance was one of the most interesting operations in the whole process of watchmaking. The balance consists of steel, brass and gold. A round solid piece of steel is inserted within a rim of brass, called a capsule. These are then subjected to an intense heat in a specially-constructed furnace, whereby the outer rim of brass is fused with the solid steel center. This is called the Gooding process, for which Mr Gooding holds a patent. As it comes from the furnace, the combination presents the appearance of one solid piece of metal. It passes through various machines, each performing a separate operation, until the solid piece of metal is reduced to a thin ring of brass and steel, across the center of which extends a single thin steel arm. On the periphery of this ring are placed the gold screws previously mentioned in this article. Simply glancing at the balance one would say the ring was of brass, but close inspection shows that the inner surface of this thin band is of steel, while the outer surface is of brass. It will be observed that a great quantity of metal is consumed in proportion to the number of balances made. For instance, one size when it comes out of the furnace after the fusing process, weighs 72 grains. When it has been cut down, drilled out and pared away, its weight is but 7 grains; after the sixteen gold screws are inserted in the outside rim, it weighs 7.20 grains. One machine takes the rough piece of fused metal and cuts the center of it till there is left but the center rim and a thin bottom piece of steel. Another machine marks out the steel arm that crosses the center of the rim, while another cuts away the superfluous steel on each side of the arm; still another drills the holes in the periphery; another drills the hole in the center of the arm; and others polish and finish the balance. The machinery for doing this is ingenious in its construction, and is the outgrowth of the requirements of the business—the invention of the men who had this work to do, and devised labor-saving machinery to do it with. This room like all the others, is characterized by perfect order and cleanliness, and intelligence and industry preside at the work benches and direct the mechanical operations.

THE ESCAPEMENT ROOM.

Henry N. Fisher is the name of the gentleman who has charge of the Escapement Room. He has been 21 years in the service of the Company, and bears a reputation of being a skillful, painstaking and intelligent workman. In this room are made those parts of a watch that pertain to the escapement. These are the pallet, fork, roller, escape wheel and jewel pin. All these parts enter the room in the rough, and depart in a thoroughly finished state. There are 40 persons employed here, 25 of whom are girls. Some of the machinery used is of very delicate construction and interesting in its operations. One class of these, whereon the jewel pin is turned, is wonderful from the delicate work it does successfully. We have before us a piece of garnet about as large as a pin, but square, and about $\frac{1}{16}$ of an inch in length. We saw this piece inserted in a lathe, and on one end of it a workman turn a jewel pin about $\frac{1}{32}$ of an inch long, and as large around as a cambric needle, the remainder of the piece of garnet retaining its original size and shape. In cutting the jewel pin, the operator has to use much diamond dust with his tool in order to make any progress, the garnet being so hard. It is also very brittle,

and that such a substance in such slight fragments can be manipulated by machinery is something wonderful. Yet the same 100 horse power engine that drives the machinery by means of which these almost invisible garnet jewel pins are made, in another part of the factory drives machinery that exerts a power equal to hundreds of tons. The other pieces made in the Escapement Room are not particularly novel, the methods of construction being substantially the same as used in the manufacture of other wheels, pinions, etc., heretofore described. The workmen here, as well as in other portions of the building, display a particular aptitude for the special work they have in hand, and seem only intent upon accomplishing the greatest amount possible in the shortest space of time. It is known to all the employes at the factory that the Company is largely behind in filling its orders, and, as their interests and the interests of the Company are identical, they put forth their best efforts to keep up the production of the factory to the maximum. In Mr. Fisher's room everything is orderly and clean and the best of discipline prevails.

THE SCREW ROOM.

In this room millions of screws of various sizes are manufactured by automatic machinery. C. H. Mann, the foreman in charge, has been 16 years in the service of the Company. Of the 30 persons who find employment here 20 are girls. There are seven automatic screw machines in operation, each turning out from three to four thousand perfect screws a day. A long piece of wire, the size of the required screws is fed in at one end of the machine ; a pair of nippers come forward, sieze it by one end and pull it out gradually ; while this is being done the thread is cut ; at the proper moment, a gripper comes from a point at right angles to the wire rod, sieezes the half perfected screw, which is, at the same instant, cut from the wire to which it was attached ; then the grippers fly back, bringing the embryo screw in position to another machine, where the head is cut and the screw completed. These movement go on automatically until the wire is exhausted and all cut up into screws. One man oversees the seven machines, feeding them with new sections of wire as fast as one is used up. Of course, much friction is created in cutting the wire, and this is provided for by an automatic arrangement by means of which a small stream of oil is fed directly upon the point where it is needed, returning to the can from which it was forced. By this means the oil is made to do duty over and over again. These screw machines are the invention of Mr. Charles V. Woerd, the Superintendent at the factory, and are regarded as a great achievment in mechanics. Rival manufacturers have sought in vain to copy it, and have gone so far as to bribe workmen to make drawings of it, but so far they have been unsuccessful in securing a machine that would do the work. When the machine has cut the screws entirely, they are gathered up and passed over to girls, who, with their small pliers, pick them up and insert them in a metal disc made for the purpose. A coating of shellac is then poured over them to hold them in place. These discs hold a large number of these small screws, into which they are inserted for convenience in grinding the heads down to an even surface. This is done by a machine having an eccentric motion, which passes them over a glass plate having an emery surface. These grinding machines are used in many of the rooms for bringing the various pieces to a uniformly even surface, the peculiar rotary motion of the machine, grinding from the center to the circumference of the glass plate, aiding materially in the required work. After leaviug the grinding machine, the screws are blued by the application of heat in the usual way. Machines for cutting screws have long been in use, but these invented by Mr. Woerd are very decided improvements upon anything previously in use, and accomplish more than double the work of any others. The Screw Room is, like the others, light, airy, clean and orderly in every part.

THE HAND ROOM.

A very delicate and interesting portion of watch making is exhibited in the room wherein the hour, minute and second hands are made. This room is located in the basement and is presided over by N. P. Mulloy, foreman, who has a force of employes consisting of 16 girls and 10 men. Here are made the hands, the plain balances for cheap grades of watches, and hooks for the main springs. To make the hands, a piece of steel wire is run under a heavy punch, in which is set a die of the required size. As the punch descends with great force upon the wire, it cuts off a piece from which the hand is subsequently to be cut. This piece contains four or five times the quantity of metal that is used for the hand, but the surplus is necessary for subsequent manipulations. The piece thus cut is then placed under another punch, which descends and stamps upon it the impress of the hand required, be it hour, minute or second hand Still another punch cuts away the surplus metal and leaves the hand complete as to its form. Comparing this with the piece from which it has been cut, reminds one of the lobster and its shell, the shell being so much more bulky than the meat. The butt end of the hand is now a solid piece, and this has to be cut away to allow its adjustment on the post that rises above the surface of the dial. This is all done by machines of different kinds. A great variety of hands is made, those of the cheaper grades of watches being quite heavy, while the second hands of some of the finer grades are scarcely larger than a hair. The hands are subsequently blued by heat, being placed in a metal vessel that is made to revolve over a gas light. Gold hands are made by similar processes from gold wire. The plain balances for cheap watches are struck out from sheets of metal by punches in the same way the hands are made. These punches can be fitted with a great variety of dies, and are machines of great power.

THE FLAT STEEL ROOM.

Of this department J. T. Shepard is foreman, having been twenty-five years in the employ of the Company. As may be inferred, he is a thoroughly accomplished workman, possessed of much intelligence and excellent executive ability. There are 54 persons employed in this room, only 20 of whom are males. The work done here consists of finishing up the flat steel work of the watches that is made in other rooms. All the flat steel pieces of a watch are received in this room in the rough, and are carried forward to completion. There is a great variety of these pieces before us as we write, of all sorts, shapes and sizes ; the names of half of them we do not remember and the other half we never did know. The work performed in this room comprises drilling, turning, milling, grinding, polishing and finishing. Much machinery is used, some of it of novel construction, working automatically and producing some curious results. The grinding is mostly done on machines similar to those previously described, the metal to be ground being fitted to the upper plate of the machine and passed over a glass plate having an emery surface, with an eccentric motion that carries the piece of metal from the center to the circumference of the glass plate. By this operation the finish is all made one way, so that the surface has a bright, glossy appearance, without any cross lines to mar the effect. What is termed snailing is produced by a similar process which gives to the surface of the metal a glossy appearance, which, as the light strikes it, resembles the peculiar structure of the snail shell—a series of curved spokes seeming to radiate from the center to the circumference, varying their positions as the light varies, but maintaining the same characteristics. Raying is still another process, accomplished by similar means, that imparts to the surface of the highly polished metal the appearance of numerous rays. These finishing touches are matters of taste, and give a highly finished appearance to what would otherwise be dull metallic surfaces. A very ingenious machine in this room is the one on which the lines are scored in the regulator dial, or gauge. These lines are exceedingly fine, are equi-distant, and must be made with the greatest accuracy. This is done by a beautiful little machine designed by the Superintendent, Mr. Woerd, and which is a great improvement upon the machine formerly in use, doing its work with greater accuracy, with less care, and more expeditiously. Mr. Shepard exercises the same careful supervision over his room that is to be observed elsewhere in the factory, and it is pervaded with the same order and neatness.

In our next article we shall describe the process of jewel making —one of most interesting operations to be observed in the factory—of dial enameling, dial painting, nickel finishing, and various other operations necessary to the production of a perfected American watch as these can only be produced by the American Watch Company.

(To be continued.)

Proceedings of the Horological Club.

A Distinguished Body of Watch and Clock Makers.

Seventy-fifth Discussion.—Communicated by the Secretary.

[Notice.—Correspondents should write all letters intended for the Club separate from any other business matters, and headed "Secretary of the Horological Club." Direct the envelope to D. H. Hopkinson, Esq. *Write only on one side of the paper*, state the points briefly, mail as early as possible, as it must be received here *not later* than two days before the end of the month in order to be discussed and reported in the Circular for the next month.]

EASY FLOWING GOLD SOLDER.

Secretary of Horological Club:

Will you be so kind as to give me directions for making some easy-flowing gold solder, of low karat? Please give full particulars.

R. P. W.

Mr. Rolliver, one of the oldest and best practical jewelers in the city, and one of our most active members, was unfortunately too much engaged to be present at this meeting, but kindly sent in the following formulas in response to the request in Mr. W's letter:

Gold Solders.—*2 Karat:* One dwt. gold coin; four dwt. silver coin; one dwt. copper; one dwt. brass.

Five karat: two and one-half dwt. gold coin; five dwt. silver coin; two and one-half dwt. copper; one-quarter dwt. brass.

Eight karat: nineteen and one-half dwt. gold coin; twenty-three dwt. silver coin; ten and one-half dwt. copper; one dwt. brass.

Eleven karat: ten and one-quarter dwt. gold coin; six and one-third dwt. silver coin; three and five-sixths dwt. copper.

English or American coin should be used.

WHAT MODERN WATCHMAKERS SHOULD KNOW.

Secretary of Horological Club:

Will some of your honorable body please enlighten me on the following subject? I lately had a fine American Co. movement to clean. The owner could not spare it long, waited while I did it, and took it with him. He said he would regulate it in his pocket, as it only wanted cleaning, and would not need much altering. I was very particular not to change anything, but to get the hair-spring and regulator the same as they were before, and all that. But since I cleaned it, the watch gains from four to six minutes every day, and it will make a minute or two difference whether he carries it or hangs it up in his room. He says it did not vary so many seconds before it was cleaned, and I know it was a very close timer. What is the matter? I am sure I did not injure anything; did not bend the hair spring or balance, or pivots. It has as good motion as ever, but something is wrong, that is sure. I feel ashamed and disgraced to have the name of spoiling a good watch. I only recollect one thing that I changed, and that was an improvement—I found the screws in the balance must have got loose, for some of them were out quite a ways, so I turned them all in as they ought to be. I took the greatest pains with everything, to do it right. If you can explain the mystery for me, you will very greatly oblige me. J. S.

The members had quite a hearty laugh over the perplexity of Mr. S., when the trouble was so obvious. Mr. Horologer then explained that Mr. S. had done a very serious injury to the watch by turning in the balance screws, for he had destroyed the adjustment for heat and cold, and the rate, and possibly also got the balance out of poise. In fine watches, which are called "adjusted," the balance is so made that it will "compensate" for heat and cold, which means, to keep the same time in warm or cold weather. To make it compensate properly, the screws in the balance are moved around the rim till the performance is quite close, then the finishing touches may be given by turning the screws a little, in or out. Besides these "compensation screws," there are others known as "rating screws," which are only moved to adjust the rate or the poise, or, sometimes, to perfect the adjustment to positions. All of these adjustments Mr. S. had ruthlessly destroyed by turning in the balance screws. It is also possible that he had done other injury, without knowing it, for a fine watch is a very sensitive article to be handled by any one who is not posted, and the finer the movement and more carefully it has been perfected, the more easily it is injured, and the greater the danger of damage by inexperienced workmen.

It was not likely that the owner would trust it again with Mr. S. for repairs, even if he was capable of making them, which he obviously could not. So he had done himself a very serious injury, the effects of which he would probably feel for years to come. It would be impossible to give him instructions, in these Proceedings, for making these repairs and adjustments, for it was a very extensive as well as important subject. But Mr. S. could get all the information he required in a book by "Excelsior," (the writer of the famous Practical Hints on Watch Repairing, in the Circular,) called "A Practical Treatise on the Balance Spring, and Compensation Balance." Part 6 was devoted to the adjustment for heat and cold. The rest treated on adjustment to positions, isochronism, rate, &c.,—the making and fitting of hair springs, and all that the practical workman needs to know about the more particular repairs and adjustments of watches and chronometers. It is published by D. H. Hopkinson, Esq., the publisher of the Circular, price, $3.50. If Mr. S. had had this book and studied it carefully, it would have saved him from an occurrence which is not only mortifying in itself, but may cause him a loss of hundreds of dollars before its effects pass away. And if he desired to avoid further blunders, he would lose no time in now obtaining a copy. It is a thoroughly practical and trustworthy work, which any workman can understand, and is, he believed, the only work in the English language especially devoted to these subjects. It has been before the public for some three years, and is heartily endorsed by all of the best workmen everywhere. Any watchmaker who wishes to understand how to handle and repair fine watches without injuring them, or who aspires to work on anything better than "plug" watches, should certainly own this book. There is no way that he could possibly invest its price more wisely or profitably.

Mr. S. need not think he is uncommonly ignorant, for he is probably no worse off than a great many others, who would have been considered good workmen years ago, but who are left far in the rear by the great advances made during the last decade or two. Chronometer balances, and watches adjusted for heat and cold, isochronism, positions, and regulated down to a few seconds a week, used to be great rarities, which not one watchmaker in a hundred would ever see. But nowadays they are used everywhere, and the workman who does not understand at least enough about these subjects to avoid injuring them, runs a great risk of being prosecuted for damages, besides the disgrace of being known as a botch. It behooves every one who is not prepared to leave the business, to inform himself on these subjects, as speedily as possible.

LINING FOR WALL CASES.

Secretary of Horological Club:

Will any of your members be kind enough to inform me of the best inexpensive material for lining wall cases for silverware? Something that will not discolor plated articles. Is there anything in the coloring matter of blue or black cheap cloths, costing perhaps 10c. to 15c. per yard, that will produce the discoloration. J. D. H.

Mr. Clerkenwell thought there would be no danger from such cloth, unless they got dampened. Mr. H. could detect any acid or hurtful odors by smelling or breathing through the folds of the cloth. In his own cases he used tissue paper of the color he wanted. This was easily applied or removed when dirty, or if a change of color was wanted. He then called attention to the following

EASY WAY TO MAKE DRILLS.

Secretary of Horological Club:

I have a struck a lead which I think will pan out good down to bed rock, to wit: Knowing that sewing machine needles were made of the best steel, I wrote to the Waterbury Needle Company, Waterbury, Conn., who wrote me that they would make them at thirty cents per hundred, without point, eye or groove. They must not have grooves, as it spoils the needle for this purpose. I ordered one hundred of each number, 000, 00, 0, 1, 2, 3, and 4, of the Howe style, as the shank is quite large and fits the chuck best, and now I have only to take one, flatten it, fit it the right shape, heat the front, put it in a piece of beeswax to cool, polish it on an oil stone, and I have a drill of the right size in five minutes, and it is truer and much cheaper than one can afford to turn down a piece of stubby wire, and at less than ⅓ of a cent. E. W. R.

READY MADE MATERIAL FOR AMERICAN WATCHES.

Secretary of Horological Club:

In looking over the June number of the CIRCULAR I find a letter from "B" on the subject of "Ready made material for American Watches," and knowing the difficulties he labors under, do not feel satisfied myself, and think *he* will not be satisfied with "Waltham's" answer. "B" is not the only one who has cause to complain, for the dealer and the manufacturer both have to contend with this mistaken idea that "duplicate parts" are *exact* duplicates of the parts used in any American Watch.

The idea of taking a record of the size of each pivot, and the corresponding size of the jewel selected to give proper sideshake, was first conceived by Mr. A. L. Dennison, first Supt. of the American Watch Co., and by him carried on for some little time. Quite a corps of young ladies were busily employed in measuring each box of trains—making a record of the number of the movement, the size of each pivot, and the size of the jewels selected to fit the same. Troubles were constantly arising, however. Pivots would be broken, and new wheels and pinions substituted, of which there was no record. Changes would be made as improvents suggested themselves, and it was found that though the *theory* was good it could not be carried out in practice, and gradually this part of the system was abandoned. If I am not mistaken it is not carried out in any factory of any size at the present time.

The general idea is correct, that movements of any given number, have, all through that series, wheels and pinions of a given size, and the general dimensions and proportions are strictly adhered to. But it is a mistake to think that, by giving the number of any movement, the manufacturer can send a new wheel, pinion, arbor, staff, or jewel to *fit* the place of one broken or lost. The chances of its *fitting* are not one in one hundred. Take for instance a balance staff, and scarcely a day passes that an order is not received for a "staff to fit number——, movement"). First, to determine the series of watch which this number belongs to. This is no trouble. But to determine whether some little change, which was made for some good and sufficient reason, took place before or after this number was put out, is another thing. Then, even though he may have a record of the size of the pivots, what guide has he for the size of the staff, so that the roller will fit, or the extreme length be such that the endshake will be right, or the balance shoulder of a size to fit the balance, or or the collet shoulder to fit the collet, and one or two other points that I might mention? The same can be said of any other part, and thus it occurs that the watchmaker has to work some little time to fit a part, (if it can be fitted at all,) which he is led to believe needs nothing but to put it in place and set the movement running.

That the system of supplying duplicate parts to American watches is a great advantage to dealers and consumers I will allow, but I *deny in toto* that such parts can be supplied by giving the number of the movement only, and the sooner the trade is led to *know* and *believe* this, the better for all concerned.

The only *sure* way I know of is to send such portions of the movement as are required to select and fit a new piece, right to the material dealer, (who is supposed to have a quantity on hand) or to the factory. The latter is the *surest*, as then, if a staff or pinion cannot be fitted to the jewels, the jewels can be changed, and everything made right. The delay would be no greater than to send an order for the part wanted, and the expense but little more. The *perplexity* would be avoided, and the satisfaction of having just what you want the first time would be more than enough to compensate.

Of one thing *all* may be certain—that material ordered by the number of the movement has but a slight chance of fitting the place for which it is intended. X.

Mr. Waltham replied that he feared Mr. "X" had not read his reply at last month's meeting very carefully. For he had clearly advised to give full information as to the movement the material was wanted for, mentioning the name of the grade as well as the number of the movement, whether full plate, three-quarter plate, key or stem winder, and any other peculiarity, saying that he "could not be too particular" in explaining the kind of movement the material was for. Even then it was not expected that the material would fit *perfectly* without any fitting at all. But he thought a workman must be extremely fastidious who would complain because he had to make some minute alteration for the end shake of the balance staff, (very likely, having been altered since the watch left the factory,) or to open the roller table hole, or fit the hairspring collet a little, or the balance hole. He thought these were very small matters compared to the convenience of being able to obtain parts which required only such trifling alterations (and perhaps none) to make them fit. Take the case of a pinion—was it not well worth all that the pinion cost, to know that it was just the right size, shape, and temper,—even if he had to fit the pivots to the jewels. Or does Mr. X think it would be better to pay nearly as much for a pinion "in the rough," and fit it himself from the beginning, rather than get one from the factory which was *almost* right, but might not be quite a *perfect* fit, and give it a finishing touch?

Mr. X advises the workman to send on any necessary parts, so that the piece can be fitted by the material dealer or at the factory. That is good advice when dealer or factory is close by, and express charges low. But the round trip would cost most watchmakers from 75c to $1.50 and upward; that would be a decided stopper. But suppose he sends it by mail. The postage would be but little, but there is the risk of loosing it, and nobody responsible for it if lost. If he wants a balance staff, he sends on the old balance, hairspring, roller table and jewels. Would not the loss of those pieces, or even of the balance only, make him grunt? Suppose that he had also sent the potance and the balance cock. Or suppose he was one of those who would consider himself imposed upon if he had to alter for end shake, after buying a staff ready made—and to avoid this he sent the upper plate with the other parts named above, to insure a perfect fit, —and the whole was lost in the mail. What would be the prospect for a crop of cuss-words about that time? Let the workman say for himself whether he had better take the risk of loss and the extra charge for fitting, or to buy the part he wanted, alone, and take the risk of having to do a little fitting after he got it.

The case supposed by Mr. B is a very pertinent one, viz: a pallet and staff. He is quite right in saying that they would not fit perfectly as bought. All companies adjust the escapement in the movement to which it belongs, except for the very cheapest grades. Probably it would be almost impossible for the lever, pallet, and staff to be changed between two movements, and fit as perfectly as before. Still more impossible to substitute pallets which have never been in a watch. No honorable company makes any such pretension. Yet even in this case, it is not an advantage to be able to buy pieces which are of the right size and shape, as near as careful workmen and gauges could make them, and then do what little fitting is required to adjust it for the movement?

If any company does not make the parts interchangable,—or if they make changes in the construction of them so often that they cannot tell what size or kind of material they used at any particular time, or when they made the changes, such company has no business to claim that their material is interchangeable and all ready to put right in the watch,—and it is a fraud for them to advertise any such thing. But there is at least one company whose material can be relied upon to require very trifling, if any, fitting to take the place of lost pieces.

The public, in their ignorance of the fact, do not understand that there is an immense difference between the different American companies, the quality of their articles, &c., but seem to think that if it is an "American watch," it must possess all the virtues the leading companies have *proved* that *their* watches *do* possess. And it is precisely the same with their material. The younger and inferior companies make the same pretensions as their superiors, and in fact live on the reputation honestly earned by the latter, but never earned nor deserved by themselves. And the reverse of this is also true, for the really meritorious companies have to suffer in reputation for the faults of their imitators. Anything made in this country is labeled "an American watch," and the disappointment and disgust of the public with the poor trash sometimes labeled "American" is visited upon all American watch companies the good as well as the others.

The public cannot be blamed, because they don't know, but the trade ought to and do know that there is a very great difference between the products of the different companies, whether in movements or materials. And they should understand and make the public understand that the fact that some companies have advertised falsely that their material is interchangable, is no proof that all American companies are in the same box, but the material of one company may be exact in fit, although that of others is not.

The Drill-Bow and the Fly-Wheel--Foot Lathe.

THE drill-bow and the fly-wheel are the two means of action of the lathe. Their respective merits have often given rise to discussions among watchmakers, as if the one should exclude the other: both are useful; it is only necessary to know how to employ them opportunely. I wish to devote a few lines to the study of these two agents, leaving the business proper of the watchmaker to others.

In technical language the drill-bow produces an alternating circular movement; from this it results that the drill-bow makes as great backward movement without effect as it does forward in producing it; whilst the fly-wheel goes forward without loss of time, so that in reality it performs twice the work of the drill-bow during the same period. But this law presents some exceptions, and we shall see by the examination of the different operations that sometimes the drill-bow performs as much work as the fly-wheel.

The drill-bow is the primitive process, not only for small work like that of watchmakers, but also those of wood and metal turners. For them it did not consist in a drill-bow moved by the hand, but in a flexible rod, more or less long and thick, according to requirement. This rod was firmly fixed, parallel to the ceiling, by its strongest end; to the other end was attached the cord, which, after going round the pully of the lathe, was joined to the footboard. In this way both hands remained free, the force being communicated to the pedal by the pressure of the foot augmented by the weight of the body; so that objects could be operated on of larger dimensions than with the drill-bow held in the hand. Sometimes, instead of a rod, a bow was used, also fixed to the ceiling by its centre, and directly over the lathe; to the cord of this bow was attached that which passing round the pulley joined the footboard, and the result was the same. Later on came the fly-wheel; that is to say, a wheel turning freely on its axis, and put in motion by means of a crank attached to the footboard. The circumference of this wheel was of wood, and little employed except for turning large objects; it replaced the rod and the bow mentioned above. Its weight was often insufficient, and had to be increased at the circumference by pieces of iron or lead. When applied to small work like that of the watchmaker it was of smaller dimensions, having little weight, and lacking force of inertia, which is partly the origin of the opinion of some watchmakers that perfect round-turning cannot be effected with the fly-wheel. In addition, these fly-wheels were difficult to make well; they were dear, and almost always went out of shape. It is very probable this latter defect was the chief cause of their being little used, until the progress made in the manufacture of iron favored the production of cheap wheels of all sizes, not liable to go out of shape, and realizing the best mechanical conditions.

Before entering into further details, let us examine a little the subject of round-turning. What is the necessary condition for turning an object round? The graver must remove from the entire circumference of the object exactly the same thickness of metal. But if the drill-bow makes, for example, three and a half turns, and the working being regular—it is always the same part of the cord which produces the movement—it is evident that the graver will remove at each movement of the drill-bow a certain quantity of matter spread over three turns and a half; there will be thus a half turn not reckoned; in these conditions, the thickness of the matter removed not being equal, the object will not be round. Skill and attention may remedy this, but it is nevertheless true that the defect is here, and care must be taken to avoid it.

With the fly-wheel the conditions are changed; the movement being continuous, if the graver is held with regular pressure (which is also required with the drill-bow), the quantity taken off is always the same. If, after having given 200 turns, the work stops half a turn further than the starting point, the fly-wheel will have produced at the worst, on 200 turns, the same bad effect as the drill-bow produced in three turns, which is markedly different. Besides, the fly-wheel not stopping short like the drill-bow, the force of the graver may be reduced as the wheel slackens, and the defect we have instanced thus corrected.

From this it appears, theoretically, that the fly-wheel turns a better round than the drill-bow. But conscientious watchmakers have noted a contrary effect in practice; and this is a question which must be examined more closely, either to dispel an erroneous opinion or to draw attention to whatever facts may present themselves. In turning with the drill-bow, the graver must bite while the object turns one way, and be withdrawn while the drill-bow makes a reverse movement; the hand must therefore become accustomed to produce an alternative movement corresponding to that of the drill-bow. Where is the watchmaker who recalls with pleasure his apprenticeship? In any case, he remembers the difficulty he had to turn a round. After having succeded and practised this method of turning for several years, what happens when the fly-wheel is tried? The alternating movement of the foot on the pedal replaces that of the hand working the drill-bow; but this movement is transformed into a continuous one, without the intervention of the will. The hand holding the graver, acting under the influence of habitude, continues its reciprocating motion until the necessary firmness has been acquired. According to the nature of the individual this change of movement is more or less rapidly achieved, during which time the turning is badly done, and is still further aggravated by the fact of the movement of the foot rendering the hand somewhat nervous; for the foot having also an apprenticeship to make, works irregularly on the pedal, and destroys the force of inertia of the wheel, especially if this latter be light. Here, as with everything new, careful experiment must be made, without prejudice. Many watchmakers are deprived of the useful aid of the lathe from want of sufficient force of will to devote some hours to the study or it.

Let us now see in what cases the use of the drill-bow is to be preferred to the fly-wheel, and *vice versa*. Their operations may be divided into three categories—first, those in which either movement may be used indifferently; second, those who require an alternating movement; third, those necessitating a continuous one. The principal operations for watchmakers are—turning, piercing, polishing, and counter-sinking.

Turning is still performed with the drill-bow, but is very well executed with the fly-wheel, this latter being the most expeditious. However, when it is requisite to give a rapid touch with the graver, as for instance in finishing, the drill-bow is preferable; when the operation is more prolonged, the fly-wheel is best.

Piercing, as well as making small counter-sinks, is usually done as rapidly by one process as the other, provided that the blades are properly placed. For the drill-bow they should be placed in the centre of the two thicknesses of the boring-bit, that is to say form two equal edges; the drill then cuts equally both ways, there is no time lost, and the to-and-fro movement of the drill-bow has even the advantage of clearing the blades of any particles having a tendency to adhere, especially when brass is pierced. With the fly-wheel the blades of the drill should be composed each of a single edge at the side opposed to the movement. These two edges form at their junction not a point, but a small ridge equally cutting and not hindering the direction of the drill. Semi-cylindrical barrel drills go better with the foot lathe, because the two blades are of necessity turned inversely to each other. When one of the two cuts, the other moves the reverse way, and is easily splintered; care must be also taken to lower the non-active side, so that it does not touch the matter. The necessity of this arrangement is easy to see if the same angle be given to the two sides; that moving reversely is promptly splintered, while that working remains intact.

Polishing is done both with the drill-bow and the fly-wheel; but unless certain conditions be complied with it does not succeed, or is performed badly. Steel objects are polished with the polishing file

or the emery wheel. Stems are polished with the drill-bow and file, because the two-and-fro movement of the file always responds in an inverse sense to the movement of the drill-bow, there being no time lost. Further, the file working from right to left, as well as before and behind, draws the material employed in polishing to the proper place, and the polishing thus obtained is perfectly clean. It is not the same with the bearings, which, as they are polished by the friction of the side of the file, are very difficult to get smooth. Some axles of balances also present parts turned in edges, which it is hardly possible to polish by hand correctly.

These difficulties originated the idea of polishing the edges with the emery wheel, which was afterwards employed for flat bearings, the result being completely satisfactory. This method of polishing with the emery wheel was first employed with the aid of the drill-bow; the object to be polished as well as the emery wheel are placed on a depthening tool; each is moved by a drill-bow; and these latter, which must both work the same way, are held in one hand. Moving thus together, the two objects met at their opposite points, whence results a regular friction. Besides, their diameters being different their speed is also different; consequently the lines are crossed, and the polishing succeeds the better. With the fly-wheel the conditions are the same; only the objects have a continuous movement in lieu of an alternating one. For polishing bearings, the emery wheel is therefore preferable.

Ordinarily, however, the polishing of a stem is joined to that of a bearing. To attain this, the emery wheel should have its circumference turned in a way corresponding to the stem; then it should be over the entire length of this latter to cut the lines. With this depthening test process, the spindles which receive the emery wheel must be left free, but be pressed one against the other, either by the hand or a special appliance, in order to give to the stem to be polished the movement necessary to cut the lines. This motion of the emery wheel right and left is communicated to the drill-bow, and there produces a movement of the cords on themselves, a friction which can only injure the success of the work. With the foot lathe this friction is obviated, the greater length of the cords rendering null the effect of the lateral movement of the emery wheel. The hand working this is alone in use, leaving the other free; the general conditions are better, and the conclusion is that the fly-wheel is preferable for polishing with the emery wheel.

Jewels require great rapidity of rotation for their polishing—three or four thousand turns a minute. Here the drill-bow is as powerless as the fly-wheel is indispensible. The important operation of pivoting is made, or rather may be made, in two ways. The first, the oldest, consists in raising the pivot by the graver, on an ordinary lathe, then polishing it with the burnisher on a special lathe, furnished with a spindle having a succession of slits graduated according to the thicknesses adopted for the pivots, and in which these latter turn and undergo the operation of polishing. For a long time the drill-bow alone was employed for this work; but since the foot lathe has come into general use it has been successfully employed for pivoting, using the same tools as before. For this it has sufficed to adapt, either to the spindle of the turning lathe or that of the pivoting lathe, a small pulley or screw ferrule, the face of which has a catching pin long enough to reach the spokes of the pivoting wheel. This latter has, therefore, no need of any apparatus to put it in motion; placed directly on the lathe, it receives its impulsion from the pin of the screw ferrule, which turns it without its having to undergo any influence arising from the tension of the cord or the inequalities of its movement. Further, when it is required to make a certain number of pinions, the time is gained by this process that would be employed in taking off and replacing screw ferrule and drill-bow. Many years ago a method of pivoting was tried, based on the use of the fly-wheel and the suppression of the pivoting lathe. This process consisted in fixing the pivoting wheel on the extremity of the arbor, like those of a lapidary; the pivot was raised with the graver, and polished with the emery wheel; this being carried by a small apparatus which took the place of the support. Satisfactory results were thus obtained, but certain difficulties were encountered which required a skillful hand; then the use of the fly-wheel being very limited led to this process being abandoned. Here, however, was the idea, which, though relinquished at the time, was not lost. The *Journal Suisse d'Horlogerie* recently published a description of this proceedure, in which the emery wheel is replaced by the polishing file. The great difficulty of this method of pivoting is to get the pinions perfectly round; this will be specially treated, but the aim of this article being simply to examine the various uses of the drill-bow and fly-wheel, we confine ourselves to remarking that the fly-wheel may be advantageously employed for pivoting, especially in quantities.

It remains to say a few words on countersinking. This tool replaces more and more the file in many of the operations of the watchmaker. It was employed for the first cutting of wheels; then it served to replace the old gouge with which the teeth range was terminated; finally, taking the most varied forms, it has been used for a number of other things. If, for some special work, the countersink may still be used with the drill-bow, it has a special advantage with the continuous movement of the fly-wheel, and for the generality of the operation of countersinking the fly-wheel is indispensible; for with this latter alone could the extension of the class of work be possible which has taken place at the present day. In conclusion we repeat that the drill-bow and the fly-wheel, far from excluding each other, tend to completion, and that it is desirable to study in which case one is preferable to the other to achieve the best results.—I. H., *Journal Suisse d'Horlogerie.*

CANOE AND CAMERA, OR TWO HUNDRED MILES THROUGH THE MAINE FORESTS—ILLUSTRATED—The above is the title of a very beautiful work, written by Thomas Sedgwick Steele, of Hartford, Conn. Mr. Steele is well known to the trade as the proprietor of one of the most elegant jewelry establishments in the East, and an enterprising dealer of sterling character. In the pursuit of health, he has spent, with congenial friends, two or three seasons in the wilds of Maine, fishing and hunting. The present volume relates his experience last year, when, with his friends, he made a trip of two hundred miles by canoes down the wild streams and through the dense forests of Maine. One of the party was a photographer, and some of the views taken by him and transferred to woodcuts, furnish the elegant illustrations to the volume. The party met with many adventures, which are graphically set forth by the author. The volume is full of interest to sportsmen and all lovers of nature, as well for its descriptions of the picturesque scenery of that region as for the tempting recital of their success with rod and gun. Mr. Steele, with his customary good taste, has published the volume in magnificent style, on beautifully tinted paper, and in the highest style of the typographic art. Mr. Steele is a true disciple of old Isaac Walton, whose vivid appreciation of the rugged beauties of nature and the exquisite delights of angling have made him the idol of all true sportsmen. To all who desire to spend, in imagination, an hour in the wildest of wild woods, and to inhale, through the workings of his fancy, the invigorating aroma of the pine forests, we commend a perusal of Canoe and Camera.

VEGETALINE—A new compound has been patented in England under the name of *Vegetaline*, which is intended as a substitute for ivory, coral, leather, caoutchouc, etc. It is prepared as follows: Cellulose (woody fibre), from any source whatever, is treated with sulphuric acid of 58° B. (=sp. grav. 1.676) at 15° C. (=59° Fahr.), then washed with water to remove excess of acid, dried, and converted into a fine powder. This is mixed with resin-soap, in a mortar, and the soda of the soap is removed by treatment with sulphate of aluninum. The mass is now collected, dried again, and pressed into cakes by hydraulic pressure. These cakes are then cut into thin plates, which are shaped by again subjecting them to pressure. By adding castor-oil or glycerine to the mass before pressure, the product may be made transparent. Colors may be imparted by the use of vegetable coloring agents. Facts respecting the strength and elasticity of this product are wanting.

The Art of the Silversmith.

BY W. HERBERT SINGER.

IT is now quite impossible to say at what epoch silver first came into use; we know that gold must have been in general demand towards the end of what is termed the bronze period, from the number of gold ornaments that have been found in connection with bronze implements of that time. Gold being found in a native state, was at once fit for use, but silver requiring more preparation from its ore, had, probably, to wait longer, until man had devised some method of working it. It is not likely, however, that silver lay hidden long after its rich sister; and, when once known, its wonderful properties as an art medium were at once appreciated, and it soon quite superseded gold for all purposes but that of personal ornament. Thus we read in the Bible of vessels of silver much more often than of vessels of gold. There are no less than three hundred and five passages in Holy Writ, in which mention is made of work in the precious metals, and from these we gather abundant proof of the prodigal use of both silver and gold by the Hebrews. Space, however, will not permit me to do more than mention the many applications of precious metals which were made by the Israelites, or by those from whom we may suppose them to have learned their work, the Egyptians; nor can I, for the same reason, do more than refer, in the briefest possible manner, to the workmanship of the ancient Greeks and Romans. Homer refers to silver, but in terms which would lead us to suppose that it was then comparatively scarce. According to tradition, it was first used for coinage by Phydon, King of Ægina, about 869 B. C. We may safely conclude that, at the time of Homer, and long after all decorative metal work, and also statues, were made by the hammer, out of thin pieces of plate, the different pieces being joined together by pins or rivets; this being long before the process of soldering was invented. Great progress was made in the modes of working metals between the age of Homer and the fifth century before Christ, the art of casting in moulds with a core being then first practiced; and this new method was a most important step towards that grandeur of perfection which was hereafter gained by the people of this nation.

Three different processes were used by the Greeks in the formation and ornamentation of their silver work. The first was that of beating, by the hammer, thin plates into various forms. A thin sheet of metal was put upon a kind of cement, which yielded sufficiently to allow the requisite amount of relief; it was then worked upon with blunt punches of different shapes, the ornament or figure being gradually raised by the ground being sunk; it was, in fact, what is now termed *repoussé* work; and I beg leave to call your attention to six studies of a head that have been executed in our factory, and which I hope will plainly illustrate the method of working in this beautiful but difficult art. In the first you see the outline of the head faintly dotted into the metal; in the second, the form is more distinct, having been traced round with a blunt punch, by which a very slight amount of relief has been obtained; in the third, we find this relief higher; and, in the fourth, still higher, as here can be seen the little punch marks, which have been made in driving back the metal in some places to obtain the requisite relief for other parts. In this study more attention has been paid to the detail; this is again to be observed in the next, and, in the sixth, you see the work completed.

The second process used by the Greeks was that of engraving the surface of the work with a sharp tool, or chasing; and the third, that of inlaying one metal into another, or damascening. These different methods were often united in one work; thus a plate was first beaten up into a pattern, and was then chased with the graver. Silver was more used for such work than any other metal, and Pliny observes as a remarkable fact, that while so many had gained renown for chasing in silver, no one was similarly famed for working in gold. It should, however, be mentioned, that soon after his time, the fashioned changed, and then we find gold-chased plate most abundant.

As with the plastic art, that, perhaps, under the guidance of Phidias, gained the highest point it will ever reach, so with this branch of it, which owed its perfection to the close relationship then existing between the silversmith's art and that of sculpture. The art of working in silver was, undoubtedly, in an advanced stage of progress, even in the heroic period, but it was now that it reached its complete development. The commencement of this wonderful result may have been due to Phidias himself, for some of the greatest Greek sculptors were also workers in silver.

I can only give a very rapid glance at the silver-work produced by primitive Italy. Before Rome had made herself the mistress of the world, the civilization of the Greeks had been spreading through a great part of that country. In Sicily, their influence was soon felt, and this province was famous for a long line of artists. Some parts of Italy seem to have had a civilization even earlier than that of Greece herself. This refinement must have come from the East but it was soon blended and absorbed in the superior culture of the Greeks. Of these nations, Etruria is especially interesting to us, for it was through her that the art of Greece first reached Rome. The jewelry of this artistic people is still the wonder of all true workmen, it being in personal ornament that they excelled. When Rome could so easily command the services of such consummate artists as these, and their Hellenic brethren, it is easily understood that so warlike a people would not delight in following the quiet and peaceful paths of art; and it was by conquest, or by these artists in their employ, that the Romans acquired most of their artistic treasure.

With the decline of the political power of the Romans, sank also their artistic power. There are many causes which brought about this end. The love of change, which is ever so fatal to pure art, was one great reason. The nobles were satiated with beautiful forms, and longed for something fresh. The artists, therefore, had to create new and vicious shapes; this led them further and further from the noble paths of yore. It must also have been difficult to follow the old traditions, when work was brought into Rome from almost every country of the world, and the style of each in its turn was the whim of the hour.

The gradual decline that now commenced was but the beginning of the end, when almost all was swept away by the barbarians, as they crowded victoriously into Rome, to take that terrible revenge or which they had so long thirsted. But before this took place, the Romans lived on in the most prodigal splendor, their luxury being such that we cannot comprehend it. Gold and silver glittered everywhere, and were used to such an extent, that these precious metals almost passed out of the hands of the silversmiths, and became a material for the builder.

No two events, probably caused such a complete revolution in the world of art, and therefore in the design and execution of every kind of metal work, as the conversion of Constantine to Christianity, and the removal, in the year 330, of the seat of the Government to Byzantium.

There can be no doubt but that the former of these events gave a great impetus to the art of silver working, and caused a great demand for such work, as, besides the costly gifts Constantine bestowed upon Roman churches, he endowed those at Constantinople even more magnificently. No sooner had the Emperor embraced Christianity, that he endeavored to do honor to his new religion by making her temples and their contents as gorgeous and costly as possible, and his zeal must have been indeed great, for, in a very few years, Constantinople became the richest city in the world, and this was mainly due to the surface of the Church.

It is most unfortunate that the writers who chronicle these riches do not give sufficient particulars concerning them to enable us to form an idea of their artistic merit; but from the fact of the size

and weight of the various objects being stated, we may conclude that the intrinsic value was more considered than beauty of form or delicacy of ornament.

The works now executed were probably debascd copies of classical examples; for, as yet, little progress could have been made in the new art. The form, as being more difficult to invent, we must suppose was a more or less direct imitation of the older style, while the Christian artist would endeavor to change the detail upon it, so as to make his production more consistent with its fresh service. The example set by Constantine was followed by his successors, each Emperor striving to add some new splendor to the Eastern capital.

So late as the tenth century, Constantinople held the proud position formerly belonging to Rome, and from her came the light that dispelled the darkness over the rest of Europe; and if it were not so high and beautiful art as that emanating from the ancient mistress of the world, it was, at least, a strong, vigorous style that has retained its influence, even down to the present day.

The whole secret of the difference between the two styles lies in the fact that, as the Greeks cultivated beauty and purity of form, Byzantine artists sought above everything beauty and richness of color. This is particularly observable in studying the gold and silver work belonging to these periods.

In the great era of art, these metals were used in their native state, and the forms into which they were worked were so beautiful, that they required no further help to make them perfect works of art. But this did not satisfy the more gorgeous, but less refined, taste of the lower Empire, and these artists were not content unless their metal work was resplendent with sparkling effect. This luxurious people delighted in splendid masses of color; this they often obtained in their work by precious stones, grouped together without any regard to design, but the effect of color. It was for this reason they brought enameling to such perfection. The rudiments of the art they no doubt obtained from the East, where the enamel was applied to the metal in a thin layer by vitrification. But the Byzantine artists were the first to practice in Europe, the art of *Cloisonné* enamel, by which process each color is separated from the other by a thin strip of metal.

We must not pass from this early period, without making mention of the important specimen of silversmith's art which has come down to our own time. I refer to the altar frontal in the church of St. Ambrose, at Milan. It is of silver, partly gilt, and in it are set, in great profusion, precious stones and plaques of enamel. It was the gift of the Archbishop, in the year 835; being a peace offering from him, to atone for the profanation of the relics of St. Ambrose, of which he had been guilty. Some attribute this work to Lombardian, and others to Byzantine origin, but its whole character seems to tend towards Latin art. It is, without doubt, one of the most important objects created by Christian art up to the year 1000.

There can be no doubt, that another most elaborate work of this age was created by Byzantine artists. I refer to the gorgeous altar frontal in St. Mark's, at Venice. This example is the finest specimen of the enameler's art that has been handed down to posterity.

The tenth century was, for Europe, a most disastrous period; war was so general, that the people had to study the use of a harder metal than silver. The general expectation of the end of the world, at the completion of a thousand years from the birth of Christ, was another cause of the gloom and apathy which now depressed the whole of the West.

The eleventh century was a period of renovation. Romanesque is the term given to the art of this transitional period, which may be said to connect ancient art with the Gothic style. Now was commenced that movement which afterwards developed the beautiful forms of the thirteenth and fourteenth centuries. Artists were tired of seeking for the traditions of the antique; they, therefore, created new shapes, and their art was gradually moulded into that severe style, so pre-eminently ecclesiastical, which retained its hold upon the people until the era of the Græco-Roman style, 400 years later.

Towards the end of this century, and throughout the succeeding one, a large number of shrines were made; they are, in fact, the characteristic object of the age. They probably sprang up in such numbers, from the quantity of relics brought home by the Crusaders, when the want was naturally felt for a receptacle worthy of such holy treasures. The shrine is almost always made in the form of a coffer, the frame-work of which was wood, a sloping or gabeled top, overlaid with thin plates of silver or gold. The sides generally consist of a series of arches, within which are placed statuettes. The arcading is enriched with *cloisonné* or *champlevé* enamel, filigree work, or is set with precious stones. The figures are executed in *repoussé* work, in rather high relief, the head being, as a rule, quite detached from the ground. These figures have no longer the supple grace with which the lost style would have endowed them; they are now stiff and gaunt, each posing in a certain solemn grandeur under its rounded canopy.

About this time lived that remarkable monkish artist, Theophilus, who deserves to rank high amongst the art-workmen of old, for his wonderful treatise upon the various arts. Six of his manuscripts are extant, and in sixty-nine chapters he deals with the art of the silversmith. Unfortunately, he has fixed no date to his learned essay, and many of the best authorities have not been able to agree as to the age in which he lived. Some writers, such as Lessing, believe him to have lived as early as the ninth century; whereas, the Abbé Texier, and others, reasoning from the knowledge he displays of glass painting, select the thirteenth as the period at which this work was produced. It is probable that the former have gone back too far, and that the latter assign too modern a date, to the time of the monk's researches; for, from the style of the work, and the terms he uses, it is more likely that he lived about the middle of the twelfth century. He mentions, in the preface, that "the Germans only, among the nations of the west, were famous for their skilfulness in the working of metals." He could not have written this much after the above-mentioned period, as, towards the end of the century, the French had quite equalled, and the Italians had probably surpassed them in their knowledge of metal working. This learned monk is so humble as to his own skill, and mentions so few facts with regard to himself, but so much of the arts in which he was so proficient, that it cannot even be decided to what nation he belonged. He commences his chapter on the working of the precious metals by mentioning the different tools that were required, and then goes on to describe minutely the various processes that it was then necessary for an artistic metal-worker to be skilled in, the requirements being so varied, that there are but few in our days, who could fulfil them. He must be able to execute *repoussé* work in its many and difficult branches; also to engrave, and, if necessary, to compose the niello which is sometimes filled into engraved lines, to produce a stronger contrast; to understand the mixture and application of *cloisonné* enamel, and the setting of precious stones; he must also be able to model in wax, so as to make the patterns for objects to be cast in silver or gold, which process he must also be able to undertake himself. We thus see, from the standard held up by this author artist—who, from the way in which he treats the different subjects, must have been himself able to produce work in the various processes he describes—that, by the end of the twelfth century, the silversmiths had mastered nearly every difficulty of their beautiful art. It is, therefore, the more disappointing, that so few specimens of this period have descended to posterity, most of the examples still extant being of German origin, consisting of either shrines or reliquaries. The treasuries of the cathedrals of Cologne and Aix-la-Chapelle are very rich in work of this time; in the former, is the shrine of the three Magi, which was commenced in the year 1190; in the latter is still preserved the shrine of Charlemagne.

One of the most famous examples of this period is an object made in our country, which goes by the name of the Gloucester candlestick. It is executed in a white alloyed metal, containing a good proportion of silver.

[TO BE CONTINUED.]

Business Notes.

The Meriden Britannia Co., whose productions have a world wide reputation, present several new designs in ice pitchers that cannot fail to attract attention.

Knos Richardson & Co. present some new and taking designs in gold chains, lockets, crosses and necklaces, of which they have an almost endless assortment.

Sinnock & Sherrill, manufacturers of stone and seal rings have recently enlarged their manufacturing facilities with a view of making a larger and more extensive line of goods.

Lissauer & Sondheim, importers of materials and tools for watchmakers' and jewelers' use, offer a well selected stock of every article in their especial line at the lowest prices.

E. Stites, one of the oldest jewelers in the Lane, offers an admirable assortment of rich jewelry. He makes a specialty of band bracelets, of which he has a select assortment in stock.

Stockwell & Gaunt, successors to Chatterton & Dodd, will continue the business of the latter firm at No. 19 John Street. They present a select line of attractive goods, and give especial attention to the manufacture of miscellaneous badges and medals.

Heller & Bardel, manufacturers of diamond and pearl jewelry, also make a specialty of fine settings, of which they keep a large variety in stock. They are very competent workmen and make an excellent line of reliable goods. All the newest patterns can be seen in their stock.

H. Muhr's Sons, of Philadelphia, are now making over 800 different patterns of rings, to which they call the attention of the jobbing trade. As manufacturers of this class of goods this firm has an established reputation, their goods being fully up to their representations.

Charpier & Wathier of Chicago, whose card will be found elsewhere, are thoroughly skillful and conscientious workmen. They devote especial attention to repairing of all kinds and match work generally. All work entrusted to their care will be attended to in a workmanship-like manner.

The Spencer Optical Manufacturing Company have just completed expensive additions to their factory which they have been compelled to make in order to keep up with increasing business. As an evidence of the popularity of Celluloid Eye Glasses, they have been compelled to increase their production until they now turn out 12,000 pairs per month.

Kendrick, Davis & Co., manufacturers of the well known dust proof watch key, have lately introduced several new patterns of keys designed for the popular trade. They have also greatly extended their manufacturing facilities at Lebanon, N. H., with a view of making a wider range of goods. The gem key is the latest production of this establishment.

E. Ira Richards & Co., manufacturers of rolled plate jewelry, have one of the largest stocks of goods of this character to be found in the market. They direct attention especially to their line of bracelets and bangles, which they make in a great variety of patterns. They are constantly bringing out new designs, and are exceedingly enterprising in this and other respects.

L. H. Keller & Co., importers of watch materials, tools, etc., are also agents for Saunier's Treatise, on Modern Horology. This work is published in monthly parts and should be on the bench of every intelligent workman throughout the country. The work is now complete and can be had for fifty cents a number by addressing L. H. Keller & Co., No. 64 Nassau Street, New York,

Brown & Bros., manufacturers of fine electro-plated flat table ware, present in this number of the CIRCULAR two illustrations of new designs in spoons and forks (the Floral and Strasbourg) that will doubtless become popular. The table ware manufactured by this house has a high reputation in the trade. Their patented spring tempered shank on forks and spoons is a substantial improvement duly appreciated by critical dealers.

Workshop Notes.

Old dentist's tools and sewing machine needles are said to make the best drills for watchmakers' and jewelers' use.

A good process to restore burnt cast steel is to heat it to a bright cherry red and immerse it in water three or four times. Then forge carefully and the steel will be nearly as good as before.

A good solution for hardening and tempering steel is said to be a weak solution of borax and sal soda. The water should first be boiled and then mixed with equal parts of soda and borax and allowed to cool.

It is said that German workmen give a very fine temper to their edge tools by simply heating them to a white heat and plunging them repeatedly into sealing wax, so that finally the tool is too cold to penetrate the wax.

Acid proof cement. Make a concentrated solution of silicate of soda, and form a paste with powdered glass. This simple mixture is said to be invaluable in the operations of the laboratory where a luting is required to resist the action of acid fumes.

The following alloy has been patented in France—Copper 720 parts; nickel, 125 parts; bismuth, 10 parts; zinc, 90 parts; soft iron, 28 parts; tin, 20 parts. This is said to form a fusible, malleable metal, easily worked by a silversmith; it resists the oxidising action of the air, and is capable of being soldered.

A green varnish for metallic objects, which is said not to lose color in the light, may be prepared by precipitating a solution of finely powdered sandarac or mastic in strong potash lye, after diluting it with water, by copper sulphate or copper acetate, and then dissolving the washed and dried green precipitate in oil of turpentine.

In Prussia there has recently been introduced a new alloy of manganese and copper, which promises to be of considerable importance. "Manganknipfer," as the new bronze is called, consists of 70 per cent. of copper and 30 of manganese, and is employed in small quantities to improve common brass, bronze, bell-metal, and the like, rendering them, it is stated, more compact, hard, and ductile.

Experiments prove that red hot steel plunged into water at 32° will be brittle as glass, but plunged into water at 212° it will be annealed and toughened—Why not carry the experiment farther and place the hot steel in a steam tight boiler or tank, and let on steam and water from a steam boiler, say at 200 pounds pressure and 500° or 600° Fah.? Would not the steel be proportionately toughened? —*Exchange.*

In forging steel be careful to first free your fire from sulphur. This can be done by sprinkling a handful of salt on it; next be careful not to overheat the piece to be forged; very small objects are easily heated in the flame of a lamp. Charcoal makes the best fire for all kinds of small tools. Do not hammer with heavy blows after the steel has cooled. By tapping it lightly, however, until it becomes black, the closeness of the grain is increased.

To temper steel on one edge. Red hot lead is an excellent thing in which to heat a long plate of steel that requires softening or tempering on one edge. The steel need only be heated at the part required, and if carefully handled there is little danger of the metal warping or springing. By giving sufficient time, thick portions may be heated equally with thin parts. The ends of wire springs that are to be bent or riveted may be softened for the purpose by this process, after the springs have been hardened or tempered.

To blue gun locks: Gun locks and revolver barrels being usually made of steel, are rendered blue by simply being subjected to heat. The articles are first finely polished and then exposed to a uniform heat, gradually applied. This is best done by immersing them in wood ashes or sand, and carefully watching the effects of the heat. As soon as they acquire the right color they are to be taken out of the sand bath and plunged in oil. The temperature necessary to obtain the color is from 500° to 600° F., the last giving the darkest shade.

An oil for lubricating small articles, and one that will remain fluid in varying temperatures, is thus described by *The Journal of Industry*: Take olive oil and dissolve it in boiling alcohol, add it drop by drop to the hot alcohol, until it is no longer taken into solution. Upon cooling, it will let fall crystals, and leave considerable portion still fluid; the fluid part is to be poured off, filtered through a piece of white blotting paper, and either used in this form, or the alcohol may be distilled off for fresh processes, and the pure lubricating oil which will remain can be obtained for oiling watches and delicate machinery. This will not oxidize or gum up, and will remain perfectly fluid even when exposed to great cold.

Trade Gossip.

A. E. Giles of Giles, Bros. & Co., Chicago, sailed for Europe in the Adriatic, June 10th.

George C. Taylor, of the firm of Taylor & Bro., sailed for Europe June 2d in the *Bothnia*.

Hagstoz & Thorpe have erected a new building corner 19th and Brown Streets, Philadelphia, which give them ample manufacturing facilities.

R. D. Kirby has entered into an engagement with the Meriden Silver Plate Company, and not with the Meriden Britannia Company as previuosly announced.

At a meeting of the Plated Ware Association held in this city June 17th, it was resolved to continue the present current prices and discounts during the coming Fall season.

Francis Henry, a watchmaker in the employ of H. P. Donnelly, of this city, has been arrested on an alleged charge of stealing twenty-two watches left with his employer for repairs.

Joseph Sterling, of Leavenworth, Kan., sailed for Europe in the steamer *Bolivia* on June 6th. Mr. Sterling is in ill health, and will remain abroad some time in the hope of recovery.

The Hartford, (Conn.) *Courant* tells a story of a watch carried by a gentleman of that city which was set October 1, 1879, and whose variation from standard sun time up to May 27, was only forty-five seconds.

Will C. Feldman of St. Peter, Minn., has opened a jewelry store at Pembina, D. T. He is on the line dividing the United States from Canada, and is, probably, the most northerly located jeweler in the country.

The United States Watch factory at Marion, N. J., has been converted into an extensive silk manufactory. The company purchasing it has erected a small village of cottages for the occupancy of its workmen.

A party of New Haven jewelers out sailing on the Sound are reported to have seen a sea serpent gamboling in the sun. This proves that Connecticut whisky is quite as demoralizing as that made in New Jersey.

C. S. Raymond, of Clinton, Iowa, has recently moved into elegant and commodious quarters near the Post Office. His store is beautifully fitted up, and is stocked with a carefully selected assortment of goods.

A. M. Wood of Kearney, Neb., has purchased the entire stock of jewelry formerly owned by E. Tripp. Mr. Wood moves into more commodious premises, and displays one of the finest stock of goods west of Omaha.

Joseph Kesselmeier, of Gallion, O., has disposed of his stock of goods, and retired from business. His successor is M. Burt, formerly of Cleveland. Mr. Kesselmeier retires with a competency acquired in the course of many years traffic in the jewelry business.

An extraordinary clock made by Felix Meir, of Detroit, Mich., is now on exhibition at Tammany Hall. Critics say that this beautiful and ingenious time-piece even surpasses the famous apostolic clock of the Strasburg Cathedral in the variety of its performances.

The wife of a California watchmaker recently gave birth to three bouncing boys at a single sitting. When pivot heard of this happy event, he deliberately unscrewed the dice box from his eye, and exclaimed, "just my luck! Three of a kind pat, and not a cent in the pot!"

The Duber Watch Case Co. have issued a very beautiful little work printed in colors, setting forth the attractive features of the goods manufactured by them. It is a perfect specimen of typographical neatness and reflects great credit on the skill and enterprise of its projectors.

The price of black onyx, cut in Germany for the American market, has advanced in price ten to twenty per cent. during the past few weeks. The advance is due to the improved condition of the lapidary business in Oberstein and Idar, which had been seriously depressed for three years.

Joseph Robinson, of Toronto, jeweler, who kept what is known as the "Sheffield House" has retired from business in favor of his two sons. Mr. Robinson was well known throughout the jewelry trade, and highly respected for his sterling integrity of character. We regret to learn of his withdrawal from active business, and trust that he may be spared many years to enjoy the fruits of his enterprise and industry. His sons, who have been trained to business in the manner their father was, will continue the "Sheffield House" under the firm name of Robinson & Brother.

The Gorham Manufacturing Company has bought out the entire plant and stock of Kennard & Jenks, of Boston, and will consolidate the machinery with their own at Providence. This makes the second silver establishment that has recently been absorbed, thus lessening the competition in this line of goods.

The Fourth of July is close at hand, and all the watchmakers in the country are cleaning up General Washington's watch and putting it in running order for the occasion. It is surprising how numerously General Washington's watch was duplicated. Or did he employ a special watchmaker of his own, to furnish him a new one every month?

For many years there has existed in Maiden Lane a duplication of some of the numbers of the buildings, which has led to considerable confusion. The Common Council recently corrected the error by renumbering several buildings. What was No. 5 is now No. 3, No. 7 becomes No. 5, and one of the old duplicate numbers becomes No. 9.

While Henry Ruben, a travelling jeweller from Syracuse, was driving along the Erie Canal, near Chittenango, N. Y., his horse, which was blind, plunged into the big ditch and was drowned. A valise containing jewelry valued at $2,800 went to the bottom, sprang open, and scattered the jewelry all about. Only $800 worth was recovered.

The Princess Louise is the latest fashion in spoons and forks in gold and silver, of the old English purest Roman styles. A pretty fancy is that of engraving a name on the handle, for instance. "Lilly," which is half covered with lillies of the valley in elaborate repousse work. Another has the initials garlanded with marguerites; this is all done in hand work.

Recently at Waupacca, Wis., lightning struck the store of Chady & Thompson in the night. The electric fluid followed the telephone wire connecting the store with Mr. Thompson's residence, entered his parlor, and tore down all the pictures on the walls that were hung with wire. Owners of telephones should have lightning arresters attached to their lines.

P. L. Gearing, of Bethlehem, Pa., recently purchased from a tramp a medal of the 79th Regiment Rifle club. Mr. Gearing was conscious that the medal had been stolen, and he, therefore, sent it to the headquarters of the regiment with his compliments. The rightful owner was soon discovered and expressed his gratitude for the return in such an unexpected manner of a valuable memento.

Luther A. Allen, a well known watchmaker of Springfield, Ill., died in that city June 2. The deceased was a conscientious and skillful workman and occupied an advanced position in the trade. His funeral took place from the residence of George W. Chatterton, the services being conducted by Elwood Commandery of Knight Templars, of which he was a member.

The journeymen jewelers of this city held a meeting at Germania Hall recently, and organized a Jewelers' Association of the United States. Its objects were declared to be mutual help and protection, and to improve the condition of all who work at the jewelry trade. The following officers were elected: President—Otto Kempner; Vice Presidents—Edward Seybold, E. Key and P. Schneider; Secretary—Hugh McGregor.

Lawn tennis is an outdoor game that is rapidly winning its way to popular favor. It is far more interesting a game than croquet, and ladies become enthusiastic over it. The retail trade are dealing largely in the requisite appliances for the game, and thus add a new feature to their summer stock of goods. Hall, Nicoll & Granberry have all the apparatus pertaining to lawn tennis, which they offer to the trade at reasonable rates.

The American Watch Company has won substantial honors at the great exposition at Sydney, and the British lion is greatly chop-fallen thereat. The British manufacturers say that they were ignorant of the tests to be applied to the watches, and were not prepared for it. Robbins & Appleton were equally in ignorance of what the test would be, and, consequently, made no special watches for the occasion. They sent just such goods as they are selling every day in the markets of the world, and these were found sufficiently meritorious to deserve the first prize.

Mr. Joseph Meyer, Jr., son of Jos. A. Meyer, jeweler, Canton, Ohio, while in this city on his way to Europe, took a trip to Newark, N. J., on Decoration Day, to see the boat races on the Passaic River. Feeling like taking a "pull" himself, he borrowed a boat and entered himself for the "single sculls," and without previous practice and in strange water, easily carried off the first prize, a magnificent solid gold medal about 3 inches long. The Newark "scullers" feel exceedingly cheap at having a stranger from an inland State take them in in this manner.

SYDNEY INTERNATIONAL EXHIBITION, 1879-1880.

EXTRACT FROM THE

Report of the Judges in Horology.

DEPARTMENT III.—EDUCATION AND SCIENCE.

GROUP.—SCIENTIFIC AND PHILOSOPHICAL INSTRUMENTS AND METHODS.

Class 310.—Chronometric Apparatus, Chronometers, Astronomical Clocks, Watches, Chronographs, etc., etc.

Judges.—JOHN M'GARVIE SMITH, New South Wales.
P. E. BOUND, Switzerland.
H. C. RUSSELL, B.A., F.R.A.S., Great Britain.
E. BECKMANN, Germany.
GREGORY P. HARTE, United States.

To the Honorable Committee on Judging and Awards, Sydney International Exhibition.

GENTLEMEN,—I have the honor to hand you herewith the report of the judges of Class 310, as above,
And remain, sirs, your obedient servant,
GREGORY P. HARTE, *Chairman.*

The following exhibits were submitted for examination:—

U. S. Exhibit, 537, American Watch Company, Waltham, Mass., U. S. A.—Watches and Chronographs.

British Exhibit, 1,048, Victor Kullberg, London, England—Watches and Chronographs.

British Exhibit, 1,054, Nicole & Nielsen, London, England—Watches, Chronographs, etc.

British Exhibit, 1,060, T. Russell & Sons, London, England—Watches, Chronographs, etc.

British Exhibit, 1,041, Castleberg & Co., London, England—Watches, etc.

British Exhibit, 1,060a, S. Backschmid, Switzerland—Watches.

• • • • • • • • • • • •

German Exhibit, 36, A. Lange & Sons, Dresden, Germany—Watches, etc.

Swiss Exhibit, L. Audemars, Brassus, Switzerland—Watches, etc.

French Exhibit, 146, A. H. Rodanet, Paris, France—Chronometers.

French Exhibit, 177, G. Tribandeau, Besançon, France—Watches.

Swiss Exhibit, 14a, International Watch Company—Watches.

In presenting the following report, the judges desire to make some explanations, which, we trust, will excuse them in the minds of the impartial for any apparent neglect in the form of their report, and for the limited number of tests made of the horological exhibits.

The judges were appointed too late to do the full amount required, inasmuch as the number of exhibits was so much in excess of any reasonable allotment for examination and report before the closing of the Exhibition.

Commencing their labors, however, immediately after the first call, the examinations were not complete until March 3d, which only permitted a time test to be made of nine days in a single position. This single position was objected to by some of the exhibitors, but ill-advisedly, for the ratings observed in the watches of the objecting exhibitors were of such character as to establish in the minds of the judges the conclusion that their watches would not have made so good a comparative showing if there had been more time to observe the ratings in other positions.

Great care was taken by the individual judges in making up their note-books during the examination of the watches and scrutinizing the inherent and comparative merits of exhibits under the ten different heads unanimously agreed upon, as follows:

1. Originality.
2. Invention and discovery.
3. Utility and quality of material.
4. Skill in workmanship.
5. Fitness for purposes intended.
6. Adaptation to public wants.
7. Economy.
8. Cost.
9. Finish and elegance of cases.
10. Timekeeping qualities.

It was agreed the judges should use the number 100 as expressing the highest degree of excellence in each of these ten elements of inherent and comparative merit, and adjudge individually to each of the several exhibits such rating as their respective judgments would warrant after careful examination; each set of opinions being made a portion of this report, and in the *résumé* the mean average being taken as the unanimous verdict of the judges.

It was also decided we should take up each exhibit in the order originally examined and, beginning with the first element of merit (originality), each judge should in numbers, express his judgment of the inherent and comparative merit attaching to each exhibit in this one element; this being done, to proceed with each succeeding element in order and in the same manner. The five judgments being complete and in numbers, the aggregated verdict is arrived at simply by addition and division.

This is not only a verdict as to the inherent and comparative merits of each exhibit, but also a full analysis of each order of merit in any exhibit as compared with all the others. • • • • • •

In giving this verdict, it was absolutely necessary to ascertain to the fullest extent the timekeeping qualities of the exhibits. The judges were led to this conclusion from the fact that, in some of the exhibits we were shown watches of equal finish containing every known application of horological science in practically the same construction, which should, as far as they could determine by merely optical examination, keep quite as good time as watches of double and treble the costs in other exhibits, thus involving their judgment in doubt upon several elements of merit.

In justice to themselves and to the exhibitors the judges determined to make the test in only one position and give the whole of the time at their disposal to testing the watches in what might be considered their normal position, if such term is allowable—that is, "pandant up," or hanging.

At the solicitations of the judges Prof. H. C. Russell, Astronomer Royal at the Sydney Observatory, kindly consented to make the tests, and each of the exhibitors was requested to send three watches of his own selection to the Observatory for this trial.

As will be seen by the report of Professor Russell, eight of the ten exhibitors availed themselves of this opportunity. It is proper, however, to state here that none of the exhibitors apparently anticipated this test, and that it is possible some of the watches might have made a better record if they had been differently attended to since the opening of the Exhibition; but they were in this respect all upon a par.

The majority of the watches had been made for exhibition purposes and specially prepared to that end; and some had been previously rated at observatories before sending.

Notably, however, to the contrary of the above, the exhibit of the American Watch Company was the ordinary and regular product of the factory, such as is finished every day.

Notwithstanding the possibility that these exhibits might have been better prepared for observatory time tests, some of the exhibits, as will be seen by the rating, demonstrate the wonderful advances made in the application of horological sciences to the manufacture of watches, and that their rating is being made equal to that of the best marine chronometers.

The following is the report of Professor Russell, and the accompanying diagram will readily give an idea of the comparative performance of the different watches.

"*Sydney Observatory, 26th February, 1880.*

"GREGORY P. HARTE, ESQ.,

"*Chairman of the Judges in Horology.*

"SIR:—I have the honor to report that, in response to your circular, inviting exhibitors of watches each to send three watches to the Observatory to be tested, I received on Monday, February 16th:

"Three watches, Nos. 611, 669, 237, from Mr. Dolman, agent for Mr. Tribandeau, Besançon.

"Three watches, Nos. 987271, 670068, 1221336, from Mr. Manson, agent for Waltham Watch Company.

"Three watches, Nos. 3171, 1935, 2526, from Mr. Allerding, agent for Mr. Kullberg.

"And on the forenoon of February 17th:

"Three watches, Nos. 11527, 19967, 12629, from Mr. Hoffnung, agent for Lange & Sons.

"Three watches, Nos. 1004, 8632, 8870, from Mr. Jacob, as agent for Nicole & Nielsen.

"Three watches, Nos. 70690, 23496, 113516, from Mr. Jacob, as agent for Thomas Russell & Sons.

"One watch, No. 47150, from Mr. Jacob, as agent for Castleberg.

"Three watches, Nos. 12731, 14483, 11660, from Mr. Wiesener, as agent for L. Audemars.

"And on 18th February:

"Two watches, Nos. 2724, 3528, from Mr. Jacob, as agent for Castleberg.

"On the 17th I began rating these watches, keeping them all in one position (hanging) and subject to the same conditions of temperature; in fact, they were all hung on one board and kept in a compartment locked up so as to avoid change of temperature, except such changes as were due to changes in the weather.

"They were rated once a day by the standard clock, which affords special convenience for this work, and the error of which was found by daily astronomical observations giving the absolute time; great care was taken in rating so as to get the exact error of each watch every day, care being taken at the same time to avoid errors in the seconds dials, a fault sufficiently obvious in some of these exhibits.

"In presenting the result of this test in the form of a diagram (see diagram on the opposite page) it is necessary to explain that the curves show only the change of rate in each case, and nothing is shown here of the actual rate which was large in several instances.

"In the diagram spaces between faint lines represent seconds; and the thicker faint lines represent the mean rate in each case. When the curve rises it shows that the watch was gaining on its previous rate, and when it falls the watch was losing on its previous rate. For example, in No. 4 curve, the thicker line shows the position of a gaining rate of 3 sec. per day; on the 18th, watch No. 4 had a gaining rate of 2·7 sec., and is plotted below the thick line; on the 19th and 20th it was less than 3 sec., but on the 21st the rate increased to 4·8 sec., and the curve rises above the line. The same rule is followed with losing rates; and, therefore, each curve shows whether the watch was gaining or losing on its own rate.

"For convenient reference the barometer and temperature curves are plotted on the same sheet, although from the short time at command the watches could only be tested in one position, a glance at the diagram will show that in some degree at least the temperature adjustment and the isochronal properties of the balance springs were also tested; and I wish to call your attention to the fact that the whole of these watches show in a more or less degree a marked response to the change in temperature, some being over and others under corrected.

"This fact is important, because it adds another proof that the old form of compensation balance—even when combined with chronometer spring and escapement and all the refinements which the best modern workman can add to it—fails to yield a complete correction for temperature; and I much regret that the American Watch Company, who claim to have overcome this fault by means of a balance involving a new arrangement of the metals, did not send to be tested any of their first-class watches containing this important improvement.

"Several of the rate curves, especially Nos. 4, 10, 13, 16, 21 and 24, respond to the change in the barometer in a way that shows the isochronal properties of their balance springs are not quite perfect. *Looking down the curves it becomes at once evident that watch No. 5, which is No. 670068, second grade of the American Watch Company, is remarkably free from these defects, and presents the best rate of all the watches tested.* No. 9, which is No. 2526, Kullberg, is the nearest approach to No. 5; indeed, the difference between its highest and lowest rates is 0·1 sec. less than No. 5, but it has not such a steady rate. The timekeeping of both these watches is remarkably good, and shows that we have entered upon a new era in the manufacture of pocket chronometers; *for these rates are better than the majority of marine chronometers.*

"*Amongst the cheaper watches tested, No. 6, which is No. 1221336, of the American Watch Company, is worthy of notice; it is a watch of the sixth grade, yet its performance has been better than that of many very expensive and otherwise first-class watches among those tested; such a watch speaks volumes in favor of the system under which it was made, and is the best comment upon the accuracy of the machines that produced it.*

"There are several watches among those tested which have kept wonderfully steady rates, but their comparative merit is shown in the diagrams much better than it could be by any description. The daily rate of each watch will be found in a table attached.

"The changes in Nos. 1, 2, 3, 17 and 19 were too great to plot.

"H. C. RUSSELL,
"*Government Astronomer.*"

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CONCLUSION OF THE REPORT.

In consideration of the facts developed in this examination and the preponderance of elements of inherent and comparative merit adjudged by the judges (each in independent judgment) being equal to nearly 70 per cent. more than the next highest exhibit, they have found it exceedingly difficult to make such a classification in degree as will give evenhanded justice to all.

We adjudge to the

AMERICAN WATCH COMPANY, OF WALTHAM, MASS., U. S. A.,

a first-class award and such other [illegible] distinction, diploma, medal or award as is consistent with the duties and obligations of the honorable Sydney International Commission, for the largest and most complete exhibit of horological instruments examined.

They also propose, as the only means by which their appreciation of the merits of the production of this company can be adequately or equitably recognized by the Committee on Judging and Awards, that a separate first-class award be given for the timekeeping qualities of all grades of these watches.

Also a separate first-class award for the perfection of this system of watchmaking and the improvements in the mechanical parts of the watch, being notably in the main spring and going barrel, the patent safety pinion, the perfect epicycloidal form of all the teeth of the train, in every grade of watch alike, and the isochronal adjustment of the balance spring.

Also to Charles V. Woerd, mechanical superintendent of the American Watch Company, Waltham, Mass., U. S. A., a first-class award for his new mode of compensating balances.

Also a separate first-class award for the improvements in cases, the number of artistic forms and designs used, the beauty and elegance of their finish and for their new and indestructible method of enamelling.

VICTOR KULLBERG.

The display of marine chronometers by this maker, with the Observatory ratings, was of the very first order. Every part of those instruments was remarkably well made, and the modifications of some of the balance wheels worthy of special attention. Adjudged a first-class award.

The display of watches by the same maker, although small, commanded attention from their very nice finish in all parts. As will be seen from the report and diagram of Professor Russell, they are good timekeepers, especially the one having the chronometer escapement. This style of watch, however, is of too delicate construction and too costly to fully meet the requirements of any considerable public want. The same objection will hold good as to the lever escapements as far as cost or economy is concerned, they being comparatively too high priced. Representing a certain class of manufacture, they are of the first order of merit, and adjudged a first-class award.

The "gas-governor" exhibited by the same maker, an instrument for regulating the amount of heat in the testing of chronometers, is commended as a useful invention.

NICOLE & NIELSEN

This exhibit, made specially for the Exhibition, comprised a full line of plain levers, split seconds, chronographs, calendars, repeaters, etc., and was a representative display of their peculiar style of manufacture in all its details. The cost of these watches, compared with others of similar construction and finish, was excessive; and while they show good timekeeping qualities, they do not equal that of other exhibits.

As representing their own methods of construction they are of the first order of merit, and are adjudged a first-class award.

THOS. RUSSELL & SONS

exhibit a full line of their manufacture, which, upon comparison with other exhibits of the same general character and construction, places them in the third order of merit, and they are adjudged a third-class award.

S. BACKSCHMID

exhibits a class of cheap watches of very inferior workmanship and finish, of the last order of merit, and adjudged a fourth-class award.

N. CASTLEBERG & CO.

exhibit a meritorious line of watches in many respects, of good finish and not excessively high priced for their performances; of the second order of merit, and adjudged a second class award.

A. LANGE & SONS

exhibit a class of watches possessing many elements of merit and of superior finish in many respects and at a cost which is quite reasonable. That the watches are constructed upon scientific principles and are intended as reliable timepieces, is shown from Observatory tests. The variations show that care has been taken to approximate a perfect adjustment, and that a partial success has been attained. A peculiarity in the construction of the balance wheel—having a horizontal split from the timing second holes each way is noticeable, which we fail to understand. This exhibit was made expressly for this Exhibition and Observatory rates sent with each watch and, as a representative exhibit, although small, was the second best examined and is, in its class, of the first order of merit, and adjudged a first-class award.

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LOUIS AUDEMARS

exhibits a wonderful class of complicated watches, calendars, repeaters, chronographs, etc., etc., combined in one watch and elaborately cased and artistically finished. The great element of merit in this exhibit is in the combination of the great number of unusual functions for a watch, and by skill in workmanship and mechanical science securing a correct performance.

The enormous cost of these watches is an effectual embargo on their use to any except the very few, and their utility is, therefore, very limited. In their class they are, however, of the first order of merit, and adjudged a first-class award.

G. TRIBANDEAU

exhibits a considerable collection of watches in a great variety of cases, of a class of workmanship, finish and performance calling for the fourth order of merit, and are adjudged a fourth-class award.

A. H. RODANET

exhibits two marine chronometers only, one of which was broken and the other out of order; commended.

INTERNATIONAL WATCH COMPANY

exhibit a collection of watches of the third order of merit, and adjudged a third-class award.

In concluding this report, the judges very much regret the limitation in time which has prevented them securing position tests of this very interesting exhibit in horology, as much on account of the exhibitors as on their own account. Such advances have in the last few years been made in this science that, in the interest of the public as well as of the manufacturers, a sufficiency of time is desirable to make tests in five or six positions, and fourteen days should be allowed to each position. Tests for heat and cold and an opportunity to carefully note barometric and thermometric influences upon the various systems of adjustment, would be very valuable and interesting.

Respectfully, etc.,
GREGORY P. HARTE, *Chairman*, United States,
H. C. RUSSELL, B.A., F.R.A.S., Great Britain,
J. M'GARVIE SMITH, New South Wales,
P. E. BOUND, Switzerland,
E. BECKMANN, Germany.

RÉSUMÉ OF THE JURY'S EXAMINATION.

NAMES OF EXHIBITORS.	Originality	Invention and Discovery.	Utility and quality of material.	Skill in workmanship.	Fitness for purposes intended.	Adaptation to public wants.	Economy	Cost	Finish and elegance of cases.	Timekeeping qualities.	Totals.
AMERICAN WATCH COMPANY, WALTHAM	98	93	93	93	100	100	100	100	100	100	941
Victor Kullberg	0	0	73	83	[illegible]	53	37	[illegible]	73	96	[illegible]
Nicole & Nielsen	39	22	47	36	70	60	40	38	76	80	507
Thos. Russell & Sons	8	0	25	30	36	34	22	26	42	44	267
Castleberg & Company	0	0	29	30	36	41	25	32	42	53	288
S. Backschmid	0	0	11	11	7	15	12	10	10	0	76
A. Lange & Sons	45	35	68	83	86	73	39	79	71	89	686
Louis Audemars	96	24	73	85	90	54	44	36	76	79	671
G. Tribandeau	0	0	10	19	15	15	16	19	20	0	114
International Watch Company	0	0	20	31	97	49	41	63	34	0	287

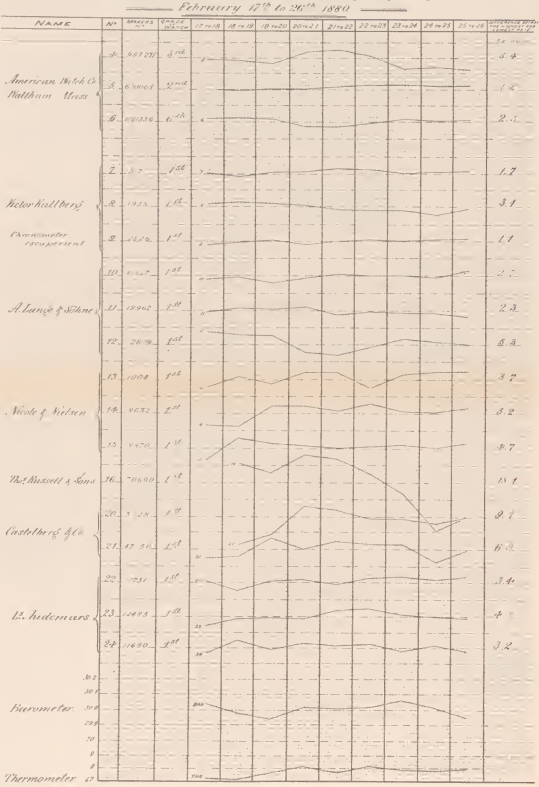
RATES OF WATCHES TESTED AT OBSERVATORY, SYDNEY, FEBRUARY 17th TO 26th, 1880.

	G. Tribandeau.			American Watch Company			Kullberg			Lange & Sons.			Nicole & Nielsen.			Thos. Russell & Sons			Castleberg.			L. Audemars.		
NUMBER.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
MAKERS' NUMBERS.	611	669	2,370	987 271	670,068	1,221,336	3,171	1,935	2 526	11,527	19 967	12,629	1,004	8,632	8,870	70,690	23,496	113,516	2,724	3,528	47,150	12,731	12,483	11,660
	gain M. S.	loss M. S.	loss M. S.	gain Sec.	loss Sec.	gain Sec.	loss Sec.	gain Sec.	gain Sec.	gain Sec.	loss Sec.	gain Sec.	loss Sec.	gain Sec.	loss Sec.	gain loss	loss M. S.	loss Sec.	loss Sec.	loss Sec.	gain Sec.	gain Sec.	loss Sec.	loss Sec.
February 18	3 30.8	0 47 1	2 14 0	2.7	9 0	4 6	0 6	1 7	1 4	9 3	0 9	3 0	9 4	2 3	10 0		...	21.7			12 0	0 2	3.1	1 2
February 19	2 15 0	1 60 4	9 57 6	9.2	2 1	5 0	1 5	9 9	1 9	3 0	gain 0 4	2 4	0.2	2.0	0.9	9.4	2 23.2	24 7	0 3	20.7	12 2	loss 1 9	1 5	gain 2 0
February 20	4 15 0	1 04 1	2 49 9	1.5	2 5	4 5	0 7	1.0	9 9	9 5	1 4	2 9	1 8	0.9	0 0	0.4	2 37.3	34 9	4 7	10 0	10.8	gain 0 3	1 9	loss 1 2
February 21	2 32 0	1 27 2	9 35 3	5 0	1 2	9 7	0 5	1.4	1.4	3.5	0 9	loss 1 0	gain 0 0	0 8	7.4	4.4	2 44.3	38.3	gain 5 5	11 0	14 0	0 7	1.4	gain 1 1
February 22	3 30 0	1 35 0	2 34 0	5 3	1.3	9 8	gain 0 2	0 4	2 0	4 2	loss 1 0	2 9	0 5	5 0	7 9	3 5	2 56 0	41.0	loss 15.5	19 4	15.0	loss 0 9	gain 0.4	0 0
February 23	1 30.0	1 29.0	2 24.0	9 5	0.9	3 9	0 0	0 9	2 9	4 0	0 2	0 7	loss 2 7	7 2	7 0	0 0	spring broken	37.2	9 0	14.4	10 2	gain 1 1	1.0	1 0
February 24	3 45 0	1 21 0	9 31 0	0 0	0 9	4 0	loss 0 9	0 1	2.1	4 0	0 4	gain 1 3	gain 0 1	3 0	7 9	loss 4 5	.....	40.9	11 0	14.3	15.1	1.0	loss 0.5	loss 0 7
February 25	2 45.0	1 14 0	2 25 7	0 0	1 9	4 0	0 7	loss 0 9	9 3	3 8	0 5	0 7	0.7	5.9	7.9	13.7	.....	30.0	2 2	10 4	10.8	0.7	1.0	gain 0 5
February 26	3 15 0	1 12 0	2 33 0	loss 0 1	1 1	4.4	0 7	gain 0 5	9 5	5 9	1 4	0 0	0 0	0 3	0 0	10 1		31 2	22.3	15 1	13 0	1.3	1.4	loss 0 9
Extreme rates	2 45.0	1 03 9	0 33 0	5 4	1 2	2 3	1 7	3 1	1 1	9 7	2 3	5 9	3 7	5 2	4 7	18 1	32 7	20.1	27 0	[illegible]	0 2	9.4	4 1	3 2

Facsimile

Diagram shewing the change in rate of Watches tested at the Observatory, Sydney

February 17th to 26th 1880



Professor H. C. Russell B.A. F.R.A.S.
Astronomer Royal Sydney Observatory
New South Wales

THE

Jewelers' Circular and Horological Review.

VOLUME XI. NEW YORK, AUGUST, 1880. No. 7

THE

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The Jeweler's League and Life Insurance.

IN the June number of THE CIRCULAR we endeavored to give some reasons why the Jewelers' League, as a medium of Life Insurance, was to be preferred, by members of the trade, to those companies which make a business of insuring lives. Our article has been widely copied by the general press, and commented upon favorably, while the insurance papers have used it as a text, from which they have preached, in the interests of the regular companies, their usual sermons against co-operative life insurance. We shall make no issue with them on this point, as we regard co-operative life insurance *companies* as among the most deceptive illusions of the day. They are organized, in every instance, simply to make places for a "ring" of schemers, who fill the offices of president, secretary, general and special agents, etc., and whose sole ambition is to secure their salaries with the utmost regularity. They solicit patronage from all classes, have no guaranteed capital, and give no security that the sums that they promise to pay will ever be forthcoming. Experience has shown that companies organized on the co-operative plan are short lived; that when mortuary assessments are frequently made members refuse to pay and drop out; that those who continue to pay soon find themselves paying away their money without any prospect of reciprocal remuneration. This is necessarily so in these organizations because of the increasing death rate with the advancing age of the members; because care is not taken to secure young and profitable members to offset the constantly increasing mortality among the old ones; and also because proper care is not observed in selecting lives for insurance, the co-operative companies being regarded as a haven for the old, decrepid and disease-stricken, who have been rejected by the regular companies. Bad management, also, is a characteristic of these co-operative associations, so that, all things considered, they are a fallacy and a delusion.

But the benefit societies organized within special trades or callings, for the amelioration of the condition of their members, are very different from these co-operative humbugs. The Jewelers' League is a fair sample of these benefit societies. It is designed for the trade alone, and no others can be admitted to membership. It is well known that in every special calling the members have a sympathy for each other that they do not exhibit towards strangers. We have seen this exemplified in the labor strikes that have occurred at various times, when the strikers have been supported by their brethren of all sections of the country. This feeling of comradship among members of all trades is dictated by a oneness of interest, that unites both old and young in common bonds of sympathy. This constitutes the strength of all trade organizations, making friends of strangers, and uniting them solidly for the advancement of any scheme that is designed for their general benefit. Hence it is that trade benefit societies have become recognized as the most formidable rivals of the regular life insurance companies. The Jewelers' League embraces among its members employer and employed, the youngest members of the trade as well as those of middle age. They are all bound together by those ties of sympathy that are found in every calling, giving to the League a strength that no co-operative association can possibly obtain. It attracts to it all the young men just entering the trade, thus keeping its ranks full of that "young blood" necessary to make the burdens rest lightly upon all, and which the regular companies find such difficulty in obtaining. Any man of good moral character and good general health, not over forty-five nor under twenty-one years of age, who is now or has been for one year immediately prior to the date of his application engaged in the jewelry or kindred trades, is eligible to membership in this League. All applications for membership must be accompanied by $3, as an initiation fee, and $2 for first assessment, which fees will be returned to the applicant if the application is rejected. Every applicant must undergo a medical examination, and unhealthy ones are rejected. On the death of a member the League pays to his heirs a sum equivalent to $2 for each member, not exceeding $5,000. This is done from the advance payments made by members. Immediately another assessment of $2 is levied on all members, whereby a sum is provided for the *immediate* payment of the next death loss.

Now, all this is very simple, requiring the services of no high-priced officers, no palatial buildings for offices, no elaborate machinery for carrying on the business, and secures to the beneficiaries the entire amount designed for them without deductions for expenses. None of the officers of the League receive any compensation whatever, the only expenses incurred being for stationery, postage, and printing. In the three years the League has been in existence it has paid but one death loss, costing each member $2, while all members, nearly 1,000, have been insured all that time to the amount of about $2,000 each. The same amount of insurance in a regular company would have cost each member something like $75 a year. Of course the insurance companies, with their enormous expenses, cannot compete with the benefit societies that are managed without cost, and which are maintained for the sole benefit of a special class, every individual of which class has a particular and personal interest in sustaining and watching over it, and in bringing to its ranks new members.

The insurance journals, in denouncing co-operative associations, make the mistake of including among them the trade benefit societies, which are managed very differently, and which unite a different class of interests to insure their maintenance. These journals point to the wrecks of co-operative companies, and hold them up as beacon

lights to warn the public against putting its trust in any kind of life insurance provided by any except the regular life companies. While it is true that co-operative life insurance companies have been failures generally in this country, it is not true that benefit societies have been. On the contrary, the benefit societies of the Masons and Odd Fellows are the oldest insurance organizations in the land, and have always been successfully and honestly administered; numerous trades have been equally successful with their benevolent associations. Indeed, where the members of these benefit societies are bound together by a community of interest begot by following a special calling, it has been found that they adhere to their obligations to each other. But when the regular companies cite the failures of co-operative companies as a reason why no life insurance plan, save that presented by them, should be patronized, they may well consult their own records, and see how the public has been swindled by companies that promised well for a time and then passed into hopeless insolvency. From statistics recently printed we learn that in New York State alone 26 life insurance companies have been started since the war, and only three of these are now in existence. During the war six were started, and only one remains. These companies amalgamated one with another, enriching certain stockholders and officers, until finally those remaining passed into the hands of receivers. By this process of amalgamation $74,192,000 of assets were utterly obliterated, having been swallowed up by thieving officers or disappeared into the capacious maw of lawyers and receivers. These assets were the premiums paid by thousands of victimized policyholders who, when they took out their policies, supposed they were making a wise and prudent provision for those dependent upon them. They not only lost the insurance for which they had paid, but the money it cost them as well. With all its faults and delusions, co-operative insurance cannot point to a record so disastrous as this, while the embezzlements or defalcations that have occurred among trade benefit societies have been so few that no record of them has ever been made.

In face of these facts, and in view of the extravagant expenditures that characterize existing life insurance companies, there is no question but the contributive system employed by the trade benefit societies is the best and safest system of life insurance. When we contemplate the enormous salaries paid to the officers of life companies, ranging from $10,000 to $70,000 a year, and remember that they have so fixed things as to maintain a life-tenure of office, and see their palatial buildings, and their extravagancies in all directions, we unhesitatingly commend the Jewelers' League to the trade as the safest, best and most economical means of securing that provision for dependent relatives that every prudent man should make. The cost of becoming a member is so trifling that every man in the trade can afford to enjoy its benefits, and we earnestly commend it to their consideration.

Fraudulent Practices in Case Making.

IN the July number of THE CIRCULAR, we alluded to the growing practice among case makers of putting heavy steel springs in hunting case watches. This is done for the sake of preserving the weight of the case and, at the same time, saving in the quantity of gold consumed. It is no uncommon thing to find hunting cases that are 24 per cent steel spring. The case is scooped out and cut away in every conceivable manner to save gold; the center is cut away to a mere shell; the stem is gouged out and filled with brass, a small hole being left for the insertion of the stem winder; and, in various other ways, the case is depreciated for the sake of saving a little gold. This practice is brought about by the competition among case maker, each striving to under-bid his competitor in the price of making cases; not only is the quality of the goods deteriorated, but the workmen are cut down to starvation wages. Some employers seem to think that wages are not essential to the life and happiness of their employes, but act as if they expected them to live on an occasional smell of an oil rag. It would be better for the trade in every way if cases were sold at a regular price for the quantity of gold they contain. The present practice enables unscrupulous dealers to sell heavy steel springs at the price of gold, not only deceiving but actually swindling purchasers.

But the evil effects of this "trick of the trade" are being overcome by the growing demand for open face watches, the cases of which contain no concealed springs. These open face watches are much more convenient than the hunting cases, and are sufficiently substantial for all ordinary purposes. The hunting case watch was invented for Englishmen, whose vigorous riding in the hunting field necessitated a guard for their watches. There is no necessity for one man in a thousand in this country having his watch protected. The open face is more convenient in every way, and life is too short to be wasted in opening and closing a hunting case. There is less chance for deception in the open case, as there is nothing to it but gold and crystal, and and no one is likely to attempt to sell crystal at the price of gold. Open face watches are daily growing more popular, especially in the large cities, and for the use of business men, who find them much more convenient than than the others. Case makers should be required by the trade to give a certificate with each case, stating the amount of gold it contains, and the difference between that amount and the actual weight of the finished case should be the weight of the spring. It is only by the adoption of some such measure that case makers will be induced to stop robbing cases of the gold they should contain and supplying its place with solid lumps of steel.

Why Mainsprings Break.

THAT the main springs of Watches are more liable to break during thunder storms than at any other period, is a fact well known to experienced watchmakers. They do not attempt to explain the phenomenon, but accept the fact and pocket the returns it brings them. An old watchmaker recently told us that, after a violent thunder storm, he invariably had a large number of watches sent in for repairs, and, in most cases, he found the mainspring broken. Electricity is, no doubt, responsible for the great number of mainsprings broken during the prevalence of a thunder storm. The modern practice of making a mainspring as large as the case will hold, thus putting a large quantity of steel in a small compass, has a tendency to make a watch a sort of lightning conductor, attracting the electricity from the atmosphere and increasing the tension upon the spring, with disastrous results. It is fortunate if the breaking of the mainspring is the only damage effected. Heat being a generator of electricity, it has been observed that more mainsprings break during the dog days—the sultry months of July and August—than at any other season of the year. Just why electricity should play such antics we can not explain; some day, when the science of electricity becomes better understood, casualties of the character alluded to will be provided against. The extremes of heat and cold do not affect the working of watches, and, in making them, they are always tested at high and low temperatures. It seems singular therefore, that they should be affected by atmospheric conditions between the extremes. We leave the solution of the problem to practical horologists and scientific men, simply putting on record the experiences of practical watchmakers.

New Circular.

WE have received the first Circular of the Horological and Thermometrical Bureaus of the Westchester Observatory of Yale College, published by the Observatory managers for the information of persons interested in these public services. The Circular contains a full description of the two Bureaus, the apparatus used in each, and the plan of operations proposed for them. This Circular will be mailed on application to any person desiring it. It will be found of much value to horologists.

Cheap Work.

WE have noticed a sign in this City that says "watches cleaned and warranted for 50 cents;" a man down in Texas offers to clean watches for 25 cents apeice. Probably these persons charge all t eir work is worth, but no respectable watchmaker can afford to work at any such ridiculous price But we are sorry to learn, there are some practical watchmakers who are cutting under in the prices that should be legitimately charged for their work. A watchmaker is not a blacksmith; he is a person who has spent years to perfect himself in his art, and is entitled to compensation for the time he has bestowed upon it. Watch repairing is a very delicate operation, and requires technical knowledge and skill. It is not to be rated among that class of work that is performed by tinkers and Jacks-of-all-trades. Cheap work is doing much to bring the trade into disrepute and to rob it of its standing among art workers. Cutting of rates for repairing watches prevails largely in small places, where there is active competition among retail dealers. This is unfortunate, for, with a proper scale of prices the retailer ought to make his jobbing work pay a goodly proportion of his expenses. Retailers in every town should adopt a scale of prices for repairing and maintain it. Cutting prices not only brings discredit upon them, but robs them of a fair proportion of their profits.

A call has been issued by the leading jewelers in the principal cities of Minnesota for a meeting of retail dealers for the purpose of organizing a State Association for mutual protection from various abuses now practiced in the trade. The circular states that "among the grievances which invite our serious attention is the promiscuous circulation of catalogues and price lists by many of the jobbers of the Northwest, working as we well know, the ruin of the Retail Trade." The meeting was called to take place July 21, at the Metropolitan Hotel in St. Paul. We hope to be able to present a report of the meeting in the news columns of the next issue of THE CIRCULAR. We are pleased to see the various States falling into line with their organizations of retail dealers, all working to the same end, and endeavoring to effect wholesome reforms in the methods of doing business. These organizations should embrace every retail dealer in the land, and be able to bring such pressure to bear on manufacturers and jobbers as will compel them to recognize, to the fullest extent, the rights of the retail dealers.

THE recent conviction of Edward R. Jennings, at Hartford, of robbery, furnishes a solution to a mystery that has long remained unexplained. In November, 1875, John F. Krugler, traveling salesman for Jacot Bros., importers, was robbed of a valise, containing $5,000 worth of watches, while stopping at the Washington House, Philadelphia. Mr. Krugler had been making a western trip, and on the cars from Chicago noticed that he was closely watched by one or two men. This made him suspicious, for he had some $20,000 of goods with him, and on arriving at Philadelphia he had his trunk and valise both containing goods, conveyed to his sleeping apartment. During the night his room was entered, the valise broken open, and $5,000 worth of watches carried off. Detectives were called in, but beyond making the suggestion that Mr. Krugler, had robbed himself, did nothing in the matter. Mr. Krugler, however ascertained that a man who arrived on the same train he did, and had a room opposite to him in the hotel had disappeared early in the morning without paying his bill. No trace of this person however, could be found. Mr. Krugler returned home, and the suspicion originated by the Philadelphia detectives that he had robbed himself followed him; as a consequence, the circumstances weighed heavily upon his mind, and operated seriously against him in his business connections. He however, always kept a vigilant outlook for the thief, and learning that Jennings, who had been arrested at Hartford for some offence, had been lavish in distributing valuable watches among his acquaintances, proceeded to Hartford and identified the watches as those that had been stolen from him in 1875. Jennings was held for examination on the charge of robbery, and recently when brought to trial pleaded guilty and was remanded for sentence. We take pleasure in giving publicity to the facts in this case, and thus contributing, as far as possible, to the complete vindication of Mr. Krugler from the suspicion that attached to him on account of his misfortune in being robbed. The circumstances operated quite seriously against him in his business, and, we are informed, caused him considerable pecuniary loss.

CHAS. P. HEROLD, manufacturing jeweler of Philadelphia has recently made an elegant presentation piece, for Gen. Grant, in the form of a table. The following is a description of the work, which is both unique and artistic : "This table is an exact *fac-simile* of the old-fashioned mahogany centre table, with marble top, on which General Grant and General Lee signed the terms of surrender of the Confederate Army of Northern Virginia, at Appomattox Court-House, Va. For the marble-top slab, however, a plate of glass is substituted, beneath which, carved from gold, in the highest style of the jewelers' art, are various patriotic and symbolical devices. Central in the top is a blue enameled ring, emblematic of Unity, bearing a star for each of the thirty-eight States in the Union and the words, '*Esto perpetua*,' (let it continue forever). Within this ring, with their staffs crossed, on the one side is the National emblem, waving to the breeze and displaying its beautiful colors, and on the other two Confederate flags—the 'Stars and Bars' and the 'Southern Cross'—furled, and presenting only the idea for which the people fought and sacrificed. Above the flags is a finely wrought head of General Grant, and beneath the same the 'Apple Tree,' under whose shade Generals Grant and Lee first met; while central in the ring is the word 'peace' with its benificent rays spreading in all directions. The 'King of Unity' is also supported by various symbols in relief : on the right, by the pine tree and beetling crags of the North ; on the left, by the palmetto and sunny plains of the South ; while above is a white dove, bearing down the 'branch of promise,' and beneath a stand of arms stacked to indicate that the clash of arms has ceased. In the upper right-hand corner is engraved a Northern manufacturing village, offset on the left by a Southern cotton-field scene ; while the two lower corners of the table are filled with views emblematic of education and religion. Around the upper rim is engraved, 'presented to General U. S. Grant, Dec. 16th, A. D, 1879, by Frank T. Weldon, Ex-Confederate ;' while around the edge of the table is also engraved, 'welcome home.' 'The whole country feels itself honored by the honors you have received from the great nations of the earth.' The table is of solid gold, and a memento of one of the most important events in the history of this country. As the gift of an Ex-Confederate it is hoped that it may prove the harbinger of good-will between all sections, which shall make the whole country great and prosperous."

An Old Style Commercial Traveler.

ONE of the "old style" of commercial travelers was Jack Hazard, of New York. Jack was passionally fond of the "pasteboards," and would occasionally even indulge in a little game with the boys in the basement of the store, when not upon the "road."

One morning when thus engaged the "old man" was heard approaching, and Jack stuffed his last trick in his pocket, chucked the rest of the pack into an empty case, and the company broke up. The cause of the intrusion was soon explained by Jack receiving an order to start for Philadelphia at once with samples of a new line of goods.

Jack flung the samples into a valise, put on a clean paper collar, bought ten cigars for a quarter, and started at once. Arrived in Philadelphia his first call was on an old Quaker house on Broad Street. Pulling himself together Jack marched in, and laying a card before the senior partner, who was busily engaged at his desk, said in his most sanctimonious manner :

"That is the party I have the honor to represent."

The old follower of Penn looked carefully at the card, and then, fixing his steely blue eye on Jack, handed it back saying,

"If that is the party thee represents, thee will find Philadelphia well stocked with his goods."

Jack cast one horrified look at the card. It was the "little joker," on which a fellow clerk had strongly sketched the head and horns of His Satanic Majesty, and the bold salesman, for once discomfited, beat a hasty retreat to his hotel.—*Boston Commercial Bulletin.*

The Jewelers' Day.

THE DIAMOND FIELD AT HOBOKEN.

THE diamond field at Hoboken is not a new discovery; on the contrary, it has been well known and diligently worked for many years. The gems it produces, however, are not such as are familiar to the trade in general. They consist of "runs," and "ins," and "outs," "short stops," "stingers," "flyers," etc., with an occasional "goose egg"—in short, we refer to the base ball field, and herewith propose to furnish an unprofessional report of the game of base ball played on July 7, between the picked nine of Providence jewelers, and an equal number of representatives of the trade in this city.

This game had long been talked of, and a "good time" was anticipated when it should take place. It has constituted a fruitful topic of discussion among the younger members of the trade for weeks, and even some of the older heads became so worked up about it as to wager small sums on the result. A match was previously played between the clubs of the two cities at Providence, on which occasion the New York Club was sumptuously entertained and badly beaten by their Providence competitors. The game played on the diamond field at Hoboken enabled the New Yorkers to reciprocate the hospitality they had enjoyed, and they did so in a manner that was entirely satisfactory to all concerned. The day was hot, but the arrangements provided for plenty of good sea air, so that little discomfort from the heat was experienced.

The New York Club, with many invited guests, numbering in all some 50 persons, assembled at the Astor House at 7 A. M. on the 7th, and, preceded by a brass band, marched through Broadway and Warren Street to the steamer Rhode Island, on which the Providence Club came to the city. They were accompanied by numerous friends, making 60 in all. After cordial greetings had been exchanged, the procession was again formed, and, with the band at the head marched back to the Astor House. Here a special and substantial breakfast was awaiting them, and ample justice was done to it by the hungry processionists, to whom an unreasonable appetite had been imparted by their march. After breakfast, the band, much to the amazement of early risers, discoursed some excellent music in the lobby of the hotel. The procession was again formed and marched through Broadway, John Street, Nassau Street, Maiden Lane, and other haunts of the craft, finally reaching the steamboat Osseo, which rapidly conveyed them to Hoboken. During all this marching and parading, Sterne and Kaiser divided the responsibility of managing affairs, and, with perspiration streaming from every pore, appeared as though the affairs of the world were trifling compared to putting the party through successfully. Marsh was commander-in-chief assisted by Kaiser, and they labored vigorously and persistently in issuing orders promiscuously, while Sterne, who officiated as adjutant, expended his entire stock of innocent adjectives trying to keep the column in order. On reaching Hoboken, Kaiser was so much overcome by his arduous duties, that he made a frantic rush for the pump, with the insane idea of taking a drink of water; he was handsomely stopped however, by Frank Bliss, who advanced upon him with a glass of lager, and thus prevented his suicidal attempt. In fact, many similar attempts on the part of various persons were similarly stopped. It was fortunate for all concerned that there was plenty of beer in the commissary department, for the atmosphere of Hoboken evidently did not agree with them, and they were compelled to drink large quantities of beer medicinally.

After the usual preliminary arrangements, the game was called at 10:45, the New York Club going to the bat. The following is the list of players:

PROVIDENCE NINE—Mellin, of C. E. Mellin & Co., catcher; Wilkinson, with Pearce & Hoagland, pitcher; Fisk, with Howard & Schrieble, 1st base; Hamilton, of Hamiltons & Hunt, 2d base; Pearce, of Pearce & Hoagland, 3d base; Carr, of L. S. Carr & Co., short stop; Hall, of B. L. Hall & Co., left field; J. McCloy, of J. McCloy & Co., center field; Hutchinson, of Hutchinson & Heustis, right field.

NEW YORK NINE—Burke, of J. T. Scott & Co., catcher; Dana, of F. L. Hoyt & Co., pitcher; Fuller, of Bliss Bros. & Everett, 1st base; Krugler, with Quinch & Krugler, 2d base; Webster, with E. G. Webster & Bro., 3d base; Carey, with Coe, Pinneo & Stevens, short stop; Geo. Parks, with E. I. Franklin, left field; Scott Jr., of J. T. Scott & Co., centre field and captain; Stephen Parks, with D. S. Cooke & Co., right field.

THE GAME.

We shall not attempt to describe the playing in the sporting language of the professional base ball reporter, for the simple reason that we don't know how. Our education in this respect was sadly neglected. Persons who thought they knew all about it, said the play was good, and sometimes they shouted "bully," and hurrahed, after which they invariably took a glass of beer. When one of the players hit a ball and started to run, everybody else took a glass of beer; when anybody caught a ball, everyone else wrapped himself around a glass of lager; everybody took beer when a run was scored, and everybody drank lager when a miss was made. Every ten or fifteen minutes there was a wild outburst of enthusiasm from the crowd, a sure indication that a fresh keg of beer had been tapped. It was a warm day, and the atmosphere of Hoboken is highly conducive to the consumption of beer; probably because there have been so many German picnics there. But, as we remarked, the game was highly interesting because of the great skill displayed by all parties interested. When Burke went to the bat, everybody took a glass of beer; when Fuller didn't hit his first ball, lager was consumed; when Dana knocked a ball clear over into New York, there was loud cheering and more beer; when Krugler ran three times around the bases and never moistened a hair, everybody drank beer to the health of his Teutonic ancestors; as each player came up to the scratch, everybody drank beer to his success, and when he retired, libations of beer were indulged in because he had either hit or missed.

The New York Club scored six runs on its first innings, and then the Providence boys took the bat. They were greeted enthusiastically—with beer. They scored three runs, when Hamilton, who had been dodging all the balls he could, was put out. Then the by-standers took a glass of beer apiece, and the two clubs swapped places, the New Yorkers going to the bat again. The intervals of play were improved by the spectators, who took an occasional glass of beer. The players took five innings each, the New Yorkers scoring 17 and the Providence boys only 10 runs, whereupon the New Yorkers were declared winners. Somebody proposed that a glass of beer be drank by each one to celebrate the victory. Then Booth shouted loudly for music, but was presented with a glass of beer, and the gurgling of the beverage as it disappeared forever drowned his voice and he quietly subsided.

Marsh, Kaiser, and Sterne now came to the front again, and having mustered their forces once more in battle array, marched them aboard the boat, and she steamed away up the Sound to Glen Island. The band played lively airs on the way up, the boys danced "stag" dances, sang songs, and at intervals enjoyed a cool, refreshing glass of beer. There was a lunch on board, consisting of crackers, cheese and beer, which was liberally partaken of by all hands and washed down with beer. Glen Island was reached about half-past three o'clock, in time for dinner. The banquet comprised a Rhode Island clam bake; hard and soft clams; beer; lobsters; clam chowder; beer; clam fritters; blue fish; lager; chickens; green corn; beer. Ample justice was done to the sumptuous array by the hungry and thirsty multitude, after which they dispersed in squads, seeking entertainment on the Island. Some indulged in billiards, some in bowling, some in promenading, some in beer, while the band kept up a continuous concert. Chris Marsh kept a fatherly eye upon all the boys, lest they should be led into any sort of excess, and was especially

vigilant in noting that none of them drank too much beer. He didn't object to a few hundred glasses apiece, but protested against their drinking beer to excess.

During the dinner, the medals for the winners, two base ball bats and a ball on a clam shell, festooned with red ribbons, were introduced, and, with appropriate speeches, were presented to and accepted by the winners of the game. The Providence Club challenged the winners to a return game, to be played at Providence one year from that day, which challenge was promptly accepted. At 5:30 the party, which numbered 200 persons, left Glen Island and returned to New York, arriving at 8 P. M. On the way home Booth, Swartz and Hall contributed to the entertainment of the party by singing selections from Moody and Sankey hymns, while various others whiled away the time by relating classical and biblical stories.

On the whole, it was a most enjoyable day, and one long to be remembered by those who participated in its festivities. There were representatives present from many of the leading jewelry houses, and employer and employed entered with equal zest into the sport and fun that abounded. There were no excesses committed by any, and no accident or breach of decorum occurred to mar the festivities. Such friendly and social gatherings are calculated to engender better social relations among the members of the trade, and to obliterate those petty jealousies and rivalries that are too frequently the outgrowth of active business competition. We hope to see more of such social gatherings, and, therefore, wish every success to the New York and Providence nines, and their aiders and abettors.

Ear Rings worn by Men and Women

SOME three centuries ago one Philip Stubbes, a man of excessively morose and gloomy temper, spoke of the ladies of his day as being so far "bewitched" that they were not ashamed to make holes in their ears in order to hang in them rings or jewels of gold and precious stones. This ring he considers of evil signification, and hesitates not to call their wearers, with the pleasing candor and ingenuousness of his age, "dissolute minions and wanton Sempronians." All who have read Sallust's account of the conspiracy of Catiline, and his admirable description of the lady who could "dance better than befitted an honest woman," will comprehend the full force of Stubbes' "wanton Sepronians." Stubbes is by no means alone in his condemnation of earrings, though few, perhaps, have inveighed against their use with greater indignation or more pungent acrimony. They have been abused both by ancient and modern writers. Pliny seems to have objected to them chiefly on the score of their extravagant cost. The ear, he says, is the only immovable part of man's body, and on none is more money spent by a woman.

Earrings, however, have their apology. This delicate ornament of the human countenance is not by any means without defence. The custom of both sexes in the Eastern and Western world supports it. Its use is not confined to what is so delicately and politely called the "softer sex." Men wear it, and have worn it. The portrait of Shakespeare in the Chandos edition shows at least one earring ornamenting that poet. There is a tradition that Charles I. wore fine pearl earrings, and the day before his execution took one and gave it to Juxon, in charge for his daughter, the Princess Royal. The fate of its companion is not known. One cannot help thinking he might have presented her with the pair. At the present time earrings are worn habitually by male gypsies and sailors. From the earliest ages earrings have been worn by male Asiatics. The Bible is not without its instances of the practice, and Juvenal commemorates the ornaments in the ears, which denoted the male born by the river Euphrates.

Women, with few exceptions, have worn earrings in every country and at every period. In their ears they have been celebrated by the poets, sculptors and painters of many times and places. Homer introduces them into the toilet of the venerable Here, each composed three bright mulberry-colored brilliants. Praxiteles made holes for them in the ears of the celebrated Venus; and Sir David Wilkie has presented us with a charming pair about to be fixed, for the first time in the ears of a little country maiden; and yet, notwithstanding the general practice and artistic consecration, people are to be found who still speak of this adornment as a barbarous monstrosity, unseemly and ridiculous, in the ear of a South Sea Cannibal, but ineffably absurd and utterably inexcusable in that of an English lady. There is, of course, no disputing about tastes. The wearers of earrings can only console themselves by reflecting that some of their fellow creatures are unfortunate enough to be born without any æsthetic sense, without any conception at all of the science of the beautiful and with a strange want of proper appreciation of this embellishment of the human face divine, this neat addition to the Creator's sovereign and conclusive work of feminine loveliness.

Some critics of this form of personal adornment have, in the irritation proved by the prevailing fashion, stepped beyond the bounds of legitimate censure. Not content with abusing the ornament, they have attributed an unworthy and insulting motive to its wearer. Women, they say, deck themselves with these gewgaws solely from a feeling of vanity. Now nothing can be more certain than that this is not the fact, if, indeed, the evidence of the women themselves, who may be credited with the best knowledge of their own motives, may be relied on. Nineteen women out of every score to whom the question is put, "Why do you submit to the pain of having your ears bored?" will answer at once, "Because it is so good for the eyes." There may be nothing amiss with a girls eyes—probably there is not—but she will have her ears bored nevertheless. What is this but an instance of that sober precaution for which the sex is so deservedly famous, the desire to prevent by prompt and present action the occurrence of ills or inconveniences which may arise in the future? A pretty thing, indeed, it would be for a woman to run the risk of the sharpest and brighest weapons in her arsenal becoming blunt or tarnished by a cowardly avoidance of a slight temporary pain. She is so far a student of ancient physology as to understand the old doctrine of humors. She is well aware that the hole in her ear and the weight of her earring will draw down to that part any corrupt humors which may arise in her eye. The earring acts, in fact, as a sort of counter-irritant, and the heavier it is the more wholesome are supposed to be its effects.

When large earrings are worn it is for this reason, and the wearer is to be praised for a certain amount of self sacrifice, the result of prudence, than to be blamed for any idle vanity or affectation, if indeed, she is mistaken in her theory, she can at most only be charged with that ignorance which is the common inheritence of humanity. Whether her Indian sisters, who add to the ring in the ear a ring in the nose, proceed from the same motive is a moot question. It is probable that these benighted heathens are influenced by the love of splendor. They glitter, however, twice as gloriously as our own women, though even their double shine grows pale before the presence of one of those Eastern people who, historians tell us, cut holes in divers parts of their bodies in order that by the insertion of precious gems they may glow with far more than native lustre.

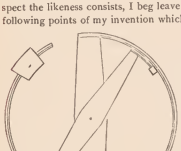
THE Chinese may as well yield the point of exclusiveness and permit the Yankee toothpick man and the laundry soap agent to go wheresoever the exigencies of trade call them. An American company has gained a foothold at Shanghai, and is making clocks for all the Orient, so that it is a mere question of time that is to settle it after all. The advent of the clock peddler decides the fate of the Flowery Kingdom, and now the forward march of trade has been announced, the exclusiveness of ages becomes a thing of the past. Chinese padogas will be about the only edifices in the Celestial Kingdom where the drummer and the picture taker will not go. Spectacle peddlers and book agents will follow later, as soon as people have learned to appreciate the advantages of the one and the language of the other. The prospect looks very gloomy for China.

On the Remarks of Mr. Molyneaux about the Compensation Error in the Balance of Chronometers.

NEW YORK CITY, June 16, 1880.

Editor of the Jewelers' Circular :

DEAR SIR : In the article by Mr. Molyneaux in the June issue of the CIRCULAR, I find the statement that my "Auxiliary" is made in imitation of his, and as I am unable to find in what important respect the likeness consists, I beg leave to call your attention to the following points of my invention which are not found in his :



PROF. AIRY'S BALANCE.

First—My Self-Adjusting Balance consists of six compensating arms, in every respect, to the best of my knowledge, a new invention.

Second—My Auxiliary consists of brass and steel like a compensated balance by means of which the inclination to run slower in a high degree of temperature is obviated progressively.

MOLYNEAUX AUXILIARY BALANCE.

Third—The long arm of the balance, which carries the compensation weights is never connected with the auxiliary but remains free, thus preventing the motion from being interfered with—which is most important.

Fourth—My Auxiliary can be made long or short, whereby the compensation for extreme temperature can be easily regulated.

Fifth—In my auxiliary, the transferring of the motion is gradual and equal. The auxiliary remaining on the short arm by which it is carried. The motion is never sudden, the small arm of the balance always having sufficient power to move the auxiliary at once.

Sixth—My auxiliary arms are made very thin so as to change as quickly as the balance spring. With a sudden change of temperature the balance itself not changing as rapidly, which would cause a running slower.

Seventh—If, after some years it becomes necessary to correct the compensation, this can be done by moving the auxiliary arms without disturbing the equilibrium of the balance, nor does it need to be taken out, or the adjustment for extremes to be disturbed, as it can be exactly adjusted for a variation of from 1 to 10 seconds without moving the screws or weights.

Upon examination of these points, I think Mr. Molyneaux will admit the difference between my auxiliary and his whether he is willing to allow the superiority of the "new coat over the old garment" or not. I beg leave also to state that the table of ratings for common compensating balances as in Mr. Molyneaux's article is not as published by me, but makes the variations to be double those shown in my table. I subjoin table showing the performance of my balance at the Washington Observatory, the correctness of which can be verified by referring to the record as kept there, or I should be glad at any time to submit the balance to any further trial. I also give the table as originally published by me, showing the errors of common compensating balances.

TABLE SHOWING THE ERRORS OF COMMON COMPENSATING BALANCES IN EXTREMES OF TEMPERATURE, FROM MY OWN EXPERIENCE.

		OR DAILY SLOW.		
		40°	65°	90°
From 40 to 90° F. — 3 to 4″		-1.5 to -2″	0.0	-1.5 to -2′
" 30 to 100° " — 7 to 10″		30°	65°	100°
		-3.5 to -5″	0.0	-3.5 to -5″
" 20 to 120° " —15 to 18″		20°	65°	120°
		-7.5 to -9″	0.0	-7.5 to -9″
" 10 to 130° " —25 to 30″		10°	65°	130°
		-12.5 to 15″	0.0	-12.5 to 15″

H. H. HEINRICH'S PATENT AUXILIARY COMPENSATION BALANCE CHRONOMETER, NO. 2. TRIED AT THE WASHINGTON OBSERVATORY.

DAILY RATE IN TEN DAYS.

1879.		S.	Temp. F.			
Aug.	19—29	A 0.0	84°			
Sept.	8	+0.4	83°			
"	18	+0.3	83°	Tried in Extremes of Temperature F.		Diff. in Ext.—0.4
"	28	+0.4	83°		84° 0 0 2	
Oct.	8	+0.3	80°		65° 0 0 0	
"	18	+0.5	80°		12°	
"	28	+1.1	76°			
Nov.	7	A +1.3	68°			
"	17	+0.9	77°			
"	27	+0.9	60°			
Dec.	7	+1.1	67°			
"	17	+0.9	68°			
"	27	+1.2	65°			
1880.						
Jan.	6	+0.8	32°	daily		
"	16	B +0.1	28°	+0.8″		Diff. in Ext.+1.0
"	26	+0.2	29°	+0.0		
Feb.	5	+0.5	18°	+0.2		
"	15	+0.4	20°			
"	25	+0.6	22°			
"	29	C +0.5	49°			

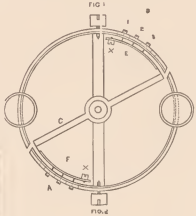


FIG. 1

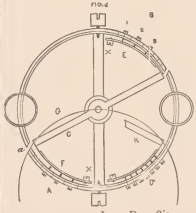


FIG. 2

A 1.3″ Difference between the greatest and least.

B 0.7″ Greatest difference between one ten days and the next.

C 0.5″ Difference during the trial from beginning to end.

In conclusion I would say that the Auxiliary of Prof. Airy, of Greenwich, resembles mine at first sight ; it does not, however, correct the errors made in the extreme of temperature—the greatest claim and in fact the sole object of my invention, nor is it claimed by him to do so, and was invented only for the purpose of enabling close adjustment of the compensation without the necessity of removing the balance.

I am, Dear Sir,
Very respectfully yours,
H. H. HEINRICH.

Care Messrs. Tiffany & Co., 15 Union Square.

Practical Hints on Watch Repairing.

By Excelsior.—No. 65.

THE PRACTICAL EXAMINATION OF TOOTHED GEARING—CONTINUED.

(1,028). *Making the Pitch Circle of the Wheel Smaller*, is done by cutting or extending the curves of the points further down on the teeth, so that the *junction* of the straight flanks with the curves of the addenda will be nearer to the center of the wheel. Before doing this, however, it is necessary to know whether the present curve of the addenda is correct, or if incorrect, what the new form should be. It is a good idea to draw out the tooth on a large scale, to find exactly how the addenda should be shaped to make a perfect gearing in each particular case, then select a cutter which will shape the points according to the drawing. This need not take much time, and the practice will soon enable one to judge quite closely by the eye alone.

If the present curve is correct, a cutter can be selected by trying them on the teeth till one is found which has precisely the same curvature, and also just fits the spaces between the teeth. For the object is not to widen the spaces but simply to cut the curves, without change, further on the teeth. If the cutter is loose between the teeth, it will produce an effect similar to cutting back the front flanks, as described in section, (1,024), instead of the one intended. These cutters are supposed to cut both sides of the teeth equally, *i. e.*, the front of one and the back of the next.

The same operation may also make the full diameter smaller, if required—selecting a cutter which will shorten the points while shaping them up.

(1,029). *Making the Full Diameter Smaller* may be done, first, as just described, and either leave the pitch circle as it was, or at the same time make that smaller, if it should be so. Supposing the pitch circle to be of the right diameter, and the addendum curves correct, the full diameter can be lessened. Second, by dressing off the *backs* of the teeth, from the roots to the points. This leaves the teeth symmetrically formed, and shortens the points, without at all disturbing the shape of the front or acting surfaces. The mere shortening of the points, without otherwise changing the teeth, can of course be done, third, by simply turning off the points in the lathe. But this way of operating will seldom be required.

If there is very little play or freedom between the wheel and pinion, or any approach to clogging, the second method of shortening the points will be preferable, as it will increase the play. In this method the cutter must have one "safe" or non-cutting side, which need not be curved, but may be plane from center to edge. Recollect that, unlike the cutters before mentioned, this one does all its cutting on one side; therefore the edge must be but little thicker than the spaces between the flanks of the teeth, else it will cut away too much.

(1,030). It is hardly necessary to say that in making any change in a wheel, whether those described or any other, it is of the highest importance that the teeth, when finished, should all be exactly equal in length, *i. e.*, their points should be at an equal distance from an axial line passing through the centers of the two pivots of the pinion. This is not so simple a matter as it might be thought. In holding the wheel in a rounding up, or other tool, it is not held by its pivots, but, in order to avoid risk, by the shoulders of the pinion arbor, and these shoulders are very commonly untrue, *i. e.*, not concentric with the pivots. A wheel may therefore be true as regards the pinion arbor, and the leaves, and yet be considerably out of center when running on its pivots in the watch. Whether it is true with the pinion leaves or arbor, or not, it should be true with the pivots. And before putting a wheel in the tool for treatment, be sure that the shoulders by which it will be held are true with the pivots. If they are not, you will find the wheel out of center when you take it from the tool, and if it was true before, you will get it out of true by putting it through the tool. Whenever the shoulders are not true with the pivots, first turn them off true, so that the wheel may be safely centered by them.

(1,031). *Tools for Changing the Shapes of Teeth.* It would be impossible in a brief article to give specific directions for arranging and operating wheel cutting engines, rounding up tools, etc.—moreover, they would alone form a sufficient topic for a series of articles, and I hope some one will write them for the Circular. It will therefore be here assumed that the workman who has these tools, has all the necessary attachments and knows how to use them.

For dressing off or cutting back the flanks of the teeth, the cutting engine or the rounding-up tool may be used. For shaping the points of the teeth, either the foregoing tools may be used or the Ingold fraises, or rounding-up cones. The cones and fraises only shape the points, but the others can shape both points and flanks.

(1,032). *Rounding-up Tools* use cutters similar to those of cutting engines. In one side is a slot, containing a spring or wing which can be adjusted sideways, to enter the space adjoining the one in which the cutter is working, and to lead the latter to the cutter. Its office is therefore to feed the wheel around. There is nothing to hold the wheel in position while being cut except the cutter itself. Consequently, if the wheel is not evenly divided, contains any thick or thin teeth, or any teeth are bent, the error will not be corrected by the rounding-up tool, but *may* be made even worse. That simply takes, as a guide, the spaces as it finds them, and widens or otherwise cuts them, acting indifferently upon the teeth whether they are thick or thin, upright or inclined, equally or unequally spaced. When it has cut its way through, between them, its duty is done.

This fault is avoided by the tool known as "Saunier's Rounding-up Tool of Precision," which moves both the wheel and the cutter, and holds them in such relative positions as to secure a perfectly true wheel. Being complicated and costly, it is only adapted for manufacturers. The tool first described is the one used by watchmakers.

(1,033). *The Ingold Fraises* are cutters shaped like a pinion, and, when cutting, act like a pinion gearing into the wheel. They have a bearing upon several teeth at the same time, so that any difference in the lengths or thicknesses of the teeth or points is removed by the bearing of the fraise on the other and correct teeth. For equalizing, rounding, or correcting an imperfect wheel, the fraises are therefore superior to the rounding-up tool—or, rather, they may be considered indispensible, and a good kit should contain both. The fraises may be used in a depthing tool, or held in a lathe, but it is better to buy the holder or tool made expressly for them. Each fraise is adapted for giving a particular form and dimension of tooth, but an assortment of from 12 to 20 fraises will be sufficient for the ordinary run of watch work, although the workman who aspires to do *first class* work will need a greater variety of sizes. As the fraises have the sides and spaces finely cut like a sort of file, and shape the teeth by filing them towards the points, instead of cutting across them like the rounding-up tool, the action of the points is smoother in the former case than in the latter. At the same time the workman should remember that the fraises act *only* on the points, and that when the spaces are to be widened or the flanks cut back, the rounding-up tool only can do it.

(1,034). *The Rounding-up Cones* are tools of the same class as the Ingold fraises, except that the latter have parallel sides and cut uniformly at any part of them, while the former are conical in shape, and it is not necessary to have a separate cone for each different pitch of tooth, but we have a number of different pitches on the same cone. Like the Ingold fraises, the cones cut, or, rather, file the teeth into shape, by placing them in gear with the wheel at the point where the size of the cone will give the correct pitch, and rotating them in contact, with the bow or otherwise. The taper of the cones enables us to change the pitch by moving the wheel towards the larger or smaller end, as may be required—the latter, to shorten the points and make the curve more rounding, and *vice versa*. Thus five cones constitute

an assortment for watch wheels. Like the fraises, the cones are only used to shape the points of the teeth.

(1,035). *The Mechanical Defects of a Gearing* include the improper planting of the parts in the movement; unfitness of either piece for the other; the results of accidents, wear, or improper treatment by workmen, and errors in the original execution of the pieces. The effect of the first is a depthing too deep or too scant; the effect of an error in the proportionate sizes (pitch circles, or geometrical diameters,) is an imperfect pitching; if the addenda or points of the teeth are too long or too short, the driving will begin and end improperly; an error in the shapes or curves on the addenda of the teeth will cause an irregular driving, or lack of uniformity in the transmission of power and velocity from the wheel to the pinion; accidents, wear, etc., result in teeth bent, wheel out of center, out of round, out of flat, teeth cut into improper shapes, uneven, irregularly shaped, etc. Imperfect execution results in teeth unevenly divided, improperly cut, wrong numbers, thickness, etc., rough surfaces or edges, and similar faults, directions for examining which have already been given.

(1,036), *The Mechanical Defects of a Pinion* are mainly the same as those of the wheel, but a few should be specially noted. See that the arbor shoulders are true with the pivots, (1,030); that the leaves are true with the pivots; that they are not too thick or too thin, (981, 988,) and are all of the same thickness; that the sides of their flanks are straight, from their roots to the pitch circle; that their addenda or points, outside of the pitch circle, have a semi-circular shape—except when the pinion drives the wheel, and then the points should be formed with a suitable epicycloidal outline, as fully described in previous articles; that the straight sides of the leaves are exactly in line with the center or axis of the pinion; that the leaves are equally divided, *i. e.*, exactly the same distance apart all the way around. The two last points can be tested by comparing two opposite leaves, to see if their sides are in the same perfectly straight line, and that that line passes through the center of the pivot. By a little practice with the eye-glass the workman can readily detect the slightest departure from the proper direction. In uneven-numbered pinions however, each leaf must be examined by itself, to test whether its sides point exactly to the center.

(1,037). The most troublesome and deceptive error is the eccentricity of the leaves. It deranges the entire action of the gearing. The workmen who takes a short glance at the gearing, sees it in only one of its phases or conditions. On looking again, he finds exactly contrary errors. On the side where the leaves reach furtherest from the center, the depthing will be too deep, and the teeth and leaves will be liable to catch and clog; on the other side the leaves do not extend so far from the pivot, the depthing is too scant, the teeth meet the leaves too soon, producing engaging friction or wedging, and leave them too soon, with slipping or drop. If he happens to look when the gearing is in the intermediate position, he will conclude that it is all right, and correct—when in reality it is in one of the worst conditions possible. As we cannot always take time to watch a gearing through a complete revolution of the pinion, it is difficult to detect this error in the movement, and the examination of the parts when out of the watch should be particularly directed to discovering whether the leaves of the pinions are concentric with the pivots. If they are not, either insert new pivots which are truly in center, or fit in a perfect pinion.

(1,038). *Examining the Depthing.* We already know that, in a correct depthing, the pitch circles of the wheel and the pinion must just meet, on the line of centers, as they stand in the watch. The question now is, how can we tell whether they meet, or fall short of meeting, or pass and intersect? The pitch circles are not marked out, so that we can see where they are; how will we know whether the depthing is correct or not? This is more difficult than it appears, because the depthing and the pitching are so closely related, and each one so closely depends on and affects the other, that few workmen can or ever try to distinguish them apart. Very many consider them substantially the same thing, and almost every one uses the same word, "pitching," to express both pitching and depthing. As for the word "depthing," they use it not only for the depthing and the pitching, but also in the sense of a "gearing," or a wheel and pinion in gear. Without seeking to clear up the confusion of ideas and terms, or to understand the causes of what they see, they are satisfied to observe certain "signs" in the action of the gearing, and therefrom, by means of some rule, try to conclude what is best to be done with it. It is the object of these articles to explain the reasons and causes of what they observe, so that they may proceed intelligently, and therefore readily and surely, in their corrections of a gearing.

(1,039). A common way of examining a depthing is to examine both the teeth and the leaves, to fix in the mind the probable position of the pitch circle on each, then get the eye in a position to look directly *across* or at right angles to the line of centers of the gearing. Keeping in mind the distance of the pitch line from the tips of the leaves, and from either the tips or roots of the teeth, as may be most convenient, we watch the teeth and leaves as they pass the center, and judge whether the two pitch circles fall short, meet, or pass. In most cases it is more convenient to judge by the nearness of the tip of the leaf to the bottom of the space, as seen in Fig. 60. Having decided where the pitch line is on the tooth, and gone as much inside of that as the addendum of the pinion leaf will reach, we have remaining the distance there should be from the tip of the leaf to the bottom of the space. This, however, is only an approximate test, and although capable of giving close results if cautiously applied, and after some practice, is useful mainly when the gearing can be seen only across, horizontally or nearly so.

(1,040). The second and usual way is by looking down on the gearing, when it can be seen from above. We cannot so well see the depth of the intersection, but we estimate it from the point at which the contact begins between the driving tooth and leaf—whether on the line of centers or before, and how far before. If the pitching and shapes of the teeth, thickness of the leaves, etc., are correct, the contact should begin, with a 6-leaf pinion, when one-half the thickness of the leaf is yet before the line of centers, *i. e.*, when that line passes through the middle of the leaf, as in Fig. 59; with a 7-leaf pinion, when about two-thirds of the leaf has passed the line of centers, and one-third is before it; with an 8-leaf pinion, when about three-fourths the breadth of the leaf has passed the center; and, with pinions of 10 leaves and upward, just as the point of contact comes on the line of centers, and the meeting flanks of the tooth and the leaf are in the same straight line, as seen in Fig. 58,—or, as generally expressed, "swell to swell," *i. e.*, the thickest part of each tooth must just reach to the "swell" or thickest part of the leaf, and touch as the point of contact comes on the line of centers. If the contact takes place sooner than above stated, for each number of pinion, the depthing is too shallow; if not so soon, it is too deep. But this can can be relied upon only *if* the parts are in the conditions above stated. The examinations must therefore include also the correctness of the pitching, the lengths of the addenda, thickness of the leaves, etc., as will be explained when we come to examine our illustrations of faulty gearings.

(1,041), The scientific and only certain way is to measure the geometrical diameters of the wheel and the pinion, and their center distance in the movement. Add together the radii or semi-diameters of the wheel and pinion, and if the sum equals the center distance, the depthing is correct; if it falls short of or exceeds the center distance, the depthing is too shallow or too deep, respectively. The methods of finding the geometrical from the full diameters or outside measurements are described in article No. 58.

The quickest way of finding out the geometrical diameter of the pinion, when it is well made, with true semi-circular addenda, is by deducting the thickness of one leaf from the full diameter. To guard against any inequality, it is well to make two or three measure-

ments, of different leaves, and of the pinion in different directions. They will either confirm each other, or discover any existing defects.

(1,042). *Examining the Pitching.* Workmen generally describe an error in the pitching by saying that the *pinion* is too large or too small. Even so high an authority as Saunier says: "Depths (gearings) are defective (1) when the primitive diameters are not correctly proportioned, a fact which is expressed *by saying that the pinion is too large or too small.*" Now the truth is that this only partly expresses the fact, for the primitive diameters may be incorrectly proportioned, and yet the pinion may be perfectly correct, and the *wheel* be too large or too small. One is quite as likely to be wrong as the other. And when the error is in the wheel, the correcting of it by changing the *pinion* will make matters worse than before. We must therefore look into this matter.

(1,043). We already know that the pitching is correct if the pitch of the wheel and that of the pinion are equal, *i. e.*, if the distance along the pitch circle from the front of one tooth to the front of the next one is the same as that from the front of one leaf to the front of the next one. The pitch is therefore the circumference of the pitch circle divided by the number of the teeth or leaves. But how are we to compare the pitch of the wheel and of the pinion, to see if they are equal, or which is the greater?

It will not do to put the points of the teeth and the leaves together, nor to put the flanks together, to see if the pitch is the same on both the wheel and the pinion. Nor will it do even to measure the distance between the fronts of two adjacent flanks, and compare them. The pitch is the distance along an arc of the pitch circle, but the above comparison or measurement would be comparing or measuring the chords to those arcs. Just as if the pitch was from O, in Fig. 51, through a, t, s, r, to b, or the arc Ob, while a straight line from O to b would be the chord of that arc. The smaller the circle of which the arc is a part, the greater the difference between the lengths of the arc and its chord, and also between the chords of two arcs of equal lengths. In Fig. 51, the arcs Ob, Oc, and On are all of equal length, but the chord of Ob is shorter than the chord of Oc, and that is shorter than the chord of ON, on the wheel. Consequently the chordial distance (got by measurement) from the front of one leaf to the front of the next, would be less than that between the fronts of two teeth, on the pitch circle—even when the wheel and the pinion were suited for each other. And the more difference there was between the sizes of the wheel and the pinion, the more there would be between the chords of the pitch arcs upon them.

(1,044). *Testing the Pitch by Measurement.* But although it is impracticable to measure the pitch, on either the wheel or the pinion, or to compare their pitches by juxtaposition, we can proceed in another way. We know that the circumference of the pitch circle is the pitch repeated as many times as there are teeth or leaves. In a gearing consisting of a wheel of 48 teeth and a pinion of 6 leaves, if the circumference of the pitch circle of the wheel is 8 times that of the pinion, the pitch will necessarily be equal in each case. And although we cannot measure the two pitch circles, we know that the proportion is the same between their diameters as between their circumferences, and we can readily ascertain their diameters and compare them.

It is evident, then, that the scientific and sure method of testing the pitching is to measure the wheel and pinion, to see if their geometrical diameters are in the same proportion as the numbers of their teeth and leaves. In the gearing just supposed, if we have to select a new pinion of six leaves or test the old one, it must be exactly one-eighth the diameter of the wheel. If its geometrical diameter is contained in that of the wheel 8 times and a fraction over, the pinion is of course too small. If contained, say 7½ times, it is too large. Conversely, in selecting a wheel suitable for the pinion, it should be 8 times the diameter of the pinion.

(1,045). *Testing the pitching by the Action* is the method commonly followed. The wheel and pinion are set at the correct depth, either in the depthing tool or in the movement, and, if the teeth and leaves are of correct sizes and shapes, each tooth should meet its leaf at the position stated in section (1,040) for each number of pinion, should drive the leaf uniformly without catching or slip, and leave it at the end of the driving without any "drop." This is the action of a perfect gearing. As perfection is seldom attained, but only approximated, in practice, workmen prefer to err on the safe side, and generally favor a gearing which approaches to having a "drop," but cannot be positively asserted to have one, or it is so slight that it is barely perceptible.

A perfect action depends on so many conditions besides the pitching, any one or more of which may be incorrect—such as the depthing, thickness of leaves, shape of the points of the teeth, etc., that this method cannot be considered as a test of the pitching alone, but rather of the perfection of the gearing as a whole. If not perfect, there will be certain peculiarities in the action which indicate some one or more errors in the gearing. But this will be explained in our studies of defective gearings, with the faults of each.

Some of the Optical Properties of Crystals.

BY PROF. W. GRYLLS ADAMS, F. R. S.

The following paper was recently read before the Society of Arts and will doubtless interest many of our readers:

I have been asked to read a paper this evening on a most interesting and, from a scientific point of view, a most important subject; at the same time, it is one which requires close attention, and it is by no means easy in the short space of an hour to put a clear view of it before either a scientific or a popular audience. I will, therefore, at once ask you to give me your indulgence this evening, while I attempt to put before you and to explain some of the very beautiful effects which are produced on passing a beam of light through crystals.

By the optical properties of crystals are meant their transparency their power of refracting or bending a beam of light, their lustre, their color, and their phosphorescence.

Most of the crystals which we shall have to study this evening are as clear, or transparent, as the clearest plate-glass; and the clearer they are, the more beautiful are the effects which are produced on sending a beam of light through them. Many of these effects are due to what is called the interference of light, *i. e.*, the blotting out of one set of waves of light by means of another set of equal waves just as one set of waves spreading over the surface of water may be blotted out by another set of equal waves going nearly in the same direction Where the crests of one set fall in the hollows of the other set, the particles of water are pushed upwards and downwards at the same time, and then remain at rest. In all kinds of wave motion we have to deal with combinations of waves and with their interference. Thus, in sound, the vibrations from two successive sections of a vibrating plate combine with one another, and they may be made to reinforce, or to interfere with one another by means of a sector revolving over the disc; in this way we may get beats which are the result of damping some of the vibrating segments. We may also get interference from the two prongs of a tuning fork. In the same way, two equal beams of light going in the same direction may interfere at certain points in their course, and produce total darkness. This interference takes place along certain lines, so situated that the difference of the distance from the two sources to every point on the same line remains the same. Between these lines the waves from the two sources reinforce one another, just as the waves of water—two crests or two hollows—come together, and make a larger wave.

In the case of light this interference may be produced by bringing a curved surface of glass, such as a lens, in contact with the face of a mirror, and reflecting a beam of light from the mirror. The light will pass backwards and forwards between the lens and the mirror, some of it getting out at each reflection, and the illumination on a screen placed opposite will result from the overlapping of these several waves from the successive reflections. We shall get one set of waves

retarded behind another set, because of the increase in the length of path due to the successive reflections. The interference bands will in this case be ranged round the image of the point of contact of the lens and mirror. They are called Newton's rings, because they were first investigated by Sir Isaac Newton.

It will be seen that the colors going out from the center are violet, blue, green, yellow, orange, red, and that these colors are repeated in the same order; so that, for each color, there are successive interference bands. Now, according to the wave theory, the size of an interference ring increases with the length of the wave, and as the length of a wave of violet light is shorter than the length of a wave of red light, the violet rings are smaller than the corresponding red rings.

Another very beautiful way of producing interference bands is by reflecting a beam of light from a steel mirror, on which parallel lines have been ruled with a diamond. When these lines are very close together, the waves of light which are reflected from the successive spaces between the lines interfere with one another, and produce interference bands upon a screen. The nearer the ruled lines are to one another on the mirror, the wider the interference bands will be apart, and the greater the separation between the colors. Hence, by means of lines ruled very close together, we may get the interference spectrum spread out over a considerable length of the screen. A mirror so ruled with equidistant parallel lines is called a diffraction grating.

I have here such a steel mirror sent to me by Mr. Rutherford, of New York, on which there are 17,296 lines ruled to the inch, by means of which very beautiful spectra may be obtained. As in Newton's rings we get successive rings of the same color, so in Rutherford's diffraction grating we get successive spectra, in which the colors are more dispersed or separated from one another as we go outward. These interference bands may also be obtained by passing a beam of light through a glass plate on which a photograph of a diffraction grating has been taken. I have here a photograph of a grating with 3,001 lines rules to the inch, from which we may obtain the successive spectra corresponding to Newton's rings of successive orders, As there is only about one-sixth of the number of lines on the grating, the length of the spectrum and the separation between between the spectra will only be about one-sixth of the length and separation of the spectra in the Rutherford grating with 17,296 lines to the inch.

The irridescent colors produced in the soap bubble, or by breathing on glass, or by scattering a very fine powder, such as lycopodium or as the spores of the truffle on the surface of glass, are due to interference; and the beautiful colors on mother-of-pearl and oyster shells arise from the interference of the light reflected from successive edges of the thin layers of which the shell is made up.

Many varieties of fluor spar and diamond are phosphorescent, and I had intended to include in this lecture an account of some of the beautiful effects of phosphorescence, but this subject was so clearly and so attractively put before you a short time since by Prof. Heaton, in his paper on "Balmain's Luminous Paint," that I may now pass over it very lightly. It is very easy for any one to make an experiment on phosphorescence, and to convince himself of the phosphorescence of crystals. Taking a lump of sugar into a dark room, and staying a short time to allow the pupils of the eys to become sensitive, he will find, on breaking the lump of sugar, that it gives out a glowing or phosphorescent light.

Of the cause of the lustre of crystals, or of their color, produced by their unequal absorption of different kinds of light, I propose to say very little this evening. On this subject I would only draw attention to the fact that the color of many crystals change when they are viewed by light passing through them in different directions. Such crystals are called dichroic, or pleochroic, if they give more than two colors. We gain some insight into the cause of this dichroism when we examine the light which has passed through them by sending it through a crystal of Iceland spar, which has the remarkable property of splitting up a beam of light into two distinct beams. On passing a beam of white light through a crystal of Iceland spar, it is split up into two beams of white light of equal intensity, but if a light be first passed through a dichroic crystal, and then through Iceland spar, the two beams of light formed are found to be of two distinct colors. I have here some dichroic crystals, which have been grown by Mr. John Thompson, and in these this dichroism is very distinctly shown. It will be seen that the color of the images depends upon the relative position of the dichroic crystal and the Iceland spar, for on turning the crystal round the image changes color.

This action of Iceland spar on a beam of white light by which two beams of white light are produced, brings me to the principal subject of this evening's lecture, the double refraction and polarization of light by crystals.

(*To be continued.*)

Black Pearls.

A CONTEMPORARY says "In reference to the recent discovery in Vienna of a valuable black pearl, supposed to have been one of the three of the same color that formerly adorned the English Crown, the Banff correspondent of *The Aberdeen Free Press* states that a gentleman there had shown him a black pearl of rare value and beauty that had been brought to this country a good many years ago from South America by a shipmaster. The pearl is oval-shaped and is about the size of a small pea; and, although jet black, it has a polish of great brilliancy. It has been cut slightly on one of the sides as if it had been previously placed in setting.

Black pearls are really not very uncommon; they are found, says Mr. Streeter, in the Gulf of Panama, and in Western Australia, and rise in value from $5 to $50 a grain. It appears that inferior colored pearls are sometimes dyed black or russet brown, and sent into the market; but the absence of the true Oriental tint and lustre is so marked that only a very inexperienced eye can be deceived by them The author just quoted, states that the famous necklace of the Empress Eugenie, consisting of a row of matchless black pearls, realized the large sum of $20,000 after the removal of the pearl forming the snap, which was subsequently sold for 1,000 guineas to form the centre of a bracelet.

With regard to pink pearls, of which mention has been made above, we may remark that, when fine and large, they command exceptional prices. They are found in the rivers of South America, and in the Bahama Islands, and vary in value according to their quality, shape, and size, the price ranging from five shillings to $30 per grain. This kind of pearl is apt to have an irregularity of form which unfits it for use as a personal ornament. It is imitated in pale pink coral, cut and finished for the purpose; but the counterfeits fail to present the peculiar sheen which distinguishes those that are genuine.

Diamond Cutting.

THE art of diamond cutting is usually supposed to have been invented by Louis Van Berquem, of Bruges, in 1456, but closer inquiry shows that he only introduced important improvements into a method already in use. It is said that there were diamond polishers, at Nuremberg in 1373, and the same trade was exercised early in the following century at Paris, where a cross-way called "La Courarie," once inhabited by the workmen, still exists among the diminishing relics of the past. Nor is it to be supposed that this art was entirely unknown to ancient nations. In India, from the earliest times, a mode of releasing the crystal from its native husk was employed, which probably differed less in principal than in application from that now used in London and Amsterdam. The gem engravers of antiquity not only worked extensively with the diamond point, but in some rare cases engraved the "indomitable" stone itself. In the Duke of Bedford's collection, for instance, is a diamond engraved with the head of Posidonius, and one bearing the portrait of a Roman Emperor was to be seen at the Paris Exhibition of 1878. After the barbarian invasion, the art became the secret of a very few, without, it would seem, ever declining to distinction; for the diamond clasp which fastened the imperial mantle of Charlemagne at his coronation had the natural faces of crystals rudely polished, and cut diamonds have occasionally been found on mediæval church ornaments.

The American Watch Company.

A VISIT TO AND DESCRIPTION OF ITS IMMENSE FACTORY AT WALTHAM, MASS.

Continued from page 112.

Reviewing the articles we have already printed descriptive of the American Watch Company's Works at Waltham, we realize more fully than ever how inadequate is the language at our command to describe the infinite variety of manipulations required to perfect the various pieces that go to make up a watch. Had we an artist to accompany us through the numerous rooms of the factory, to supplement our work with illustrations of the various processes, we should feel that we had given the reader a more comprehensive idea of this immense enterprise. Lacking the facilities, however, afforded by the artist and the engraver, we will hasten on with our work of describing, to the best of our ability, the various operations we witnessed in the process of watch-making. The

JEWEL-MAKING ROOM.

The jewels of a watch are important factors in securing its accuracy as a time-keeper. The pivots of the wheels are of steel, while the plates supporting them in position are of brass. If the points of the pivots were inserted in the brass their constant movement would soon wear the softer metal, and the regularity of the movement be destroyed. Hence it has been found necessary to introduce jewels into the holes where the pivots rest, thus forming a bearing of the hardest substance known for the pivot to run on. All the jewels used in the American Watches are made on the premises from rough stones. The Jeweling Room is under the care of William R. Wills foreman, who has been in the business for twenty-three years. He is an expert in every branch of the work entrusted to his care, and possesses rare executive ability. There are 75 persons employed in this room, about one-half of them being girls. Upwards of 200,000 finished jewels a month are turned out in the jeweling room, requiring a stock of stones in the rough worth from $25,000 to $30,000, to be kept on hand all the time. There are 80 machines of various kinds in service in the room, some of them doing work of the most delicate nature. The jewels of watches consist of rubie, sapphire, or garnet. The stones from which they are cut are received in the Jeweling Room in the rough; with delicate machinery, aided by a plentiful supply of diamond dust, the rough stones are cut into thin slabs, 10° (Metric system), or the 500th part of an inch in thickness, and these slabs are then cut into little disks about the size of a pinhead. This is the watch jewel in an unfinished state. It is then passed through various lathes, where it is turned to suitable dimensions, capped and drilled through the centre ; that is, it is drilled nearly through from one side, and then turned and drilled from the other. In all these operations the tools employed are frequently dipped in oil and diamond dust, otherwise they would make no impression on the hard surfaces of the jewels. After being drilled, the holes are carefully opened to the required sizes to accommodate the pivots, by means of a steel wire dipped in diamond dust. The jewels are next faced, cornered, and counter-sunk. All this work is done with the aid of magnifying glasses, and after every operation each jewel has to be carefully examined to ascertain if any imperfections in the stone have been developed. It has frequently been found when a watch has become disordered that the constant wear of the pivot had developed a minute flaw or soft place in the jewel, and, following the line of the flaw, the pivot had become diverted from the perpendicular. Hence the necessity of examining every jewel critically under a powerful glass before putting it in a watch. When the jewels are finished they are passed to girls to size. This is done by means of a delicate gauge, from which projects a thin, tapering steel wire. The jewel is forced down on the wire as far as it will go, and the wire pushed into the gauge, where there is a register that records the diameter of the hole in the jewel. The jewel is then placed on a card that is divided off into squares, whereon are numbers designating the various sizes. When a number have been thus gauged, they are placed in small boxes, each size by itself, and are then ready to be inserted in the plates of the watches. Some of the machinery used in this room is geared so that the jewel revolves under the tool at the rate of 1,800 revolutions a minute ; this high speed being required to enable the cutting tool, aided by diamond dust, to do its work. In this room all the diamond dust used in the factory is made, as, also, are the diamond drills, cutters, etc. The process of making diamond dust is exceedingly interesting. Brilliant gems are not, of course, used for this purpose, but the cuttings, or outside coating of gems, known in the trade as bort. This is as hard as the gem itself—is, in fact, diamond possessing the fullest degree of hardness, yet lacking the brilliancy of the diamonds sold for ornaments. This rough diamond is placed in an immense mortar made of hardened steel, and ground to powder by a pestle also made of hardened steel. Yet, such is the cutting power of the diamond dust that these ponderous mortars and pestles are ground away by it, and last but a short time. Fifty carats of rough diamond placed in the mortar will be increased, in the process of pulverizing, to 400 carats by the additions of impalpable steel cut from the mortar and pestle. This extraneous matter is afterwards removed by chemical process, and the original 50 carats of pure diamond restored. In all operations where it is used the diamond dust must be pure, otherwise the work is impaired. Of the ruby, the lighter colored specimens are preferred for the manufacture of watch jewels, the dark colored being more porous; under the magnifying glass it resembles a sponge, so porous is it. It is no small matter to keep track of the immense number of jewels made in this room, and to see that none of the precious stock is wasted. Mr. Wills has several young ladies to assist him in keeping his books and in counting and taking care of the jewels. Great dexterity is required of the workmen and workwomen who operate the various machines by which the jewels are made, but long practice has made them so nearly perfect that they get the most out of the material entrusted to them. On every side in Mr. Wills room there is the same evidences of thorough discipline that prevail elsewhere in the factory, and order and cleanliness are pronounced characteristics.

DIAL ENAMELING ROOM.

In this room 40 persons are employed, mostly males, under the supervision of Charles Moore, foreman, who has been connected with the business 21 years. Here the dials of watches are made. A watch dial consists of a thin copper plate, upon both sides of which enamel is placed. The enamel used in the Waltham factory is imported from Paris, but comes originally from Switzerland, and is called Swiss enamel. England produces this article to some extent, but the Swiss enamel is whiter and better for watch dials. The enamel is first pulverized in a mortar to a very fine powder, after which it is mixed with water to the consistency of thin paste, and spread carefully upon the copper disk prepared to receive it. The dials are then sent to the firing room, where they are twice subjected to an intense heat, which gives to it a bright glossy appearance, and makes it exceedingly hard. It is then returned to the Enameling Room, where it undergoes 20 different processes of trimming, dressing, polishing, etc. It then goes to the dial painting room, where the figures, etc., are painted upon it, after which it is returned and fired twice more to fix the paint. The small dial in the face of a watch for indicating seconds is made separately from the dial that marks the hours and minutes. It is made in the same manner as the larger one, painted in the same manner, and afterwards firmly cemented in its place on the larger dial.

DIAL PAINTING ROOM.

Painting the numbers upon dials is a very delicate operation, and is all done by hand. The Dial Painting Room is in charge of Josiah Moorehouse, foreman, who has been employed at this work 22 years. He was the first apprentice in America to learn this branch of the business. In this room 42 persons find employment, 14 of whom are girls. On receiving the dials from the enameling room they are

divided off into spaces for hours, minutes and seconds. These divisions and the circles on the dial are laid off by very finely adusted machinery. The hour, minute and second figures are painted in by girls, who use very fine camel's hair brushes for the purpose. Upon the dials of the American watches there is generally painted "A. W. Co., Waltham," in letters so small as to be almost undistinguishable, yet if examined under a magnifying glass it will be found that each letter is perfectly made and exactly proportioned to its fellows. This class of work is done by men of great experience, and is executed in the ordinary manner of painting, with very fine brushes, without the aid of machinery, and with the use of magnifying glasses. The lettering upon watch dials varies, and some we have seen that contain several long words in letters smaller than any known to type founders, yet every one perfect and arranged in the most symetrical order. One has but to examine the dial of his watch to form a just appreciation of the delicacy of this work, and of the long years of practice requisite to render one an adept at it. After being painted the dials are, as before mentioned, returned to the firing room, where they are subjected to the process known as "paint-firing."

THE ADJUSTING ROOM.

In speaking of the Finishing Room in a previous article we stated that the average grades of watches were here completed and made ready for the market. But there are finer grades that require a much nicer adjustment than that given in the Finishing Room, and these are sent to the Adjusting Room. This is superintended by J. C Bates, who has followed this special branch of the business for 18 years. He is a thoroughly skilled watchmaker, and has sole charge of the adjustment of the fine and expensive watches made by the American Company. He has three practical watchmakers—men who can build a watch from the ground floor up—as his immediate assistants, but the fine watches as they pass through the various departments of the factory, are at all times under the supervision of Mr. Bates. In the Adjusting Room is to be found every appliance known to the science of horology for securing accuracy in watches. Time is taken at the Observatory, and the famous clock in the basement of which we have heretofore spoken, records in the Adjustment Room every beat it makes. Here the fine watches are adjusted to the greatest nicety, being subjected to changes of temperature in hot and cold chests, and run in six different positions for 24 hours at a time. The variations made under these different conditions are carefully noted and provided for. Every part of the watch is inspected under the microscope for imperfections that might possibly escape notice under the ordinary magnifying glass. The fine watches are usually run for three months in the Adjusting Room under varying conditions, and when Mr. Bates finally pronounces them to be satisfactory the purchaser of one may feel assured that he has as trustworthy a watch as it is possible to make.

NICKEL FINISHING ROOM.

In some grades of watches the plates and other portions of the flat work are made of nickel instead of steel or brass. Nickel takes a beautiful finish, and, under proper manipulation, can be made highly ornamental. The Nickel Finishing Room of the Waltham factory is in charge of Charles Berlin, who has been seven years with the company. Twelve persons are employed in this room, four of whom are females. The ornamention of the nickel surfaces is called the Damaskeening process, which the dictionary says is "the art of adorning iron or steel, by a peculiar process of manufacture, by etchings, or by inlaying with gold or silver—used chiefly in enriching the blades of swords and the locks of pistols." This is what is done in the Nickel Finishing Room. The work is mostly done by machinery, the intricacy of which it is utterly impossible to describe. A Damaskeening machine is one of those intricate problems in mechanics which the uninitiated can only gaze upon with admiration and wonder without hope of comprehending. Suffice it to say that it passes over the surface of the metal with various eccentric motions, easily regulated, imparting to the work a finished and artistic appearance, which may be made in a variety of designs. It resembles the snaling or raying finish we have mentioned, as being imparted to certain portions of the flat steel work. It is not so much a matter of surprise that this peculiar ornamentation can be given to a metallic surface as that machinery so intricate can be made to do the work.

THE SILVER MELTING,

Many of the American watches are cased in silver cases, and these are made on the premises. The silver from which they are made is received in the bricks as known to commerce. Mr. C. W. Rogers is foreman of the Silver Melting Room, and has been at the business for 23 years. There are 25 men employed in this room, but no girls. Here the silver bricks are melted, and, by the use of ponderous machinery, the silver is rolled out into sheets of suitable thickness for cases, is punched and swedged until the required form is given for cases. Other machines draw out bars of silver into wire, which is used for the ring in the handle, and for other purposes. The machinery in this room is nearly all of a massive and powerful character, and many different styles are used. After the cases have been formed they are passed to the

FINISHING CASE ROOM.

Mr. E. H. Owens, foreman, presides over this room, and for 25 years has followed the business of case-making. He has under his supervision 99 men. Here the cases are finished in the various styles adopted by the American Company. It is not our purpose at this time to attempt to describe the processes of case-making and finishing, but simply to make note that these departments exist in the Waltham factory. In a subsequent article we propose to describe the gold case-making establishment of Robbins & Appleton, in their elegant new building in New York city, and, as the processes are nearly identical with those of silver case-making, we omit further comment on the Silver Melting and Finishing Case Rooms of the factory.

THE MACHINE SHOP.

All the machinery used in the Waltham factory is made on the premises, and all the repairing is done in the shop of the company. Further, a large proportion of the machinery is invented and designed by the employes, the patterns made by them, and the work completed in the Machine Shop. Thus quite a number of the machines in use in the factory have no duplicates in any other watch-making establishment in the world. In addition to making the machinery and doing the repairing for the factory, the Machine Shop is also held responsible for the construction of all the tools used by the 1,300 workmen and workwomen employed in the factory. It will be seen, therefore, that the Machine Shop is necessarily an important and extensive part of the works. As a matter of fact the shop occupies two rooms, each 172x24 feet, and both are filled with work-benches, lathes, drills, and all varieties of machinery known to metal workers. Mr. E. A. Marsh is foreman of this immense department, and has charge of 68 workmen. Mr. Marsh has been 13 years with the company, and is accounted one of the most skilled workmen in his line of business that can be found in this country. In addition to his skill as a mechanic, he has the inventive faculty largely developed, and is constantly devising improvements to the machinery that comes under his supervision. The work done in this Machine Shop alone would constitute a valuable business by itself, and he would be accounted a fortunate and prosperous man who owned it. Yet, large and important as it is, it is dwarfed by the immense industrial establishment, of which it is but a single factor.

THE NASHUA DEPARTMENT.

We have left till the last of our series mention of the Nashua Department. This is a complete watch factory by itself, and was formerly owned by a company that engaged in the watch-making business at Nashua. In 1861 it was absorbed by the American Watch Company, and the entire plant is now in the Waltham factory C. S. Burham has charge of this department, and has been 15 years in the employ of the company. Four rooms are required to conduc

the work of this department, and these are filled with every kind and description of watchmaking machinery, similar to that found in other branches of the factory. The force employed in the Nashua Department comprises 150 persons, about equally divided between males and females. Here all parts of a watch are made except the main springs and dials. The work done is mostly fine grade watches, and the processes are, of course, identical with those we have previously commented upon. Nothing gives a better idea of the extent of the Waltham factory than the fact that the Nashua plant, a complete factory within itself, occupies but a very small portion of the premises, and employs but 150 persons, as against 1,200 employed in the remainder of the building. The leading characteristics of the entire establishment—quiet, industry, neatness and thorough system—are as conspicuous in the Nashua Department as elsewhere in the great factory.

CONCLUSION.

With a full consciousness of the imperfect manner in which our work has been performed, we here bring our sketch of the American Watch Company's Works at Waltham to a close. We have sought to convey to our readers an idea of the various processes of watchmaking as they strike an unprofessional observer, having little knowledge of the technical terms employed in mechanics. The things that impressed us most during our visit, next to the wonderful machinery noted, were the perfect order and neatness, the persistent and cheerful industry, the dexterity and skill of the numerous employes, and the more than paid-for interest that all manifested in their tasks. Here was no eye-service, requiring the constant presence of the master or the sharp rebuke of the overseer, but service cheerfully given, and the giving apparently enjoyed by the giver. Here was not encountered the stifling and disease-breeding atmosphere so commonly met in great factories, but every room is light and airy, well ventilated, clean and wholesome looking. The workmen and workwomen all wore a pleasant and contented look, were neat in their appearance, and an air of superiority gave evidence that they are possessed of a greater degree of intelligence than is commonly found among the working classes. Indeed, it is not probable that in any other great industrial establishment in the world can there be found so many persons grouped together possessing an equal amount of mechanical skill and trained intelligence. The men are from the ranks of our best workmen, and the females, trained in the factory especially to their respective branches of the business, come from well-to-do families in New England. Many of them seek employment here, not because their condition in life compels them to manual labor, but because it gives them cheerful and congenial surroundings, and a feeling of entire independence. The work is healthful in itself, and the location of the factory—in the suburbs of the village, on the banks of the Charles River—is charming. In the immediate vicinity are pleasant boarding houses, where the unmarried portion of the employes find comfortable homes, while the public library near by in the village furnishes them an abundance of reading matter, of which they avail themselves liberally.

It is difficult to decide which to admire most, the genius and skill that have made such giant strides in perfecting machinery so that the most delicate piece of mechanism known—a watch movement—is made through its instrumentality, or the courage, the enterprise and Yankee pluck that embarked its capital so freely and so confidently in the business. It is quite a number of years since watchmaking by machinery was first undertaken in this country, but every step taken was an experiment that involved large expenditures. Great courage was required to jeopardize so much capital, and indomitable perseverance to continue the enterprise in the face of the many difficulties encountered, and the fierce opposition arrayed against it. But it was the possession of just these qualities that made the American Watch Company successful, and its fame to spread to all quarters of the globe. To-day the capacity of the Waltham factory is equal to the production of 750 completed watches a day, and fully one-third of these are consumed by the foreign demand. The success of the company in distancing all competition in the manufacture of watches, and creating and maintaining an enviable reputation for them in all lands, is a triumph for American skill, enterprise and persistency of which the Nation may well be proud. Attempts have been made in Europe to manufacture watches by machinery, but thus far with but limited success. Capitalists appreciating the vast superiority of American watch-making machinery, have gone so far as to purchase it for their factories abroad, but, with the machinery at hand, foreign workmen have not been able to do work equal in character to that produced here. They do not readily comprehend the adaptability of our machinery and tools to every requirement of the business; they are more in the habit of relying on the dexterity of their hands and the clumsy tools used by their predecessors in previous generations. The Yankee idea, to do nothing by hand that can be done by machinery, has not generally found lodgement in the brains of foreign mechanics. Yet it is to the continued application of this idea that the American Watch Company largely owes its success; their employes have for years been racking their brains to devise machinery that would dispense with hand labor as far as possible, do the work equally well, and at less cost. Whenever these ideas have taken practical form, the company has ever been ready to spend its money freely in experimenting to develop the inventor's thought. Liberality of expenditure for material and skill, a determination to excel, persistence and push, are qualities that are characteristic of the American Watch Company, and have given to its products a reputation for excellence that is world-wide.

As intimated above, we shall, in another article, describe the processes of case-making as they are to be observed at the factory of Robbins & Appleton, general agents of the American Watch Company.

Basal Plane Quartz Crystals.

UNTIL within a very few years crystals of Quartz with the basal plane have been accounted excessively rare. So recently as the year 1877, Professor Egleston, of Columbia School of Mines, remarked, in a lecture before the Academy, on some rare quartz crystals, that five years before "only three crystals of quartz with the basal plane were known to the scientific world: one owned by the British Museum; one by the Imperial Museum at Vienna; the other in St. Petersburg, and these came from Brazil. They were considered priceless treasures, and the very *ultima Thule* of rarity in the mineral kingdom."

In a communication dated Morgantown, N. C., May 20, Mr. E. W. Hidden, mineralogist, informs us that in a locality in the South Mountains of Burke County, North Carolina, quartz crystals with the basal plane are comparatively abundant. Mr. John T. Humphreys, who discovered the locality, has more than a dozen of them, and Mr. Hidden himself has seven In these specimens the apex of the pyramid of the crystal is cut off at an exact right angle to the sides of the crystal.—*Scientific American.*

London Jewelry Trade.

TAKE the Post Office London Directory, consult that portion which relates to the trades of the metropolis, and look under the headings "Gold," "Silver," "Jewelry," and "Watch," with various cross-references. It will then be seen how amazingly numerous are the distinct branches of manufacturing industry, while the Street Directory will equally well show how closely they cluster in and around Clerkenwell. Lloyd-square, Northampton-square, Kingsquare, Myddleton-street, Exmouth-street, Mount Pleasant, Rosoman-street, Clerkenwell-close, St. John's-square, Amwell-street, Percival-street, Spencer-street, all are well-nigh packed with workers in gold and silver, jewelry, trinkets, clocks, and watches. Sometimes a chamber-master will employ only a son or an apprentice, while working at the bench himself, and from this minimum there are all grades up to 50 hands or more. The most trifling articles are only made in many of these places, while others turn out the larger and more showy wares.

Proceedings of the Horological Club.

A Distinguished Body of Watch and Clock Makers.

Seventy-sixth Discussion.—Communicated by the Secretary.

(Notice.—Correspondents should write all letters intended for the Club separate from any other business matters, and headed "Secretary of the Horological Club." Direct the envelope to D. R. Hopkinson, Esq. *Write only on one side of the paper*, state the points briefly, mail as early as possible, as it must be received here *not later* than two days before the end of the month in order to be discussed and reported in the CIRCULAR for the next month.)

WATCHMAKERS' LOOP FOR EYE-GLASS.

Secretary of Horological Club:

I herewith send you, for examination of the Club, a watchmakers' loop, which, as I find it to work so nicely, I thought perhaps it would be of some interest for the craft to know of it. The principal points are cheapness, lightness, ease of holding on, and rest to the eye. One is not obliged to take off the loop in order to look at other objects. It may be kept on for hours at a time, without any inconvenience or trouble to the eye. Hoping it may meet with your approval, I remain, WM. F. MCKENZIE.

This "loop" is a skeleton frame for the eye-glass, made of small spring wire, and consists of a ring of the right size to hold in the eye easily, as the glass is usually held. To this ring are fastened four fine wires which reach out to the glass and hold it, and constitute the frame proper. Near their outer ends these wires are bent into a slight notch, and the glass is held in these notches. A fine wire ring is slipped over the ends of the wires, outside or in front of the glass, and serves to keep the wires pressed together against the edge of the glass. By slipping off this ring, the wires spring outward and release the glass, for wiping off or changing. As the four side wires are equi-distant around the glass, and small, they do not obstruct the vision at all, but the workman can see above, below, and all around the glass, as well as if he had no glass on. As there is no frame to confine the air around the eye, there is no heating or dampness. Altogether, it was very favorably commented on, and pronounced a very neat and ingenious contrivance. The sample was nicely made and presents a pleasing appearance on the bench. We shall be glad to hear again from MR. MCK., or any of our readers who have improvements likely to be useful to the craft.

READY MADE MATERIAL FOR AMERICAN WATCHES.

Secretary of Horological Club:

In penning you the few lines with regard to the mistaken idea of the trade on "Ready made material for American watches," I had no idea that I was treading on "Waltham's" toes, as it was not my intention to lay the blame on the Waltham or American Watch Co., any more than to any other company who gave out the idea that material can be duplicated by giving the *number of the movement*, so that the new material can be put into the place of the old or broken part without more or less labor on the part of the workman, as "B" complains of, and thus gives the employer, who is not a practical man, a chance to find fault because so much time has been consumed in doing the job.

If "Waltham" will read over my communication he will readily see that I have acknowledged the *general idea* of supplying duplicate parts, but from past experience I most certainly should not advise the trade to put too much faith in the idea that if they send the number of the movement, together with "full particulars," to *any* company, they would be sure to get what they wanted. May I ask what Waltham would do in case he sent for a balance staff, giving a full description of the movement he wished it for, number and all, and had one returned to him that was too *small* on the balance shoulder, (the balance having been opened previously for a larger one)? Would he bush the balance, or put a "duplicate" on the staff? I row not. If his staff was *smaller* than the original one, and the table roller hole was too large, he could hub his roller, but would it not take much time? If his collet shoulder was too small, would he like to squeeze up his collet until it fitted? If his endshake was too strong or not strong enough, would he like to *bend his bridge* to make it right, thus throwing his jewels out of line? *He* might re-jewel his staff, if he had jewels to fit the pivots, or change the jeweling by raising or lowering his hole jewel and then refitting his endstone. But what does the "boss" say at using up so much time, when he expected the job was at least *two-thirds done*, when he had obtained the staff from the material dealer, or the company to whom he had sent? "Waltham" must remember that although *he* may have all the facilities for refitting these different parts, there are hundreds of those who try to repair American watches who do *not* have these facilities for making the changes necessary to fit a "duplicate part, and thus are obliged to use up much time, as "B" did.

It has been my experience while working in one of the leading American factories, that the same difficulties are met with there, nearly every day. A workman breaks a pivot, a staff, or a jewel. Let him go to the records and get the size of that pivot, staff, or jewel, and I'll wager a good hat that not one time in five will he find one that will answer the measurements as laid down for that number, and very often will he have to have it jeweled over, even when they have a large stock to select from. In case a part is too small, he cannot do as the Irishman did with the stick of timber. *He* said that if the stick was too short he could *splice it*, but if too long, he did not know "fat the divil he should do wid it." My old schoolmaster used to say that "almost" takes away half.

Again, "Waltham" says, if a watchmaker sends by express the "old balance, table roller, hair spring," &c., the round trip will cost him 75c to $1.50. Very well—allow that to be the case. When he gets his material it is *fitted*, and without further trouble, and the stock of "cuss words" is kept on hand to be showered on the one to whom he sends an order for a pin to fit "number—— watch of your make," which he is in a hurry to get done, but cannot fit at all in many cases, and in others has to resort to all sorts of dodges to make it answer.

If sent by express, tha express company is responsible for all losses. If sent by mail, the chances are *largely* in favor of receiving it back all right. If he sends by express it will cost him no more to send the whole movement than to send the parts, and then, if necessary to change jewels, they will be fitted to the plate and the job is done. On the other hand he has to fit his jewels, he takes the chances of breakage, &c., besides consuming much time in doing the job.

In hopes that I might say something that would *correct* this mistaken idea that material *could be sent by mail or express to take the place* of broken or lost parts without much if any fitting, and thus lead the trade to adopt such means as would help *them*, and save the fault finding with workmen, who have to do the fitting, I sent my last communication. I had no idea that I should get up any controversy on the subject, or that I should employ so much of your valuable space in making myself understood, and I thank you very much for the courtesy shown. "X."

The Secretary, in reading this letter, omitted some parts which only Mr. Waltham could answer, as that gentleman was not present—having left the city soon after our last meeting, on his usual Summer vacation in the warm weather. The chairman then called on Mr. Horologer to reply to our correspondent's queries.

Mr. Horologer thought he was hardly competent to judge of the difficulties encountered by our country brethren in obtaining ready-made materials, because here, in the city, we could send all necessary parts to the office of the companies to have the missing pieces fitted in, as Mr. X recommended. But such a course might not always be profitable for the country dealer to pursue. Take the instance when he wants a balance staff, and sends all the part by express to insure a good fit. The express charges would be, say, $1.50—for it would as often be more than that, as less—and the cost of the new staff would be 75 cents or $1. This would leave a pretty small margin for the watchmaker, out of the price for putting in a new staff—and for that margin he has to put the movement together, regulate it, and be responsible for it. Undoubtedly, it would be the surest way to secure a good fit, and he presumed it would be preferred by all the companies and material dealers.

But in the case of a balance which had been opened by some watchmaker to fit a large staff, the roller ditto, &c., &c., and the company or the material dealer had to fit them, they would be pretty sure to make an extra charge for such extra work. Such faults are not the work of the companies, and they do not profess to supply material which will meet such instances without fitting. The trade understand that, or they should if they do not.

In the case of a movement which has never been mis-handled or changed, they profess to supply materials which will require very little if any fitting, and in his own experience with such movements of any fair quality, he had never had any trouble. Of course, absolutely perfect fitting was not to be looked for in any kind of human work. A workman would naturally expect to make some trifling

alterations in any case—and it was his habit, even when he got the materials from headquarters, to make more or less of these minute adjustments and changes that produce perfect fitting—although most workmen might have thought it was sufficiently well fitted before. He was never satisfied with "a good fit," so long as he thought he could make it any better. He usually kept on hand two, three, or half a dozen of the pieces most commonly needed, so as to save even the trouble of sending out for a single one—and he seldom failed to find in his own stock one which would not fit with very little labor on it.

As to the "leading company" which would "very often have to have the movement jeweled over," from not being able to find a staff to fit, out of a large stock to select from, *their* materials certainly could not be very uniform, or very closely fitted—and could hardly be fairly called interchangeable. And with most of the companies it would be requisite, he thought, to follow the plan urged by Mr. X, and send all the necessary parts, in order to insure a fit.

He agreed with Mr. X, that American watch material as a rule, is not interchangeable, in the sense of being substituted without fitting considerably. In fact, there were only two of the American watch companies which, in his opinion, could rightfully claim that quality for their materials. But even with the others he considered that it was a great saving of time and trouble, in most cases, to buy their ready made parts, and then do the necessary fitting of them himself.

LINING FOR WALL CASES.

Mr. Clerkenwell said he had answered an inquiry at our last meeting, relative to cheap linings, and he was now very happy to lay before the club some information on a better class of linings, and the management of cases generally, sent in by the well known plated ware manufacturing firm of Rogers & Bro., of 690 Broadway, this city. As this subject was directly in their line, and they were interested in knowing the best ways of preventing silverware from tarnishing, their note undoubtedly gives the best information attainable, and will be of value to our readers.

"Billiard cloth is most durable, but costs about $3.00 a yard—is 50 inches wide and can be had in different colors. Flannels, in different qualities, are the cheapest. Dark blue, indigo-dyed, shows silverware to the best advantage. Many use crimson, red, &c., &c.

Put lining on with book-binders' paste. Sponge it off with spirits of camphor, which kills anything tarnishable in the dye, and *prevents moths.* A few lumps of *unslacked* lime in a saucer, or a sponge saturated with spirits of camphor, inside the case, absorbs noxious gases. Use no *anyline-dyed* goods. Cases should be made with *tight joints* and tight doors. It is gas from lights and stoves that tarnishes goods. The back of the case should be independent of the wall of the building, so as not to absorb any dampness. ROGERS & BRO.

WANTED TO PURCHASE—THAT KISSING CONTRACT.

Secretary of Horological Club:

I read with intense interest the account of the kissing suit published in your last journal. From all appearances, it is a sad case of injured innocence. Without doubt the plaintiff is old, homely, and bald headed, and it is not to be expected that a young lady would kiss a bald-headed man forever for one set of jewelry. It would be against human nature to require it of her. But if he is a young man, then he must be a slow-coach, to kiss a pretty girl for thirty mornings in succession without proposing. She probably got tired of such trifling. I don't blame her one bit, but glory in her spirit—and so say all my sisters and my cousins and my aunts.

At any rate it is a dead sure thing that there was something wrong about him, or she would not have soured on him so decidedly. At the very least, he must have been an awful poor kisser. If it had been—ahem! somebody I could mention—in his place, she never would have refused to fulfill that contract, *never!* That proves that the blame was all on his side, and that she was innocent. Now I, for one, don't propose to see a charming young lady imposed upon in any such manner, if I can help it. I am a young man, just turned 21, and have all the money I need for comfort. If the lady is agreeable, I will buy out the plaintiff's claim against her, and take my chances of an equitable settlement with the young lady herself. As I understand the matter, there are 70 kisses now due on the contract. But the precise number don't matter, for I feel sure she would not be particular about the number, when she saw me.

I do not go into this thing for the sake of the kisses, however, for I can get all the lip salve that is healthy for me, without going very far for it. My motive is purely chivalrous. So strong are my respect and devotion to the fair sex that they impel me to rush to the rescue when I see a lovely maiden in trouble, and offer my assistance. As your own sympathies must have been deeply touched, I bespeak your co-operation in my efforts to redress her wrongs.

Now, the question is, what will plaintiff take, cash down, for his right of action and all claims against the lady? Your statement of the case does not give the names of the parties, so I cannot apply directly to them. But if you will inform me of the full name of either party, by return mail, you will perhaps confer a priceless favor upon a persecuted young lady, and greatly oblige and relieve an anxious sympathizer. AUGUSTUS A.

The chairman said that the club knew nothing about the matter except what appeared in the papers. But we will publish his letter, and if it meets the eye of either of the persons concerned, and they see fit to send address to the club, with an indication of willingness to negotiate, we will forward it to Mr. A., with our best wishes for his success in rescueing the damsel from her perilous predicament.

De-Magnetizing Watch Movements.

ONE of the most difficult problems presented to watchmakers heretofore has been to de-magnetize watch movements when they became magnetized, and it is safe to say that nothing in horology has so perplexed practical members of the craft. A magnetized watch is of no value as a timekeeper so long as it remains in that condition. Many persons have claimed to have discovered a remedy, but the trade in general has not achieved that knowledge. L. & A. Mathey, the well known importers of watches, have recently discovered a method of de-magnetization that is simple, quickly performed, and entirely successful. Recently they brought us a watch movement in its normal condition, and requested us to have it magnetized. We took it to the establishment of Condit, Hanson & Van Winkle, in Liberty Street, and had the movement thoroughly magnetized, so effectually as to stop its running. We returned it to Mr. Mathey in that condition. On the following day, much to our surprise, he returned with the movement, from which the magnetism had been entirely removed, and it was again in fine running order. We are, of course, ignorant of the means employed by Mr. Mathey to accomplish this result, but were thoroughly convinced that he had discovered a method whereby he had achieved success in this matter. We take great pleasure in recording the facts, and calling the attention of the trade to them. Watchmakers who have long labored in vain to remove magnetism from watches will appreciate the value of this discovery.

Printing Dials.

IN printing the hours on metal dials the black coloring matter is the soot obtained by holding a clean copper or sheet metal plate over the flame of an oil or petroleum lamp. A glowing tool serves the purpose very well). As soon as a sufficient deposit is produced it is collected on a piece of glass, care being taken not to mix any foreign substance with it. A few drops of essence of lavender are then poured on the lamp black and the mixture pounded with a spatula. This done, first sufficient copal varnish is added to give the composition a proper thickness, so as to prevent it spreading when applied. The varnish thus prepared is put on by means of a very fine camel's hair brush. To secure brilliancy the dial is dried at a slow heat, by passing it lightly over a spirit flame, the reverse side of the dial being the only part exposed to the flame. The composition must be made in quantities large enough for present use only, as it dries very rapidly and cannot be again used. To secure good results this process requires some experience, which can only be obtained by careful experiments. The painting especially requires a certain aptitude and lightness of hand, which may however soon be attained by strict attention. Before painting the dial should first be made hot whenever it can be done with safety. But in many cases when it cannot without danger of injury, the surface of the dial should be corroded with a solution of sulphate of copper, acidulated with nitric acid. Carefully wash with this solution and allow to stand a couple of hours, then wash with clear water and dry.

The Hannay Diamonds.

IT will be fresh in the memory of some of our readers that a few months ago a statement was made to the effect that diamonds had been artificially produced in Glasgow by a process not yet divulged, and that, having been examined by the highest chemical and mineralogical authorities, the new gems had been found to satisfy all the conditions hitherto alone supplied by the diamonds from nature's own laboratory. When, however, it became known that the new diamonds were almost microscopical, and that a gem worth 10 shillings cost £5 to make, the interest in the subject somewhat diminished. It has, however, revived on the publication by Mr. G. B. Hannay, in the recently issued number of the "Proceedings of the Royal Society," of the precise method by which he obtained his startling and novel results. And if only as a record of indomitable perseverance against ever-increasing difficulties, of scientific acumen, and of the true application of the Baconian method of research, it is worthy of study. Some idea of the nature of the investigation may be obtained from the fact that out of 80 complex and difficult experiments only 3 succeeded. Violent explosions were frequent; furnaces were blown to pieces; steel tubes burst, scattering their fragments around. On other occasions, tubes which had been carefully prepared, filled welded, and nested in a reverberatory furnace for many hours, were found to have leaked and spoiled the experiment. "The continued strain on the nerves," writes Mr. Hannay, "watching the temperature of the furnace, and in a state of tension in case of an explosion, induces a nervous state which is extremely weakening, and when the explosion occurs it sometimes shakes one so severely that sickness supervenes."

The diamond-making experiments were started in September, 1879, when Mr. Hannay made many attempts to find a solvent for the alkali metal, sodium, potassium, and lithium. But in no instance could such a solvent be found which did not, in the gaseous state, and under pressure, unite with alkali. Even in the case of hydrocarbons, such as paraffine spirit containing only hydrogen and carbon, the alkali combined with the hydrogen, setting free the carbon. Now, as we know, diamond is pure carbon; hence, when this element was set free from a pure substance, it was thought that conditions of pressure and temperature might eliminate it in the hard, crystalline, adamantine form, viz, as diamond. Glass tubes were first employed, but although of great thickness in comparison to their bore, they were found to be insufficiently strong, and they were replaced by wrought-iron tubes 20 inches long by 1 inch diameter, and having the diameter of the bore half an inch. In these lithium was heated for many hours to a high temperature in paraffine spirit, and on subsequently opening the tube, carbon in a hard form was found within it. Great difficulty was experienced in getting the tubes perfectly air-tight, and eventually the open end was welded, at a white heat, and by that means alone did it resist leakage. Sometimes tubes would burst with an explosion like a gun. A tube 20 inches long by 2¾ diameter and ½ inch bore, was filled with a hydrocarbon made from bone-oil, to which some charcoal powder was added in order to keep an excess of carbon in the tube. Its open end was welded, and it was heated for 14 hours with lithium. On opening it a quantity of gas appeared with some minute pieces of hard carbon which had evidently separated out from solution. Another similar tube burst at the end of eight hours heating. A tube of cast iron no less than 3¾ inches diameter, and with a bore of only ¾ of an inch, exploded at the end of an hour with a fearful report, wrecking the furnace. Several tubes of steel also burst under the enormous pressure, at last shattering the top of the furnaces. The author remarks that in nature the temperature must at one time have been much higher than anything we can now produce artificially; while the pressure obtained at a depth of 200 miles below the earth's surface is greater than that which any of the materials from which we can form vessels can resist.

We come now to the great experiment which resulted in the artificial production of veritable diamonds. A tube 20 inches long by 4 inches diameter, of coiled Lowmoor iron, was bored so as to have an internal diameter of ½ inch. Thus the central bore was surrounded by walls of iron 1¾ inches thick, and, of course, capable of resisting an enormous pressure. In the tube was placed a mixture of 90 per cent. of bone-oil and 10 per cent of paraffine spirit, together with 4 grammes (about 62 grains) of the metal lithium. The open end of the tube was welded air-tight, and the whole was then heated to redness for 14 hours, and was allowed to cool slowly. On opening it a great volume of gas rushed from the tube, and within was found a hard, smooth mass adhering to the sides of the tube. "It was quite black, and was removed with a chisel, and as it appeared to be composed principally of iron and lithium it was laid aside for analysis. I was pulverizing it in a mortar when I felt that some parts of the material were very hard—not resisting a blow, but hard otherwise. On looking closer I saw that these were most transparent pieces imbedded in the hard matrix, and on triturating them I obtained some free from the black matter. They turned out to be crystalline carbon, exactly like diamond." Such is Mr. Hannay's account of his discovery. Subsequent chemical and optical analysis has proved that these hard, shining crystals are in every respect true diamonds. The cost is obviously great: so, also, is the danger to life and property; and the great difficulties to be overcome render disappointments common. What we now want is to get vessels of a material sufficiently strong and non-porous to resist the high pressure and temperature upon which the success of the experiment depends. What we have learned among other things, from the brilliant researches of MM. Caillelet and Pictet, which led to the liquefaction of the so-called permanent gases, and from Mr. Hannay's experiments, described above, is that we must push the forces of nature to their utmost strain by using our most powerful mechanical devices for producing pressure, our strongest materials for resisting it, and our intensest means of producing heat and cold.

Pneumatic Clocks.

PARIS clocks have long afforded a subject of ridicule to foreigners. In a few days there will be no room for derision. Within the last week handsome public illuminated timepieces have been erected in the middle of the causeway of the leading thoroughfares. These are all in communication with the works of the new Pneumatic Clock Company, in Rue St. Anne. By means of subterranean tubes this company receives the time direct from the Observatoire every morning, and regulates all the timepieces in connection simultaneously. In future it will be possible to have the correct time laid on in any house, like gas or water, at the trifling cost of from three to five centimes per clock per day. The air is compressed by steam engines and driven at intervals of a minute through the communicating tubes, so as to move the minute hands the requisite distance at each pulsation. It can be applied to any clock. The company undertakes to pay all the cost of the fittings. It supplies clocks gratuitously and charges only a subscription. By this new system all trouble of repairing and winding up is done away with. Over one thousand pneumatic clocks are ordered in Paris already and will soon be tested at New York, where the patent for America has been purchased.

Transparent Gold.

IF a solution of gold in *aqua regia* be neutralized with carbonate of soda, and the gold precipitated by adding a solution of oxalic acid to the hot gold solution, the gold is precipitated as a yellow powder, showing bright gold-colored spangles. On examining this precipitate by the microscope, these spangles will be found to be triangular and hexagonal plates which transmit light, the color of the light being dependent on the thickness of the crystal, and when one crystal happens to overlie another, the edges are sharply defined by the difference in color.

The Art of the Silversmith.

BY W. HERBERT SINGER.

[*Continued from Page*

THIS interesting specimen is still preserved in the South Kensington Museum. In outline, it follows the general design of these objects, having a straight stem, with a knop in the centre, a triangular base, and a large receptacle at the top to prevent the grease from dropping, with a pricker to hold the candle ; but it is remarkable for the marvellous amount of decoration with which it is covered, every member being loaded with ornamental detail. This consists of volutes and foliage, in the folds of which are grotesque figures of men, birds, and monsters. This form of candlestick was to be placed upon the altar, but the churches at this time were furnished with others which stood upon the floor of the church. From the earliest days of Christianity it had been the custom to light a large candle at the great festival of Easter, as a type of the new dawn given by the Resurrection, and this larger candlestick was made to hold the Paschal candle.

I have not yet mentioned an object which has ever received especial care from the silversmith ; I refer to the chalice. This interesting object has not been spoken of at an earlier period, because, although there are records of the large number of chalices in use in the primitive church, we have but scanty knowledge of their design and detail. In the first days of Christianity, the chalices were of great size, to allow for the large number of communicants ; but, at an early date, there was also a small chalice, in which the priest consecrated the wine, and, after his own communion, poured a small portion of it into each of the larger chalices, a sufficient quantity of unconsecrated wine being added. In many churches, these chalices were hung up on the wall, around the altar, by their handles.

The chalice has been made of various metals and substances, such as gold, silver, copper, tin, glass, wood, &c., but it was more often made of silver than any other material, that being the metal most adapted to its various requirements ; and it was forbidden by an early Canon to make the bowl of anything but the precious metals, the inside of the bowl being always quite plain, and also some distance below the lip on the outside. In the twelvth century the cup was reserved to the celebrant, and from that time the chalice was made of a much smaller size. The large two-handled chalices were, no doubt, of classical shapes, but sufficiently altered to make them applicable to their new purpose. The smaller chalice, in the earliest period of which we have any example, is of a massive character, the bowl semi-circular, with a rather small round base, and thick stem.

The silversmith's art of the Middle Ages reached the greatest perfection during the thirteenth century, continued to flourish throughout the fourteenth, and slowly declined during the fifteenth century. With the dawn of Gothic art, the heavy lines of the Romanesque style disappear, and are replaced by those elegant shapes, the value of which consist in the beauty of their contour, and not in the cost of the material in which they are executed. This style is essentially ecclesiastical, and is perfectly adapted to the production of objects in the precious metals for the service of the Church.

The pointed style of architecture marked a complete change in the silversmith's art. During the twelfth century, both the architecture and the metal work or Europe had borne a resemblance, in many respects, to the productions of the Eastern Empire ; but with Gothic art, that likeness entirely ceased. The artists who elaborated the wonderful pointed arch, together with the intricate tracery and columns of this period, had brother workers in the precious metals, who carried the art of the silversmith to the same pitch of excellence.

At the commencement of the century, we find that many of the silver objects then created, depend upon architectural detail for their enrichment. The little ornamentation with which such objects were decorated, was always exactly adapted to the shape in which it was placed, every part being especially designed for its own peculiar position. It was not, as in some periods of art, when the object was considered only as a means of showing off some elaborate combination of detail, of which the designer was so proud, that he would sacrifice beauty of form, and all else, so long as he was able to produce this specimen of his manipulative skill ; in so doing, he often made his work almost worthless, by not observing one of the first rules of art, viz., that ornament is made for the object, not the object for the sake of the ornamentation.

During the next century, a great change again took place. The art of the silversmith now took a much wider range ; hitherto, during the Middle Ages, it had been almost entirely restricted to the use of the Church, and a great majority of the workmen had been inmates of the monasteries ; but many of the objects now produced were for the sideboards of the nobles, and the art may be said to have almost forsaken the cloister, and to have fallen into secular hands.

A large quantity of the silver-work now executed was remarkable for its bizarre composition. This characteristic is most evident in the hanaps, fountains, ewers, nefs, and salt-cellars. The articles for ecclesiastical use comprised chalices, crosses, censers, book-covers, burettes, and reliquaries.

In the preceding century, the reliquary almost always took the form of a miniature edifice ; unless the work was destined for a cathedral, such objects now usually took the form of statuettes in silver, the general tendency of the age being towards the cultivation of sculpture, and this gave the silversmith an opportunity of displaying his skill in that art. The shape of the chalice also underwent a change. The bowl is made smaller, and is often semi-ovid in form, the base being frequently divided into lobes, the knop being ornamented with architectural detail, and upon each side of the stem is worked a small arch with cuspings, the proportion of the whole being excellent.

Of secular art, the salt-cellar and nef seem to have claimed the greatest attention from the hands of the silversmith. By the frequent mentions made of the salt-cellar in inventories of this period, its size and weight, and complicated design, it being composed generally of numerous figures, we learn in what importance it is held by the mediæval host. Salt was the emblem of hospitality, no guest being placed below the salt. Thus so significant a piece of plate had necessarily to be a conspicuous object.

The nef was a work which enabled the nobility to display their richness and luxury. In shape it was a miniature ship, which formed a receptacle to contain the goblet, and other utensils, for the use of the person to whom it belonged. It was placed in the center of the table, occupying the position of the modern epergne. As an example of workmanship, the nef is the most interesting, as every part was made with the greatest care. Thus the ropes, sails, &c., are all found in these miniature vessels. Upon the deck men were often placed, and sometimes animals, these being executed with the greatest skill.

It is curious to note that, while large and important objects are numerous, mention is made of only one fork in nearly every inventory of this time, this indispensible article being probably used for the first time about the middle of the fourteenth century, and then only for serving food from the large dishes.

There is but little to record of the silversmith's art in France during the Middle Ages. The first quarter of the fourteenth century was a most disastrous time to that country. Large quantities of plate were then melted down to enable the nation to carry on her war with England, and a great portion of what then escaped the crucible went towards the payment of the heavy ransoms demanded for the chiefs taken in battle.

Concerning silver work in England during these centuries, but scanty information can be obtained, and specimens left to us are even more rare than in the neighboring country.

This period had a dark commencement, under the auspices of

King John. His son, Henry III., was a great admirer of the arts, and did much towards the development of artistic workmanship in the precious metals. The greatest work undertaken during the reign of this King was the Abbey of Westminster. One object destined for this edifice—the shrine of Edward the Confessor—claimed his especial care, and, from documents, we learn what riches were expended upon the ornamentation of this costly gift. The shrine was commenced under the superintendence of Odo, but was not quite completed at the time of the King's death. William of Gloucester was also employed by Henry, the silver statue for the tomb of the Princess Catherine being by his hand. St. Paul's Cathedral was also very rich in works of silver. From the inventory of the objects in this cathedral, we learn that the service of the Church must have been performed here with great magnificence.

It was during the reign of Edward I., that a great part of France was under the sway of England. In the conquered district was Limoges, which accounts for the large quantity of enameled works that were now introduced into England, and it would seem were greatly admired by the English, for the art was soon after largely practised in this country.

There are but few specimens of fifteenth century silver work left to us, the ecclesiastical plate with but very few exceptions having disappeared at the Reformation, and most of the plate in the hands of the rich nobles and commoners having been melted up during the civil wars. But, although the originals have long been lost, there are numerous dispositions of these former riches to be found in mediæval wills, from which we learn that many of the feudal lords were possessed of great riches in gold and silver plate both for ecclesiastical and domestic purposes. The merchant princes of the fifteenth century also had their treasures well stocked with silver plate. Some of the London guilds, and colleges in Oxford and Cambridge, possess specimens of the latter part of this century, but they are probably not examples of the best work of the age.

The village of Nettlecombe, in Somersetshire, has in its church a pre-Reformation chalice and paten. The chalice is very beautiful in its proportions, and has served as a model for many of those produced in modern times. It stands nearly six inches high. The bowl at the lower part is broad, with the sides conical. The hexagonal stem is divided into two parts by the knop, which is an excellent piece of work. At the projection of each of the arms, forming this member, is a leopard's head, the spaces between being ornamented with pierced work. The base is divided into six compartments, and in one of these is an engraved plate, upon which the traces of enamel are still visible, the subject being that of the crucifixion. We owe our knowledge of this chalice and paten to Mr. Octavius Morgan. They are of great interest, not only on account of their beauty, but also from their antiquity, for they are almost the oldest examples of hall-marked English plate known.

It was in the year 1327 that the workers in the precious metals had granted them their first charter of incorporation, and in 1462 they received a third charter. The powers thus granted to the Goldsmith's Company authorized them to inspect and stamp all gold and silver work produced in this country.

The Romanesque style took deeper root in Germany than in any other country of Europe, for we find that the Germans continued to produce work in that style longer than any of the other nations. But, when the older forms gave way to the newer ones of Gothic art, a very beautiful style was developed, which was most perfect during the thirteenth century. One of the best specimens of this period is the shrine of the Great Relics, in the treasury at Aix-la-Chapelle. Its general form retains the old outline, but we see a great difference in the character of the ornamentation. The foliage on the ridge of the pointed roof is most beautiful in design and execution.

Another specimen, dating from the early part of the thirteenth century, is the shrine of the Three Kings, at Cologne; in this there are more traces of the Romanesque style than in the example before mentioned. As the century grew older, these large objects became more scarce, and in their place a reliquary was made to contain only a part of the departed saint, and its form partook of the shape of the member which it contained. The next change in German art was commenced by the artists of Augsburg and Nuremberg, and, although it lacked much of the grace and refinement of the previous period, it was a style well adapted for the production of works in the precious metals.

The condition of Italy, at the beginning of the thirteenth century, was particularly favorable to the cultivation and development of the fine arts. Comparative peace was now established between the many small but wealthy States, into which this kingdom was then divided. At the head of each was an independent prince, and, as these rulers had no longer to vie with one another, as to who should be chief in battle, each strove for the State he governed to produce the finest works of art. The silversmith's art was in especial demand, it being held in greater estimation in Italy than in any other part of Europe, thus gaining for those who produced such work, a higher social position and, accounting in a great measure for the rapid improvement that was now made in this artistic land.

At first the workers in silver were pupils of sculptors. Of them they learnt design and composition, but many of the apprentices soon excelled their masters, and a few years later we find that most of the great sculptors commenced their career in the workshops of a silversmith. Thus, again, the arts of sculpture and silver-working are brought together.

It was only during the thirteenth century that Gothic art held its sway in Italy, but during that time many great works were created. It will be impossible to give more than a rapid glance at this bright epoch in the history of the silversmith's art. As an example of the universal excellence of the work produced in Italy, I cannot do better than describe the chalice of this period. The bowl is most elegant in shape, the sides forming a graceful curve; round the lower part is often a little ornament in enamel. The knop, although an important part of the whole, is subordinate to the bowl and base, and was treated accordingly. The work upon it was generally in enamel, each color being contained in a simple, but effective form. The stem is hexagonal, and is either decorated with a pattern in nicello or enamel, or divided into little compartments with a deep edge, which produces effect by its shadow. The base is the member which gave the artist the greatest scope for displaying his skill, and he took advantage of it to the utmost. It was usually divided into six or eight lobes, and upon these were represented various subjects in enamel or niello, and although the figures were so small, they were admirably composed and drawn, the border of each division being richly ornamented with a minute pattern, and the part of the base between that upon which the subjects were executed, being covered with a beautiful design in low relief.

The Church now had command of enormous revenues, and it was in costly metal work that the best means were found of investing its surplus funds. This accounts for the numerous and costly altar frontals which were made during the Middle Ages for the cathedrals of Italy. Upon them the greatest artists worked, and they are worthy illustrations of the wondcrful skill of the Italian silversmiths.

The fifteenth century in Italy is chiefly remarkable for the works in bronze that were then created. It is at once noticeable to every student of art history that gold first claims the attention of a nation when in the infancy of art. Silver is next used as a medium, in which to express their ideas of beauty. When their art is fully developed, the precious metals are, of course, still used in their proper sphere; but we also find that the baser metals, and especially bronze are much employed, as in that material the artist can carry out ideas that would be impossible in the more costly metals. Now, instead of town striving against town, as to which should possess the most massive object in gold or silver, we find one endeavoring to outbid the other, to secure the services of the most skillful artist of the day to execute, perhaps, some small, but perfect piece of work.

(To be continued.)

Business Notes.

Aikin, Lambert & Co., have published a very useful price list designed exclusively for the legitimate trade. It will be sent to any address on application by parties enclosing business card.

Messrs. Smith, Walker & Co., of Boston, Mass., have appointed Albert Lorsch, the well known importer of watches, optical goods, etc., sole agent for their celebrated diamond mountings, a large line of which may always be found at Mr. Lorsch's establishment, No. 37 Maiden Lane.

Noah Mitchell, No. 694 Broadway, manufacturing jeweler, has increased his manufacturing facilities with a view of meeting the requirements of his customers. Mr. Mitchell has now a very complete and well appointed factory, and a force of workmen in thorough sympathy with their work.

In the advertisement of Kearney & Swartchild, printed in THE CIRCULAR last month, a typographical error occurred in the price of their regulators. Regulator No. 14, the price was given as $210 ; it should have read $110. We shall ask the firm to divide with us the surplus they derive from this error of the types.

J. T. Mauran, manufacturing jeweler, presents an attractive line of fine rolled plate goods, and makes a specialty of wire and coral pins, drops and sets, jet goods in pins, drops, sets, buttons, etc., and a variety of lace pins, sets studs, sleeve buttons, etc., in Roman goods, to which the attention of buyers is directed.

Coggswell & Wallis, of Chicago, keep pace with the requirements of their increasing trade, and offer a very large assortment of clocks, watches, jewelry, silver and plated ware, watchmakers' tools, etc. Retail dealers will find in this establishment goods suited to the demand of any locality, and at prices that cannot be bettered.

Messrs. J. A. Riley & Co., present in this issue of the CIRCULAR another attractive page of illustrations representing a few new designs of their popular (patented) bracelets, so favorably known in the trade. These goods are made in 14-Karat gold (only), and representing a wide range of popular ideas exquisitely designed and beautifully finished. They are constantly introducing new and artistic effects in this line of goods, that cannot fail to command the attention of buyers

Messrs. Sinnock & Sherrill, manufacturers of seal and signet rings, have just introduced a number of special designs intended for followers of special callings. There are locomotives for railroad engineers, fire engines for firemen, etc., in intaglio and came. These designs are perfect *fac similes* of the articles represented, and cannot fail to commend themselves to the parties for whom they are especially designed.

The Celluloid Show Case Company have leased the factory, corner of Hamilton Street and R. R. Ave., Newark, N. J. They are now filling up the building and expect to be ready to commence operations about August 1st. They have added stair rods to the list of their specialties in celluloid, and they are very handsome. The officers of the company are, President, Robert A. Johnson ; Vice President, Joshua S. Cooley ; Secretary and Treasurer, Caleb K. Colby ; Superintendent, Geo. Burch, formerly of Messrs. Burch & Fellows.

The enterprising firm of Kossuth Marx & Co., No. 39 Maiden Lane, occupy six pages of the present issue of THE CIRCULAR in noticing the principal features of their large and comprehensive stock of goods. First among these is their line of diamond goods, embracing all kinds of ornaments, in the latest and most approved designs ; solid gold bracelets, in all styles, are also conspicuous, and plated bracelets are almost without limit. Gold and plated chains are to be found in the stock in almost endless variety, as well as rings of all kinds, shapes and designs. The firm are the only manufacturers of American silk guards, to which they invite attention. A perusal of their advertisement will repay every member of the trade.

The Jewelers' League.

We devote this column to the interests of the League and its membership. Letters or inquiries pertinent to its business or purposes, and which might interest the trade or inquirers, will be herein answered. Address *'Jewelers' League, Box 4001, P. O. New York*, or the office of THE CIRCULAR.

The following persons were admitted to membership in the League at the last meeting of the Executive Committee, July 2d :

Arthur H. Atwood, of Atwood & Wentworth, Portland, Me. ; Meyer Bauman, of L. Bauman & Co., St. Louis ; Charles A. Burch, Cooperstown, N. Y. ; Henry B. Dominick, of Dominick & Hall, New York City ; Augustus Dubosq, Philadelphia. Frank Fontneau, with Bliss & Dean, Attleboro, Mass. ; Chas. A. Fricker, Americus, Ga. ; Harvey S. Hartwell, East Pepperell, Mass. ; Reuben N. Hershfield, Leavenworth, Kansas ; Herman M. Heyman, with L. Bauman & Co., St. Louis ; Adolph Hirsch, Chicago ; Wm. Luther Jones, Martinsburg, W. Va. ; Frank A. Knowlton, Worcester, Mass. ; Alvin F. Lee, with Bliss & Dean, Attleboro, Mass. ; Fred. E. Leimbach, New York City ; Philip A. Leimbach, New York City ; Leo Lesquereaux, Jr., with Justis & Armiger, Baltimore, Md. ; E. S. McLaughlin, with F. I. Marcy & Co., Providence, R. I. ; Herbert M. Norton, Corry, Penn. ; Henry J. Olney, Waltham, Mass. ; Arthur Peley, with Tiffany & Co., New York City ; E. W. S. Pratt, Moores, N. Y. ; J. H. Schmidt, Washington, Mo. ; Wm. A. Schultz, Philadelphia, Pa. ; Will H. Smith, Jr., with L. Seppelman, Fremont, O. ; T. W. Wallis, with Coggswell & Wallis, Chicago ; Albert M. Wentworth, of Atwood & Wentworth, Portland, Me. ; J. Brodhead Woolsey, of Glorieux & Woolsey, Newark, N. J. ; Augustus W. Wortman, with Black, Star & Frost, New York City. Thirty in all.

Three applications were referred for correction, and three were rejected.

Total membership, 780.

The League will probably number eight hundred members at the next meeting of the Executive Committee, in August. Very little exertion on the part of the members will bring our membership up to a thousand. It is within the power of the readers of this column to accomplish this within the next month.

The Dutoits Pan Mine.

MESSRS. ALFRED H. SMITH & CO., importers of diamonds, present in this number of the CIRCULAR a very beautiful illustration of one of the most famous diamond mines in South Africa. The cut is a beautiful specimen of wood engraving, being perfect in every detail, both in design and execution. Messrs. Alfred H. Smith & Co. have, on several occasions, presented to the readers of the CIRCULAR beautiful illustrations of this character that were highly interesting. In this connection we would call attention to the fact that this house has established an office at No. 170 State street, Chicago, in charge of James C. Rich, thus affording Western buyers excellent facilities for selecting and ordering goods in the diamond line from a large and well selected stock. One of the members of the firm being located in London, the importations of the house are regular, and comprise all that is new and novel in their line of trade.

THE following alloy of copper will attach itself to surfaces of metal, glass, or porcelain : 20 to 30 parts finely blended copper (made by reduction of oxide of copper with hydrogen of precipitation from solution of its sulphate with zinc) are made into a paste with oil of vitriol. To this add 70 parts mercury and triturate well ; then wash out the acid with boiling water and allow the compound to cool. In ten or twelve hours, it becomes sufficiently hard to receive a brilliant polish and to scratch the surface of tin or gold.

Trade Gossip.

British Burmah has yielded some splendid sapphires lately.

The demand for high class jewelry is active, and highly satisfactory for the season.

J. Allan, of Charleston, S. C., sailed for Europe in the steamer "Circassia," July 24th.

During the past three months there has been a noticable increase in the importation of Swiss watches.

Solomon Abbott's jewelry store at Winchendon, Mass., was recently destroyed by fire. Stock saved with slight loss.

Chas. E. Moody has entered the employ of Messrs. Krementz & Co., and will represent them on the road in the Southern states.

Henry Fera, importer of diamonds, who has been making his annual visit to Europe, is expected to arrive home on the 3d inst.

Maiden Lane wears a busy aspect at present, there being many jobbers in the city, who are reported to be buying liberally for the fall trade.

A large find of pearls has been discovered in New Zealand. They are said to be of fine quality, and far more brilliant than those found in the South seas.

General J. Dean Hawley, the well known jeweler, of Syracuse, has resigned the command of the Tenth Brigade of the National Guard of the State.

Moss agates, that were formerly so much in demand, commanding a large price, have now no market value, being used only in the cheapest styles of jewelry.

Austrian women wear a curious ring for luck. It has attached to it a little pig swinging from a golden circle. This would be an appropriate device for the belles of Cincinnati.

Nearly fifteen hundred thousand dollars worth of pearls were taken out of the Persian Gulf last year, while thirty divers fell victims to the monsters of the sea during the fishing season.

There probably never was a time in the history of this country when the demand for diamond jewelry was so great, or when they were so generally worn by both ladies and gentlemen.

There is a jeweler in this city possessing decided ideas where the line of credit should be drawn, who announces by a placard in his show window: "In God we trust. All others are expected to pay cash.

Rubies are now extensively used in jewelry. They are very handsome, and exceedingly expensive. London dealers apparently have made a "corner" on rubies, and are holding them for a "raise."

Mexican opals are said to possess little permanent value. After being worn for a time they lose their color; and assume a milky appearance. They are about as worthless as the natives of that country.

G. W. Childs, of the Philadelphia *Ledger*, the well known philanthropist and millionaire, has become a special partner with Hagstoz & Thorpe, of Philadelphia, manufacturers of the James Boss patent stiffened gold watch cases.

George E. Strong, of New Orleans, our old friend, and the friend of everybody in the trade, is sojourning for a brief period at the North. We are happy to announce that he has left a goodly share of his gout behind him.

Samuel Perry, of the firm of N. Matson & Co., Chicago, has led to the hymenial altar, Miss Matson, daughter of the senior partner of the firm. The happy couple are spending the honeymoon in Colorado, among the Rocky Mountains.

There was a man who had a clock, his name was Matthew Mears, he wound it regular every day for four and twenty years. At last his precious time piece proved an eight-day clock to be, and a madder man than Mr. Mears I would not wish to see.

That time ball on the Western Union building still attracts public attention, and hundreds of persons lounge on the corners daily for the purpose of setting their watches. Owners of cheap watches are detected by the frequency with which they set their tickers by the time ball.

Theodore Kearney, of the firm of Kearney & Swartchild, is enjoying much needed rest in the wilds of Colorado. Mr. Kearney has been an active business man for many years, and a vacation is something new to him. We hope he will enjoy it, and return with renewed health and vigor.

A Chicago genius has discovered that solitaire diamonds are made of several pieces, and cemented together. When that chap's ears have attained their full length he will be able to pluck ripe cheese from the face of the moon, or set Lake Michigan on fire by the friction produced by rubbing his cheek against the sands of the beach.

Gerardus Boyce, one of the oldest silversmiths of this city, died recently at his residence, 462 West 23d Street, at the age of 85 years. He was born in this city, and half a century ago was famous for the excellence of his workmanship. He served in the war of 1812, and received a pension of $24 a month from the Government. Mr. Boyce was a director in the National Fire Insurance Company.

John H. Pippen, of Mobile, Ala., died June 6th, in the 46th year of his age. For many years he was connected with the house of James Corning & Co., and afterwards with Zadek & Caldwell. On the death of Mr. Corning, he became his successor, since which time he has conducted the business. He located at Mobile in 1856, when he was 20 years old, and remained there until his death.

Another large bank of coral is reported to have been discovered off the Neapolitan Coast, ten miles south of Sciarra. The new Italian fisheries law secures to the discoverer the exclusive right of fishing for a period of two years. But this enactment has not yet come into operation. Consequently several fishing vessels from Torri del Greco have already sailed for the banks in hope of making a rich harvest.

The forty-ninth exhibition of the American Institute of the city of New York, will open September 15, and continue open until November 27. A feature of the exhibition will be specimens of the work done by amateurs and apprentices, and to encourage these to exhibit, the managers have determined to admit work of this class without charge, and to award premiums to such as may be deserving. We hope to see the jewelry trade well represented at this exhibition.

The Western jobbers are in the city earlier than usual this season, a little too early, in fact, for some of the manufacturers who are not ready with their new designs for the fall trade. These buyers are followed about from door to door by the regular army of "box men," who waylay them in hallways and in the streets, and insist upon showing their samples. A buyer's life in New York is rendered a burden to him by the importunities of these pestiferous seekers after patronage.

The new thing in Paris is a little gold or silver pig, worn by actresses as a trinket on their watch chains. The jewel is looked upon as a talismanic counter charm, which brings good luck to the wearer. It is an old Roman knick-knack, which has been made popular by the recent lectures of a learned professor, who has been discoursing on the worship of the goddess Fortune twenty centuries ago by the people of Italy. They made offerings to her of fat pigs, and gold and silver rings were made to represent them by votaries.

The produce of the South African mines is enormous, and the quality of the stones, which is frequently marred by a somewhat tawny complexion, is reported to be improving. Vast profits have, of course, been realized. One gentleman's claim is said to have cleared in two years £45,000. The New Rush Mine yields £3,000 a day. In 1875, when the diggers had been at work only four years, gems to the value of £3,500,000 had been extracted from it. The pockets of diamonds sent by post bag from Kimberly to Cape Town in 1876 weighed 773 pounds, and were worth £1,464,590. Nor does there seem to be any present prospect of the supply coming to an end.

The General Term of the Marine Court has just rendered a decision of importance to pawnbrokers and others accustomed to advancing money on personal property. Henry Fera, a dealer in diamonds, on the recommendation of B. W. Plum, gave one Hazeltine possession of a quantity of diamonds, for which he claimed to have a customer, with permission to sell the same and return the money. Hazeltine, it is claimed, had no customer, and, instead of selling or returning the diamonds, pawned them. Discovering where they were, Fera got an order of arrest against Hazeltine; and the property was turned over to the police magistrate, but the claimant failing to give the statutory bond, they were returned again to the possession of the pawnbrokers. The latter were then sued by Fera in the Marine Court for the recovery of the property or its value, he claiming that he never parted with title to it. On the trial the verdict was in favor of the plaintiff. From this judgment an appeal was taken to the General term, where it was recently argued. The Court has now decided that plaintiff having invested Hazeltine with the apparent ownership of the property, and the defendants relying on such ownership and having advanced their money in good faith, they were entitled to a lien on it for the amount of their advance. The judgment of the Court below is, therefore, reversed and a new trial ordered.

THE

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THE

JEWELERS' CIRCULAR AND HOROLOGICAL REVIEW

The recognized organ of the Trade, and the official representative of the Jewelers' League.

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The Condition of Business.

It is particularly gratifying and in some respects surprising to find that the number of business failures in this country during the first six months of this year was less by nearly two thousand than in the first half of 1879, and that the aggregate of the liabilities was only half that during the six months of last year. In 1879 the number of failures was 4,058, and the liabilities amounted to $65,779,390. In 1880 the figures are 2,497 and $32,888,763.

When we compare the total liabilities of the six months of this year with those of the corresponding period of two years ago, the reduction is even more remarkable. In 1878 they were about four times the aggregate of 1880. The figures for the three years are: 1878, $130,000,000; 1879, $65,779,390; and 1880, $32,888,763.

What makes this heavy decline in the number of failures and in the total of liabilities this year especially encouraging is the circumstance that it has occurred in a period remarkable for a rapid fall in the prices of all commodities. The second quarter of the year was a time of reaction and of unsettled values, and the markets, which had been largely controlled by speculators, were clogged with goods salable at price that in many cases had dropped to the lowest ebb. Yet in this quarter there were fewer failures than in the first quarter.

The aggregate liabilities, however, were greater, for during April, May and June exceptionally large failures took place among the iron men, and among heavy and rash speculators in other articles. Leaving these out, business in general bore the strain of the declining markets with a strength that is surprising. Instead of increasing, the number of failures fell off.

We find in these facts gratifying proof that business is now on a more solid basis than it has been for many years, and that the prosperity we began to enjoy last year has been made real and substantial. Though there has been a heavy decline in prices since the opening of winter, the profits of last fall have enabled the merchants to stand it without impairing their capital, even where they have suffered losses. The percentage of loss by debts has steadily diminished for two years, and is now exceptionally small. Credit was never in a better condition.

Yet we cannot expect this to be a year of extraordinary business profit. The indications are that prices will be low in the autumn; that while the volume of the transactions will be enormous, the per centage of gain will be small. Contradictory reports regarding the condition of the crops are circulated by speculators, but a harvest equal to that of last year may be expected, while the European yield is likely to show a decided gain over that of 1878 and 1879. This means prices for grain lower than we have known for a long period.

Goods Sold on Memorandum.

THE Court of Appeals of this State, recently passed upon a case of considerable importance to jewelers, and all other merchants who are in the habit of trusting out their goods on memorandum. Some time ago a diamond broker named Livingston was introduced by another broker to Henry Fera, importer of diamonds, and received from him a stone for which he said he had a customer. This stone was returned, and soon afterward Livingston obtained from Mr. Fera two sets of diamond earrings, he representing that a lady desired to examine them. The goods, valued at $525, were transferred to Livingston on memorandum account, the understanding being that he should sell them if possible and, from the proceeds, pay Mr. Fera their value, or, if unable to sell them, to return the goods. Soon afterwards it was ascertained that Livingston had absconded, after having pawned a large quantity of goods in a fictitious name. Subsequently the diamond earrings were found in Simpson's pawnshop in the Bowery. Mr. Fera brought suit against Simpson in the Marine Court to recover his property or its value. After trial, he obtained judgment against Simpson for the full amount claimed and costs. From this decis on the defendants appealed. Recently the Court of Appeals rendered its decision in the case, overruling the decision of the lower Court and ordering a new trial. In announcing its decision, the Court of Appeals held that when goods were sold on memorandum account, a colorable title to the goods passed with them, the receiver obtaining sufficient title to them to justify an innocent third party in purchasing them, and that the seller could not recover from such third party. His only remedy lies in a civil suit against the person who received the goods on memorandum account.

As the jewelry trade is given to extensive transactions on memorandum account—a pernicious practice at the best—this decision is of much importance. Hereafter dealers must understand that in parting with their goods on memorandum account, they relinquish their title to them, and invest the *pseudo* purchaser with the right to dispose of them as he sees fit. If he sells and subsequently pays for the goods, all right; but if he sells or pawns them without paying for them, the person who let him have them has no remedy against the holder of the goods, but must look to the person to whom he transferred them, for his pay. A person who would thus dispose of goods bought on memorandum account must, of course, be devoid of character or standing, so that to look to him for payment would be throwing good money after that which is lost, so that the person who sells goods on memorandum account actually has nothing to rely upon but the honor of the one he trusts. In the case of Mr. Fera's diamonds, Mr. Simpson advanced $310 upon goods valued at $525. He did so in good faith, having no reason to suppose that Livingston was not the actual owner of the diamonds. Had he been compelled to restore the diamonds

and lose his $310, he would have suffered a great hardship. Mr. Fera must therefore, submit to the loss and charge it to the unbusiness like practice of trusting out goods on memorandum account.

We have heretofore deprecated this memorandum business as injurious to manufacturers and dealers alike. Manufacturers not unfrequently find that the demand for goods on memorandum account consumes quite a large percentage of their stock, and are thus led to increase their product beyond the limits of the legitimate demand. Subsequently, these memorandum goods are thrown back upon their hands, shopworn or in an unsaleable condition, and after the style has had its run. Instead of having made a successful season, he finds that the returned goods have materially reduced his profits. The memorandum business has long been an evil from which the trade suffered, and now that the Court of Appeals has rendered a decision adverse to it, we hope to see it abandoned.

The Absurdities of a Diamond "Expert."

A Chicago man, who claims to be a diamond expert, gives to the *Tribune* of that city the following information, which owners of gems may be interested in : "There are a great many so-called solitaires sold as single stones which, when put under the blow-pipe, will come apart in pieces, put together for the American market. I have detected them and separated them. There is not one diamond in ten sold in our market but is the refuse of the London market. They are sold at a fictitious value, so that not half the selling price can be got when put on the market. Nearly all are off-color, specked or feathered. Very few "old mine diamonds" are on the market. Those are the real valuable stones that are marketable all over the world. People that are investing in these jewels will be surprised, I expect, at these statements, and yet they are true.

The above paragraph has been going the rounds of the press for some time, and has appeared in most of the prominent papers of the country. The statements contained in it are so ridiculously absurd that they would be unworthy of notice were it not for the fact that the public, which eagerly devours all that is written about diamonds, may be induced to accept them as true unless they are denied. That they are accepted as true is known by the fact that editors of presumed intelligence print them without question. A representative of THE CIRCULAR showed the paragraph to several dealers in diamonds and asked their opinions of the man who wrote it. "He's an ass," said one, "a double barreled ass, and his statements are so absurdly false that it is not worth while to notice them." The trade generally was equally emphatic in denouncing the idiocy of the writer. It would be well enough to let these statements pass unheeded were the trade alone concerned, for they would not be deceived by them, but the public is. Indeed, we have received several letters from dealers asking us to refute them, as their customers were inclined to put some confidence in them.

The writer makes several distinct statements to which we will reply *seriatim*. First, he says "there are a great many so-called solitaires, sold as single stones, which, when put under the blow-pipe, will come apart in single pieces, put together for the American market." This statement is absolutely and unqualifiedly false, having no foundation in fact to rest upon. For every solitaire the writer will produce so put together and sold as a genuine diamond, we will guarantee to give him a pure single stone equal in weight. No such diamonds are known to the trade, for the simple reason that they could be so easily detected that there would be no sale for them. It would be mechanically impossible to fix together two pieces of diamond so exactly that the line of jointure could not be detected or would not destroy the brilliancy of the diamond The slightest speck or flaw in a diamond impairs its lustre and injures its market value ; the light must strike through it from all sides without impediment to give it brilliancy. Any process of joining together would necessarily have a line, and the lack of harmony in the parts would destroy the value of the stones used.

The second statement is that "there is not one diamond in ten sold in our market but is the refuse of the London market." This statement is as false as the first. It is a well known fact that American buyers of diamonds are the most critical that purchase in the markets of London or any other city, and London dealers ransack Europe to find the most brilliant and costly gems for the American market. American buyers will have none but the best, for there is no demand here for the "refuse." An English dealer who exhibited diamonds at the Centennial Exhibition said that what surprised him was the fact that every American lady was an excellent judge of precious stones, and, as a consequence, his stock compared unfavorably with the goods exhibited by American jewelers. As Americans acquire wealth they buy diamonds, and it is a national characteristic to have the best of everything.

The third statement is that this "refuse of the London market," nearly all being "off-color, specked or feathered, is sold at a fictitious value," is quite as untrue as the others. Diamonds, like gold, have an absolute market value, and this value can be realized at any time. They never become second hand, but a good diamond is always fresh and new. The setting may have become *passé* or worn out, but the gem is always a gem. Americans who buy diamonds are usually too "cute" and well informed to be deceived in the value of a diamond. If they do not know it themselves, they are too "sharp" to trust their own judgment, but go to an expert to obtain its valuation. As to their being "specked," etc., the fact that American dealers import the purest gems they can find controverts a statement so absurd.

"Very few old mine diamonds are on the market," says this veracious expert. This is the only true statement made by this writer, and it is true, simply for the reason that the "old mines" "petered out" years ago, and have ceased to be worked. These "old mine" diamonds were generally very fine stones, judged by the old standard, and, as they were placed on the market, were bought up and remain as heirlooms in old families. Occasionally a few find their way to the market through the medium of the pawnshops. But the mines of more recent discovery have yielded just as pure and brilliant diamonds as did ever the mines of Golconda. It is also true that the taste for diamonds has been greatly cultivated within the past few years, and those that were rated as first class, and have received historical renown as diamonds of superior magnificence, would now be rated by experts as second class gems. The supply of diamonds has also been greatly increased, and, as a natural consequence, the proportion of poor diamonds has also increased. But the difference between the pure gem and one that is less perfect is always noted in the difference in price. It may be that occasionally some horse jockey or other "sport" may palm off on a verdant customer a low grade diamond for a pure gem, but persons who deal with such characters deserve to be swindled. Respectable dealers do not do business in that way, and even if they desired to, the army of diamond experts is so numerous that they would soon be detected and their business ruined. The diamond trade is peculiar, because it deals in intrinsic values, the prices of which are well known. It would be quite as easy for a dealer in gold bars to alloy his metal or to charge a fabulous price for it, as for diamond dealers to resort to tricks and artifices in their business transactions.

There is this to be said relative to the statement that pieces of diamonds are joined together to make solitaires. There is a class of stones known as "doublets" that are used in the manufacture of cheap jewelry. These consist of a thin veneer of garnet over various colored glass, giving to the so-called stone the appearance of amythist, ruby, emerald, or diamond. But these cheap things are never sold as genuine stones, unless an occasional instance where some sharper victimizes some verdant country man by selling him a veneered piece of glass for a valuable stone. One disreputable character in this city has frequently advertised "veneered" diamonds for sale, but even he has not the face to offer them as genuine stones. In the manufacture of these "doublets," a piece of glass is heated to almost a molten condition, and then a thin flake of garnet laid on, when the two substances become fused and compact. The garnet is used because it is harder than glass, scratches less easily, and is sus-

ceptible of a higher polish. Such stones as do not possess brilliancy in any great degree, will come apart in hot water, and soon become greasy and scratched. Imitation turquoise are made of bone dust and is superior to the genuine stone, preserving its color better, and wearing longer. Imitation amythist often have a better and more lasting color than the genuine. These imitation stones, however, are used only in cheap jewelry, and are sold for just what they are. No substitute, however, has ever been found or made for the diamond. That is a gem so pure as it come from nature's workshop that man's ingenuity has thus far been unable to imitate it. And so well known is it to all classes that the opportunities for deception are exceedingly rare. Public interest in the diamond trade is so great that it is a serious misfortune for any person calling himself an "expert" to put forth such statements as are contained in the above paragraph. They are calculated to make owners of diamonds suspicious of those they possess, and to discredit diamond dealers in the estimation of the public. Newspapers are so anxious to obtain special news that sufficient care is not exercised to reject that which is false and misleading.

The Jewelers' Protective Union

THE Jewelers' Protective Union, to which we have heretofore called attention, continues to perform its functions in a most satisfactory manner. Its aim is to recover the property of its members that is stolen from their traveling salesmen while on the road. The Union is managed with great energy and fidelity, and has succeeded in recovering every trunk and its contents that has been stolen from its members, sending three or four of the thieves to State prison. Its membership now includes 125 merchants and manufacturers in the jewelry trade, to whom over 200 certificates have been issued to the authorized travelers of the firms represented in the Union. A certificate entitles the holder in case he is robbed, to call upon any one of Pinkerton's detective agencies to assist him in the recovery of the goods stolen, the expense of the search for them being borne by the Union. These certificates are transferable on application to the Union from one traveler to another, but one certificate will not do duty for two travelers for the same firm. As proof of its efficiency we learn that the jewelers lost by robberies on the road, $50,000 in the two years prior to the organization of the Union; and there has been only two robberies of members since, and in both cases the goods were recovered. Thus far the expenses of the Union have been defrayed by the membership fees, no assessment having been levied to meet the costs of pursuing the thieves. It is suggested that greater efficiency would be secured if the fund to work with was increased by the payment by each member of say five dollars yearly on each certificate. With a fund thus raised at their command, the officers of the Union could do their work in less time and more effectually. It is also suggested that, as the owner of goods stolen is more interested in their recovery than any one else, he should pay a certain percentage of the value of those recovered, into the treasury of the Union, thus obviating the necessity of levying a special assessments for expenses incurred. When a dealer loses a trunk, he would gladly pay 25 per cent. of its value for its recovery, but after the goods are again in his possession, he grumbles fearfully if asked to pay a moderate assessment. "When the devil was sick, the devil a monk would be, but when the devil got well, the devil a monk was he." It would be more satisfactory to all concerned, undoubtedly, if the by-laws of the Union were amended so as to cover this point, and we suggest that at the next regular meeting the matter be considered. We have no doubt but such a rule would be more satisfactory to all members, because more equitable.

AMERICAN manufacturers came off with flying colors at the Sydney International Exhibition. The list of awards shows that 223 exhibitors of articles of American manufacture received 288 prizes—some of them having double awards and special medals beside. Our Australian trade, already large and profitable, will expand in consequence of this gratifying triumph.

Wisconsin Retail Jewelers' Association.

THE retail jewelers of Wisconsin held a meeting at Watertown, July 14, and organized a protective association, having the above title. Nearly every city and village in the state was represented, and the proceedings were harmonious throughout. The plan and object of the Association are substantially the same as the State Associations of Illinois and Iowa.

John T Smith of Whitewater, was chosen President, and W. H. Thorp, of Beaver Dam, Secretary. The Constitution and By-Laws of the Iowa State Association, were, with slight amendments adopted. The following preamble, which was unanimously adopted, sets forth the objects for which the Association is formed:

We, the undersigned, Retail Jewelers of the State of Wisconsin, believing that it is for our mutual interest to meet together for the interchange of horological knowledge, and that it is necessary for us to take some measures that will restrict the injudicious distribution of catalogues, price lists, discount sheets, etc., etc., by Manufacturers, and Jobbers, who neither recognize our rights as retailers, nor the principles that govern all honorable business relations, and realizing, as we do, that the depression in our trade is in a great measure due to this cause, earnestly invite all Retail Jewelers of the United States to co-operate with us in our efforts to protect ourselves from what has become a dangerous monopoly, of the retail jewelry trade of this country, by the so-called Jewelry Jobbing houses. We also invite the attention of Manufacturers to the justice of our demands, believing it to be their duty, so far as lies in their power, to protect us in the sale of their wares, as it is through the retail dealers that their goods reach the masses. In view of these facts, and to the furthering of these ends, we do establish this.

The following resolutions for the consideration of the manufacturers and wholesale dealers in watches, clocks, jewelry, silver plated ware and optical goods, were presented and ordered printed:

Whereat, The Retail Jewelers of the State of Wisconsin have formed a Mutual Protective Association; and

Whereas, It is an acknowledged fact by every Retail Jeweler throughout the country that the injudicious and indiscriminate distribution of illustrated catalogues, price lists and trade discounts by a large number of jobbers, has wrought great injury to the legitimate jewelry trade, therefore be it

Resolved, That all price lists, trade discounts, &c., &c., hereafter sent to any Retail Jeweler in the State of Wisconsin, shall be closely sealed by the party sending the same, and be it further

Resolved, That while we recognize the right of Manufacturers and Wholesale Dealers to solicit patronage from whoever will purchase, we also have the right to withold our trade from said firms, and we hereby notify all Manufacturers and Wholesale dealers in watches, clocks, jewelry, silver plated ware and optical goods, that after Aug. 1st, 1880, if any of their illustrated catalogues, price lists or trade discounts are given, or any watch, clock, or article of jewelry, silver plated ware or optical goods is either sold or consigned to any party not considered a legitimate dealer in such goods by the Wisconsin Association, said Manufacturer or Jobber shall have his name placed on a black list, and every member of this Association shall be notified by the Secretary of the same, and ever after, no member of this Association shall be permitted to purchase any goods of such party or parties until such time as the Executive Committee shall inform them that all restrictions against said firm have been removed.

By order of the Wisconsin Retail Jewelers' Protective Association.
JOHN T. SMITH, President, W. H. THORP, Secretary,
JOS. SALICK, CHAS. B. TOUSEY, FRANK FOOTE, Executive Com.

President Smith issued a stirring address to the retail dealers of the State, setting forth the abuses from which they suffer at the hands of the jobbers, and urging them to unite with the Association for the purpose of reforming them.

A Diamond Robbery.

INFORMATION was received in this city recently to the effect that Henry Schuler, a traveling salesman for Noah Mitchell, dealer in diamonds and jewelry at No. 694 Broadway, had been robbed of a valuable lot of diamond jewelry while stopping at Bagg's hotel in Utica. Subsequent inquiry shows that Mr. Schuler was on a business trip at Utica, remaining over Sunday at Bagg's hotel His sample trunks were in his room at the hotel, and sometime be-

tween 4 P. M. Sunday and 8 A. M. Monday, the trunk was opened and goods valued at $9,600 stolen therefrom. They consisted of earrings, studs and rings, the thief having made a careful selection from the goods and taken only the most valuable. Mr. Schuler caused the arrest on suspicion of W. S. Saiter, a traveler for a New York jewelry firm, who was apprehended in Rochester and returned to Utica for examination. After Mr. Schuler had presented to the magistrate all the evidence he had against Saiter, that official promptly discharged that gentleman, saying that there was not the slightest grounds for detaining him, or for entertaining a suspicion that he was implicated in the robbery, beyond the fact that he was stopping at the hotel at the time. At the examination, Mr. Schuler testified that he left his trunk locked in his room, and on going out fell in with some gentlemen whom he did not know before, and with whom he took several drinks. He then inquired the location of some houses of ill fame, and starting out on the street, accosted an unknown female whom he treated to ice cream. Returning to the hotel at a late hour, he went to bed without examining his trunk. In the morning he discovered the robbery and reported it.

From Mr. Schuler's own statement he clearly is not a proper person to be entrusted with a valuable stock of goods, and certainly not one to cast suspicion upon a gentleman possessed of so good a character and reputation in the trade as Mr. Saiter bears. It is very little to the credit of Mr. Schuler the account he gives of the manner in which he spent his time Sunday afternoon and evening. He was evidently bent upon enjoying himself, after the manner of his kind, in the company of lewd women and men regarding whom he knew nothing, having no regard for either the property of his employer, or the reputation of the house he represented. When travelers become so reckless it is not surprising that their employers lose their property. A man is known by the company he keeps, and travelers should understand they have it in their power to bring discredit upon the house they represent by making themselves odious in the communities they visit. The trade will sympathize with Mr. Mitchell in his loss, and with Mr. Saiter in his unjustifiable arrest, but sympathy for Schuler would be wasted.

THE bank clerks of New York City have a benefit society—similar to the Jewelers' League—and nearly every bank clerk in the city is a member of it. This society has a large fund safely invested, and jealously guarded. Several bank officers who, during their lives, saw the great benefits this Association was conferring upon numerous hard worked and underpaid young men, very considerately left liberal bequests to the society when they died. It is in this way that it has accumulated so large a fund. Here is a hint to some of the wealthy gentlemen in the jewelry trade. Hundreds of young men in the trade are members of the League, and the sum which their widows and children will derive from the League when they die constitutes the only provision that many of them have been able to make for those dependent upon them. The League is one of the most beneficent organizations of the age, and is doing a grand and noble work in insuring the lives of the members of the trade. Some of those gentlemen who have accumulated large fortunes through the exertions of the very class of men who constitute the League, will be doing a charitable and commendable act by leaving the organization a handsome legacy. We could name fifty gentlemen, each of whom who could well afford a legacy of $10,000, and we hope this gentle reminder will induce them to amend their wills in such a manner as to make the bequests we have suggested.

Mutilated Coin.

IT may not be out of place, in this connection, says the Chicago *Times*, to caution the public against taking bored and clipped fractional coins. The Treasury does not redeem coins so mutilated at their face value. It simply buys them as bullion. Take the coins to the nominal amount of $20, and if they are not mutilated the government will redeem them at par, though their actual-value does not exceed $16.50. But, if they are all mutilated, so as to be deprived in the aggregate of 5 per cent. of their value, the government will only take them as bullion, and give about $15.70 for them. Of course, people will not sell these coins to the government at a discount of 20 per cent. or more from their face value, so long as they can pass them at par But it is to their interest to keep this portion of the currency in such a condition that it may be redeemed without loss at any time. It is, therefore, to their interest to refuse bored and clipped fractionals, when tendered, as they have a perfect right to do. If those whose business involves an extensive use of fractionals will make it an invariable rule to refuse the mutilated pieces, their example will be generally followed, the practice of stealing silver by boring or otherwise mutilating coins will be stopped because it will no longer pay, but be a losing business, and this portion of the currency will be kept in a good, redeemable condition.

Obituary.

A WORTHY TRIBUTE TO A WORTHY MAN.

WILLIAM KENDRICK, of Louisville, a well known jeweler, died in that city March 16. He was an exceedingly genial and popular gentleman, as well as a thorough business man. As a token of the estimation in which he was held by them, the traveling salesmen of the leading New York jewelry houses prepared an elegant testimonial to be presented to the family of the deceased. It reads as follows :

DIED

AT LOUISVILLE, KY., MARCH 16TH, 1880.

WILLIAM KENDRICK.

The sad tidings of his death having reached his friends in

NEW YORK CITY.

WE, the undersigned, representatives of our respective houses, deem it fitting and requisite in consequence of our past relations with Mr. Kendrick, and in view of his long and prominent connection with the jewelry business, in some manner united manner to evince the high regard we held for him during his life, as well as to manifest our deep sorrow at his death, so unexpected, Therefore,

Resolved, That we bear most willing testimony to the integity of his whole business life, to the uniform gentleness of his conduct and to his urbanity of manner, qualities which have made it a pleasure to us all, from the youngest to the oldest, to meet him socially and to transact business with him.

Resolved, That among the whole circle of our widely extended trade, we have known no man who better deserved or who more fully enjoyed the confidence, and affection even, of his business friends.

Resolved, That we desire to unite with the more immediate relatives of the deceased in sorrow for their present and great bereavement, and that we most respectfully tender to his family our sincere sympathy in their loss, at the same time deeply realizing that while they have been deprived of an affectionate husband and father we have also lost a universally acknowledged friend.

New York, March 27th, 1880.

Geo. Nelson Fenn.	Frank H. Carpenter.	F. S. Gorton.
W. F. Cory.	Court E. Hastings.	Frank E. Knight.
Philo W. Schofield.	A. L. Peck.	John D. Lyon.
W. A. Bryant.	Geo. Shiebler.	Harry Osborne.
S. Y. D. Arrowsmith.	S. W. Pickering.	C. L. White.
James C. Rich.	M. L. Bowden.	Chas. E. Dorr.
H. Howard.	J. F. Crane.	C. W. Buechner.
Geo. Smith Rice.	Robt. M. Wilcox.	D. L. Kennedy Jr.
J. W. Watson.	Geo. A. Lawrence.	Chas. D. Kent.
G. E. Luther.	Thos. H. B. Davis	W. P. Melcher.
S. H. Hale.	Henry E. Ide.	

This was elegantly engrossed by Tiffany & Co., mounted in a beautiful gilt frame and forwarded to the family. The engrossing is an artistic piece of work that reflects credit upon the firm that did it. Such a testimonial bearing the autographs of so many friends of the deceased, cannot fail to be appreciated by his bereaved family.

ERNEST SCHMIDT.

Ernest Schmidt, an old and highly respected jeweler, of Milwaukee, recently died in that city, of dropsy, Mr. Schmidt had been in the jewelry business for 32 years, and had made hosts of friends in the trade. His death occurred after a long and painful illness He was 74 years of age. His son, W. Schmidt, will continue the business.

OGDEN CRITTENDEN.

Ogden Crittenden, a well known jeweler of Cleveland, O., died in that city July 26. Mr. Crittenden had been in ill health and a great sufferer for many years, and during that time had given but little attention to the store. His family will conduct the business in the future.

The Winchester Observatory at Yale College.

WE take the following extracts from the second edition of the official circular of the observatory, which may be had by addressing the Astronomer in charge, P. O. box 853, New Haven, Conn. A reprint of the orlginal circular will be found on page 38 of our present volume.

"All comparisons of pocket time-pieces are made at the same part of the seconds dial, and by means of the chronograph. It has been found by experiment that this means of comparing the watch movement with the observatory standard clock may be relied upon to the one-tenth of a second—a degree of accuracy exceeding that obtainable by any other known methods of comparison of watches having rapid trains. The daily rates of the watches, during cloudy weather, are made to depend upon three standard clocks, all of them of a high grade of excellence and specially protected against climatic changes. Chronographic methods of registration are employed throughout in the observations for clock errors and comparisons.

As will be seen from the preceding regulations, the observatory does not receive time-pieces for the purpose of regulation, but only to examine work already finished and to give an authoritative statement of what may be expected of a particular time-piece under varying conditions. The relations between the observatory and senders of time-pieces are confidential, except that those movements receiving certificates will be mentioned in the annual reports of the Astronomer in charge.

The following tabular view of the order and numbcr of days in the tests to which pocket time-pieces are subjected will be found convenient: —

Test No.	Position and Temperature.	Class of Certificate. I.	II.	III.	IV.
1	Dial up, Ordinary	12			
2	" Refrigerator	1	1	1	
3	" Oven	1	1	1	
4	" Ordinary		8	8	12 or
5	Dial Vertical, Pendant Up	14	8	8	12
6	" " Right	2	2		
7	" " Left	2	2		
8	Dial Down	2			
9	" Up	8			
	Total No. Days	42	22	18	12
	Observatory Charge	$5.00	$3.00	$2.00	$1.00

The certificates issued with any movement contain a more or less detailed statement of its performance, according to the class in which it is successful. The following tabular view shows the class of a certificate in which any particular detail relating to a pocket time-piece may be found :—

Mean daily rate is stated in Certificates of Classes I., II., III., IV.

Mean variation is stated in Certificates of Classes I., II., III., IV.

Variation of 1° Fahr. is stated in Certificates of Classes I., II., III.

Difference before and after oven and refrigerator is stated in Certificate of Class I.

Difference between pendant up and dial up is stated in Certificates of Classes I., II., III.

Difference between pendant up and pendant right is stated in Certificates of Classes I., II.

Difference between pendant up and pendant left is stated in Certificates of Classes I., II.

Difference between dial up and dial down is stated in Certiff-cates of Class I.

Difference between first and last week is stated in Certificates of Class I.

Difference between the extremes of rate is stated in certificates of Classes I., II., III.

All of the foregoing classes of certificates bear the seal of the college and stamp of the observatory. All of the records on which certificates depend are preserved at the observatory, and at any subsequent time one duplicate certificate will be issued if desired. The charges for duplicates in the various classes are as follows :—

Class I.....$0.75	Class III.....$0.50
" II....., .60	" IV..... .40

These duplicates are marked as such.

The certificates under the preceding regulations are not confined to watches received from dealers or makers. Any person who desires to know how a time-piece performs may enter it under the regulations, and, if it successfully passes the tests imposed, it will receive a certificate.

Where no certificate is issued, a detailed statement of its performance, but which does not bear the college seal, is returned with the movement. This statement gives the daily rate, the daily variation, the temperature at which the tests were conducted, and the variations positions. It bears the stamp of the observatory, and frequently serves the purpose of a certificate, especially where a certificate has not been issued on account of some slight failure in one of its requirements. Persons may, therefore, feel that whether a movement receives a certificate of one of the four classes or not it receives a careful examination, the results of which will be recorded in such a way as to be readily made use of in deciding upon its qualities."

The Science of Hardening and Tempering Steel.

IN the whole range of the mechanical arts it would be nearly impossible to find another proness at once so simple and so common in practice, and yet so little understood in theory, as the hardening and tempering of steel. It was probably this fact which led the Institute of Mechaniaal Engineers (of England) to place this subject among those to be specially investigated by a committee of its own members, whose first report has recently appeared. To illustrate the facts that require scientific explanation, the process of hardening and tempering a cold chisel, which is usually done at one operation, may be briefly described. After heating, the point is dipped in cold water, and thus the tool is hardened. After cooling, the smith lifts the steel from the water, and watches it closely as the heat remaining in the body of the metal diffuses itself through the hardened portion. As the heat spreads the color passes from a white lustre to a pale yellow, to straw color, to brownish orange. Then the point is dropped into water again, in the full confidence that after cooling the temper will be that desired. If the smith delayed, the brown would become dappled with purple, and would then pass successively into full purple, light blue, full blue, dark blue ; and each color would give its own temper upon cooling, as bright blue for swords and watch springs, dark blue for saws, &c. These are the well known facts, and yet their "how" and "why" has always been equally a mystery to the artisan and the scientist, although upon the correct solution of the paoblem depends so important a matter as knowledge how best to reach that judicious compromise which should blend the maximum of hardness and toughness. Now, either can be procured at pleasure, as the colder the bath, the harder the steel, and the slower, (as in oil,) the tougher ; but extreme hardness is produced at the strength of tenacity, and vice versa. The committee's conclusion was suggested by Edison's experiments upon wire, which he made public in 1879. These experiments showed that incandescent platinum wire became covered with minute fissures, due to the expiration of the occluded gases under the action of heat, and that when the wire was cooled in a vacuum the fissure closed. By a succession of heatings and coolings the gases were entirely expelled, and the platinum became much harder and denser. As the committee suggests, it may be that the first and extreme heating drives out the gases occluded at ordinary temperatures, thus producing the denseness of hard steel. When the metal is slightly heated, as in tempering, reabsorption begins, and the characteristic colors are due to the changes in the surface, the gradual opening of minute fissures, which are produced by this reabsorption. In connection with this latest theory may be mentioned one or two earlier ones. One is that when steel is heated the carbon becomes amorphous and the steel is soft ; while, if cooled quickly, the carbon crystalizes, taking the properties of diamond, and the steel becomes, as it were, diamond set in iron. This theory of Julien's is, perhaps, the most striking one, but while accounting for hardness, it does not explain the temper of steel, to say nothing of objections to the postulated liquefaction of carbon.

Practical Hints on Watch Repairing.

By Excelsior.—No. 66.

THE PRACTICAL EXAMINATION OF TOOTHED GEARING—CONTINUED.

(1,046). *The Inter-dependence of the Pitching, the Depthing, and the Center Distance.* As already shown, the relation or connection between the depthing and the pitching, in the performance of the gearing, is so close that it is often difficult to determine at once whether a certain faulty action is caused by an error in the former or the latter. Many workmen make no effort to do so in the practical examination. Yet they are two distinct and different things, and require entirely different treatment.

Again, a wheel and pinion may be correctly proportioned for each other, and when properly set in a depthing tool may give a perfect action, as regards both pitching and depthing. But, when placed in the movement, the action is entirely wrong. The reason is, of course, that the distance between the arbor points of the depthing tool was equal to the sum of the radii of the wheel and pinion, but the distance between the pivot holes in the movement was not. Consequently, the center-distance being wrong, the depthing must also be wrong. Shall we alter the wheel, or the pinion, or shall we move the pivot holes to change the center distance? Theoretically, we should always do the last. But, in practice, that is often so serious an undertaking, that we may well seek to know whether some easier course will not answer substantially the same purpose.

(1,047). To render perfectly clear the difference between them, how an error in one affects the others, and the proper corrections, let us study a gearing consisting of a 10-leaf pinion, and a wheel of 80 teeth. The geometrical diameter of the wheel must be 8 times that of the pinion, their semi-diameters or radii will also be as 8 to 1, and the center-distance should be $8+1=9$ times the radius of the

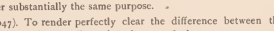


Fig. 61.

pinion. Let Fig. 61 represent this gearing—*a* being the center of the pinion ; *A*, that of the wheel ; *a O*, the radius of the pinion ; *A O*, that of the wheel ; and *a O A*, the center distance. Suppose *a O* to be 10 millimeters, hundredths of an inch, or any other standard of measurement preferred. Then *A O* must be $10\times 8=80$, and *a O A* must be $10+80=90$. Such a gearing will be correct in pitching, depthing, and center distance. For if the geometrical diameters are proportioned to the number of teeth and leaves, *i. e.*, as 8 to 1, the pitching will be correct ; if the pitch circles (or radii) just meet, the depthing is correct ; and, as the sum of the two radii equals the center distance, that is correct.

(1,048). Now let us suppose that, on measuring a real gearing which should have had those proportions, we find that $a\,O=10$; $A\,O=79$; $a\,O\,A=90$. We see at once that the cause of the scant depthing is that the wheel is too small, for its radius only measures 79, while it should be 80 in order to form a correct gearing. The center-distance and the size of the pinion suit each other, as *a O* is one-ninth of *a O A*, as it should be. By simply stretching the wheel till it measures 80, we secure a correct gearing. We might also obtain a correctly proportioned gearing by changing the pinion for another to suit the wheel—putting in a pinion which would measure $79\div 8=9\frac{7}{8}$, instead of 10. We must then change the pivot holes, to reduce the center distance to $79+9\frac{7}{8}=88\frac{7}{8}$, to secure a correct depthing. But the former would evidently be the easier and better course.

(1,049). But if *a O* was 9 ; *A O*, 80 ; and *a A*, 90, the fault is in the pinion, and the only remedy would be a larger one. The workman may ask why it would not answer to enlarge the wheel as before, to correct the scant depthing. The answer is, that the wheel is already much too large for the pinion, and if we enlarge it to 81, in order to correct the depthing, it will be still more unsuitable for the pinion In order to gear properly with this pinion, the wheel should be $8\times 9=72$, which is a wide difference from 81, or even 80. It is therefore useless to think of trying to alter the wheel sufficiently to make good gearing, as, after we had reduced it to 72, to secure a correct pitching, we must then change the center distance from 90 down to $9+72=81$, in order to have a correct depthing. Besides, we have no *right* to alter the wheel, for it is of a correct size for the center distance, while the pinion is not suitable either for the center distance or for the wheel. But by simply rejecting the pinion, and fitting in one which measures 10, instead of 9, we easily make a gearing which is perfect throughout.

(1,050). But now suppose *a O* is 10 ; *A O*, 80 ; *a O A*, 91. We still have a scant depthing, but as the wheel and pinion are correctly proportioned in size for gearing together, the cause of the scant depthing is in their being planted too far apart. The correct remedy would be to move one of the pivot holes towards the other, and make the center distance and depthing correct. But this would often be difficult and expensive. If we enlarge the wheel to 81 we correct the depthing more easily, and, although we disturb the pitching by doing so, the proportion 81 to 10 is but little out of the way from 80 to 10, and may be disregarded, because it is in the direction of making the wheel a trifle too large for the pinion, (926, 991). It would be much more objectionable, however, to make the wheel that amount too *small* for the pinion.

If the measurements were *a O*, 10 ; *A O*, 80 ; *a A*, 89, the only trouble is a depthing too deep, caused by the pivot holes being too close together. The proper remedy is to change the center distance but if that is difficult the wheel may be dressed down to 79, as the error of pitching would not be excessive.

(1,051). Next suppose *a O*, 11 ; *A O*, 79 ; *a A*, 90. Here the wheel and pinion are unsuitable for each other, and neither one is suited for the center distance, although the depthing is all right. If we take the center distance for our guide or standard, then, to suit a 10-leaf pinion, and an 80-tooth wheel, it measures 9 times the radius which the pinion should have ; for the proportions must be as 8 to 1, and the center distance must equal the sum of the two radii, which will make $8+1=9$ equal parts between *a* and *A*, of which the pinion radius should occupy 1 part, or $\frac{1}{9}$ of *a A*, and the wheel 8 parts, or $\frac{8}{9}$ of *a A*,—which requires the pinion to be 10, and the wheel 80. Consequently, we must alter both the wheel and the pinion.

Let us see if we can correct the gearing any more easily. In order to suit the wheel, we must have a pinion $79\div 8=9\frac{7}{8}$. The center distance must then be changed from 90. to $79+9\frac{7}{8}=88\frac{7}{8}$. To suit the pinion, we would need a wheel $11\times 8=88$, and the center distance would have to be $11+88=99$.

We conclude that it will be easier to take the course first mentioned. On looking more closely, we see that the wheel is within $\frac{1}{18}$ of the required size, and we can easily enlarge it from 79 to 80, thus making the gearing all correct except the pinion. By now putting in a new pinion, of size 10, the gearing is made perfect. But it would have been impracticable to make a good gearing while retaining the old pinion, as it would have required the enlarging of the center distance from 90 to 99, as before stated—which would in general not be allowable, even if possible.

(1,052). If *a O* is 11 ; *A O*, 81 ; *a O A*, 92, we have a gearing which is *all* wrong except the depthing. The wheel and pinion are not suited to each other, nor is either one suited to the center distance. We have two courses :

1st. We may change both the wheel and the pinion, to sizes which are suited to each other and to the center distance, and thus make a correct gearing. This would require the pinion to be $92\div 9=10\frac{2}{9}$, and the wheel 8 times as large or $8\times 10\frac{2}{9}=81\frac{7}{9}$. We can enlarge the wheel sufficiently, but must fit in a new pinion.

2d. We can change the pinion and the center distance to suit the wheel. This would require a wheel of size $81+8=10\frac{1}{8}$, and the center distance should be $10\frac{1}{8}+81=91\frac{1}{8}$. In the preceding exam-

ples, the word "size" refers, of course to the radius, not to the diameter.

(1,053). In the same way, if the workman has siezed the idea of the process, he can easily analyze any case of defective gearing, by measuring the center distance and the geometrical radii of the wheel and pinion, and determine which will be the easiest course for correcting the gearing; or if compelled by circumstances to vary from strict correctness, he can see where a variation will do the least harm. Even if both the wheel and pinion are lost, or so worn or injured as to be useless, he can just as easily determine the correct sizes for the lost parts from the center distance alone, by knowing the numbers of the teeth and leaves. If they are not known, he can ascertain them as directed in articles No. 54, 55, and 58.

(1,054). It will be seen that it is not always safe to take it for granted that we can get the proper radius, for either a wheel or a pinion, by subtracting the radius of the other part from the center distance, for neither the radius of the part we have, nor the center distance, may be suitable for that gearing. But if we first ascertain that they are correct, and suited to each other, then the radius of the missing part will of course be found by subtracting the known radius from the center distance—or it can be found by direct calculation therefrom.

We perceive, therefore, that a careful measurement of the center distance, the wheel and the pinion, will enable us to determine the correctness or error of the pitching, the depthing, the center distance, the thickness of the pinion leaves, the equality of the pinion, and of the wheel, and the lengths of the addenda of the teeth.

(1,055). In making these measurements, it will generally be best to consider the center distance as fixed, or as the standard to which the sizes of the wheel and pinion should conform. But if the pivot holes are not jeweled, so that moving them will not cause any great trouble—or when it is undesirable to change one of the parts, for any reason, that part may be retained, and the other part and the center distance be altered, as already explained.

If we make either part the standard, to which the other must be caused to conform in size, we should generally select the one which will require the least change in the other. It is generally easier to measure the primitive diameter of the pinion; as the addenda are nearly always semi-circular, and we have only to take the thickness of one leaf from the full diameter. But it is not so safe a standard as the primitive diameter of the wheel, for the reason that any error of measurement is *multiplied* when we apply it to the wheel, while any slight error in measuring the wheel would be *diminished* when applied to the pinion; in the gearing before us, in the proportion of 8 to 1, or reduced to ⅛ of the original error. The methods of finding the primitive from the full diameter of a wheel were given in article No. 58.

(1,056). *Examining the Addenda or Points of the Teeth.* We now comprehend clearly all the relations of the pitching, depthing, and center distance, but we have yet to consider the addenda or points of the teeth. As has been previously shown, the length of the addenda, outside the pitch circle, determines at what point the driving shall begin and end, and their shape determines whether the driving will be uniform or irregular. Therefore, by lengthening the points of the teeth, (enlarging the full diameter, then cutting back the pitch circle to its former size, to prevent a change in the pitching,) we can cause the driving to commence nearer to the line of centers, and to extend further after it. If the points are too long, they will catch against the pinion leaves. When the teeth are thicker than necessary, the points can be shortened without touching the front or acting surfaces, by dressing off the backs of the teeth, from roots to points, (1,029).

Conversely, if the points are too short, the driving will begin too far before the center, with "wedging", etc., and it will terminate too soon, *i. e.*, not carry the leaf so far as it should for a good action. Of the two errors, it is preferable to have the points too long, rather than too short, for the former can be partially compensated by a shallow depthing—especially if the curves of the addenda are quite full and round. But the former can be but little improved by a deeper depthing. The driving before the center will be lessened, but it will be more irregular, and the "drop" will be greater. The practical examination of the correctness of the addenda therefore includes two tests, one for the uniformity of the driving, and one for the place of its beginning and ending.

(1,057). *Testing the Uniformity of the Driving.* If we examine the action of a wheel and pinion whose pitching and depthing are correct, and find a perfectly uniform driving, from the line of centers to the end, we know that the addenda are properly shaped, for otherwise the driving could not have been uniform. And if the points had been too long or too short, we should have had the faults stated in the preceding section. In applying this test, the parts should be set at the proper depth in a depthing tool. On one of the centers which carry the wheel being tested, and close to it, slip a graduated sector or plate, and on the wheel or its arbor fasten a finger or index whose point passes over the graduated scale as the wheel turns, and indicates its movement. Arrange a similar finger and sector on the pinion which works into the wheel, and the centers carrying it. Finally place the two sectors and fingers so that, at the meeting of the tooth and leaf on the line of centers, each finger will point to the *O* on its scale.

(1,058) Now turn the pinion through ¼ of the pitch arc, which, in a 6-leaf pinion will be 15°, and hold it there. Gently pressing the wheel forward into contact with the pinion, note where its finger points on its scale. Then move the pinion forward another 15°, and again note where the finger of the wheel points. If, at each such movement of the pinion, the wheel finger advances an equal distance on the scale, the curves of the addenda are evidently correctly formed, and we have a perfect gearing. If not, the addenda has not the correct epicycloidal curve.

Should the wheel finger move over a less space than it should, near the middle of the test, it will of course indicate that the curve is too full and rounding, and *vice versa*.

If an excess of motion is found near the end of the addendum curve, it indicates that the addendum is shorter than theory requires. But, if the wheel finger does not move far enough, *i. e.*, not through the correct proportionate space, the point of the tooth is longer than necessary for uniform driving, and the correctness of the curve has been sacrificed in order that it might reach the end of the tooth, (987, 988).

(1,059). Instead of the tests covering ¼ of the pitch arc, each may cover any smaller part preferred. The method may be varied, by moving the *wheel* through equal spaces, and noting the positions of the pinion finger on its scale, at each change. But the former way will be more convenient.

In the case of pinions of less than 10 leaves, it will be remembered that the driving before the center is not expected to be uniform—the irregularity being a necessary evil incident to the use of low-numbered pinions. But the trial will show precisely what the method of driving is, in that part of it.

(1,060). *Testing the Beginning and End of the Driving.* The above is the true method, and the only reliable one, for practically testing the correctness of shape of the addenda of the driver, whether that be the wheel or the pinion. But, as has been explained in sections (974, 987), the uniformity of the driving is frequently sacrificed, with low-numbered pinions, in order to cause the driving to begin nearer to the line of centers than it would do if the addenda were formed with the true epicycloidal curve, and the theoretically correct lengths. The driving becomes irregular, but we lessen the engaging friction and "wedging" before the center. But the same method will enable us to ascertain how far before the line of centers the contact begins, how far after it the driving ends, and whether the variation from uniformity, shown on the scale, is such as to indicate the best driving attainable under the circumstances. It will also enable us to ascer-

tain precisely what effect is produced by any alterations we may make in the lengths or shapes of the addenda.

(1,061). As the addenda are always *lengthened* beyond the point fixed by theory, when the driving before the center is to be lessened as described, the wheel finger should move over spaces on its scale which are not equal, but become gradually less, as the pinion finger is advanced from the line of centers, by equal movements, to the end of the driving, *i. e.*, till the point of the tooth parts from the leaf. Such a form of addendum will give a good distribution of the motive force during the driving. Such a gearing will not be a perfect one, but the action will be a sort of compromise between different evils, avoiding the worst of them, while sacrificing as little as possible of the desirable qualities.

It should be added here that the same apparatus will enable us to observe and measure the effect produced upon the driving by making the depthing more deep or scant, by incorrect pitching, etc.

(1,062). *The General Examination of a Gearing.* In the preceding tests we have supposed the pitching and the depthing to be correct—at all events, we can make them so. But when examining the gearing in action in the movement, we do not, ordinarily, know that to be true, but depend on this examination to show us also such errors of pitching and depthing as may chance to exist. In practically examining a gearing in the movement we are therefore compelled to observe the action as a whole, *i. e.*, as the resultant of whatever merits or errors the gearing contains, all acting together, and neutralizing or aggravating each other, as the case may be. Having noted well any faults in the action, we next compare and analyze them, to find what particular error or errors caused them. For the same fault in the action may be caused by entirely different errors in the gearing. For instance, if we notice a decided "drop" as the tooth meets the leaf, the pinion may be too small or wheel too large, (error of pitching,) the depthing may be too deep, the addenda too short, etc. If the tooth meets the leaf too far before the line of centers, the pinion may be too large or the wheel too small, the leaves too thick, the depthing too shallow, the addenda too short, etc.

(1,063). In the same way, each fault *may* be the result of different errors, among which we must pick out the actual cause. On the other hand, the absence of a certain fault does not prove the absence of error in the gearing, for there may be very serious errors which may happen to neutralize each other and so prevent the appearance of this particular fault, although other faults may at the same time be made worse. To enable us to accurately determine the causes of the faults we discover, the examination of the gearing in action should be supplemented by an equally careful search after any mechanical defects which may exist, (1,035, 1,037). Having all the facts before us, the following explanations will show us where the trouble lies.

Workshop Notes.

The principle of the correct time-keeping qualities of a watch or clock may be compared to an exact circle with a pivot or centre exactly equi-distant from any point of the circumference. The truer the circle (as well in distance as in height) the more exact the performance.

Dr. Kaylor found picric acid and boraic acid in a gold varnish for metals which afforded a very hard and beautiful surface ; and he recommends a clear solution of shellac, with the addition of picric acid and about half of one per cent. of boraic acid as giving results equally good.

To remove stains from statuary marble, take equal parts of fresh oil of vitriol and lemon-juice ; shake up these substances very thoroughly in a bottle ; wet the spots with the mixture, and in a few minutes afterward rub with a soft linen cloth, and the spots will be found to have entirely disappeared.

Oxidised silver. Articles of silver can be oxidised (as it is erroneously called) by introducing them to a solution of sulphur and potash, upon which the surface of the articles become coated with a thin covering of sulphuret of silver. Real silver may be frosted by being heated until the oxygen in the air converts some of the copper (one of the alloys of silver) into an oxide, which may be removed by introducing the metal into weak sulphuric acid or ammonia, the surface of the silver, which is nearly pure, now exhibiting a frosted or dead appearance, and may be brightened by burnishing.

A clockmaker of Copenhagen named Louis Soendenberg, who for some time past has had charge of that city's electric timekeepers, has invented an ingenious appliance which, it is said, obviates the necessity of winding up the regulator from which the clocks in question take their time. By a mechanical contrivance, which periodically cuts off the stream of electric fluid emanating from the battery, and brings an electro-magnet to bear upon the relaxed mainspring in such sort as to renew its tension instantaneously, perpetual motion is practically imparted to the works of the regulator—that is to say, so long as the batteries connected with it are kept properly supplied with acids. The discoverer of this experiment has satisfied himself, by six months' successful experiments in his own workshops, that his system works faultlessly, and has applied for permission to adapt it to the electric clocks set up by the municipality in different parts of the Danish capital. Electricity, under Mr. Soendenberg's compulsion, is destined not only to make Copenhagen's clocks go, but to wind them up, with never-ending occurrence.

The *Enquirer* publishes the following as a means of silvering by cold rubbing : Make a paste by thoroughly grinding in a porcelain mortar, away from the light, water, 3 to 5 ounces ; chloride of silver, 7 ounces ; potassium oxalate, 10.5 ounces ; common table salt, 15 ounces ; and sal ammoniac, 3.75 ounces. Or, chloride of silver, 3½ ounces ; cream of tartar, 7 ounces ; common table salt, 10½ ounces, and water enough to form a paste. Keep the paste in a covered vessel away from the light. Apply it with a cork or brush to the clean metallic (copper) surface, and allow it to dry. When rinsed in cold water the silver presents a fine frosted appearance, the brightness of which may be increased by immersion for a few seconds in dilute sulphuric acid or in a solution of potassium cyanide. The silvering bears the action of the wire brush and of the burnishing tool very well, and it may also be "oxidized." For the reflectors of lanterns the paste is rubbed upon the reflector with a fine linen pad, then, with another rag, a thin paste of Spanish white, or similar substance, is spread upon the surface and left to dry. Rubbing with a fine linen rag restores the lustre and whiteness of the silvered surface.

At a recent meeting of the Royal Dublin Society, says *The Iron Monger*, Dr. J. E. Reynolds gave some illustrations of a process he has discovered for coating metallic and other surfaces with a brilliant and strongly adherent layer of galene. The plating of a tube of brass, and another of glass, was effected at the meeting by simple immersion in a solution which speedily deposited a beautiful mirror-like layer on the material. This layer readily assumed its final polish by friction with a wash leather, and it bore some severe treatment without giving way. The color of the deposit is darker than pure silver, but brighter than oxidized silver, and the coated surface can be made to assume a peculiar bluish bloom, which enhances its beauty. Dr. Reynolds exhibited a number of specimens in iron, steel, brass, glass, porcelain, ebonite and other articles, which had been subjected to the action of the atmosphere for a period of more than two months in some instances, and all withstood this severe test completely without showing tarnish or rust. Dr. Reynolds mentioned that the cost of his galene plating process did not exceed one-eighth that of the nickel-plating. Moreover, any intelligent workman could quickly become his own plater, as the use of electricity is altogether avoided.

In the last number of the *British Watchmaker and Jeweler*, Herman Bush gives the following interesting idea : A handy way to replace a worn-out square on a winding arbor.—If the old square is not already too thin, file nearly round and cut a good thread in a screw-plate ; take a piece of square steel and drill a hole into it somewhat smaller than the thickness of the screw, and tap with a hardened screw-drill ; countersink the lower end in order to fit well, fix the piece on to the screwed arbor and finish off, when the new square will answer every purpose. For a going barrel make a right hand, and for a fusee a left handed screw. In case the square of the arbor is too much worn to allow filing round and yet leave a sufficient body for screwing, cut it entirely away, and drill a hole in the center of the arbor ; take a piece of hardened square steel, slightly conical at the point, drive into the hole and finish off. To ensure the utmost security, which, however, is not essentially required, the pieces may be soft-soldered in addition to the fastening by screwing or plugging. The same manipulation will answer for squares to fit on the stopfinger on stopwork of Geneva watches, also for French clocks, musical boxes, &c. These auxiliaries may perhaps be condemned by some watchmakers who strictly maintain the necessity of replacing every damaged part of a watch by an entirely new piece ; but after giving the arbor merely once a trial, will no doubt be adopted, as it combines efficiency with economy.

Some of the Optical Properties of Crystals.

BY PROF. W. GRYLLS ADAMS, F. R. S.

The six systems of crystals, which are distinguished from one another by their forms, may be reduced in number to three when we consider simply their optical properties. Crystals of the cubic system —to which belong alum, common salt, the diamond, and many of the elementary bodies—refract light singly in the same way and according to the same law as glass or water, and hence we may conclude that the waves by which light is transmitted in these crystals travel with the same velocity in all directions within the crystal. These crystals of the cubic system have equal degrees of elasticity in all directions. They have not the power of splitting up a beam of white light into two separate beams, but refract it as a single beam, so that one of these crystals cut with parallel faces acts on a beam of light in the same way as a piece of plate-glass. We see that the diamond, which belongs to this system, has not the power of double refraction. Crystals of the square-prismatic or pyramidal system, and of the rhombohedral or hexagonal system, have one optic axis which coincides with the principal axis of the crystal. When light passes through them in the direction of this axis, it is refracted singly according to the ordinary law of refraction for glass or water, but when a ray of light passes through them in any other direction, they divide it into two rays, which pass in different directions through the crystal. One of these rays is refracted according to the ordinary law of refraction, and the other is refracted according to a different law. These rays are called the ordinary and the extraordinary rays, and it will be seen that when the crystal is rotated, one of these rays revolves around the other.

Ice, talc, mica, tourmaline, and Iceland spar belong to the rhombohedral system, and these crystals have one optic axis coinciding with the principal axis of the crystal. They are called uniaxal crystals. According to the wave-theory, the wave corresponding to the ordinary ray spreads equally in all directions in the form of a sphere, but the wave corresponding to the extraordinary ray spreads with different velocities in different directions; its form is that of a spheroid, either oblate—*i.e.*, a sphere, flattened towards the poles like the earth—or prolate—*i.e.*, elongated in the direction of the poles. The wave for the extraordinary ray is of the form of an oblate spheroid, like the earth, in the case of mica and Iceland spar, and of the form of a prolate spheriod in ice, zircon, quartz, and some other crystals. The polar diameter of the spheroid is the optic axis of the uniaxal crystal, and in most crystals the two waves spread with the same velocity in the direction of this axis.

This is the case with Iceland spar, which may be taken as a type of uniaxal crystals. As we shall presently see, in quartz the two waves spread with unequal velocities even in the directon of the axis, so that the spheroid for the extraordinary ray lies entirely inside the sphere for the ordinary ray. There are other peculiarities of quartz to which I shall presently have to refer.

Let us consider now the action of Iceland spar on the two beams of light passing through it. These beams proceed from the same point in different directions through the crystal, showing that they have different indices of refraction, or that one goes faster than the other. The slowest in Iceland spar is the ordinary ray, and that is most refracted or bent on entering. The crystal may be cut so that this ray may fall on the plane of section at so large an angle that it will be totally reflected and not get through at all, whilst the extraordinary ray will fall on the plane of section a smaller angle of incidence, and may get through. Thus we get only one of these two rays. This is the arrangement of Foucault's prism.

If the prism be cut at a different angle, and the parts cemented together with Canada balsam, then this Canada balsam reflects the ordinary ray, and allows the extraordinary ray to pass through. This is the arrangement in the Nicol's prism. For the same size, the Nicol's prism has the disadvantage of being longer, but it also has great advantages over the Foucault's prism. We get here only one of the two rays, and we shall find that it differs in character from a beam of ordinary light. It has been changed in passing through the Nicol's prism, in such a way that it cannot get through a second Nicol's prism when the principal planes of the two prisms are placed at right angles to one another. It has a distinct relation to the principal plane of the Nicol's prism, through which it has passed; and without positively stating that such is the case, I would say that the investigations of those who have most fully considered the suiect seem to show that the vibrations, by which this extraordinary ray passes through the Nicol's prism, take place only in the principal plane of the prism. If then the ray is passing horizontally, and the principal plane of the Nicol's prism is vertical, the vibrations for the extraordinary ray take place in vertical straight lines. All investigations show that whatever relation holds between the extraordinary ray and the principal plane of the crystal, the same relation must hold between the ordinary ray and a plane perpendicular to the principal plane. In a crystal of Iceland spar, with its principal plane vertical straight *down* the room, the vibrations for the extraordinary ray will be up and down in vertical straight lines, and the vibrations for the ordinary ray will be in horizontal straight lines *across* the room; in both cases the vibrations are at right angles to the direction in which the ray is going.

From the relation of the vibrations for these rays with regard to particular planes they are said to be polarized, and a beam which is transmitted by vibrations, which take place always in the same plane, is called a beam of plane-polarized light. The Nicol's prism which produces this effect is called a polarizer.

We have other means of producing plane-polarized light. If instead of Iceland spar we take a crystal of tourmaline we get only one ray, but on examining it in the same way as we examined the beam polarized by the Nicol's prism, we find that when the principal plane of the tourmaline is at right angles to the principal plane of the examining Nicol's prism or analyzer, no light is allowed to pass through We see then that the tourmaline and the Nicol's prism produce the same effect when their principal planes are parallel, so that tourmaline only allows the extraordinary ray to pass through. We may see that two tourmalines, with their axis at right angles, will allow no light to pass through. The vibrations transmitted by the first tourmaline are stopped by the second. Thus we may use two tourmalines; one as a polarizer to produce a beam of plane-polarized light, and the other as an analyzer to examine it.

Now, let us study, by means of polarized light, the effects produced by crystals and other bodies, which may give us some idea as to their different degrees of elasticity in different directions. We may make use of models to give clearer ideas as to the action of these crystals on a beam of light.

A beam of light, before entering the crystal, is transmitted by means of vibrations in every direction, at right angles to the direction of the beam; when it enters a double refracting crystal, the vibrations take place in two planes, at right angles to one another, and, on emergence, we have two plane-polarized beams. Another model will show the action of the tourmaline on a ray of common light. The ordinary ray is stopped, and only the extraordinary ray is allowed to pass through. The vibrations are represented as taking place in a vertical plane—*i.e.*, parallel to the principal plane of the tourmaline—and these are stopped by the second tourmaline, which has its principal plane horizontal.

When we place a plate of a doubly-refracting crystal, such as selenite, between two Nicol's prisms, with their axis crossed, no change will be produced by the selenite so long as its principal plane coincides with the principal plane of either of the Nicol's prisms; but if the selenite be turned, light passes through, and the field becomes brighter and brighter, until the selenite is turned through an angle of 45°. With a thin plate, the light is colored, the color depending on the thickness of the plate. Now, keeping the selenite fixed, and turning the analyzer, the brightness of the beam diminishes, until when the analyzer has been turned through 45°, the color vanishes.

On continuing to turn the analyzer in the same direction, the field will again become colored, but with the complementary color. If we make use of a double image prism for an analyzer, we get two images which are of complementary colors, so that where they overlap we have white light,

In the thickness of the selenite plate, one wave is retarded behind the other by a distance, which is half a wave length for one given color; hence the two waves corresponding to that color interfere or blot one another out, and the remaining light gives the complementary color. In the spectrum of the light, when analyzed, there will be a dark band in the position of the color blotted out by the interference. The reason why the two images are complementary will appear thus:—Suppose a principal plane of the first Nicol's prism vertical. Let the principal plane of selenite be inclined at 45° to the vertical, so that the vibrations take place in two planes each, inclined at 45° to the vertical, the vibrations taking place in these inclined planes will be upwards and outwards together. Now, as far as they are both upwards, they reinforce one another, and as far as they are both outwards at the same time, they oppose one another; hence the waves which come out, reinforcing one another, when the analyzer has its principal plane vertical, oppose one another and interfere when the principal plane of the analyzer is horizontal. As color depends upon wave length, the color which is strongest in the first position of the analyzer is entirely wanting in the second position. The particular color which is blotted out depends on the difference of retardation of one wave behind the other in the thickness of the selenite, and hence the color depend on the thickness. If we take a lens of selenite which is thinnest at the axis, we get colored rings, due to the interference of the successive colors. If different plates of selenite be placed over one another, so as to give different thicknesses in different parts, there will be a change of color wherever the thickness changes. In consequence of this, colored pictures of objects may be produced by placing different thicknesses of selenite on glass plates, and adapting the thickness properly to the color of the various parts of the object.

To be Continued.

Views of Correspondents.

This department of THE CIRCULAR is open for communications relating to the jewelry trade, but the editor does not hold himself responsible for the sentiments expressed by contributors. We invite correspondence, but require that it shall be free from all personalities, and the writer's integrity guaranteed by the disclosure of his true name to the editor. Anonymous communications will not be noticed.

To the Editor of the Jewelers' Circular:

What are we going to do with those drummers who travel about the country selling their wares to the legitimate trade and then stock up the Fancy Goods dealers and other outsiders with goods, and sell them in many cases on better terms than they will the regular jewelers. When spoken to about it they reply that if they don't sell them somebody else will. I have made up my mind to stop buying from these men, and it seems to me that if all other jewelers would do the same thing, these drummers would soon be driven off the road, and honorable travelers would then have a chance. This would soon break up the practice of selling to outsiders, for manufacturers cannot afford to lose the trade of the regular jeweler.

FAIR PLAY.

[Our advice is to let these drummers severely alone.— Ed.]

Editor of the Jewelers' Circular:

I have read a letter from E. R. P. Shurley in a Western paper, in reply to your editorial of "A Co-operative Watch Company Suggested."

It is true, and Shurley states it forcibly that we are in need of another watch factory, and I agree with him in that respect, but I don't think he ought to stoop to calling bad names and making faces at the editor of the CIRCULAR for expressing his opinion; this is a free country, and every man is entitled to an opinion, if he is capable of forming one. That we are in need of more watch factories I will try to prove, by my experience during the last twelve months, when at no one time could I procure the quality of movement I ordered; I have frequently sent orders to New York jobbers for a certain grade, and they have invariably sent me a watch made by an entirely different company. Now, what does this prove? That the demand is greater than the supply. Only last week I sent for two movements of a certain low grade, either the Broadway or No. 7, in place of which I received two *common* imitation American watches, (Swiss make). To prove that jobbers cannot get the movements, I wrote to Messrs. Robbins & Appleton, Bond Street, New York, asking them if they could let me have such movements as I required, as I was willing to pay net cash for all I wanted. (It is true I am only a small dealer, but that is neither here nor there. I want to give my customers the articles they ask for.) Robbins & Appleton wrote me that they were unable to supply all orders for this class of movements, but hoped to be able to do so very shortly, and recommended me to stick to my jobbing house. Now I am perfectly willing to do so provided I can get what I order, but I see it is not the fault of the jobbers. The fact is they cannot get the movements, so what is the use of being jealous of new enterprises? Competition is the life of trade, and the more factories we have, the better the quality of work will have to be turned out, to enable them to sell their wares. Hoping you will think it worth while to give this space in your valuable journal,

I remain Yours, &c., SUMTER.

As for our friend Shurley calling us names and making faces at us, we don't mind it a bit. It does us no harm and amuses him. The fact that our correspondent could not obtain at a particular time, certain low price movements, is no argument that the supply is not equal to the demand. There were but few of them in the market at that time. As a matter of fact, there is so little profit in cheap movements that manufacturers prefer making the better grades, for which there has been a great demand of late. Of the cheap movements the manufacturers only turn out sufficient to keep their lines good. It is not for their interest or the interest of the dealers that the market should be flooded with cheap grade watches, thus injuring the demand for the better grades. If existing companies, possessed of capital, experience and responsibility, cannot afford to make this class of goods, how can a new company, possessing none of these elements, hope to do so? We should be glad to see a dozen more watch companies in operation provided they were properly organized, and the retail trade would be benefitted thereby, but we remember the demoralization caused by the United States Watch Company, whose goods were forced on the market through the medium of auction houses, hardware and fancy goods dealers, and in every other illegitimate way. The proposed Trade Watch Company does not, in our judgment, present either an attractive, business like or practicable scheme, and only threatens demoralization to the watch trade. We have no idea, however, that it will ever reach a point where either its threats or its promises are liable to be fulfilled.—Ed.

Editor Jewelers' Circular:

Permit me to call your attention to a few of the annoyances we poor country jewelers are compelled to suffer, at the hands of a certain class of thoughtless men, who travel for some Eastern jewelry manufacturers. The other day, while waiting upon some lady customers, two of these drummers entered my store, and one of them, in order to get ahead of the other, immediately began to unpack his goods and lay them out on the show case, while the other fellow entered into a political discussion with my watchmaker who was busy at his bench on hurried work. The discussion became quite heated, and would doubtless have lasted all day had not my customers hurried through their purchases, and left. Having a respect for the houses represented by these men, I hesitated to turn them out, but declined to buy of them. They demoralized my business for the time being, stole the time of my employe, and disgusted my customers as well as myself. I appeal to the employers of traveling salesmen to instruct their agents that even the time of a country dealer is of value, and that he has rights that should be respected. I beg, however, to bear testimony to the courtesy and gentlemanly bearing of a majority of the travelers with whom I come in contact. It is only occasionally that I suffer from an ignorant boor, and I throw out this hint in the hope that it may prove of benefit in improving the manners of those few who are worse than bores. AN OHIO JEWELER.

Practical Treatise on the Metallurgy of Platinum.

BY H. BUSH, HULL, ENGLAND.

PLATINUM was first discovered in 1735 by Ulloa, a Spanish traveler, in alluvial deposits of rivers in South America, and attention drawn to its remarkable properties by Mr. Charles Wood, Assay Master in Jamaica, in 1741.

The metal, when pure, resembles polished steel, and when melted with the hydro-oxygen is nearly as white as silver, yet somewhat softer, but of about double its density or specific gravity, and is, next to Irridium, the heaviest substance known, being 21 times heavier than the same volume of water.

It suffers no change by exposure to either oxygen, hydrogen or moisture, nor is it oxidized when exposed to any degree of heat, and retains its polished surface under all circumstances; it is not affected by any single acid and is soluble only in a mixture of 3 parts of hydro-chloric and 1 part of nitric acid, and can be melted only by voltaic electricity or by the application of ignited oxy-hydrogen through a specially prepared blowpipe, or may be welded into a solid mass after having undergone a careful chemical preparation.

Most metals combine with platinum, but few alloys only have been practically employed in the arts and chemical preparations.

Nine parts of fine gold mixed with one part of platinum will have nearly the color of gold but the density of platinum, and possess great elasticity, which makes it a valuable alloy for dental springs; alloyed with silver in various quantities are used to a considerable extent under the name of Dental Alloy, as plates, hooks and rivets for artificial sets of teeth. A good alloy for writing pens, not being exposed to corrosion, is made of four parts of platinum to three of silver and one of copper.

An alloy of imitation gold, resembling in color 12 carat gold, is made of three parts of platinum and nine of copper; a good alloy for small bells giving a nice tone, is made of a hundred parts of nickel, twenty parts of tin, two parts of silver, and one part of platinum. Steel, intended for fine cutting instruments, may be greatly improved by having added one part of platinum to two hundred parts of steel, whilst in fusion.

But the great usefulness of this metal in its pure state or alloyed with about 10 per cent. of irridium, results from the obstinacy with which it resists nearly all external agents—heat, light, air, moisture, alkalies or any single acid, and hence its important adaptability for the manufacture of vessels for chemical manipulations, such as sulphuric acid stills, crucibles, evaporating dishes, digesters for the parting of gold and silver by nitric acid, retorts for the manufacture of acetic acid, etc. It is employed, in place of gold, in making the touch-holes of fowling pieces, etc., where it has proved the valuable property of neither burning nor oxidising. From the sulphate of platinum a fulminating powder is prepared, which is nearly as effective, but less exposed to spontaneous explosions than the fulminating powder prepared from silver; from the oxide of platinum is prepared the chemical for imparting a silver lustre to ceramic ware. It is also very advantageously employed for batteries for electro-gilding or silvering, or galvano-plastic operations.

In jewelry it is recently employed for settings of diamonds, or in chains alternately with gold links, where the contrasting colors produce a pleasing appearance; its chloride is a very useful agent for producing the oxide-looking appearance on silver goods.

In watchmaking it is employed for screws in compensation balances on account of being heavier than the screws made of gold, and is also used for covering galvanically, superior watch movements or parts of movements made of nickel alloy.

In electricity its use is at present extensively contemplated for various purposes, such as the production of electric light, etc., and greatly experimented upon by the leading electricians of Europe and America.

It has also been used for coining in Russia, but has been abandoned for this purpose, and all existing coins redeemed by the government of that country.

It is also of great importance for forming mirrors in reflecting telescopes, and for tipping certain surgical instruments.

Originally this metal was found in the sands of alluvial deposits in Choco and Barbacoa in South America, afterwards in Peru, Brazil, California and other parts of North America, also to a great extent in Borneo and Burmah, likewise in Australia, in Spain, and in the sands of the Rhine in Bavaria, but principally since 1825 in the eastern side of the Ural Mountains in Russia, which district produces 35 cwt. annually, or about five times the quantity obtained from all the other localities. It is usually found in flattened grains from the size of a sandcorn to nuggets weighing up to 20 lbs. Troy. The largest specimens of nuggets on record are one from Choco of two ounces in weight presented by Alexander von Humboldt to the Museum in Berlin. The Museum in Madrid possesses a specimen found in Condoto in South America weighing above twenty ounces, and the two largest specimens were found in 1827 in the Ural Mountains near the Demidoff mines, one weighing 11½ and the other 21 lbs. Troy, and are deposited in the cabinet of Count Demidoff.

The crude ore never consists of pure platinum, but is always associated with several metals such as palladium, rhodium, irridium, osmium and rhuthemium; then in addition to this it very commonly contains iron, copper, and occasionally manganese, lead and even silver; it is also found in small quantities in gold and silver ores and requires great attention in the making of assays of ores from gold mines, as it will not separate from the gold in the ordinary assay, but there are certain methods of completely separating it.

The converting of extracted platinum into its ore or quantities of particles of trade platinum into a solid mass is effected for commercial purposes by two different methods. The first or the old process discovered by Dr. Wollaston and improved by Berzelius and Vanqualain is used to a great extent, as it may be pursued in an inexpensive way, but lacks the superior qualities of the metal produced into a mass by the new process invented by Monsiers Deville and Debray, the great metallurgical chemists and manipulators in Paris.

The operation of the latter process, which, however, will admit to be pursued on a large scale only is effected by the use of a gas stove designed to produce the heat and of the crucible in which the metal is to be melted; the gas stove or apparatus consists of a copper tube of 12 millimeters (½ inch) in diameter, terminating at its lower end by a slightly conical socket of platinum. A tube of copper of 3 or 4 min. (⅛ inch) in the interior and also terminating with a socket of platinum adjusted by a screw, penetrates into the first tube by its upper part and is held there by a screw-valve, which permits, when loosened, to give the lower end the desired height comparing with the lower end of the outer tube; this outer tube or cylinder has on its upper end about an inch under the screw-valve, a rather large hole, to which is fitted by connections with a band around the cylinder and a piece of pipe of about 9 min. (⅜ inch) a tap with a large bore or a kind of gasometer tap. A similar tap is fitted to the angularly bent upper end extremity of the inner tube to come in position above the tap in connection with the outer tube. The tap in the outer tube is brought into connection with a pipe emitting hydrogen, or ordinary coal gas by means of an india rubber pipe and is to serve as the combustible, and by the tap attached to the inner tube, enters the oxygen or air introduced by a pair of bellows which are connected by an india rubber pipe to the projecting end of the tap, which is being mixed with the hydrogen, and by its consumation produces the great heat not to be obtained in any other way. The lower end of the inner tube and about an inch above the platinum socket has a hole of about 2 min. (1/12 inch) to allow the oxygen to thoroughly mix with the hydrogen in the outer tube, yet this hole depends for its size on the dimensions of the oven to be employed.

The oven or crucible in which the combustion or melting of the metal takes place, is composed of lime or carbonate of lime, or ordinary blocks of sandstone used for building. These materials possess the property of standing a great degree of heat and being at the same time a very slow conductor, by remaining nearly cold outside, whilst

the fusion of the metal is going on in the interior. The whole is constructed of two parts, the bed and the lid ; which are made to fit together by a groove. The lid is likewise pierced at its centre with a conical hole, in which fits the platinum socket of the outer tube or cylinder, and has on its upper side latterally, a groove for inserting mortar to make the fitting of the tube in the lid air-tight ; the lower side of the lid is hollowed out to the shape of spherical cavity. The bed of the oven or the crucible is also hollowed out spherically, the depth of which to be nearly two-thirds of the radius of the circle of the block. This cavity forms the receptacle to melt the platinum ; on the edge of this cavity in the base, are in opposite directions cut grooves inclining inwardly, and corresponding grooves are also cut into the edge of the lid ; by the opening of the grooves the produced combustion will escape, the metal to be melted introduced, and after melting to run off. Pieces of stone or burned lime with a tolerably long projecting end to form a handle, are fitted in these grooves, but are not cemented in with mortar.

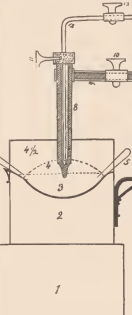
The removal of the two plugs, whilst the operation is going on will afford inspection of its progress, which may be observed through a piece of oblong colored glass fitted into a board and held by the handle towards the face, as the heat in the crucible is so dazzling and consequently very difficult to allow the inspection with the naked eye.

For safety sake the bed as well as the lid are surrounded by strong iron bands to support the sundry parts in case the oven should crack. On the front side of the iron band on the lower edge of the base is fastened a loosely fitted hinge, connected with the stand the base is resting on, and on the hind side of the band near the upper edge is a securely fastened handle with which to lift the crucible over, in order to run off the fused metal into an ingot. To effect a fusion the lid is first adjusted to the bed and the grooves brought to meet, then holding the pipe in the hand the tap is slightly opened to allow a feeble current of combustible gas and which, on passing through, is ignited ; then the tap in connection with the inner tube is opened to allow a sufficient quantity of oxygen to pass through and to mix with the hydrogen, the pipe is then inserted into the conical hole of the lid and kept gently moving to all sides in order to temporarily heat the receptacle for the metal, at the same time slowly increasing the pressure of gas by gradually opening the tap until the oven has attained the maximum temperature. The stone plug on the front side of the bed is then removed and a sheet of platinum introduced laterally through the groove, and the jet of gas directed on to the platinum, it is then very easily noticed, where the heat has most concentrated or best adapted for fusion. In lowering or raising the orifice of the tube conveying the oxygen, the bottom of the crucible is heated sufficiently to keep the platinum in a molten state, although the maximum of the heat is on the top. The lid is then securely luted on to the bed with mortar, and also the tube fitting into the groove on the top of the lid. The tap conducting the hydrogen is then entirely opened, to allow it to pass freely, and platinum is introduced in small quantities through the groove ; if the platinum is in small strips or sticks, there is hardly time to put them in, they will disappear at once on entering the crucible. After all the metal intended to be melted is introduced, the plug is inserted again and the heat kept up ; the progress may from time to time be inspected by removing the plugs and looking through the colored glass. When all is melted it is advisable to give the oxygen an extra pressure, which gives to the liquid platinum a watery, latitudal appearance and regulates the temperature of the mass. The platinum may then be cast into a cast iron ingot well coated with plumbago, or into a mould of lime or coke.

The sandstone, of which to the heat, exposed surfaces are converted into lime, or the lime of which the oven is constructed, plays an important chemical part in the action of the operation ; it is in fact analogous with the cupel used for assaying gold and silver by absorbing all impurities and inferior metals which may be in connection therewith, as they become oxydized, and form with the lime fusible combinations and penetrate into the pores of the crucible, and the operation not only effects a thorough, simple fusion, but a most complete refining of the metal. Platinum obtained in this manner will possess all the characteristics of malleability, laminability, ductility and pliability ; and besides being of a continuous sheet may be wrought into any size and shape of vessel. The operation is applicable to the reducing of extracted virgin platinum from the ore, as well as the melting of trade platinum. If it should be desired not to cast the molten platinum into an ingot or mould, it may be solidified in the crucible ; on finding the platinum thoroughly melted, the gases are turned gradually off, beginning with the hydrogen, and in such a manner as always leave the oxygen somewhat in excess, and at length the flame may be extinguished, the crucible and its contents allowed to cool down, the lid removed from the bed, and the platinum can easily be taken out as a solid lump. The same preparation will answer for fusion of platinum with iridium, of which a quantity of 250 Kilogrammes or more than 500 pounds Troy, were melted at Paris on the 13th of May, 1874, in the presence of the leading metallurgists of France, Russia, Belgium, Holland and England, and from which was intended to form the new metric standards for the various governments who have adopted the metric system of weight. Each set of the standard weights will cost 3,500 francs, and 45 sets had been ordered by different governments.

The value of the platinum melted for this purpose amounted to 210,000 francs, and the operation was successfully accomplished with the greatest facility and regularity, and without any mistake or accident, for the French government, by M. Tresca, the Sous-Directeur of the Conservatoire des Arts et Metiers in a building erected for the purpose. The platinum for this purpose was obtained from Mr. Geo. Matthey, of Johnson, Matthey & Co., Hatton Garden, London, who gave his cordial assistance in the operation, and possessed great experience in melting of platinum. The assaying of the metal prior and after melting was entrusted to M. Henri Sainte-Claire Deville, who is the Directeur of the Ecole Normale. The metal was first melted in quantities from 10 to 15 Kilogrammes, then remelted to quantities of 80 Kilogr. and lastly remelted to the entire enormous mass of 250 Kilogrammes.

ILLUSTRATION OF THE CRUCIBLE AND HYDRO OXYGEN BURNER FOR MELTING PLATINUM.



1. Wooden block as stand for furnace.
2. Base of the Crucible.
3. Cavity or receptable for the platinum, or bed of the oven.
4. Cavity in the lid of the oven. 4½—lid of the oven.
5. Stone Plug.
6. Opposite stone plug.
7. Handle of the furnace for tilting over to pour the metal.
8. Outer tube or cylinder admitting the hydrogen.
9. Side tube in connection with outer tube.
10. Tap for conveying the hydrogen.
11. Screw in the valve for holding the inner tube in position.
12. Inner tube for admitting the oxygen.
13. Tap for conveying the oxygen.

A bed of six inches diameter and two inches in depth will suffice for melting twenty-five pounds of platinum; for larger or smaller quantities of metal the furnace can be made in proportion

A simple arrangement can be made for hanging on the ingot before the mouth of the furnace to pour the metal in without risk of spilling.

(To be continued.)

Another New Trade Watch Company.

THE GREAT AMERICAN DEMAGNETIZED HYDROSTATIC TIME ANNIHILATOR THAT IT IS TO PRODUCE.

MR. ARISTARCHIUS PLUMBAGO recently arrived in this city, from the wilds of the great West, intent upon an enterprise that, in his estimation, is to revolutionize the watch manufacturing industry of the world. Plumbago is a person of vast intellectual resources, who is constantly devising philanthropical and beneficent schemes for the benefit of mankind. It cannot be said that his enterprises have heretofore been marked with any great degree of success, or have made liberal terms pecuniarily to either himself or those who have invested in his benevolent plans for the amelioration of those woes with which the human race is afflicted. In fact, Plumbago is impecunious, and also, in the vulgar parlance of the day, "out of a job." Nevertheless, his gigantic intellect continues to dwell upon the misfortunes of his fellow creatures, and to devise means for their intellectual, moral and physical improvement. Casting his eagle and philanthropic eye about him, he became convinced that what the human family at present stands most in need of is a time annihilator, possessing a combination of scientific and mechanical accuracy, and, at the same time, one that can be furnished to the trade at a minimum expenditure of the circulating medium. In short, Plumbago satisfied himself that the necessity of the hour is a cheap watch.

He is, therefore, at present in this city eagerly engaged in the congenial occupation of explaining his views to whoever will listen to him, and soliciting subscriptions to the stock of a company that is to manufacture the watch of the future—the Great American Demagnetized Hydrostatic Time Annihilator. "This company," explains Plumbago, "is to have a paid up capital of $10,000,000, the shares to cost only $1 each, and be taken entirely by the retail trade. This is a great philanthropical enterprise that is about to be inaugurated for the elevation of the social and moral status of the human race. As I cast my eyes over the world, I percieve that millions of human beings are groveling in ignorance, sin and misery; under the sunny skies of Africa there are thousands of negroes whose besotted ignorance is only equalled by their absence of clothing; in the regions of the North Pole there are other thousands more abundantly clothed, but equally ignorant; we see the savage black and red men making war upon the white race, and slacking their ignorant prejudices in human gore. Why is this thus? Why does this ignorance, this savage brutality, this nakedness, this degradation, exist? Simply because this crushing monopoly in the watch trade has prevented these unfortunate people from becoming possessed of watches. A watch, Sir, is the emblem of intellectual superiority. Look at those fortunate beings who possess watches. Did you ever see a man wearing a watch who had not clothes to cover his nakedness? Did you ever know a man wearing a watch to attack, single handed, the flower of the British army? Is it not a fact that a majority of those who wear watches can read and write? Do not they possess sufficient intelligence to bet on elections, and are they not adepts in horse trades? Certainly, all these blessings belong to those who wear watches. It stands to reason, therefore, that the watch is the great civilizer of the age, the most potent educational medium of the nineteenth century. Give to the natives of Africa, of Zululand, of Lapland, of Greenland and every other land, a watch apiece, and they immediately become the peers of the wearers of watches in this or any other country. Give them two, and they will become our superiors. My plan is, therefore, to make cheap watches by the million for the conversion of the heathen, both at home and abroad. For it is a fact that heathen, ignorance, misery and sin exist even among the watch-wearing people, simply because the watch manufacture has heretofore been controlled by a grasping monopoly, that insisted upon keeping up prices whereof they could make a profit.

"My plan is to appeal to the benevolent and Christian retailers in jewelry of this country to subscribe to this new company; to take stock in shares valued at $1 each. At this price everyone can afford to buy them. The money thus subscribed is to be employed in making cheap watches which can be sold to the heathen or the Christian for $1 each, and still leave a margin of 100 per cent. profit. I do not propose to pay any dividends to stock holders; I never have in any of the great enterprises in which I have been engaged; the subscribed capital will be considered in the light of a donation for missionary purposes. Whatever profit may be derived from the sale of my Time Annihilators, will be required to pay the salaries of the officers of the company. I shall be President, Secretary and Treasurer. As I shall also combine the office of President with that of General Manager or Superintendent, I shall, of course, expect a liberal compensation for my arduous services.

"The company is to commence operations as soon as the first million dollars are subscribed. Having received a few subscriptions, my salary has already commenced. We shall have the most extensive plant ever known. I have visited the great watch factories of this country and Europe, and, by carefully studying the various methods of production, and bringing my massive intellect to bear upon the subject, I have devised a machine which surpasses all others in the rapidity and cheapness with which watches can be turned out. It is very simple. I have but to feed into a hopper, a mixture of brass, steel, iron, nickel, and holes of various sizes, set the wheels in motion, and the machine will turn out 10,000 complete watch movements a day, all set up and ready for casing. I am negotiating for an iron mine for the company, but the brass I shall furnish myself from my own private supply. As our machine will be run by electricity, we shall require no labor, skilled or otherwise in making the movements. For the present, we shall make the cases in the usual way, but will soon perfect our machinery for making these. I am now engaging an army of case makers to begin operations. My plan is to locate the case factory in the vast wilderness of the West; to offer the greatest inducement to the best workmen to locate there in our employ, and then, after getting them to our factory, will cut down their wages so that they can't get away, and force them to work for us at any price. I have tried this before and found it to work admirably. By this means we shall be able to make watches very cheap—possibly for less than cost—so that the entire proceeds of sales will be profit. But, as I said before, stockholders must not expect dividends—they will be engaged in a great missionary work, and the sweet consolation of an approving conscience must be their reward. The officers of the company will take the profits.

"This is but a general outline of my plan; there are many details connected with it not necessary to explain. As, for instance, how the officers propose to furnish all the material used by the company, at such prices as will afford them adequate remuneration; what gold, silver, iron, nickel, or other metals may be used, will be furnished from private mines, for which I am now negotiating. As to placing our Time Annihilators on the market, I shall totally ignore the usual channels afforded by jobbers, and shall, so far as this country is concerned, rely upon those liberal retail dealers who subscribe for stock in the company. So long as these pay cash for their watches, and give satisfactory bonds that they will sell none but ours, they shall have the exclusive control of them. But, in order to work up a foreign demand for our watches, I shall send circulars, price lists, etc., to every clergyman and missionary in the known world. Also to all manufacturers of firearms, whose dealings with savage tribes are extensive; to all railroad and express employes, and to all travelers by land or sea. I am opposed to monopolies in the watch trade and will drive them all out of the business if possible. The Great American Demagnetized Hydrostatic Time Annihilator is to be the watch of the future, and, by means of the agencies I have suggested, and others, I hope to see the day when every human being will stand erect and clothed in one or more cheap watches. Of course, this will create a demand for watch chains, especially when people

begin to wear two and three or even four or more watches, and the chain makers will amass fortunes, until such time as we get our brass foundry in operation, when we will make our own chains I can see no limit to the demand for our Time Annihilators; they are to be made highly ornamental, richly frescoed, with bay windows and all modern improvements, and I expect to see people vieing with each other to see who can wear the greatest number of watches. We shall make one kind for the owner to consult as to the time for him to get up; another to regulate the hour for imbibing his matutinal cocktail; still another will tell him when breakfast is ready, and another will indicate when he should take his 'leven o'clocker; thus we shall have a separate watch for each important event of the day, even to notify the owner when it is time to drink between drinks. As a comfort and convenience, a beneficent and humanitarian agent, universal civilizer and unequalled evangelizer, the Hydrostatic Time Annihilator will have no rival.

"I am aware that is claimed that the watch market is already overstocked; that the supply exceeds the demand; that the price of watches is already too low. These are the cries of the great watch monopolies of the country, and are put forth for the sole purpose of keeping up the price of watches, enabling them to make enormous profits, and to revel in those luxuries familiar to the pampered favorites of fortune—overdue notes and protested paper. These statements are fallacious, as I shall demonstrate with my company. As I have said before, we shall have no dividends to make to stockholders; we shall pay no bills that can be avoided; such labor as we employ will receive no compensation; there will be nothing to pay but the officers. Consequently, our watches will cost almost nothing, and we can afford to sell at a liberal discount from this Cheap watches are always in demand for horse trades in this country, and among savages they will take the place of glass beads in all barters hereafter made. Indians on the plains will use them for buttons on their blankets, and the natives of Africa will utilize them to hold their suspenders on. For these purposes we shall send ready made button-holes with each invoice of watches. Fashionable ladies will use them to ornament their dresses, and, in fact, they will come into use in a variety of ways. The supply will never exceed the demand, notwithstanding the shriek of the monopolists.

"Our business will be of great benefit to the present trade in one respect, by increasing the amount of repairing to be done. Our watches being cheap, it cannot be expected that they will last a great length of time. Consequently, as they get out of order, they will be taken to the repairer. It will be necessary for every purchaser to have duplicate sets of watches, so that he can keep one set at the repairers while he wears the other set. Travelers will be obliged to follow the example of sailors in regard to wives, and have a set of watches in every port undergoing repairs. You will see that our plans are extensive, but there is no doubt of their success. We shall make the American nation famous throughout the entire globe for its watch industry. Our Time Annihilators will carry a knowledge of the American eagle into all lands, and the name of The Great American Demagnetized Hydrostatic Time Annihilator Manufacturing and Disseminating Company, will be written upon the pages of future history as the greatest benefactor to the human race that ever had a corporate existence. A few more shares can be obtained by any philanthropist by personal application to myself and the payment of the face value in the currency of the country."

Mr. Aristarchius Plumbago is a gentleman of large ideas, as will be observed from this disclosure of his plans. He has the utmost faith in himself, which is a fortunate thing, as no one else has. His talk, however, is hardly less visionary than have been some of the schemes proposed in reference to the watch trade. How visionary those have been may be ascertained by consulting the numerous wrecks of watch companies that strew the land. Nevertheless, with every new scheme proposed come new swarms of victims, and it is only after they have parted with their money that they discover how hollow and visionary was the proposed enterprise. Mr. Aristarchius Plumbago has had his prototype in the past as well as the present.

English Plate Marks

ARTICLES of plate are exempted from the capricious desire of the maker to see his mark upon his goods. The Goldsmiths' Company, associated as early as 1327, and regularly incorporated 70 years later, in the reign of Richard II., at present undertakes this duty. As the law now stands, all articles of plate manufactured in or near London must be sent to Goldsmiths' Hall, to be tested and to be marked. For this assay they receive from the manufacturers fees amounting to some five or six thousand a year, and from the Government a fixed salary for collecting the excise duty on gold and silver, and paying it into the Bank of England. The assayers exercise their functions with skill and impartiality. Small particles are scraped off the goods to be submitted to the test, and these are duly analyzed. The assayers do not know, and are not allowed to know, from whose manufactured goods the particles have been scraped off, but additional severity in the test is adopted where any manufacturer is found to have often sent goods below the standard. The marks adopted by the Goldsmiths' Hall are five in number, and each has its own special significance. There is the sovereign's head, which indicates plainly enough the reign. Next follows the lion passant; this is the standard mark, and is known to have been in use at the commencement of Queen Elizabeth's reign, but was probably introduced in Henry VIII.'s. The price mark is impressed next to it, and was fixed by one of those numerous acts which were passed in William III.'s reign to regulate and improve the condition of coinage, but whose impressions remain unaccounted for. One is the leopard's head, which is *par excellence* the hall mark, and the other is the maker's mark, which from long custom is added to the remaining four. But the period of the manufacture is not left to the mere vagueness of the sovereign's reign. The "date letter" supplies the missing information. Twenty letters of the alphabet are used for this purpose, the series beginning with the first, omitting J and terminating with U. On the 30th of May every year the letter is changed, and the shape of the letter every 20 years. Thus from 1796 to 1816 ordinary capitals were employed. The letter D would indicate that the article passed the Goldsmiths' Hall in 1799. With 1816 commenced the series of small letters, so that a date letter of d would fix the year as 1820. Old English capitals followed till 1856, and the next series commenced with small English letters. These various alphabets are of very old date, the earliest known commencing with the year 1438. But though London is the chief seat for the manufacture of plate in England, there were other towns which had their own assay offices or halls. Birmingham and Sheffield did a large trade, and constant communications were established between the local hall and Foster-lane. For this purpose what was called a "diet box" passed at the end of the year from the country town to the capital. The assayer in Birmingham scraped eight grains from every troy pound of manufactured plate. Four of these he retained and at once assayed; the other moiety was carefully deposited in the diet box, which contained specimens from all the articles manufactured. Once a year the box was sent up to the capital. The Assay Master of the Royal Mint would then take a fair average of all the small portions it contained, and solemnly make his assay. If the average reached the standard, the local assayer received a certificate; if not, he was fined.

It will thus be seen that there is a clear difference in theory between the marks on plate and on china. The latter are impressed by the manufacturer, at his own choice and for his own benefit. The former are compulsory, undertaken by a monopolist company, who are paid for the services which the public are forced to accept at their hands. The distinction suggests not merely important privileges, but grave duties. We have seen within the last few years the taste for Queen Anne furniture and for antiquities of all kinds spread into the region of plate and silver ware. Forthwith the curiosity shops seem to have been largely stocked with the rarest and most desirable pieces of old silver. The connoisseur, naturally and at once wary of counterfeiting, has found security in the hall mark. That guaranteed the genuineness of what had become suspiciously plentiful. And so with simple trust he bought largely and was largely swindled. In some cases the marks were forged, in others genuine marks were inserted into modern plate. Imposture proceeded on so extensive a scale that the Goldsmiths' Company have at last awakened to the importance of the subject, and are resolved to put down the imposture. It is well to get this assurance even now. But it comes rather late. In their own interest, in the interest of the public, and as a slight duty arising from a substantial privilege, the Goldsmiths' Company should long ago have shown this activity.

The Industrial Arts of India.

IT is safe to say that our knowledge of Hindu civilization has been more expanded during the past ten years than during the whole previous term of England's relation to India. The establishment of universities, officered by native instructors, of academies and archæological societies, and the rapid development of the native press, have combined to give a great impulse to the study of Hindu religions, laws, manners, history, and literature. Among the specific fields of inquiry recently explored is one about which very little information has hitherto been accessible, and this want is now met in the carefully prepared and profusely illustrated book, entitled *The Industrial Arts of India* (Chapman & Hall.) The author of these volumes is Dr. George Birdwood of the India office, who undertook this work at the joint request of the Committee of Council on Education and of the Secretary of State for India.

A considerable part of this unique and interesting book is devoted to a survey of the Hindu Pantheon, for the reason that the arts of India are, in a special and emphatic sense, an illustration of the religious life as that life was already organized in full perfection under the code of Manu. Mr. Birdwood devotes much space to describing art work in wood, copper, brass, and other metals, including gold and silver. The only mention of gold plate in the Rig-Veda is an allusion to golden cups, but the wheels and yokes of carriages are described as made of gold. Perhaps the oldest example of really ancient gold work is the casket belonging to the India Office library, which was found in the Cabul Valley, and is referred to a dynasty of Græco-barbaric kings, who ruled in this part of India about 50 B. C. The whole is executed in the finest style of beaten (repousse) goldsmith's work, and the storks, or cranes, with outstretched wings, in the spaces between the arches, in which apostle-like figures are niched, recall at once the figures of angels carved in the spaces between the arches in Christian churches. There is also a very ancient *patera* belonging to the India Office library, which depicts in high relief the procession of Dionysos. This is known to have been an heirloom in the family of the Mirs of Bedakshan, who claim to be descendants of Alexander the Great, and who sold it in their extremity when they were conquered by a neighboring potentate. The Panjab has at all times maintained a traditional reputation for the excellence of its gold and silver plate. The best known is the parcel gilt work of Cashmere, whose elegant shapes and delicate tracery, graven through the gilding to the dead white silver below, which softens the lustre of the gold to a pearly radiance, producing a most charming effect. It is an art said to be imported from Mangolia, but influenced by the natural superiority of the people of the Cashmere valley over all other Orientals in artistic metal work. Among the Prince of Wales's Indian presents was a tray with six cups and saucers in ruddy gold, which is an exquisite example of the native goldsmith's art. This "ruddy gold" is used in India only in Cashmere, and outside India proper in Burmah. In all Hindustan elsewhere gold is stained deep yellow, except in Sindh, where the goldsmiths and jewelers give it a singular and highly effective tinge of olive brown. In the Bombay Presidency the plate of Kutch and Gujaret has long been noted. The goldsmiths of Kutch are also very skillful in decorating arms with silver and gold, and colonies of them are established all over the province. In the city of Bombay alone there are 2,825 jewelers who find constant and lucrative employment. The Indian goldsmith has sometimes to execute his work on a truly colossal scale, reminding one of the tasks undertaken by members of the same calling for Solomon's temple and house.

The art of enamelling has been brought to great perfection in India, and Mr. Birdwood describes some work of this character which is exceedingly elaborate and beautiful. During his visit to that country, the Prince of Wales received some elegant samples of the jewelers' art, of which presents perhaps the daintiest in device is a native pen and ink case, shaped like an Indian gondola. The stern is figured like a peacock, the tail of which sweeps under half the length of the boat, irradiating it with blue and green enamels, brighter even than the natural iridescence of a peacock's tail. The canopy which covers the ink bottle is covered with green, blue, ruby, and coral red enamels. It is the mingled brilliance of its emerald greens, turquoise and sapphire blues, and ruby reds which, laid on pure gold, creates the superlative beauty of the enamelihg of Jaipur. The art is thought to have been brought to India long before the Christian era from China, where, according to Chinese annalists, it was practised at a very early date. From Hindustan it seemingly passed through Assyria into Egypt, and through the Phœnicians to Europe.

The Jeweler's art in India is of the higest antiquity, and the forms of Indian Jewelry have come down in an unbroken tradition from the early ages of Vedic civilization to the present day. The code of Manu minutely defines the duties of the jeweler, and the fines he is to pay for boring gems improperly, or for debasing gold. In the "Ramayana," Sita is depicted as arrayed for her marriage with Rama with jeweled butterflies in her raven hair, a golden zone about her slender waist, and her ears resplendent with gems, while bands of gold encircle her ankles, arms, and waist. On her fingers she has jeweled rings, and on her toes golden bells that tinkle as she walks with narrow naked feet over the gorgeous carpets. An old vocabulary, compiled for the court of Vicramaditya (B. C. 56), gives a long list of jewelry, all of whose names are still current terms in India. After the Archaic jewelry of Ahmedabad (made of chopped pieces, flat or cubical, of the purest gold strung on red silk), the work of the purest Hindu style is the beaten gold of Mysore and Vizagapatan, which illustrates the admirable way in which the native craftsmen elaborate an extensive surface of ornament out of seemingly a quite inadequate quantity of metal. By their consummate skill they contrive to give to the least possible weight of material and to gems commercially valueless the highest possible artistic value, a character in striking contrast with modern European work, in which the craftsman's object seems to be to bestow the least amount of labor on the greatest weight of metal. The finest gemmed and enameled jewelry in India is that of Cashmere and the Panjab. It consists of tires, aigrettes, and other ornaments for the head and brow; of earrings, ear chains, nose rings, and nose studs; of necklaces and collars with back and breast pieces; of armlets, bracelets, rings, and anklets in infinite variations of form. The bracelets, like those of Assyrian sculptures, often end in the head of some wild beast, and the pendant plaques are sometimes enameled at the back, with bird or animal *affronté*, on either side of a tapering cypress tree. The jewelry of Scinde and Baluchistan usually takes the form of solid silver torques anklets, and bracelets of a severe style of rectangular construction and ornamentation. The silver filigrain work, in which the people of Cuttack, in Orissa, have attained surprising skill and delicacy, and which is so frequently seen in the Bombay shops, needs only a passing reference, since it is identical in character with that of Arabia, Malta, and Genoa. As regards the price of Indian jewelry we may note that at Lucknow, formerly the headquarters of the industry, the finest and most elaborate work only adds six per cent. to the value of the raw material, and all over the peninsula the artisan's and dealer's compensations combined represent a premium of only one-twentieth to one-fourth on the net worth of the metals and gems used. An artist of the highest pretensions is happy to work for fifty cents a day, and sixteen cents is considered fair wages for a skilled workman.

Mr. Birdwood's description of artistic work in furniture, and in fabrics of various kinds are full of interest. The author says it is only through generations of patient practice that men attain to the mystery of such subtleties, and, once learned, it is of moment to the world that they should not be forgotten. He pronounces it a terrible error to have darkened by the pressure and teaching of the English schools of art, and the competition of Government jails and other State institutions and departments in India, the light of tradition by which the native artists have performed their matchless work in gold and silver, brass and copper, and jewelry, and in textile fabrics.

A Pendulum Experiment.

THE large old-fashioned clock of the last century, that used to stand in the corner of the "sitting room," and was large enough to contain an entire small boy when an impending parent with a switch suggested the propriety of flight and concealment, has become nearly extinct. A few of these clocks still tick in secluded country places, and occasionally a collector of bric-á-brac boasts the possession of one of them, but they have been almost entirely superseded by the small and portable clock which is one of the staple productions of Connecticut.

Mr. McIlvaine, of North-by-West Hampton—a small village situated in the neighborhood of the four cardinal point Hamptons, Long Island—is sufficiently fortunate to be the owner of an old-fashioned clock of great miscellaneous merits. In addition to telling the hour of the day, it tells the day of the week, the time of the rising of the sun and moon, the state of the tide, the text of last Sunday's sermon, the age and sex of the children, and other facts too numerous to mention. In fact, it is an encyclopedic clock, and to sit in front of it and watch it six hours a day would be an excellent method of obtaining a liberal education.

Mr. McIlvaine's family consists of himself, his daughter, and his son, the latter being aged a little over 12 years, and being a boy with a painful fondness for scientific experiments. While Mr. McIlvaine is a most estimable man, it must be confessed that he is somewhat arbitrary in his ways, and it may be cited in proof thereof that he has made a domestic law that all persons who come to visit his daughter shall go home at or before half-past ten o'clock. This is rather trying to Miss McIlvaine, since, as all rural young ladies know, the rural lover is shy during the day time and the early evening, and rarely bites freely, to use an angling metaphor, until after eleven o'clock. Of course, the chances of catching an eligible husband are greatly lessened when a domestic game law forbids the prosecution of the sport after half-past ten. Nevertheless, as Miss McIlvaine was an obedient daughter, she obeyed the parental command, and warned all young men off the premises when the fatal hour arrived. If a wicked and deceitful generation asks why she did not turn back the hands of the clock when she had a desirable young man in the parlor, it may be answered that she scorned deception, and that her father kept the glass which covered the face of the clock carefully locked.

Master McIlvaine attended school, and, as a painful consequence acquired a good deal of scientific information. Although this was, of course, deplorable, it would have been much less injurious to the peace of the community had Master McIlvaine been less ingenious than he was. It was the way in which he applied his scientific information that made him a terror to all respectable people. For example, having learned that eggs sufficiently matured to fit them for political purposes contain sulphureted hydrogen gas, he conceived the plan of supplying the town with illuminating gas, and began a system of operations with the aid of six dozen of the local grocer's last year's eggs, which threatened to temporarily render the East End of Long Island uninhabitable, except by persons fortified with hay-fever. This dangerous boy was one day taught by a depraved scientific book that the speed of the clock varies as the length of the pendulum. That very evening, before going to bed, he lengthened the pendulum of his father's clock nearly two feet, not with any deliberate malice, but merely in order to try the experiment.

At eight o'clock that evening young Mr. Slocum called on Miss McIlvaine, much to her pleasure, since she was confident that his capture was a mere question of time. A little later old Mr. McIlvaine looked into the room, and, glancing at the clock, remarked that he was going to bed. Absorbed in their conversation, the young people, when they were left to themselves, took little note of time, until it suddenly occurred to Miss McIlvaine that it must be nearly half-past ten. Hurriedly releasing herself, she turned up the lamp, and to her astonishment found that it was only nine. Mr. Slocum admitted that he, too, was surprised to find that it was no later, but expressed much delight at the prospect of further conversation.

After a prolonged period of convesational bliss the young lady again turned up the light, and found that it was only half-past nine. Mr. Slocum said that he would undergo repairs with a large needle and a skein of worsted if he didn't think they had "sot and sot for mor'n six hors." At this implication that he found the evening a tedious one, Miss McIlvaine became indignant, and a quarrel ensued, which consumed a good deal of time before peace was restored. Conversation was resumed, but after a time both Mr. Slocum and Miss McIlvaine became decidedly sleepy. In fact, each charged the other with having actually fallen asleep, and a new quarrel seemed at one time imminent. Mr. Slocum felt that it was a point of honor not to take his leave before half-past ten, but he began to wish that the evening would come to an end. When for the third time the lamp was turned up, the clock said that it was only ten, he insisted that it was wrong. Miss McIlvaine thereupon said he was a brute, and that a man who could not sit two hours with a young lady did not deserve to be treated with civility. For the rest of the evening the lovers occupied seats several feet removed from one another, and the light was no longer turned down. From time to time they glanced at the clock, which ticked with awful solemnity, though its hands crept with exasperating slowness. At intervals they slept in their chairs, and when Mr. Slocum, waking from his last brief nap, said that at last half-past ten had arrived, he felt profoundly grateful, and, arousing Miss McIlvaine with a gentle shake, informed her that he didn't know but what he might as well be going.

As he approached the front door, accompanied by his fair though but partially awakened friend, the dread sound of parental boots smote his ear. He saw, to his horror, old Mr. McIlvaine, fully dressed, descending the stairs, and the next moment he was requested to explain what he was doing in that house at such an early hour. Mr. Sclocum tried to explain that it was not so very early, and that, in fact, it was just half-past ten, but he was requested with much plainness to abstain from impudence. Opening the door and letting in the daylight, Mr. McIlvaine produced his watch, and having convinced the bewildered Mr. Slocum that it was five o'clock in the morning, he proceeded to drive the young man from the premises at the toe of his boot, and then went calmly to attend to his morning cows.

In the course of the day Master McIlvaine happened to explain the mystery of the clock, and his father comprehended how it had come to pass that his daughter and her lover had sat up all night. It was, however, too late to recall the peremptory leave-taking of the young man at the front door. Mr. Slocum's feelings were permanently outraged, and it is hardly probable that he will again expose himself to the treachery of the McIlvaine clock. Thus, Master McIlvaine's love of scientific experiment wrecked his sister's matrimonial prospects, and led a worthy young man into a painful and contused position.—*New York Times.*

Swindling in Antique Silverware.

THE rage for antique silverware in England has developed an ingenious method of swindling, which has just been discovered by the Goldsmiths' Company of London. The fraud is effected by cutting out genuine hall marks from small but antique articles of silverware and inserting them on large pieces of wholly modern plate. Thus the bottom of a salt cellar, say of Queen Anne's time, is dexterously removed and worked into a fabric of a tankard, a soup tureen, or some equally massive object in silver recently manufactured, and the sham antique—the authenticity of its hall mark defying all experts—thus passes muster of having been made one hundred and eighty years ago, and commands a corresponding enhancement in price. One dealer of this sort has lately been convicted and sentenced to a heavy term of imprisonment.

Proceedings of the Horological Club.

A Distinguished Body of Watch and Clock Makers.

Seventy-seventh Discussion.—Communicated by the Secretary.

(Notice.—Correspondents should write all letters intended for the Club separate from any other business matters, and headed "Secretary of the Horological Club." Direct the envelope to D. H. Hopkinson, Esq. *Write only on one side of the paper*, state the points briefly, mail as early as possible, as it must be received here *not later* than two days before the end of the month in order to be discussed and reported in the CIRCULAR for the next month.)

How to size a ring on a ring gauge.

Secretary of Horological Club:

A ring was recently given to a workman to alter, with instructions that it should be changed to size 6½, Allen's gauge. The workman altered it so that the *edge* of the ring came to the mark 6½, on the ringstick. The man who gave the instructions objected to it; saying that the *centre* of the *inside* of the ring should be over the 6½ mark. The workman replied that the proper way to make a ring of a certain size on a ringstick was to bring the *edge* of the ring to the mark, because any ring properly made is of the same size at the center as it is at the edges; and the ringstick is made tapering so that when the edge of the ring is pushed up as far as it will go, the centre of the ring necessarily stands off from the stick. In a narrow ring this would make very little difference, but in a wide one, it amounts to something.

Now, who was right, the workman, or the salesman?

Please state also which is the method generally used in New York?

S.

Mr. Rolliver replied that the workman was right. The edge of the ring shows the size inside, as well as the center would. The mark on the stick shows what the size of a certain number will be. When the edge of the ring comes on the mark, the inside of the ring is of course that size. That is the practice here, and among workmen generally.

It may be that the salesman had taken the size or order from the customer in the manner which he claimed was right. In that case, the ring would have to be cut on the same plan, in order to fit the customer. But that is not the usual way of measuring.

How to tell an "adjusted" watch.

Secretary of Horological Club:

I notice in catalogues and lists of prices a good deal said about "adjusted" movements. But the word "adjusted" seems to mean different things at different times, for some quite cheap watches are called "adjusted," the same as the very best quality. Now, what have we a right to expect of an "adjusted" watch, and how can an ordinary workman tell whether a watch is really "adjusted" or not? Full particulars are desired.

F. B. P.

Mr. Isochronal replied that the meaning of the term "adjusted" varied, according to whether it was applied to the balance, the movement, &c. An adjusted balance may be chronometer or compensation balance which is adjusted for changes of temperature, so that it will keep the same rate in warm or cold weather. This adjustment is made more close or perfect in fine watches than in cheap ones. A great many are sold as "adjusted" that have never been adjusted at all.

But there are other adjustments besides that for heat and cold—as the adjustment for positions, which enables the watch to keep the same rate whether hanging up or lying down, or in any other position, while carrying, &c.; the adjustment for isochronism, which is an adjustment of the balance spring to secure isochronal vibrations of the balance; the rating or timing is often called the adjustment for rate, &c. An adjusted *movement*, or one "fully adjusted," should have all of these adjustments, but an adjusted *balance* is only adjusted for heat and cold.

An expansion balance whose rim is not cut entirely through, is certainly *not adjusted*, and cannot be. This is a simple test for some kinds of cheap bogus "adjusted" watches. But the methods of testing cut balances, and also for testing the other adjustments, are too numerous and too lengthy to be explained in these reports. Mr. P. had better send to the publisher of this journal for a copy of Excelsior's "Practical Treatise," where he will find full directions, not only for testing all the different adjustments, but also for making them, in the best possible manner. Our correspondent will have a better idea of the use and value this book will be to him, if he will read the remarks of Mr. Horologer, on "What the Modern Watchmaker should know," in the Proceedings of the Club at our July meeting. He will also see that "full particulars" are rather more of an undertaking to give than we would care to enter upon, off hand, and one which comparatively few workmen are competent to accomplish. But he may rely upon this work as fully trustworthy and correct, and is probably the only practical work of the kind which he can obtain at any price.

Ready made material for American watches.

Mr. Ruby Pin then took the floor and observed that, on looking over the report of the Proceedings of the Club at last meeting, he had noticed the statement of the Secretary that in reading the letter of Mr. X., he had omitted some parts of the letter which only Mr. Waltham could answer. Having some curiosity to know the tenor of the omitted parts, he had examined the original letter a few days since, and believed he had a little something to say about the matter himself.

Those portions which concerned Mr. Waltham, that gentleman could answer on his return. But there was also an insinuation by Mr. X., that the deliberations of this body were governed by the advertising columns of the CIRCULAR. This was something that did not concern Mr. Waltham alone, but the entire Club, and he proposed to answer it himself and now. He could say that Mr. X. or any other correspondent who insinuates anything of that kind, intimates something that he knows nothing about, and something contrary to the facts. We know no more about the advertisers or advertising columns of the CIRCULAR, and have no more interest in them, one way or the other, than any other subscribers. The space kindly given us in the CIRCULAR is given without condition, and there is no understanding that we shall have any special regard for advertisers, but we expect, and are at liberty, to bestow commendation or disapproval according to our individual opinions on the merits, and our past published Proceedings show that we do so. Mr. X. may be the best advertiser the CIRCULAR has, or he may not advertise at all. That is a matter we do not know, and which does not concern us in the least. We have only to deal with his communications to us. And, with all due respect to Mr. Horologer, he thought that gentleman had been altogether too mealy-mouthed in his reply to the strictures of Mr. X.

Mr. Horologer explained that he was not aware that Mr. X. had questioned the fairness of our discussions.

Mr. Ruby Pin then inquired if he had any conscientious scruples or private reasons for not naming the "two companies," whose materials he thought worthy of being considered really "interchangeable?"

Mr. Horologer replied that he referred to the American and Elgin Companies.

Mr. Ruby Pin then requested that Mr. X. would favor us with the name of that company which was very often unable to replace a broken staff without rejeweling the holes, even out of a large stock to select from. Let us know which it is. We have had enough of insinuations and back handed slaps. If there is anything to be said here, let it be said openly and above board. We will show Mr. X. and that company whether our discussions are governed by the advertising columns or not.

Mr. Ruby Pin then declared that he fully endorsed all that Mr. Waltham had said in favor of the principle of interchangeable parts, and that the materials of some companies were interchangeable in fact—and he believed that gentleman might have stated the case still more strongly than he had. He was not interested in sustaining Mr. Waltham's statements in any way, except because he believed them to be justified by the facts. Personally, he was more interested in the sales of the Elgin watches. Mr. Waltham had stood up for the materials of the American Watch Co., and that was all that he was bound to do. Had he (Mr. R.) been present at that meeting, he should have added the Elgin Co. to the list—and he wished now to say that he considered their materials equal to those of any other company for close grading, accurate fitting, and "interchangeability." Two companies are now squarely on the record. If any others see fit to present their claims, they have an equal chance before the Club, whether they "advertise" or not.

Mr. Ruby Pin said that he never had any noteworthy trouble in his own experience. in replacing broken parts with ready-made materials of either of these companies. A nephew of his, in business in an interior town, had also informed him that he seldom had any difficulty at all in ordering either Waltham or Elgin materials by mail—sending merely the number and description of the movement—and that he had on several occasions, after ordering a balance staff in that way, found it a complete fit as sent, and had the watch together in perfect running order within 15 minutes after receiving the staff in the mail. He denounced as absurd, the case supposed by Mr. X., of a balance staff too small for the balance, and hair-spring, and roller table, with pivots which would not fit the jewels, and endshake which required the jewels and endstones to be moved. He challenged any member of the Club to say that he had ever experienced such an instance with either Waltham or Elgin materials. He then closed by reading a letter taking the same views, handed him

by the Secretary—written by a gentleman whose initials will be recognized as those of a frequent correspondent and a workman of experience.

Secretary of Horological Club:

I see in the July number of the JEWELERS' CIRCULAR a reply to a Mr. B's complaint in a previous number of the CIRCULAR, about ready made material for American Watches. My experience has been somewhat the reverse of that of "B" or "X." I have several times replaced damaged or lost wheels and pinions in both Waltham and Elgin watches, and never had any trouble in getting a wheel and pinion that would fit, without sending the plates to the factory. I once ordered pallets for a home movement, and did not send the escape wheel, and of course had to adjust the action of wheel and pallet. But I have No. 7 Elgin movement on my rack now, that required a new lever, pallet, and pallet arbor. I sent the escapement to the factory, with the request to send me a new lever, pallet, and pallet arbor, for a No. 7 movement, which I received in a few days, and it was all right—required no alteration of pivots, endshake, fork and roller action, or wheel and pallet. Balance staffs I usually turn in myself, as it would require a large assortment to have one suitable for all the different grades, and the original cock and foot hole jewels are frequently replaced with others with larger of smaller holes.

H. P. B.

HOW TO REGULATE A FINE WATCH.

Secretary of Horological Club:

Will some member of your honorable body please inform me how to regulate the "Arnold," Chas Frodsham watch? I have tried altering the hairspring by taking up and letting out, but could never obtain the desired effect. I will be greatly obliged to the Club for an answer. W. W. S.

Mr. Isochronal answered that when a watch has no regulator, it is regulated by the timing screws in the balance rim, at the ends of the center bar. They are turned very slightly, inward to make the watch gain, and outward to lose. Both screws must be turned exactly the same amount, or the balance will be thrown out of poise, and *regular* running will be impossible. Should the amount of regulation wanted be too much to be easily corrected by these screws, it shows that there is some fault in the movement, which should be looked after and repaired. This may be in the escapement, or elsewhere. It is sometimes caused by the balance rim having become bent by careless handling.

But the hairspring should never be disturbed in a fine watch, unless in some very exceptional circumstances. Its length and curvature have probably been carefully adjusted to secure isochronal vibrations of the balance, and taking it up or letting it out will at once damage or destroy the isochronism. Even taking up a hairspring and afterwards putting it back where it was in the beginning will often spoil it for fine running, because the shape of the spring and the condition of the metal have been so altered by the pressure of the pin in the hole, the bending or straightening of the coil, &c., as to unfit it for isochronal action. It is difficult, in fact, for a workman who is not fully posted in fine watchwork, to handle a fine movement without injuring it in some way, although he may not know how he did it, or discover the fact till the owner complains of its inferior performance.

Why a fine watch is so difficult to handle without injury to some of its adjustments, or how it should be handled to avoid such injury, would take altogether too long to explain in these meetings. The best thing he could do was to repeat what he had already said to so many correspondents, inquiring about these finer branches of watchwork—and to advise Mr. S. to obtain a copy of Excelsior's "Improved Treatise" and study it thoroughly. He will find there full practical instructions upon all such points, much of which cannot be found elsewhere. The information he will obtain from that book will save him much time, trouble, and perplexity, even in repairing the most ordinary work—and may prevent his ruining a fine watch and getting the name of a botch, as happened to a recent correspondent of the Club. It is very probable that Mr. S. had done little and perhaps no injury to this watch, but even in that case would have been saved a deal of trouble and vexation had he known in the first place what to do.

Why workmen would be content to plod along in ignorance of the requirements of a fine, or even a fairly good, watch, and in constant danger of doing it serious damage, when they might inform themselves by expending the earnings of a single day, was a mystery to him. It could not be because they did not know about Excelsior's book, for the Club has recommended it repeatedly as one which every workman ought to have and to study. The information it contains is useful to everyone, even apprentices. It is the only work devoted to those special subjects in the language, and each subject is treated fully and thoroughly, in plain language that any workman can understand. Any man who would run risks to avoid paying $3.50, has none of the spirit which actuates the true workman, and will prove more of a detriment to the craft than of good. He wished to say that he did not mean these remarks for Mr. S., who was a new subscribrer to the CIRCULAR, and consequently had not seen any notice of that book before—but he was speaking generally, of those who did know about it, but who thought more of their pennies than of informing themselves upon subjects which they *must* understand if they do not want to "butcher" their work. As this is the only really practical and complete work to be had on these subjects, it cannot be said that they buy some other one, but shows that they act from sheer indifference—for the cost need not deter anyone. He had no sympathy or patience with such, and the trade would be better off without than with them. If they botched their work, lost their customers, and got an ill repute, he could not say that he was at all sorry for them, but thought that it was no more than they deserved—and was only sorry for the competent members of the trade who availed themselves of every opportunity to inform themselves, but who must neccssarily suffer in reputation by the blunders of the so-called watchmakers who neither understand their business nor desire to learn.

WHAT IS GOOD RUNNING FOR A CHRONOMETER?

Secretary of Horological Club:

In your judgment is a chronometer running well that gains three-tenths of a second a day when it is in good order? N.

Mr. Isochronal replied that there is considerable misapprehension on this subject. A small average daily rate is often accepted as evidence of good running, whereas that has no bearing in considering the question. *Steadiness* of daily rate is the quality required. The *amount* of the daily rate is a mere matter of regulation. A chronometer might average a daily gain of three-tenths of a second, or less, for any given period, and yet run very poorly, because of great *fluctuations* in the daily performance. In all trials of chronometers or watches, it is this great quality of *uniformity* in daily, weekly, or monthly rates, which is determined, and the *amount* of the rate has no effect on the result. If our correspondent means to ask whether a uniform gain or loss of three-tenths of a second is a good rate, we would say that it is generally considered a fair rate, although it can of course be improved. But a *uniform* rate of three-tenths of a second per day is one which fifty chronometers fail short of to every one that surpasses it.

WHO SELLS THE INGOLD FRAISES?

Secretary of Horological Club:

In the May and June numbers of the CIRCULAR in the Proceedings of the Horological Club, I noticed a tool mentioned called Ingold fraises. I also see, in the July number, "Excelsior" mentions the same tool—page 108, section (4)—which fully convinces me that it is a good tool, and one which it will pay any jeweler who wants to turn out good work, to pay the price named in the June number, viz: 30 to 50 shillings. Can you inform me where such a tool can be had and what it will cost in this country? An early reply will greatly oblige, A. P. A.

Mr. Uhrmacher said he did not know of any dealer who kept the fraises in stock, but any of our principal material houses would import them to order. There is no question that they are valuable tools, and, as Excelsior says, are indispensable to a good workman's kit. Mr. A. is evidently not one of the "plug workmen" who think a file is good enough to shape teeth with. Nothing is a surer sign of a good workman than a determination to have good tools. And one cannot go wrong if he follows Excelsior's suggestions.

DESTROYING THE MAGNETISM IN WATCHES.

Mr. Clerkenwell then said that, as correspondents have often inquired how to remove magnetism from watches, which have unfortunately become magnetized, he took pleasure in informing our correspondents that Messrs. L. & A. Mathey, No. 16 Maiden Lane, in this city, seem to have discovered a practical way of accomplishing the result very quickly and thoroughly. They do not tell how it is done, but will treat watches which are sent to them for that purpose, on reasonable terms. They are already doing a considerable amount of that kind of work. The watches of iron miners seem to be particularly liable to be injured in this way, judging from the number sent them from the iron mining districts of Pennsylvania, to be demagnetized. No doubt many of our readers will be glad to know that a method has been hit upon which seems to really destroy the magnetism, and they may send their watches to Messrs. Mathey with perfect confidence.

The meeting then adjourned.

The Art of the Silversmith.

BY W. HERBERT SINGER.

FROM the middle of the thirteenth century to the termination of the fifteenth, the metal work created by the Italian artists was of the greatest beauty; the forms were then both pure and correct, and it was the study of ancient art that brought about this splendid result. The style of these two centuries in Italy is one peculiar to herself, and of which she may indeed be proud. Although it was, in a certain sense, a revival of the old traditions, it was to the sixteenth century that the term of the "Century of the Renaissance" has been given. The sixteenth century was, above all others, a time when classical subjects were most produced, to the popular taste. Indeed, the style now practised was well suited to the commoner objects executed in gold or silver, but it is doubtful if the grandeur of the two preceeding centuries could be attained in their larger and more ambitious works. One great reason why the work of the latter part of this century did not reach the high standard of the sixteenth is to be found in the fact that the artist and the workman ceased to be one and the same individual. The designer was now a person in a higher social position than the plebeian artisan who executed his thoughts. Here, then, was the beginning of this fatal breach, which has done more injury, and more to prevent future progress, than all else to this noble branch of the industrial arts.

But, just before this fatal change took place, there lived an artist, who seemed to unite in himself the genius that usually falls to the share of a generation of artists.

Benvenuto Cellini is the artist of all others who represents the silversmiths of the revival, as Michael Angelo and Raphael represent the painters and sculptors. He was born at Florence in the year 1500, and at the age of thirteen was placed in the workshop of Michael Angelo. The first work of which he speaks in his memoirs is a silver buckle; upon it were represented in low relief cupids and grotesque heads, intermingled with foliage. When nineteen years of age, he went to Rowe, and, during the two years he resided in that city, devoted himself principally to the study of ancient examples. He then visited various places, and amongst others his native town; but in 1523 a quarrel obliged him to quit Florence, and he again returned to Rome, where he remained until 1537, and it was at this time that he gained much of his renown. In 1540, Cellini paid his second visit to Paris, and remained five years at the French Court, during which time he executed many important works for Francis I.

Had we not the short account by Vasari of this remarkable man, and if there were only his own autobiography by which to judge of his merit as an artist, we might well have doubted if the vast reputation of this artist, workman, and author, was not gained more by his pen than by works of his creation. Let us, however, form our opinion of him as a citizen, from the well-known memoirs in which he gives such a graphic description of his various doings; and, as an artist, from what another says of his work; and before Cellini is accused of being a man of the worst character, we must consider the state of society at the time in which he lived. All the dangerous vices of a highly cultivated people were allowed to flourish without any restraint whatever; but, notwithstanding this, Cellini has painted himself in no enviable light. As an artist, however, he must have had the highest position, and his works were, without doubt, held in the greatest estimation.

The Italian biographer, in his "Lives of Painters and Sculptors" speaks of him in the following glowing terms:—"Benvenuto Cellini, citizen of Florence, at present a sculptor, in his youth cultivated the goldsmith's business, and had no equal in that branch for many years, nor in making fine figures of alto and basso-relievo, and every other work belonging to that ingenious art."

Before we take leave of the great Florentine artist, I must mention that he, like Theophilus, wrote a treatise on the silversmith's art. In this he describes the method of making jewelry, composed of gems the composition and application of niello, the art of filagree, enameling, jewelry properly so-called, that is the art of forming, from sheet gold or silver, the little figures with which he so richly decorated his work. He also speaks of the engraving coins; but the most interesting portion is that wherein he explains the process of making gold and silver vases, and silver statues of even the size of life. One method of ornamentation much used during the sixteenth century, and which received so much attention from Cellini, is damascening, or the art of forming designs in gold or silver, on iron, bronze, or other hard metal. This is one of the most interesting processes used in the decoration of metal work, and I am able to illustrate the method of producing this work by two specimens, the one in an incomplete stage, and the other the same design finished.

Spain was one of the first countries to follow the great example set by Italy. This may be explained by the frequent intercourse then existing between these two nations, and also through the unsettled state of their art after the evacuation of the country by the Moors. It was now that the discovery of the New World poured into Spain a hitherto unheard of supply of the precious metals, especially of silver; and, as one would suppose of a people so devoted to their religion, large quantities of these riches were made into church plate and given to various cathedrals and churches throughout the land.

Perhaps, after Italy, no other country of Europe flourished so beautiful and characteristic a style as that which was developed by the Germans during the sixteenth century; and, what adds an additional interest to it is, that it is a national art, a creation of their own, and not, as was the case with the other countries, a direct copy of the Italian Renaissance. At the commencement of the century, the traditions of Gothic art were much adhered to, the constructional lines of that style being generally used, but they were greatly modified, and afterwards almost entirely superseded by the vegetable forms, which, at first, were only entwined round them, but, by degrees, these ornamental branches formed the essential part of the design in much of their silver work. This peculiar characteristic was impressed upon their art by an eminent group of artists, at the head of whom was Albert Durer, and the style of which I speak will at once be detected in many of his etchings. The work that was now produced in Germany does not, of course, bear comparison with the masterpieces of the Italian silversmiths, but this German art has a grandeur of its own, which can only be obtained by earnest endeavor in an original style. This is not the time at which to expect great works to be created for religious use, especially by the country which gave birth to the Reformation, but at Augsburg and Nuremburg were manufactured every class of secular metal work in the greatest profusion. The artists of Nuremberg preserved in their work that German feeling of which I have spoken longer than their brethren of Augsburg, but in the latter part of the century, nearly all the silver work, especially that composed of figures and ornament in low relief, closely resembles that of Italy. In the form of their vases, they still preserve their originality; and the arabesques with which these objects were often decorated, are beautiful in design, and exquisite in workmanship.

In France, it was during the reign of Francis I. that this style reached the height of its power. The king, having seen the productions of Italian art, determined that his own countrymen should have the benefit and example of the greatest masters. Together with eminent painters and sculptors, Benvenuto Cellini was invited to the French Court, and by these artists was the cinquecento introduced and developed in France.

We have now reached a period in the history of the silversmith's art at which I desire to draw particular attention to England. Not that the work produced in this country during the fifteenth century is worthy of being classed before that of the other nations of Europe, but because the art of this land is naturally of the greatest interest to

us; and, moreover, I do not think we should be satisfied with the state of this industry in England at the present moment; and if my humble efforts to-night are to lead to any practical result, it will be necessary to follow more closely the history of this art in our own country, and to devote but few words to the silver work of other nations.

It is sad to find that the records we have of silver plate in England during the sixteenth century relate more to destruction than creation. But for the wholesale spoliation which now befel the goods of the Church, what art treasures would have yet remained to us!

It is usual to credit Henry VIII. with having effected the whole of the ruin which now befel ecclesiastical property, but in the reign of his son Edward VI., many of the parish churches retained their original plate. It was not, indeed, until Queen Elizabeth allowed all the churches to be sacked of the last remnants of these "monuments of superstition." that almost everything was swept away. Before this, however, a gradual devastation had been steadily going on, for in the last year of the reign of Edward VI., by order of the commisioners, nearly all was seized but a few chalices, the number and size of those being left according to the size of the congregation. But even these could not long be spared, for directly after came injunctions from the king that all "monuments of feigned miracle" were to be ruthlessly extinguished. The chalice in which the mass had been celebrated came under this ban, and but few escaped its dire influence.

In the churchwardens' accounts for the year 1552, in very many parishes. will be found an entry relating to the exchange of the chalice and paten for a communion cup. But these new objects had but a short life, as upon the accession of Mary in 1553, they were not, of course, considered fit for the restored ritual of the Church of Rome. The respite granted to religous art during the short reign of Queen Mary was, however, of no avail, as her half-sister, Elizabeth, was a most inveterate enemy to all Popish belongings.

In 1659, at the visitation of Matthew Parker, he inquires if within the diocese of Canterbury, "they do minister in any prophane cuppes, bowles, dishes, or chalices hitherto used at masse, or els in a decent communion cuppe provided and kept for the same purpose only." The consequence of this untiring search is the almost entire destruction of pre-Reformation ecclesiastical silver-work.

"The fair and comely communion cup of silver, and a cover of silver for the same, which may also serve for the ministration of the communion bread," which the Commissioners of Queen Elizabeth directed to be used in every parish in England, is too well known to need much description. Numerous examples are to be met with all over England. It is very remarkable what exact uniformity of design was always maintained in these Elizabethan chalices. The bowl is always of the same elongated form, somewhat resembling an inverted bell. As the feeling became less Popish, so the bowl of the chalice was made to turn outwards at the edge, until at length it was almost the shape of a goblet. Round it is an engraved band, composed of two double lines, which interlace in precisely the same way in nearly every example, the space between being filled by a running pattern composed of conventional foliage. The stem is still divided into two parts by the knop, which is, however, much smaller. The foot is now always round, and some of its mouldings are worked into small flutings. It will be seen that it is an object to which the term cup is more applicable than that of chalice, especially as no sacred monogram, or other emblem to mark their religious use, is often found forming part of the ornamentation of the communion cup.

The similarity in shape and design of these vessels seems to point to some regulation pattern being at once ordered, but no such injunction has yet been discovered. These chalices were mostly made in London, Norwich, York, and Exeter, a very slight deviation in the shape of the bowl being observable in those made in the various localities. The Norwich chalices are noted for the greatest divergence from the usual pattern. The silversmiths of this city made the bowl wider and with straighter sides than is found elsewhere. This form of communion cup continued in favor until about the middle of the next century, but after 1600 the type degenerates,

Flagons which came into use during the reign of Queen Elizabeth and took the place of the cruets of former days, became now a necessity of the time from the increased use of wine at the communion. Some of these were of great size; two in Frome Church, lately turned into other church plate, held nearly a gallon each. These were long straight-sided vessels, with good bold bases and well-shaped covers. The average quantity of wine used at this church in 1575, for the 10 communions in one year, for a population of 5,000, was fully "ten quarts of sacke" upon each occasion!

When we turn to secular plate, we find that the hanap was the object upon which the silversmith could best display his artistic power and skill of execution. There is a beautiful specimen at the Mercer's-hall, which illustrates the style at beginning of the century. It is also intersting as being the earliest known that is hall marked. The Elizabethan hanap, although not so well known as the chalice of the same date, is still in the cabinet of many collectors of old English plate, the style of ornamentation being very similar to that upon the chalice.

During this century, the salt-cellar was made in various shapes. The first type was that known as the hour-glass salt. About the middle of the century, it became an object of more beauty and importance, being generally square and highly enriched with *repoussé* and engraved work. At the end of the century, we come to the circular or bell-shaped salts. These were made in three tiers, the two lower compartments holding the salt and the upper forming a pepper-castor. Although not deficient in ornamental effect, they cannot be favorably compared to the types before mentioned

The rose-water dish gave the silversmith every scope for displaying his power of design, and, from remaining examples, we see that of this, by many, every advantage was taken. This is the case in a beautiful specimen belonging to the Merchant Taylors' Company. In the centre is a coat of arms in high relief; round this are six panels containing, alternately, dolphins and conventional vegetable forms, all executed in *repoussé* work, The mazer bowls also received enrichment from the silversmith, the silver rim placed round these wooden bowls to increase their depth being often highly decorated.

It was during this century that apostles' spoons came into such general use, they being the fashionable christening present of the period, the wealthy giving a complete set, and the poor a single spoon, having upon it the patron saint of the donor, or the saint in whose honor the child is named. During the time Holbein was court painter in this country, he found leisure to make some beautiful drawings for gold and silver work; but, although these drawings are most exquisitive designs for silver objects, none of the English silversmiths seem to have been sufficiently skilful to follow the example he set them.

The most important productions of the silversmiths in England during the seventeenth century, were the large drinking vessels, known as grace cups, or loving cups. These are all very much alike in style, generally being composed of a bowl covered with ornament in low relief, surmounted by a cover of open or pierced work, and in form somewhat resembling a steeple; the stem is often composed of acanthus leaves, with baluster-shaped mouldings, the foot being round, and some of its members ornamented with flutings; others with a small running pattern. Many of the city companies still possess examples of these grace cups, and they often bear the name of the warden who presented them to the company.

Repoussé work in high relief seems not to have come much into fashion before the time of Charles II., but after his time the large tankards, and particularly caudle cups and trays, were covered with bold *repoussé* work, to the exclusion of the former style of James and Elizabeth. During this century a large amount of engraved ornament was applied to smaller objects, especially watch cases.

[TO BE CONTINUED.]

The Alleged Trade Watch Company.

AT the last meeting of the Jewelers' and Watchmakers' Guild of the United States, held in Chicago, a resolution was put through by interested parties, endorsing a proposition to organize among the retail dealers, a Trade Watch Company, which should make watches exclusively for members of the Guild. As a natural sequence to this unpractical and visionary scheme, retail dealers were solicited to buy the stock of this embryo company. In the July number of the CIRCULAR, under the heading of "A Co-operative Watch Company Suggested," we exposed the fallacy of co-operative schemes, explaining that they had, with but few remarkable exceptions, proved disastrous to all engaged in them, and cautioned the retail trade against having anything to do with these will-o'-the-wisp watch companies. We find in a Western paper a letter signed by "E. R. P. Shurly, Acting Secretary, Trade Watch Company," which is supposed to be a crushing answer to our article. Mr. Shurly, we believe, by Western courtesy, rejoices in some military title, and, as military titles are all the rage during this presidential year, we suppose we ought to consider ourselves annihilated by the heavy artillery Private Shurly has turned on us. But somehow we do not. On the contrary, the letter of Corporal Shurly is so strongly confirmatory of all we said in opposition to the proposed company, that we regret that he did not send it to the CIRCULAR for publication, whereby a circulation would have been obtained for it within the trade. We would be glad to have every retail dealer read his article that he might be convinced how little bottom there is to the scheme, and so save any money that he might have contemplated throwing away in the purchase of its stock.

It was superfluous, however, for Sergeant Shurly to question the integrity of THE CIRCULAR by insinuating that our opposing the "co-duperative" watch company was paid for by one of the companies already in existence. It is well known in the trade that neither money nor patronage can buy the editorial colums of our paper, and, also, that all our patrons stand on an equality so long as they pay their advertising bills; they can say what they please in their advertisements, but in no other columns have they a voice. It is unfair for Lieutenant Shurly to judge an old established paper like THE CIRCULAR by the methods he adopted when he was editor of *The Watchmakers' Magazine*, which publication, we are informed, died in his arms after a brief struggle for a precarious existence.

Quoting our statement that "dealers have not, as we understand it, any complaint to make against existing watch companies," Captain Shurly alleges that the dealers have a grievance in the practice of jobbers selling goods at retail, which practice is permitted by manufacturers. This is an old grievance, and a very serious one, but where will the dealers find a more vigorous champion of their rights than THE CIRCULAR has been? In season and out of season we have contended against this and other abuses practiced by "retail jobbers," and this fact alone is sufficient answer to Major Shurly's insinuation that our columns are controlled by any manufacturer or combination of manufacturers. But, let us ask, how will the proposed Trade Watch Company exercise a restraining influence on these "retail jobbers?" The Trade Watch Company, to be successful, must dispose of all its products, and it will necessarily have to call in the jobbers to their aid; should they attempt to limit their product to the wants of the members of the Guild, the factory would languish for lack of employment. Members of the Guild are going to sell just such goods as there is a demand for, and when the so-called Trade Watch Company has created a public demand for their watches, retail dealers, and jobbers also, will handle them, but until there is such a demand—which it will take years to create—the dealers in and out of the Guild, will continue to sell the watches of those manufacturers who have established reputations. As to the "retail jobbers," their offence is not confined to selling watches by retail at wholesale prices, but it extends to all goods handled by retail jewelers. The abuse must be broken up as a whole, not by piece meal. If the retail dealers would combine and refuse to buy any goods of jobbers who sell by retail, they would put an end to that abuse very speedily, and would receive the hearty support and co-operation of the manufacturers.

Lieutenant Colonel Shurly says that the Trade Watch Company is not a co-operative company; that if the officers of the company are not honest, the laws of the State of Illinois must make them so. Ever since the days of Adam and Eve, the respectable portion of the community has been looking for some means by which the scalawags could be made honest. They have tried imprisonment, hanging, burning at the stake, beheading, drawing and quartering, and various other pleasant expedients, but all in vain. Now comes Colonel Shurly exclaiming "Eureka! the laws of the State of Illinois will do it!" But the statement that the company is not co-operative leaves it in a worse condition than we had supposed. We had thought, of course, that those retail dealers who subscribed their money to put the Trade Watch Company on its feet were to have a voice in its management, and something to say as to how their money should be squandered—we should say, expended. But no! they are to simply put up their money, and the officers of the company, including the Acting Secretary (all of whom are to be made honest by the laws of the State of Illinois,) will attend to its disbursement and to all the other business of the company. In short, it is to be a stock company, the working capital of which is to be subscribed by retail dealers; a clique of interested persons are to be incorporators, the board of officers, the managers, the sole arbiters, the gentlemen who draw the salaries and snub stockholders, while those who have put up the money are to stop outside in the cold, and get their satisfaction by seeing how nicely the "other fellows" are fixed. In the good old days they used to organize "wild cat" banks on that same general plan.

But the meat of this scheme lies in the plant. Brigadier General Shurly says the company proposes to buy the Rock Island factory, and treats us to a bit of history in connection therewith to the effect that the factory is "a magnificent building, beautifully situated on an island near Milan, about three miles from Rock Island, large enough to turn out 500 watches per day. The building is supplied with shafting and a Turbine wheel, some machinery, *but none that could be utilized for watchmakers*, aside from the shafting. This building, with the power, machinery and about seven acres of land, can be secured by the Trade Watch Company at a nominal cost." This is a brilliant opening for a juvenile watch company. It reminds us of the old lady who bought a new pair of andirons that were so beautiful that she had to get a new carpet to match, and then new furniture to match the carpet, and, finally, a new house to match the furniture. It would have been just as easy to have said that the water power at Niagara Falls is equal to the production of a million watches an hour; all that is wanted is the proper machinery to do the work. We don't blame the Rock Island Watch Company (?) for wishing to dispose of a lot of machinery that cannot "be utilized by watchmakers," but the morality of their attempt to get rid of it on the "co-duperative" plan is at least questionable. It is, perhaps, fitting that the gallant but erratic Major General Shurly should appear as the public champion of this attempt to palm off a lot of worthless machinery as a watch-making plant, but he should be cautious to make his published utterances coincide with his private views.

Notwithstanding the sanguine anticipations of General Shurly, we again caution our readers against being deluded into "taking any stock" in the yet unborn Trade Watch Company. The scheme is visionary in the extreme and impracticable in the highest degree. Watch making is not a business that any jack-at-all-trades can pick up and make successful. Years of experience are required to make marketable watches by machinery, and such experience cannot be had for the asking. It has cost millions of dollars to build up the trade and to perfect the art of watch making, and large sums have been expended by every company that has undertaken it before a single marketable watch was produced. The preliminary expense to making a watch has bankrupted more than one company that started out under even better auspices than those proposed by Lieutenant General Shurly. And here let us venture a prediction: instead of 500 watches a day that Field Marshal Shurly sees the Trade Watch Company turning out in the future, we predict that it will never make one; that, so far from its being a magnificent success, it will never reach the proportions of a respectable boil, and come to a head.

The Jewelers' League.

We devote this column to the interests of the League and its membership. Letters or inquiries pertinent to its business or purposes, and which might interest the trade or inquirers, will be herein answered. Address *Jewelers' League, Box 4001, P. O. New York*, or the office of THE CIRCULAR.

The following persons were admitted to membership in the League at the meetings of the Executive Committee held in August :

Wm. Henry Baylis, Port Jefferson, Long Island ; J. M. Bell, of Bell Bros., San Antonio, Texas ; J. F. Cordier, New York City ; James Y. De Mott, Newark, N. J ; Wm. J. Eroe, with Geo. W. Pratt & Co., New York ; Willard Farrington, with Farrington & Hunnewell, Boston, Mass.; James V. Forster, with A. M. Hays & Co., New York ; James S. Franklin, with Derby Silver Company, New York ; Wm. Goeggel, Reno, Nevada ; H. O. Johnson, Chicago, Illinois ; Julius King, Cleveland, Ohio ; Jacob H. Massey, Allentown, Penn.; Abbott T Maynard, with A. Stowell & Co., Boston, Mass.; Wm. L. McCausland, Providence, R. I.; Joseph Nordmann, of, and Leon Nordmann, with Dinkelspiel & Nordmann, San Francisco, Cal.; Henry A. Pfeiffer, with J. H. Knapp, New York ; Maurice L. Powers, with Kossuth Marx & Co., New York ; Henry J. Scheid, Philadelphia, Penn.; Horace M. Shortlidge, Philadelphia, Penn., with Meriden Britannia Co.; Josiah Stedman, Boston, Mass.; James Stroud, with Clapp Bros. & Co., Chicago, Ills.; Geo. W. Swinnerton, Newark, N. J.; Henry Tilden, Jr., of, and Chas. H. Williams with Tilden, Thurber & Co., Providence, R. I.; Wm. L. Walden, Malden, Mass., with Bigelow, Kennard & Co.; Wm. P. Wallace, with J. T. Scott & Co., New York City ; Leopold Wormser, with Julius King, Cleveland, Ohio ; Chas. S. Hungerford, with W. B. Clapp, Young & Co., Chicago, Ills.; Frank M. Lewis, with Samuel Lewis, Washington, D. C.; George W. Scribner, with, Bowler & Burdick, Cleveland, Ohio. Thirty-one in all.

Two applications were rejected and two were referred for correction.

Leo Lesquereux, reported last month as with Justis & Armiger, is from Columbus, Ohio, and Louis P. Maas, with Justis & Armiger Baltimore, should have appeared in the list of applicants admitted to membership.

There are now in the League 813 members. At the commencement of the present year there were 563. This addition of 250 members for the seven months makes an average monthly gain of 36. The largest accession was 72 in April, and the smallest 24 in June. If the same rate is continued through the year, the Committee will be able to sunmon one thousand members to the next annual meeting. To have our growth equal the increase of 1879 over 1878 there should be enrolled at the end of this year 1,100 members. Some members appreciate their privileges ; notably so this month Mr. W. F. Cory of Chicago, who is doing effective work for the League. It does not take any time or attention from one's legitimate business to speak a good word for the League, and that word very often reminds the one to whom it is addressed of his intention, which had been forgotten, and he immediately takes the necessary steps to become a member.

There are rumors of a proposed change in the Constitution to be discussed at the next annual meeting. An important one is a proposition to reduce the limited number of members to twelve or fifteen hundred instead of 2,500 as at present.

Of course the adoption of an amendment like this would keep out of the League for a while, a number who are willing to join now, but who neglect from month to month to carry out their intentions. That the membership of the League remains so long without a loss by death is a matter for hearty congratulation and it is a remarkable fact, too. It bears witness to the care and prudence of our Executive Committee in the acceptance of members.

There is a general desire for the adoption of a badge of membership. Those interested are earnestly invited to furnish designs for selection and approval of the Executive Committee.

Freaks of Fashion in Paris.

JEWELRY is not quite so Medici as the rest. The height of *ton* is to wear a small enameled pig on a chain or armlet. It is not called *porte-bonheur*, but *porte-veine*, the word *veine* (*avor de la veine*) being the slang of *bonheur*. This pig is not only made of beautiful enamel in imitatlon of the animal in its juvenile state, called "sucking" in English vernacular, but it is manufactured by threes, fives and sevens, all of a row, for shawl-pins, etc., and in silver or gold. Before the adoption of this animal in polite society there was no term so awful to the French as the word *cochon*. The unaccountable actualite in jewelry originated in Austria, where he who sees a pig considers it a good omen. The Empress of Austria wears one, in the same way as the Neapolitans wear a coral horn to frighten off the effect of an evil eye.

Prettier are the symbols worn by professiona's and which allude to their career if artistic. Thus, an artiste wears the gold pallete with imitation or real gems for red, green, white and other paint. The first who set this fashion was Mlle. Jacquemart, who received such a brooch as a gift from M. Thiers. The golden lyre is adopted by Mme. Viardot, the golden mask by Mlle. Sarah Bernhardt, and the golden whip by a diva of the *haute école*.

Persons not professional stars wear their names and monograms, or anything that teaches the world at large who they are, what they believe in or whence they come, it being one of the signs of the age to bring personal merit and biography to the world's notice ere death leaves this task to others.

A pretty idea is the monogram in minute flowers sewn on the front of kid shoes, but embroidery on corded silk is better for this purpose.

Sapphire Hunting in Siam.

FIVE years ago a native hunter in Siam found sapphires in a remote and secluded district. Some men who were let into the secret followed him to the mines and brought back to Rangoon and Calcutta a number of very valuable stones. A rush ensued from British Burmah, thousands of adventurers flocking to the mines, some to find sudden fortune, but more to lose their lives from privation and jungle fever. The mines occur in the provinces of Battambong and Chantaboon. In his commercial report for 1879, the British Consul at Bangkok says that the miners are very careful to conceal their gems while in Siam. Being anxious to show some of the gems to Admiral Coote, the Consul called for specimens from some miners who had just returned from the diggings. One miner, a poorly clad and miserable looking fellow, produced a few small stones, and after a great deal of coaxing was induced, with many precautions, to give a private view of his great prize, which was a large sapphire in the rough, valued at $10,000. He would probably not have shown this stone at all had he not been on the point of leaving in a steamer. Owing to the secrecy thus observed by the possessors of valuable gems, it is impossible to give any estimate of the total value of the stones found, but that individnals have made very large profits is certain. One man dug out a stone which he offered for sale in Chantaboon for $500, but did not find a purchaser. He went with it to Rangoon, where he was offered $7,500 ; but, having awakened to the value of the stone, he declined to sell, and took it to Calcutta, where he evidently obtained $15,000 for it. Now, however, there are many experienced gem merchants established in the neighborhood of the mines, and something like the real value of the stone can be obtained by the miners on the spot. The largest sapphire hitherto found, so far as the consul knows, weighed 370 carats in the rough, and when cut turned out 111 carats of the finest water. The ruby, onyx, and jade are found in the district, but the quality of none of them is such as to make them very valuable.

Business Notes.

Keller & Untermeyer are the authorized agents for the International Watch Company's watches, a large line of which they have constantly on hand.

May & Stern offer a large and attractive display of foreign watch tools and materials of all kinds ; also an extensive display of jewelry. They have recently added a department for diamond goods, of which they have a reliable assortment.

S. M. Lewis & Co., No. 7 Maiden Lane, manufacture the celebrated patent seamless bead neck chains in solid gold, silver and rolled plate. They are overwhelmed with orders, as their goods are rapidly becoming exceedingly popular.

Louis Kahn, of the firm of L. & M. Kahn, arrived from Europe on the 9th ult. Mr. Kahn spent several months abroad in search of novelties in watches, etc., for this market. The firm carries a large line of chatelaine watches, diamonds and precious stones.

Arnold Nicoud has just received a very beautiful line of ladies' watches especially designed for one of our leading jewelry houses. The movements are exquisitely cased with various ornamentations from original designs, and reflects great credit on the taste and enterprise of Mr. Nicoud.

The Middletown Plate Company present for the fall trade, at 13 John street, a very fine assortment of new patterns in tea sets, waiter's butter dishes, baskets, &c., in all the variety of table ware ; and in addition there is a very elegant assortment of rich jewel boxes, card stands, vases, and other goods in Niello finish, and a great variety of rich glass, exquisitely mounted.

Miller Bros., the well known manufacturing jewelers, of No. 7 Maiden Lane, offer a large and comprehensive line of jewelry, among which may be found new styles of etruscan sleeve buttons, mounted with rustic letters, and also with birds' and animals' heads, and other fancy ornamentation. They also exhibit large lines of new goods mounted in diamonds, sapphires, etc.

Morgan & Headly, of Philadelphia, having greatly enlarged their manufacturing facilities, are now prepared to execute all orders for spectacles and eye glasses promptly and in the order of their receipt. They have recently added much new machinery to their factory, some of which is of special design. They offer the trade an entire range of goods in their line uniform in quality.

T. J. Pottinger, with George Wolf, jeweler, of Louisville, Ky., is introducing to the trade a new instrument for obtaining the size for finger rings. It consists of a thin loop of spring steel, nickel plated, that slips over the finger, and being pressed down to fit the finger, registers on a delicate gauge the exact size of the finger. The register corresponds with Allen's ring gauge, the difference between the two instruments being that while Allen's measures the ring, Pottinger's measures the finger desired to be fitted.

Rogers & Brother, No. 690 Broadway, call attention of the trade to their extensive variety of novelties in electro-silver plate. They have many new designs for the fall and holiday trade. Dealers visiting the city are invited to inspect lines and prices. For the benefit of dealers who do not visit New York, they have prepared photographs of many of their goods, and photograph albums will be sent to dealers on receipt of business card and references. To avoid the delays and disappointments attending the rush at holiday time, this firm will receive orders now and ship the goods at a specified date in the future.

Albert Berger & Co., agents for T. A. Willson & Co's. celebrated spectacles, introduces a large line of their goods. Among the special features noted is their patent compensating joints as seen in the advertisement. The temple is made of one piece with the bent edge left open, which acts as a spring on the joint pin. This temple is widened where it banks against the end piece, thereby relieving the joint from all strain. This spring in the temple compensates for all wear and lends additional strength to the center joint. As all the parts as well as the lenses, are interchangeable, dealers can be supplied with such parts as they may require.

Foreign Notes.

Queen Victoria is the owner of a silver-gilt casket, in which are lockets containing locks of hair of thirteen officers who fell at Isandula Each locket is engraved with an "In Memoriam," and the name of the officer, together with the date of his death. The souvenir was ordered by the Queen.

In preparing to move the obelisk at Alexandria, two inscriptions have been found upon it—one in Latin, the other in Greek. They fix as the year of its erection at Alexandria, by Barbarus, prefect of Egypt, the eighth year of Augustus Cæsar's reign, or about 32 years before the birth of Christ. Fontius, the engineer, did it.

A handsome writing table has been made at the command of Queen Victoria out of a portion of the timber of the old Arctic ship Repulse, which was lately broken up. Her Majesty intends to present it to the President of the United States "as a memorial of the courtesy and loving kindness which dictated the offer of the Resolute."

The true value of jewels, as souvenirs of affection, is shown in the will of the late Earl Stanhope, in which he gives certain diamonds to his daughter-in-law, Evelyn, (the present Countess Stanhope,) for her life, stating that, in so doing, it is in accordance with the wishes of his late wife, as expressed in a memorandum, in which she sets forth that the jewels were part value of the deceased peers published works, and as such she was very proud of them. After the death of the Countess, the diamonds were to be made heirlooms, to pass with the title.

The French Museums have recently been enriched by various works of art left them by M. Phillippe de St. Albin, a rich collector who died in November last. Among these are a coffer in enamel given by Louis XV. to the Empress of China, brought back from the Summer Palace ; two knives belonging to Henri IV. and Marie de Medicis, bearing their arms. A ring by Guay representing Marie-Antionette : an intaglio (antique) representing Timoleon ; two cameos, one of Louis XVI., the other an antique of Antonia. A dozen of plates of Imperial Marly, painted by the best masters of the period. A harlee's dish in 18th century faience, representing the inhabitants shaving themselves while shells are bursting around.

A short time since Lord Cavendish announced in the House of Commons that a discovery had been made of no fewer than 647 pieces of "antique plate," (so called) the Hall-marks on which were simply forgeries. The collector had given a high price for those pieces of silver—several thousand pounds—buying them as genuine Queen Anne work, which they purported to be. Lord Frederick Cavendish assured the House that "action had been taken by the Goldsmiths' Company," and there for the moment the matter was allowed to drop. The vendor alleges—though not upon oath—that he bought this modern rubbish, believing it to be true Queen Anne silver, of a man who is now dead. He refuses to pay the fines to the Goldsmiths' Company, and though he has returned the money to the lady who bought the goods, he is yet free "to carry on business as usual," and no man hinders. It certainly would be interesting to trace these forgeries to the workshop whence they were delivered, and to ascertain how many more are likely to be in circulation.

The last report of the Astronomer-Royal of Greenwich observatory to the Board of Visitors, (June 5, 1880) contains the usual account of the present state of the Royal Observatory, divided under 17 heads. The printing of the observations has been for some years gradually falling more and more into arrear, but arrangements have now been made for accelerating the rate of printing, and it is hoped that eventually the volume for each year may be completed before the end of the year next following. The calculations of the Transit of Venus, 1874, are being proceeded with, and 128 pages of the objective prisms are now in type, which contain the text and the greater portion of the tabular part of the Honolulu work. Sir George Airy concludes his report with the following general remarks :—"The determination of places of stars, sun, moon, and planets was handed down to me from my predecessors ; it has in various ways been much extended. The magnetic and meteorological observations (the first originating with myself, the second partly with the movement introduced by the Royal Society, and partly with myself) constituted a distinct branch of science, having this property in common with the original astronomical work, that it is incessant and regular. The much later introduction of photographic and spectroscopic astronomy, established at the instance of the Board of Visitors, and carried on with vigor and regularity has created a third department. All these departments appear, at present, to be working efficiently and well. But I can easily imagine circumstances which would interfere materially with the successful continuation in one place of this triplicate series of observations. Though I think this possibility of partial failure worthy of the contemplation of the visitors, yet I do not see any necessity for action of any kind at the present time."

Trade Gossip.

The newest bracelets are of silver beads.

Gilt pins with pearl heads are new for bonnets.

The man who spends all his money on a diamond shirt stud carries everything before him.

The so called 14 K. chains made by certain of our manufacturers, bears no resemblance to silence, because silence is golden.

Reproductions of antique jewelry are still fashionable, the public apparently rapidly acquiring an appreciation of classical art.

I. P. Libbey, formerly of Washington, D. C., has removed to Sioux City, Iowa, where he will shortly open a well stocked jewelry store.

Frank C. Lawrence, late of Du Quoin, Ill., has opened a jewelry store at Alamosa, Colorado. He reports business as being satisfactory.

Cameo intaglios are now all the rage, and our leading houses have introduced many very beautiful examples in rings of this highly artistic work.

The wife of a St. Louis jeweler stabbed the man who attempted to hug her. This proves that all women are not enthusiastically in favor of a free press.

D. C. Hope, late of Sparta, Wis., has opened a very beautiful and attractive jewelry store at Eau Claire, Wis. We wish him abundant prosperity in his new home.

Messrs. Nelson & Cornwell, of Cannon City, Colorado, have dissolved partnership. Mr. Nelson will continue the business, while Mr. Cornwell removes to Silver Cliff.

Among odd rings exhibited this year is one consisting of a golden horseshoe nail twisted around the finger and set with precious stones of rare values. The effect is unique and pretty.

Dunkelee & Davies' jewelry store, No. 695 Broad street, Newark, was entered by burglars on the evening of the 9th ult., and robbed of six hundred dollars' worth of gold pens and pencils.

In the extreme west the drought has been so severe as to materially interfere with trade. The latest reports, however, indicate that the crops are turning out better than was expected, and after harvest trade will improve.

Anna Belora, a rich Havana widow, now sojourning at Saratoga, is reported to wear $60,000 worth of diamonds. Some of the widowers in the trade, who have been dazzled by their splendor, are bound to Have Anna if possible.

Robert Wilkes, a well known jeweler of Toronto, and his two daughters, were accidentally drowned while crossing a lake in a small boat. The boat was struck by a sudden squall which capsized it with the fatal result mentioned.

A syndicate, or combination of diamond dealers has been formed in Europe, the members thereof virtually controlling the market. It is announced that they propose to advance prices considerably, especially in exceptionally fine goods.

The astronomers are puzzled about a dark red spot which appeared upon the disk of Jupiter in 1878. In October the planet will be more brilliant than he has been for a dozen years past and there will be a good opportunity to examine the beauty spot.

The weather has been intensely hot in this city recently, and such of the trade as could get away, have been enjoying themselves at seaside and mountain resorts. Those who could not leave have had to be content with short trips to Coney Island, Rockaway and Long Branch.

An ostrich owned by a California jeweler recently swallowed fifteen stones, seven nails, two bottles of Kelly's watch oil, a pair of band bracelets, a Waterbury watch, two keys, a neck tie, four plain gold rings, and a gold cross, and then it died from an effort to look cross-eyed.

Loeb & Co., exporters of clocks, silver plated ware and various kinds of novelties in fancy goods, etc., have failed. The liabilities are estimated at $250,000, of which $150,000 is due New York. Their principal creditors are among the leading clock companies. A statement of affairs is promised shortly.

A Business Man's Convention is to meet in this city in the early part of September. Its purpose is to start a permanent museum, in which article representing the commercial, agricultural, and industrial interests of the country may remain on exhibition. A large number of well known manufacturers, merchants, and bankers have already united in this movement, which was put into shape a year ago. The coming Convention can be made interesting and useful in many ways.

The origin of the South African diamond is, according to J. A. R. Smit, volcanic, being found in a primitive gangue, and presenting signs of merely secondary modifications. The mines, he holds, are extinct volcanic craters, and the diamonds have been formed at the expense of organic matter under the joint influence of great pressure and strong heat.

The manufacture of medals and badges is rapidly becoming an important feature of the jewelry business. Several firms in this city who make a specialty of this class of work exhibit samples that are exquisite in design and rich in workmanship. Society badges of all kinds can be found in stock, while samples of appropriate presentation badges are displayed to suit all tastes.

The late Duke of Wellington left silver plate valued at $1,500,000. Most of this was of fine Indian workmanship, and as Wellington prosecuted a vigorous campaign in India, the supposition is that some of the Indian Provinces were short just that amount. Some younger member of the family might open an establishment in competition with Elkington for the sale of silver plate, and have an excellent send off in the way of stock.

George Tegtmeyer, a young man formerly in the employ of Woglom & Miller, manufacturers of onyx goods, has been arrested on a charge of obtaining goods on forged orders. Some thirty-three pawn tickets representing a large amount of stolen property, were found on the person of the prisoner. It is reported that quite a number of jewelry firms have been victimized by the sharp operations of this young candidate for Sing Sing.

There is great complaint among retailers of the large number of debased settings for rings that have been lately introduced by some manufacturers of so-called jewelry. Some of the settings are nothing more than gilt backed up with brass. Dealers cannot be too careful in making their selections of goods of this class, and the price charged for them is a fair indication of quality. Rings made of 14 karat gold cannot be sold for the price of 8 karat gold, and dealers will do well to be suspicious of rings that are offered at too low a price.

On Saturday Aug. 21, Captain E. F. Curtis, of the steamer *Plymouth Rock*, was presented with a handsome gold watch, gold chain and locket by his friends and associates on the steamer and in the Long Branch Ocean Pier Company. The watch is an American movement, and the case is a marvel of fine workmanship and engraving. On the front of the case is the captain's monogram in highly ornamental letters, while on the back case is a view of the Long Branch Pier with the *Plymouth Rock* in the foreground. The engraving is considered to be as fine a sample of artistic work as was ever produced. The testimonial was got up by Wheeler, Parsons & Hayes.

Dealers should remember that the fall trade is now upon us, and that it is the early buyer who gets the choicest of goods. Manufacturers are already receiving large orders from all sections of the country, a sure indication that a liberal trade is anticipated by dealers this fall. The probability is that during the present month manufacturers will be so overwhelmed with orders that dealers who are late in supplying themselves will be disappointed in getting goods, as they were last fall. There is nothing so conducive to success in business as promptness in anticipating the demands of the trade. It is better to be a month too soon than a day too late. Send on your orders now if you want them attended to promptly.

The Chicago jewelers had a lively time during the encampment of the Knights Templar that occurred during the past month. All the popular jobbing houses were besieged by buyers who visited the city during the festivities. The city was crowded with visitors to an unprecedented extent. Among the buyers were J. C. Shuter, of Minneapolis, Minn., F. C. Cook, of Jamesville, Wis., C. L. Otto, of Mendota, Ill., H. M. Avery, of South Haven, Mich., Mr. Dewey, of Munson & Dewey, of Mendota, Ill., Mr. Fisher, of Fisher & Swift, Petersburg, Ill., L. D. Merrill, of Sparta, Wis., D. C. Hope, of Eau Claire, Wis., A. C. Armstrong, of Ottawa, Kan., J. C. Coffman, of Petosky, Mich., Mr. Hil, of Marion, Indiana., and many other representatives of the trade in different sections of the country.

A locket recently designed by a London jeweler for a bride, is of crystal seal engraved from the back, and hand painted. The design is extremely elaborate; on the curling waves of a green sea the Cambria, Mr. Ashbury's famous yacht, the winner of the ocean race in 1870, is coming proudly in, her white sails filled by the summer wind. The second object on the glittering expanse is the "spot boat" at Sandy Hook, its red hull, two black balls and the American ensign flying from it, forming an exquisite contrast of color. In the middle distance of this sea piece on crystal is a yacht, presumably the Cambria's defeated rival, miles behind, with tiny hull and speck-like sails; while the funnel and smoke of the tug waiting on the winner completes the design on the left.

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THE

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Robbery of Manufacturers by their Workmen.

A FIRM of manufacturing jewelers, who do business in this city but whose factory is located some distance away, recently made the discovery that they had been systematically robbed by their workmen for the past six or seven years. The amount of their loss cannot be accurately ascertained, but it is known to mount well up into the thousands of dollars. Neither is it known just how the robbery was perpetrated, nor who are the guilty parties. All that there is known is that there is a very considerable discrepancy between the amount of gold sent to the factory to be worked up and the amount returned in manufactured articles. The inquiries set on foot in consequence of this discovery brought to light the fact that several other manufacturers have been similarly robbed, and the question in the trade now is, are there any manufacturers who have escaped pillage at the hands of their workmen. While it is possible for one or two, or even more employes in a factory to systematically rob their employers, the fact that they are able to successfully conceal their operations, brings suspicion upon the innocent as well as the guilty. It is unfortunate that this should be so, and the large majority of the workmen who are honest, should, for their own reputations, keep a close watch over their employers' interests, and a special surveillance over their fellow workmen regarding whom their suspicions may have been aroused.

But manufacturers are far from blameless in the matter. They place great temptations in the way of their workmen without surrounding them with proper safeguards to prevent their yielding to criminal impulses. In the matter of giving out gold to be alloyed, as is necessary for the manufacturing of jewelry, a grave responsibility is imposed upon the workmen, and there is probably not one manufacturer in ten who has so systematized this one thing as to be certain that the full amount of gold issued is returned in the manufactured goods, or that the alloy is of the full value for which he stipulated. It is not a difficult matter for the persons who have special charge of the alloy to abstract, at each melting, a small portion of the gold, supplying its place if necessary, with a greater quantity of the base metal provided for the alloy. Even should the product of the alloy be weighed, which, we are informed, is seldom done, there would be no perceptible loss of weight, the extra amount of base metal supplying the place of the gold. It is customary for some qualified person to test each alloy to see if it is of the proper degree of fineness and of suitable condition for working; but even this test, if performed by an honest person, can be provided for by the dishonest workmen, who simply prepare the metal so that it will pass inspection, abstracting the gold afterwards and adding base metal. By this means the product of the factory is deteriorated unknown to the proprietor. But there are many ways by which workmen, other than those charged with the preparation of the gold for manufacturing purposes, can abstract the precious metal while it is undergoing the process of manufacture, and nothing but a thorough system of checks, whereby one workmen is made a check upon another, can remove this temptation from the workmen and insure to the proprietor honest returns of the material sent to the factory. These should, in justice to the employees, be adopted in every factory. No man has a moral right to place temptation in the way of another, and when it is necessary to place so valuable a material as gold in the hands of workmen, they should be made to feel that the system of accounting is so perfect that any lapse on their part from the strictest integrity is sure to be detected. Men will not be dishonest when the chances of detection and punishment are against them; it is when the conditions by which they are surrounded are so lax as to very nearly guarantee immunity, that the temptation constantly before them becomes irresistible, and, yielding to it, they become thieves, robbing their best friends, the men who give them employment. It is not only to the interest of employers to surround their workman with every possible safeguard to prevent dishonesty, but they are morally bound to do so.

Manufacturers are lax, also, in employing their workmen. When trade is brisk, they employ anyone who says he can do the work required, without inquiring as to his character, his previous employment, habits, or social surroundings. It is no wonder, therefor, that bad men get into the factories, not only robbing their employers, but setting bad examples to others, especially to the younger workmen. We heard of an instance not long ago, where a man who had been repeatedly convicted of larceny, was employed, without inquiry, to work in a jewelry manufacturing establishment, and in less than a week had disappeared with $500 worth of tools and material. In this instance the recklessness of the employer brought its speedy punishment. Without taking into consideration the risk employers run in thus picking up their workmen promiscuously, without inquiry as to their moral status or their personal surroundings, it is a duty they owe to their other workmen to exercise due care lest they introduce among them persons of bad character. Gold workers are, from the very fact of their working in this precious metal, exposed to greater temptations than workmen in general are, and care should be taken that they are not contaminated with persons having neither principle nor character. Angels do not come down to work in factories for wages, and until they do, the frailties of human nature to be found there should be guarded against. Recently the elevated railroad company issued an order that ticket sellers and ticket takers —the only ones who have opportunities to rob the company—would be required to give bonds in the sum of $250, specifying that the bonds provided by a fidelity insurance company would be accepted.

Why could not manufacturing jewelers exact similar bonds from their workmen who fill the more responsible positions? This fidelity insurance company is organized for the very purpose of furnishing bonds to persons occupying positions of trust, and, on the payment of a small amount in premiums, the company will guarantee the fidelity of any person of good character, or who can give acceptable references. By exacting such bonds from their workmen, employers are guaranteed against loss through their agency, and are spared the trouble and annoyance of hunting up their references, or making inquiries as to their character. Banks and other corporations are exacting fidelity bonds from their employees; why should not the manufacturing jewelers?

It might be inferred from the above that we hold a poor opinion of the honesty of the workmen engaged in the manufacture of jewelry. Such is not the fact. On the contrary, we believe them generally to be possessed of much intelligence, skill, industry, and as much honesty as falls to the lot of the average of humanity. But that there are black sheep among them, as there are among all other classes of citizens, the robberies we have referred to, and others, abundantly prove. Because of the black sheep found in all communities, courts and police regulations are necessary, and the punishment of offenders is intended to deter others from the commission of crime. So we would have it in every factory connected with the trade—the employer should provide the police regulations that will prevent crime by speedily detecting and punishing it, and by supplying such preventatives as citizens generally provide for the protection of their property. As communities combine together to thwart the designs of evil doers, so should the honest workmen combine to thwart the purposes of their unprincipled comrades. Every manufacturing establishment is, at least during the hours of labor, a community by itself, having its own rules and regulations; it is for the preservation of the good name and fame of these communities that we desire to see every temptation to wrong doing removed from their midst, and every precaution taken to protect the reputations of the majority of workmen from suffering for the misdeeds of a very small minority. While thieves and robbers are harbored among them, the innocent and the guilty alike fall under suspicion. It therefore behooves the honest workmen for their own sakes, to join hands with their employers to unmask the thieves who make use of their skill as workmen to mask their villainous intentions.

Conscientious Workmanship.

TO repair a fine watch well requires a great amount of technical skill and a thorough knowledge of the mechanical value of all the parts. The man who is competent to repair fine work is capable of making a watch, for, to know how to put the various parts in good working order implies sufficient skill to construct those parts. The required ability to do good repairing is not to be had for the compensation accorded to a common laborer, and, as a consequence, if the owner of a fine watch wants it properly repaired when it needs it, he must be content to pay a good price to a competent workman to have it done. Unfortunately for the public, which is shockingly ignorant in the matter of watches, there has been so much competition among jewelers for repairing that prices have been cut so fearfully that good work has become the exception. Even our best workmen cannot afford to do good conscientious work at the prices paid for it. As a consequence, much botch work has been done of late years, some of it by workmen who knew better and who would have been glad to have put conscience into their work if the price paid would have admitted of it. But when they are asked to do work at a price that will scarcely pay for the material used, they botch over the job with as little expenditure of labor as possible. An old watchmaker informs us that he has been called upon to repair fine movements that have been almost ruined by the slovenly manner in which they have previously been repaired. If he should charge the owners a fair price for undoing the work of his predecessors, he would be denounced as a swindler, and the low price paid for the very repairing that spoiled the watch would be cited to prove that his charges were extortionate. What is a conscientious man to do under the circumstances? He can't afford to do good work at a low price, and if he charges a fair price he loses the job. The consequence is, more botch work. It is unfortunate that good workmen will lend themselves to such folly. They should take the trouble to explain to the owners of watches the difference between good and bad workmanship. If a man owns a fine horse that gets lame, he is not going to take him to a corn doctor for treatment, but will pay a high price to the best veterinary surgeon he can find. He should be educated to treat his watch in the same way. But the trouble lies primarily with the jewelers who are so jealous of their neighbors that they cut prices to starvation rates for the sake of securing work. This is not only unnecessary but it is suicidal. The public is willing to pay a fair price for good work, but, not knowing the difference between good work and botch work, will go to the man who does it cheapest. It seems to us that a fair and equitable scale of prices might be agreed upon by which all reputable repairers might be governed. If this were done, the public would soon learn the difference between cheap work and good work, and only patronize those who are capable of supplying them with the latter.

Seeking to Harmonize the Retail Dealers.

IN various Western States, organizations of retail jewelers have been formed for the purpose of protecting themselves from the methods adopted by a certain class of jobbers to rob them of their trade. These several State associations are doing good work by bringing the retailers together, enabling them to make the acquaintance of one another, and to come to a better understanding as to the grievances they suffer at the hands of the jobbers. The points of which they complain have been frequently commented upon in THE CIRCULAR, and the injustice of the course pursued by jobbers—who sell goods by retail to persons outside of the trade at the same prices they charge regular dealers; flooding the country with circulars and catalogues, seeking to capture the retail trade away from the retail dealers; and selling to tailors, fancy goods dealers, hardware merchants and everyone who will buy, the same as they do to dealers—has been severely condemned by us, as well as by the State Associations. What is wanted to give strength and power to these organizations is the hearty co-operation of every retail jeweler. Already their membership is quite as great as could have been expected during the brief period that has elapsed since their organization, but there are still a large number of dealers who remain outside of them because they do not fully comprehend the objects for which they are organized. W. N. Boynton, of Manchester, Iowa, is a leading spirit among these State Associations. At the recent meeting of the Iowa Society of Watchmakers and Jewelers, it was deemed of importance that some one should visit the various cities and villages in the West and seek to arouse in the retailers a more lively interest in the work of the State Associations. Mr. Boynton was selected for this purpose, and since that time has visited many places with marked success, meeting with a hearty welcome from his brother jewelers and securing their earnest approval of the efforts that are being made to reform existing abuses in the trade.

One great obstacle to the growth of the State Associations is found to lie in the petty quarrels, bickerings, and jealousy of rival jewelers located in the same place. Their rivalry is carried to such an extent in some places that each loses no opportunity to undersell his competitors, to undermine their business character and standing, and to overwhelm them with personal abuse. Of course, all this reprehensible business is reciprocal, and is carried to such an extent that all the jewelers in the place have lost standing in the community, and are regarded more in the light of scolding old women than respectable business men. Mr. Boynton's mission has been to harmonize these local differences as far as possible, bring the rivals together, induce them to forget their quarrels, and to come to a mutual under-

standing with each other in business matters. When this is accomplished, and these men brought to see that they have been blinded by their local misunderstandings, they are easily led to take an interest in the welfare of the trade in general, and to co-operate with the State Associations to eradicate the evils from which all are suffering.

One thing that has greatly embittered the rivalry between local dealers, is the lack of uniformity in prices charged for repairing watches. If Smith wanted two dollars for doing certain work, Jones would offer to do it for a dollar, while Brown would do it for fifty cents. Instances have been known where the competition ran so high that watchmakers, in order to get a job away from a competitor, have actually paid a premium for the privilege of doing it! The consequence of such cheap work is botch work, and many a fine watch has been ruined by watchmakers who preferred doing cheap work in repairing to doing good work. They put their prices so low to spite their competitors that they could not afford to put good work into the job. A strong point made by Mr. Boynton is to get local dealers, however hostile they might be, to agree upon a scale of prices for repairing. The scale presented to them has the approval of the Iowa State Society of Watchmakers and Jewelers, and is deemed fair and equitable. For the benefit of the trade in general, we append it as follows:

LIST OF PRICES FOR REPAIRING WATCHES, CLOCKS AND JEWELRY.

Arbors, Swiss, English or American barrel, loose rachet	$ 2 50
" " " solid	3 50
Barrels, Swiss or American Mainspring	3 50
" English	3 00
" Duplex	4 00
Balances, Swiss, English, American, Steel or Composition	2 50
" " " " Expansion uncut	3 50
" " " " cut not adjusted	5 00
Collet, Hairspring	50
Cleaning, Swiss and American Lever, Cylinder, Verge	1 50
" English	2 00
" Duplex	2 00
" Independent Second	2 00
" Stem-Winder, additional	
Chains, English Fuzee	2 50
" Verge	2 00
" Mending	50
Clicks, Swiss, Short	1 00
" Self-acting	1 50
" English fuzee, per pair	1 50
" " barrel	1 00
" " maintaining	1 50
" American	1 00
Cylinders, Swiss	3 50
Caps, Swiss, Rachet	50
Caps, Swiss centre	.25 to 50
" American winding post	.75 to 1 00
Dials, Swiss, English and American	2 00 to 5 00
Forks, Swiss, English and American	3 00 to 5 00
Fuzee, English, complete	5 00
" " snail and rachet only	3 00
" " wheel only	3 00
Hands, Swiss, English, American, ordinary, per pair	50
" " " seconds, each	25
" Sweep	50
Hooks, English, chain	1 50
" Swiss, barrel	50
Hair Springs, Swiss, English, American, ordinary	1 50
" " " fine	2 00
" " " Breguet	4 00
Jewels, Swiss Centre	3 00
" " 3d, 4th and 'scape each	1 50
" " Cock and foot, each	2 00
" " Caps, each	1 00
" " Roller, each	1 00
" " Pallet, each	2 00
" American and English, cock and foot, each	3 00
" " " " Plate, in box settings, each	2 50
" " " " Caps, "	1 50
" Duplex Roller	2 50
Where jewel bezel is broken an extra charge will be made.	
Mainsprings, Swiss and American	1 50
" English	2 00
Nuts, American, centre	1 00
Pinions, Swiss and English, centre	3 00
" " 3d, 4th and escapement	2 50
" " Cannon	1 50
" American, centre plain	2 50
" " " Patent	3 50
" " 3d, 4th and escapement	2 50
" " Cannon	2 00
Pivots, balance and escapement	2 00
" 3d and 4th	1 50
" Cylinder plug	2 50
Poising, balance	.50 to 100
Rachets, Swiss and American, ordinary	1 00
" " Large, for split click	1 50
" English fuzee	1 50
" Maintaining	2 50
Regulators, ordinary	2 00
" Patent	3 00
Roller Tables, Swiss, English or American, ordinary	1 50
" " " with crank	2 50
Screws, Swiss, English or American, simplest	25
" " " difficult	.35 to 50
Stop Works, Swiss	1 00
" English and American	1 50
" Duplex	2 00
Squares, Swiss hand	1 00
" Duplex	1 50
Studs, Hair Spring	50
Staffs, Swiss, English or American Balance	3 00
" Duplex balance	5 00
" Chronometer Balance	7 50
Teeth, Main Wheel	.25 to 50
Wheels, Swiss and American Main	.3 00 to 5 00
" 3d, 4th and escapement	.2 00 to 3 00
" Dial, each	1 00

CASE REPAIRING.

Bezel, Swiss or English, Silver	2 00
" American, with joint	2 50
" Gold, labor only	1 50
Joints, Swiss, American or English, Silver	1 50
" " " " Gold	2 50
Pendant Bows, Silver	.1 00 to 1 50
" " Gold	.2 50 to 5 00
" " Gold Plated, same as silver	
Push Pins, Silver, plain top	75
" " fancy cap	1 00
" " stem-wind	1 50
" Gold, plain top, labor only	75
" " fancy top	1 00
" " stem-wind	1 50
Pendants, Silver, soldering only	.1 00 to 1 50
" Gold, "	.1 50 to 2 50
Springs, Hinge	.2 to 3 50
" lock	.1 50 to 2 50
Glasses, Geneva or Lunette	25
" Flat, for open-face	50
Gold Bezels and Pendant Bows, per dwt	.10k. 1 00; 15k. 1 25; 18k. 1 50
Labor extra.	

CLOCKS.

Cleaning, time	75
" strike	1 00
Cords, linen	25
" gut	50
Alarms	.100 to 1 50
Springs	1 00
Hands, each	25
Bell wires	25
Pendulum Balls	25
" Rods	25
Verges	75
Dials	.75c to 1 00

REPAIRING JEWELRY.

	Ordinary.	*Rolled Plate, Large.*	*Gold.*
Catches	10	15	50
Joints	10	15	50
Pin Stems	10	"	50
Ear Wires or Hooks	15 to 25	"	50
" " Hard soldered		50 to 75	
Rings, hard soldering, plain		25 to 50	
" " stone		75 to 1 00	

This price list is based upon the proposition that all work specified in it will be done in a workmanlike manner, and when several repairs are required at the same time a consistent reduction of 10 to 15 per cent. may be made according to nature and quantity, which must be left to the honor and judgment of the mechanic. When new parts are put in it is customary to warrant such parts for one year against breakage from natural working of movement. When a watch is *put in order* it should be warranted to keep time for one year, except from breakage of parts not replaced.

Mr. Boynton's method of proceedure may be shown by a hypothetical illustration, which is by no means an exaggeration. Going into a city of goodly proportions, he finds there are five or six retail jewelers of different nationalities, all of whom are at swords' points, each trying to undermine the other and destroy his credit, their business rivalry having become a personal matter so that they are not on speaking terms. He calls upon Smith and interests him with an account of the good work the State Associations are doing, and finally turns the conversation on local affairs. Then Smith unbosoms himself. He would like to do an honorable business, and be on good terms with his neighbors, but there is that Dutch scoundrel Rheinhardt, who is cutting prices in every way and is not to be trusted. Smith is willing to subscribe to the scale of prices but is sure it will be impossible to get Rheinhardt to sign. Rheinhardt is approached,

and he gives terrible accounts of Smith and Goldstein, both of whom are rascals of the deepest dye. But Rheinhardt signs the agreement Goldstein does likewise, and finally all the jewelers in town have subscribed to them. Then an effort is made to get them all together to talk over matters, and this being accomplished, they discover that they have been blinded by their prejudices; that they have misunderstood each other; that misrepresentation has had much to do with their mutual hostility; and they find out that, after all, they are all pretty good fellows, and might as well live harmoniously together as to continue fighting like cats and dogs. Local harmony being thus restored, it is a slight step to persuade them to become active workers with their fellow dealers throughout the State to correct the greater evils from which the retail trade in general is suffering. Thus the combination against those jobbers who adopt illegitimate means to secure trade, is gaining strength.

Mr. Boynton is entitled to great credit for the efforts he is making to harmonize and unite the retail dealers of the West for mutual protection. He is thoroughly in earnest, and never fails to convince those who listen to him of his sincerity and disinterestedness of purpose. He is a practical jeweler and watchmaker himself, seeking to do a legitimate business in his own town. He graduated at the bench, and knows the business in all its details. Being, also, a man of good sterling sense, he fully appreciates the injustice done to the retail trade by illegitimate jobbers. Being called upon to assume the duty of visiting the retail dealers of the West, he did not hesitate to accept the mission, and to do his work faithfully. He receives no compensation whatever, but, to meet traveling expenses, carries with him a line of goods for sale. Thus far his sales have fallen far short of his expenses. A man of Mr. Boynton's integrity and standing is entitled to the respect of everybody, and he should receive a hearty welcome from every dealer with whom he comes in contact. He is not a meddler in the business of other people, but his mission is to seek to reform existing abuses in the trade, and to point out to those who suffer from these abuses the way by which they can be remedied. We wish there were more such men engaged in similar work, not only in the West, but in the East. Indeed, Maiden Lane itself might be the better for a few visits from men of this stamp. To make the State Associations successful in the work they have undertaken, retail dealers everywhere must be made acquainted with their aims and objects. A half hour's talk with men of Boynton's stamp will do more to accomplish this end than all the printed circulars that can be sent out. We earnestly commend him to all retail dealers, and wish him God speed in his good work.

Misdirected Parcels.

NEARLY all the goods shipped by the manufacturing jewelers to their customers are forwarded by express. Thousands of packages leave Maiden Lane and adjacent streets daily by this means, and there is scarcely a moment when one cannot see from one to a three express wagons in the street waiting for jewelers' packages. These packages are all valuable, often containing precious stones and goods of rare workmanship, yet they give evidence of great carelessness in the handling. An agent of one of the express companies informs us that many of these valuable packages are misdirected, and that there is an average of five packages a day that contain an error in the direction so flagrant that the company cannot make out for whom they are intended. Often a package is thus sent to a point entirely different from what was intended, as, for instance, to Richmond, Indiana, instead of Richmond, Virginia. Very often the delay occasioned by missending goods results in the loss of the sale, and the package comes back to the manufacturer, after having gone the rounds, refused by the person ordering because it reached him too late too be of service. This has happened frequently with goods designed for wedding presents, the event having taken place while the goods ordered were on their travels. A manufacturer will receive an order for goods from a customer whom he is anxious to please; he will take great pains to put up the goods himself to guard against mistakes; will frequently go out to select from his neighbors' stock to ensure satisfaction; and then, having carefully packed and sealed the goods, will turn the package over to an office boy to direct and ship. In nine cases out of ten where packages are misdirected, it has been found to be the work of the office boy—a person not possessing intelligence to pack the goods, much less to select them, yet is left to perform the most important part of all, directing the package properly and attending to its prompt shipment. This is a luxury of carelessness that dealers in goods of such value as jewelry cannot afford to indulge in. It should be made an inexorable rule in every establishment shipping goods, that the bookkeeper, whose business it is to enter all sales on the books of the firm, should inspect every package to make sure that it is properly addressed. As he must naturally be familiar with the names and addresses of the customers of the house, he would be very certain to detect any error made in addressing packages. The adoption of such a rule would save the manufacturers, their customers, and the express companies much annoyance.

Obituary.

JOSEPH FORNACHON.

JOSEPH FORNACHON, of the firm of Safford & Fornachon, died at his retidence, at New Rochelle, September 10, aged forty years. Mr. Fornachon was born in Nanchatel, Switzerland, but came to this country when seven years of age. His educational advantages were excellent, and were fully improved by him. He first became identified with the jewelry business by entering the employ of Magnin Guedin & Co., in the capacity of a book-keeper. His business instincts, however, led him to prefer the more active walks of the business, and, after several years spent as a salesman for various firms, he became a partner with J. Eugene Robert in the business of importing watches and watch movements. He was subsequently chosen Secretary of the Jewelers' Association, which position he held with credit to himself and the association, until he resigned it to engage in business under the firm name of Safford & Fornachon. Mr. Fornachon was possessed of rare intelligence and keen discernment; he was a man of excellent business habits, and his integrite was beyond suspicion. His genial social characteristics, excellent conversational powers made him a favorite with all who knew him. Mr. Fornachon had met with some business reverses, for which he was not responsible, but assumed voluntarily the obligations thus imposed upon him, rather than suffer his integrity to be questioned. As a consequence he died possessed of but very limited means, leaving a widow and three children in embarrassed circumstances. The funeral of the deceased was largely attended by the trade, among the members of which he was an universal favorite.

B. LE ROY STEVENS.

B. Le Roy Stevens, of the firm of Coe, Pinneo & Stevens, died suddenly in Newark, N. J., Sunday, Sept. 5th, of congestion of the brain. Mr. Stevens has been identified with the manufacturing jewelery business for many years, and was well and favorably known. He had been ill several times during the summer, but was only confined to his room for a week previous to his death.

AN individual by the name of John Hoffman, hailing from Dunmore, Pa., has lately succeeded in victimizing certain firms in the trade to a considerable extent. His plan was to secure an introduction to a house, buy a few goods and pay cash for them; returning home he would order goods, to be sent C. O. D., always being prompt in his payments. After having paid cash for several orders, he would get credit for thirty days; then he would order liberally. When the thirty days expired, he was not to be found. Investigation disclosed the fact that he is not in business at Dunmore, but is a peddler, who travels about selling goods of different kinds. Having worked the jewelry trade for all it was worth, he turned his attention to other lines, and is now understood to be practising his peculiar methods upon fancy goods dealers. The moral of this little story lies in the application of it.

The New York Jewelers' Association.

THE sixth annual election of officers of the New York Jewelers' Association, was held at their rooms, corner of Broadway and Bond Street on the 14th inst. Mr. Daniel F. Appleton, President of the Association for several years, declined a re-election, being satisfied with the honors already conferred upon him by the Association. Mr. Ethel C. Hine, of the E. N. Welch Manufacturing Co., was therefore elected to succeed Mr. Appleton. Mr. W. R. Alling, of Alling Bros. & Co., was elected Vice President, in place of Mr. T. Slater, of Enos, Richardson & Co. Mr. T. G. Brown was re-elected Treasurer, and Henry Olmstead Secretary. The Association continues to exercise a healthful influence on the trade, and is in a prosperous condition. Its prosperity has been long assured, and continues to grow in popularity. Mr. Hine, the newly elected President, was long identified with the old American Clock Company previous to its dissolution, and is a gentleman possessed of marked executive ability. He is highly esteemed in the trade, and under his auspices the Association can scarcely fail to maintain its well-earned reputation.

The Jewelers' League.

We devote this column to the interests of the League and its membership. Letters or inquiries pertinent to its business or purposes, and which might interest the trade or inquirers, will be herein answered. Address *Jewelers' League, Box 4001, P. O. New York*, or the office of THE CIRCULAR.

The following persons were admitted to membership in the League at the meeting of the Executive Committee on Sept. 3 :

J. H. Bauerlein, with Cady & Olmsteads, Kansas City, Mo.; J. N Bell, Jr., Washington, No. Carolina ; Elbridge Flint, Littleton, New Hampshire ; H. F. Steck, Washington, Iowa ; M. A. Sumner, Defiance, Ohio, and the following from New York City : F. J. Boesse, of L. H. Keller & Co.; Addison Conkling, with Mulford & Bonnet ; Edward Hunziker, of L. H. Keller & Co.; F. H. Platt, with G. W. Platt.

At an adjourned meeting held Sept. 10 : David J. Ayers, Keokuk Iowa ; Chas. E. Bride, Brooklyn, N. Y.; E. B. Bullock, with W. H. Wilmarth, Attleboro, Mass.; Henry J. Conway, with S. Kirk & Son, Baltimore ; Fritz Dirking, San Francisco, Cal.; Gustav Ephraim, New York City ; W. E. Greeley, Honesdale, Penn.; E. A. Hosier, with Cady & Olmsteads, Kansas City, Mo.; Adolph Jerger, Hawkinsville, Ga.; Harry P. Johnson, Abingdon, Va.; Chas. F. Kleine, San Antonio, Texas ; Calvin I. Lee, with Cady & Olmsteads, Kansas City, Mo.; Chas. A. Newcomb, with Clapp Bros. & Co., Chicago, Ills.; George W. Sadtler, Baltimore, Md.; Delos Sanders, Cortland, N. Y.; Fred. Schaub, Jersey City, N. J.; Wm. B. Sniffen, Newtown, Conn.; D. S. and F. W. Spaulding, Mansfield, Mass.; R. C. Stiddig, San Antonio, Texas ; C. S. Strowbridge, Cortland, N. Y.: George W. Ward, with Sadtler & Sons, Baltimore. Thirty-one in all.

One application rejected and six applications referred for corrections.

There were several appointments to the Advisory Board. The full Board is as follows :

Albany, Henry Rowlands ; Baltimore, R. J. Walton ; Boston, G. H. Richards, Jr., E. L. Libbey ; Buffalo, Austin M. Edwards ; Brooklyn, B. A. Jeannot ; Attleboro, Albert N. Bliss ; Chicago, S. N. Hale, Caleb Clapp, J. R. Richards, W. F. Cory ; Milwaukee, W. S. Stanley, Jr.; Newark, N. J., Theo. Shaw ; No. Attleboro, E. E. Barrows and S. E. Fisher ; Paris, France, Wm. Herrick ; Philadelphia, Jno. F. Simons and D. F. Conover ; Pittsburg, W. C. Hodge ; Providence, F. I. Marcy, T. W. Manchester ; San Francisco, Sam'l McC. Miller ; Springfield, Ills., Chas. E. Mason ; St. Louis, Mo., August Kurtzebonn ; Cincinnati, O., Herman Bakhaus ; Cleveland, O., R. E. Burdick ; Des Moines, Iowa, N. C. Plumb ; Louisville, Ky., A. J. Kriel ; Rochester, N. Y., Max L. Gutman ; West Meriden, Conn., F. E. Knight ; Worcester, Mass ; F. Knowlton.

Amount in General Fund, $1,371.15.

Amount in Benefit Fund, $1,599.80.

The members unfortunately can no longer boast of immunity from loss by death, as the Executive Committee at their next meeting will be obliged to appropriate the balance now in Union Trust Co., for the benefit of the family of John J. Barker, of Brooklyn, N. Y. Three weeks ago our late fellow member was apparently in good health and his chances for a long life were as bright as any of the members. In two weeks he was striken down with pneumonia. He was 34 years old on June 1st, 1880, and at the time of his initiation into the League, April, 1878, he was employed in the factory of Baldwin, Sexton & Peterson, of N. Y. City. He was esteemed by all who were acquainted with him, and the sorrow of those who were his companions, for their loss, and sympathy for his family, is sincere. His wife and three children will be benefited from the advantages gained by his membership with the League. It is gratifying that the benefit fund has reached so satisfactory an amount. The objects of the society would not be gained by merely increasing its membership and its treasury, without an opportunity of dispensing its benevolence among and for its members. The assessment which will become necessary will act as a long roll and will remind the members of the good objects for which the society was formed. It will stimulate those who are members, and it will commend the League to all who are not members.

An Important Horological Invention.

COMMUNICATED BY H. BUSH, HULL.

HERR AUGUST ERNST MULLER, a celebrated chronometer maker and Professor at the Polytechnic Institute in Vienna Austria, has after many years' study, practice and experiments succeeded in accomplishing a normal chronometer escapement, patented in the principal European countries and exhibited at present in the Elite Industrial Exposition in the Prater-Retonda, Vienna, which promises to become the time indicator of the future, claiming the following advantages :

(*a*) Watches with this normal chronometer escapement can be produced at the same price as watches with lever escapement ; marine chronometers at about the third part and turret clocks at at slight advance of their present price.

(*b*) Temperatures, even extreme ones, have no influence on the rate of this escapement.

(*c*) The action of the escapement is absolutely uniform and independent of the irregularities of the motive power and train.

(*d*) The escapement does not require an isochronous balance-spring and difficult adjustment.

(*e*) The nearest possible isochronism of the oscillations of the balance is effected by a simple, peculiar and unique arrangement producing a timekeeping of less than a minute variation in a year, or five seconds in a month, dispensing with costly compensation-balances or auxiliary compensations, and consequently saving the expenses arising from their construction and application.

(*f*) The impulse of the escapement acts by the least possible power, and is therefore enabled to operate with a considerable weaker mainspring as in other watches.

(*g*) The escapement, once in action, will not stop, even if exposed to excessive shaking, a banking will absolutely be impossible, whilst the requisite power for setting it in motion is so light, that the winding itself produces the oscillition of the balance.

(*h*) The friction of the teeth and pivots being in consideration of of the weak motive power required, very slight, makes this normal chronometer escapement more lasting and durable than any other chronometer escapement.

(*i*) All the parts of the escapement can be produced by the application of machinery making the parts interchangeable, which is impossible with ordinary chronometers necessarily requiring hand finish by an expert in horology.

(*k*) That in consideration of the superior time-keeping, small cost of production and application to all timepieces and turret clocks, releasing of the hands once in every minute, indicating the division of time, enables it to supersede public clocks set in motion by electricity or pneumatic, which are not only of very expensive construction and maintaining, but at the same time of far less reliability and uniformity.

The Time Work and Time Signals of the Greenwich Royal Observatory.

BY C. STEWART MURRAY.

IN March last Mr. G. L. Criswick, F. R. A. S., delivered a most able and interesting lecture at the British Horological Institute, Northampton Square, upon the system of Greenwich time signals. As the lecturer is also a member of the Society of Telegraph Engineers, his story was fully illustrated by large diagrams and drawings of the mechanism and wires connected with his subject. An abstract of this lecture was afterwards published in the official journal of the Institute, but upon going carefully over it we found that the treatment was far too technical for all but readers well acquainted with the scientific side of telegraphic art in working combination with practical horology. Such being the case we decided to go over the same ground in a more popular way, adding things that were not necessary to the lecture, and leaving out others that are not necessary to the reader. Accordingly, by the special permission of the Astronomer Royal, for which we most sincerely thank him, we duly found ourselves under the great time-ball. Mr. Criswick was there, and very kindly placed his valuable aid at our disposal. Before, however, we proceed on our main errand, we will offer a short introductory preface for the purpose of better enabling the reader to comprehend what is to follow.

First and foremost, then, before time can be signalled it must be "made," and the Royal Observatory at Greenwich is the place, beyond excellence, where the manufactured article can be turned out in the most perfect manner known to civilization, especially to the highly cultured civilization of nautical astronomy. The ever-lauded ancient world had no such "machinery" for the production of hours, minutes, and seconds as we have. The Babylonians, the Chaldeans, the Greeks and Roman knew nothing of our "tools," nor did our own early Saxons. Even the Chinese and Hindoos, who are supposed to have the first knowledge of everything, were in no better condition. Egypt, comparatively enlightened as it undoubtedly was, stood in the shadow of ignorance in this respect. What would Hipparchus, Ptolemy, Meton, Thales, Aristotle, and all the ancient host have given for a sojourn in Flamsteed's old house on the hill of Greenwich Park? Thales, Pythagoras, and Archimedes would have been beside themselves with joy. The immortal godfathers of the constellations were in a "darkness visible" that we never knew; still they were astronomers. Does not the Dramatic poet, Euripides, make the chorus in one of his tragedies say, "What is the star now passing? The Pleiades show themselves in the east. The eagle soars in the summit of heaven."

From the time that astronomy came into Europe in the 13th century until now, what an army of time-makers there has been. It may not be known beyond the learned circles that old Walther us, the pupil of Regiomontanus, has the credit of being the first astronomer who used a clock in his observations. But what a clock it must have been, that "regulator" of the closing years of the 15th century! It could hardly have been much better than the Clepsydra of Ctesibius, with the hours spirally marked upon the column, one cupid dropping tears to supply the water-wheel that moves the wheel-work concealed in the base, and another cupid rising on the back of the dolphin, marking with the arrow in his hand the hours as he passes them. An important period in the history of time-making may be said to be comprised between the death of Tycho Brahe, in 1601, and that of Sir Isaac Newton, in 1727; and from the latter date to the foundation of the Royal Astronomical Society, in 1820, embraces another. But in this country there were students of the stars previous to the conquest; for instance, there were Adelin, about the year 680, Walfred Ripod, 698, Bede, 730, and others. How few of the long array of names that could be given knew the ABC of their science as it is known now. They had no perfect transit instruments, no equatorials, no siderial and no solar clocks, and yet how they plodded on in their allotted paths with the poor means at their command. Their time signals were from the sun, the moon, and the stars, as they are now, but the world had either to go or to send to have those signals read. The electric telegraph was to them in the womb of the far distant future.

"Time," says Laplace, "is to us the impression left on the memory by a series of events, the existence of which we are sure was successive. Motion is suitable to serve as a measure for it because a body not being capable of being in several places at once, incapable of ubiquity, must in passing from one place to another occupy successively all the intermediate parts. If at each point of the line described it is animated by the same force, its movement will be uniform and the portions of that line may measure the time employed in traversing them."

This is a correct definition, indeed, from the author of the celebrated "Mecanique Celeste." Such was to be expected. Laplace was a mathematician first, and a Frenchman afterwards; and, although his name seems far removed from us in our memories, he lived until the year 1827.

Having stated what time is, we will next explain how it is made and how it is distributed.

Every place has a meridian—that is, an imaginary line directly overhead from north to south, which the sun passes in his daily course. It is the highest point reached by that luminary, and in daily life always indicates noon. The English meridian is fixed over the Greenwich Observatory, and as from it all the calculations for the Nautical Almanac are based, it may be practically taken to be the world's meridian for navigating purposes. That being so, any place that is either east or west of this line is so much before or after the noon of Greenwich. Furthermore, this before or after noon is called in the language of nautical astronony east and west longitude, or *length* from the place above named. From what has been said it will be readily understood that time and distance from a given meridian are convertible terms, hence a knowledge of their relationship to each other is indispensible to the conduct of the affairs of man, kind. The earth being a globe has a number of imaginary circles given to it; but they are only imaginary to *sight*, for their positions are well known and defined by astronomers. Thus there are circles of latitude and circles of longitude, both celestial and terrestrial. The circles of longitude are meridians, and the other circles at right angles to them are circles of latitude. It is to be noted that every terrestrial circle has its corresponding celestial one. The celestial meridian passes through the celestial poles and the highest part from the horizon of the place it passes over, whilst the terrestrial circle passes through the terrestrial poles of the earth and the earth itself. As longitude means length, latitue, from *latus*, broad, means breadth. But the circles of latitude have no meridian, their starting line being the equator, the greatest of all the terrestrial circles. This circle is supposed to cut the earth into two equal hemispheres, the circles on each side of it going north and south. Hence we have the terms north and south latitude. The meridians of longitude deal with both time and distance, whereas the circles of latitude deal with breadth or distance only; that is, distance on each side of the equator.

A meridianal line cuts through every one of latitude, until after going round the world it returns to the place of rest and so completes the circle. In proof of this it may be mentioned that the meridian of Greenwich passes near the town of Cambridge, through Louth, in Lincolnshire, about two degrees east of Aberdeen, a little east of the Shetland Isles, and away across the Arctic Ocean to the north pole. Now, all the places directly under it have precisely the same time as Greenwich, for when it is noon at the Royal Observatory it is noon with them. Going south, the line leaves England at Lewes, in Sussex, enters France by the mouth of the Seine, on by Havre and Bordeaux, across the Pyrenees by a small Spanish village named Luz, where it enters Spain, then along the provinces of Arragon and Valencia, crossing the Mediterranean, east of Gibraltar, through the great Desert of Sahara, and so on to the Equator. Here, too, all the places

under it in this direction would have the same time as Greenwich. The line after crossing the equator goes down near New Zealand, through the south pole, up the Great South Pacific Ocean, across the Northern Pacific and back to Greenwich again. If it were possible to take a chronometer set to mean time here along this line, it would be found to agree with the mean time noon of all places that it passed away to the equator. If Mr. Criswick, therefore, had his wires laid on, he could fire guns and drop time-balls for all of them, as far as the equator. On the other side of that circle they are in the eastern hemisphere, and our daylight does not travel so far; they have to wait, or rather we have to wait, being westward of them, for our share every day.

Having thus spoken of the circles of latitude and longitude, which are the foundations of the making of time, we must not omit to mention that these circles are divided into 360 equal parts called degrees. Many working astronomers have expressed regret that, upon the revival of learning in Europe, the decimal scale was not adopted, as it would have greatly facilitated their computations. The 360, although not decimal, are divisable by 2, 2, 4, 5, 6, 8 and 9; and yet it was argued in the last century that the decimal notation would have been the best.

In order to arrive at what is called mean time, the astronomer has to deal with a sidereal day and a solar day. There is a lunar day, which indicates the interval of the moon's meridional passage from one day to the next; the time of this day always exceeds twenty-four mean time hours, varying from 24 hours, 40 minutes, to 25 hours 6 minutes. On account of this large irregularity, astronomers never employ the moon as a time measurer in the same way that they do the sun and stars.

A sidereal day is the transit of a star over the same meridian twice; in other words, such a day is the interval between the first appearance of a star on the meridian of Greeenwich and its next appearance on the same point.

There is a belt of constellations near a great circle of the heavens called the ecliptic, or path of the earth round the sun, known as the zodiac, from a Greek word signifying animal, because those constellations were supposed by the ancients to resemble animals of some kind with one exception, namely *Libra*, the balance. There is a ram, a bull, twins, a crab, a lion, a virgin, a scorpion, an archer, a goat, a water carrier, and two fishes. These constellations are made up of groups of stars, and the first point or star of Aries, the ram, is what the siderial day is measured by. When this point passes the meridian of Greenwich *twice*, a sidereal day has been completed. This sidereal day is a little shorter than a mean time one, and consists of 23 hours, 56 minutes, and 4 seconds of mean solar time. The sidereal day has a sidereal clock, and if this clock is regulated it will always show meridian time when the star does; the appearance of the latter on the meridian does not vary one second of time from one day to another—in fact, from one century to another. If the earth did not move in an orbit round the sun we are told that the sidereal day would be the most exact time that could possibly be made; but as a sidereal day is nearly four minutes shorter than a mean solar one, on this account it will not answer our purpose entirely.

The solar, or *apparent* day, is the passage of the sun twice across the same meridian, and is the time that is shown upon a correct sundial. But as the sun increases and declines throughout the year it will not do for a measure of time. The sun's days are not equal, as we all know. As neither the sun-dial day nor the sidereal day will give the time that is wanted, recourse is had to computation, and by means of this computation we produce what is known as "mean time," or a mean solar day throughout the year. This day contains 54 hours, 3 minutes, and a decimal over 56½ seconds of sidereal time, thereby making it longer a little than a sidereal one. In order to have a reliable basis, the whole of the solar noons in a year have been taken, and an average mean of all these has been calculated, the duration of one of the said days giving what is known as "mean time," and the difference between this and the sun-dial is called the equation of time. It follows, therefore, that the astronomers do not go by the real sun of the heavens, but by an imaginary one that they are able to fix on the same meridian at the same instant every day throughout the year, no matter what part of its path round the sun the earth may be in. As this mean time day has a mean time clock that beats so many seconds in the twenty-four hours, it can always be regulated by means of the real sun, the sidereal clock, and the transit instrument. From this combination arises what is known as the "equation of time," or the difference between true solar time and mean time. The difference is so great that in November the true sun-dial time is a quarter of an hour before mean time, and in February a quarter of an hour behind it. A table will be found in most almanacs called "clock before sun" and "clock after sun."

There are three causes all acting in combination, which go to vary the length of the solar days. These are the inequality of the diurnal motion, the difference in the direction of that motion, and the greater or less angular distance from the equator at which the motion is effected. It would be too much extending this paper were we to go into a full explanation of all these causes; in fact, they would require a paper for themselves. It may be stated that the motion of the equatorial fictitious sun is based upon that of the real sun, and that the hour circles of these respective suns always coincide four times in each year, namely, in April, June, September, and December. Their meridians have been known to be passed almost at the same instant. Astronomers have computed sets of solar tables from which can be seen day by day the relative positions of the true sun and the equatorial fictitious sun; the clock of this fictitious sun has, too, a certain relationship to that of the siderial clock, and ultimately to what are designated "clock stars," which govern them both, and are the real foundations of our time keeping. They tell us at Greenwich that the real and fictitious suns are never far apart in position, and that the inconvenience of having the mornings sometimes a little longer than the evenings, and at other times the evenings a little longer than the morning, is as nothing when put against having an equalizing standard for time. Curiously enough, and directly contrary to what most people believe, Mr. Criswick told us that in fixed observatories the sun is not made use of for finding mean time "except in cases of rare emergency, owing to the errors still remaining in the solar tables." The "clock stars," as we understand it, whose positions have been settled by the accuracy attached to the continued scientific observations of a hundred years are what the astronomer relies upon. They are called "clock stars" because they are so distant that they always appear to be in the same places in relation to the yearly journey of the earth along the ecliptic around the sun. With respect to this distance and motion, a few words of an explanatory character may be acceptable.

The nearest star to the earth is so much farther off in miles as compared to the sun that it is perfectly useless to write it down in figures; no reader could comprehend them, but this may afford a glimpse of the immensity. Light comes from the sun in 8¼ minutes, whilst from the nearest star it takes three years and four months. Arago, the celebrated French astronomer, has laid it down that the light from the smallest stars visible in the telescope of forty feet focal length will require 2,700 years to reach the earth! Taking therefore, the computed rate of the earth through space to be over 65,000 miles an hour, the distance of stars from it that never seem to move may be imagined, but certainly not comprehended. The whole length of the earth's orbit has been put down at nearly 574 millions of miles, and as the "clock stars" never seem to us to change their position from us, whatever part of that orbit we may be in, the non-astronomic mind becomes dazed with the vastness of the subject.

Ignorant and thoughtless people babble about *millions* and *billions*, as if such numbers stood for so many eggs in a basket; indeed, at times, even with less consideration, many of them would not know a million or a billion in figures if they saw the figures. Well, here they are respectively—1,000,000 and 1,000,000,000,000. The Christian era had a beginning, but at the very first second of time of the year 1 until this present moment not one sixteenth of a billion of such seconds has passed! There are 86,400 seconds of time in 24 hours, or a day; it would therefore, by computation, require just 31,687 years, 17 days, 22 hours, 45 minutes, and 5 seconds to make up a *billion* of seconds of time.

(To be continued.

Practical Treatise on the Metallurgy of Platinum

BY H. BUSH, HULL, ENGLAND. [CONCLUDED.]

The dimension of the oven for melting the first named quantities, which size will answer for any ordinary commercial purposes, had a hemispherical cavity of 15 centimetres (about 6 inches) for containing the metal, and was supplied with one hydro-oxygen gas tube inserted in the centre of the lid; for the next melting an oblong cavity of the same breadth, but a little deeper and longer was used and being supplied with three hydro-oxygen burners, and the dimensions of the oven for the melting of the entire mass were of 124 centimetres=44¾ inches in length; 15 centimetres=5¾ inches in breadth, and 7 centimetres=2¾ inches in depth. Thickness of the stone above the cavity in the lid. 15 centimeters=5¾ inches. This oven was supplied with seven hydro-oxygen burners, and for obtaining a sufficient blast the power of a 15-horse steam engine was employed. The time occupied for the operation was from 2:10 P. M., when the furnace was begun to be heated and lighted, until 3:27 P. M., or in all 1 hour and 17 minutes until all the metal was melted, when the gases were extinguished and the metal allowed to solidify, being thought too great a mass to pour into a mould; at 4:15 the lid was lifted and about an hour after the metal removed from the crucible. The melting in this instance will always be considered as an important episode in the history of platinum, as a like quantity will rarely be required in one piece for any other purpose.

The operation of the first named or old process, which is more of chemical nature than the direct melting one just described, is conducted by dissolving the platinum in aqua regia, consisting of three parts of muriatic to one of nitric acid. In case the platinum should contain silver, the same will subside at the bottom as chloride, and may be saved by allowing the acid to cool down and to be carefully decanted from it; if all is thoroughly dissolved and no more subsiding of chloride of silver observed, the solution is tested for gold by gradually adding saturated solution of oxalic acid, which will attack the gold only without affecting the platinum. The gold in the solution will precipitate as a yellowish powder, and oxalic acid is continued to be added as long as precipitate is formed. The solution is then set aside for 24 hours, as it takes some time for the gold to settle thoroughly. The acid containing the platinum in solution is then carefully decanted, and the precipitate of gold well washed and melted with some borax and saltpetre. A saturated solution of sal-ammoniac is then added gradually to the solution containing the platinum, which will be precipitated as a grayish powder, and the adding of sal-ammoniac solution continued until no more precipitate is formed, and then some of the solution added in excess and subsequently a little pure alcohol. The solution is then evaporated to dryness and the residue washed with dilute alcohol to soak out most of the ammonium, dried and placed into a clean crucible, covered and annealed when the remaining ammonium will be expelled, and pure platinum, dull grey in color and of a porous or spongy form remain. The spongy platinum is then rubbed finely between the fingers, mixed with water and gently pressed through a fine wire sieve in order to keep back all coarse parts, which are again rubbed into fine powder, mixed with water and run through the sieve, this operation repeated until all the platinum is thus disposed of; in conducting this operation it is of great importance to avoid the use of any hard body which would cause particles of the metallic powder to aggregate into lumps, and also to observe strict cleanliness in order to prevent the introduction of any greasy matter, which would greatly retard the result of obtaining the metal in a perfectly homogeneous state. To ensure success, it is advisable to wash at this stage the metallic substance repeatedly in warm water, allowing it to settle thoroughly prior to each decanting of the water. The platinum paste is then introduced in a cast metal cylinder similar to a mortar, accurately fitted with a steel piston by which the escape of the pasty mass is prevented; after first ramming in the piston with a mallet, greater force is applied, and lastly a screwpress is brought to bear upon it, which will separate all the water from the mass of paste. The cylinder is then placed in the oven to thoroughly dry the containing mass, which will bake into a cake and may be removed by turning the cylinder upside down. The resulting disc of platinum powder is then placed into a clean crucible, covered and inserted into a larger crucible of plumbago, and exposed to a white heat in the furnace, when the mass will condense to a semi-solid state, and may then readily be welded into a perfectly solid mass by hammering it, whilst red hot, on the anvil; care to be to hammer the metal after each annealing, on one side only, and not to attempt to hammer the other side of the metal until annealed again, or else the malleability of the metal will be irretrievably impaired, and the whole process to be begun afresh; it is in fact the safest, to hammer platinum obtained in this way always on one side only, to prevent loss of time, chemicals, and perhaps metal. Most of the platinum in commerce, and especially such as is used in small quantities is prepared in this manner, and if carefully prepared in accordance with the described mode, will satisfactorily answer all purposes. After the platinum is reduced either by melting with hydro-oxygen, or by condensing in the chemical process, it is heated to redness and thrown into a bath of muriatic acid, which will remove all impurities adhering to it either from the lime in the crucible or plumbago in the ingot, or any matter which might have come by accident in contact with the metal, whilst being melted, poured or condensed; this latter process is absolutely necessary to obtain a faultless surface, before being subjected to hammering, etc.

Separating silver from platinum in dental alloy, cut the scraps up into small pieces and anneal in charcoal fire; filings are also annealed, but treated separately; clear the filings with a magnet of iron or steel, and immerse the metal in *concentrated sulphuric acid* and bring to a boiling heat, which will dissolve the silver without affecting the platinum, (nitric acid will likewise dissolve the silver, but more or less of the platinum along with it, which would then be lost). After ceasing of the ebullition of the acid, decant and pour fresh acid over the metal, expose to heat again until no more ebullition is perceived, decant the second acid into the first and wash the remainder, which is pure platinum, two or three times with warm water and add the washings to the solution containing the silver. The silver is then precipitated by adding to the solution, which is to be diluted to double the quantity, gradually small quantities of saturated salt solution until no more precipitation or clouding is formed, the acid is then carefully decanted and the precipitate washed in warm water, dried and reduced to a metallic state by melting with carbonate of soda.

The separated platinum may be reduced to a solid mass by any of the methods described.

Another method of separating the silver from platinum in dental alloy consists of: Dissolving the alloy in aqua regia, which will dissolve the platinum and leave the silver as chloride in the shape of curly powder at the bottom, after a quantity of chloride has subsided, the solution is removed from the heat and allowed to cool down, and then the solution is decanted from the chloride and again exposed to heat until no more chloride is observed to form. The chloride is carefully collected, washed, dried, and fused. The platinum which is held in solution is then precipitated with sal-ammoniac solution as described. In case gold is suspected in the solution, it is precipitated with oxalic acid solution, which will affect gold only, and leave all other metals in solution undisturbed.

A CURIOUS circumstance of natural silver-plating is reported from the Lord of Lorne Mine, from the American Flat section, Nevada. The sides next to the veins and the hanging walls of the ledge are covered with a thin coating of natural plating of pure silver as smooth as glass. The vein itself is narrow, and is being prospected by means of a tunnel. The superintendent says this peculiar feature of the enclosing walls is observable so far as the tunnel has followed the ledge. The ore of the vein itself is of a soft, easily-worked nature, showing considerable chloride as well as sulphurets, yet not giving very high assays. The filmy deposit of silver on the walls was evidently condensed and forcibly deposited there under immense pressure, as it has a smooth, burnished appearance.

Practical Hints on Watch Repairing.

By Excelsior.—No. 67.

THE PRACTICAL EXAMINATION OF TOOTHED GEARING—CONTINUED.

(1,064). *Characteristics of a good Gearing.* In examining a gearing in action, you will particularly notice, 1st, the *engagement*, or passage of the point of the tooth into the pinion, to see that it does not touch the leaf, and that there is some slight space between the leaf and the back of the tooth; 2d, the *meeting*, or point of first contact, at the beginning of the driving, to see that it begins on the line of centers or at the proper distance before it, as already explained; 3d, the *driving*, from its beginning to its end; lastly, the *parting*, or manner in which the point of the tooth ends its contact with the leaf.

(1,065). A perfect gearing will have a clear, free engagement, the tooth and leaf will meet without drop at the proper point, will have a smooth, easy, uniform driving till the end, the tooth will part from its leaf without any hurrying, or drop, and in any position of the parts there will be freedom. Although the tooth will have less freedom when it is quite thick, or its curves or addenda are quite full and round, yet there must always be play enough to prevent any risk of catching or clogging.

We distinguish the parts as the engaging (or following) tooth and leaf; the acting tooth and leaf. *i. e.*, the driving tooth and the driven leaf; and the departing tooth and leaf. By "points," we mean the addenda, or those portions of the teeth and leaves which are outside of the pitch circles.

(1,066). *Faults of an Imperfect Gearing.* These are quite numerous, and as it is of the first inportance that each should have its own own distinctive name, we will consider them separately. Passing by the terms for mechanical defects, etc, (1,035), and errors of pitching, depthing, center distance, length and shape of points, etc., all of which we call "errors," we have the following "faults" of a gearing in action, as the results or effects of those errors: butting, catching, wedging, bottoming or striking, clogging, slipping, and dropping—besides premature, late, and irregular contact, irregular driving, pointing, and scraping.

Although it is a new thing to thus classify the faults, it will be found wonderfully convenient, not only in understanding these articles, but also in the workshop, for explaining alterations to be made to workmen or apprentices, or jotting down faults on the bench slip, etc. At present it is almost impossible to understand precisely what a workman means, unless he gives a long description about the peculiar action to which he refers.

(1,067). *Butting* is when the point of the tooth butts against the leaf during the engagement or in entering the pinion, or the point of the leaf butts against that of the tooth—and always causes stoppage. In Fig. 58, if the teeth were further apart, (pitch increased,) the bottom or engaging tooth would butt against the point of the following leaf *n*, in passing. On the other hand, if the teeth were closer together, (wheel pitch less,) the point of the engaging leaf above the tooth *m*, would butt against the addendum curve just below it. This occurs even when the depthing, shapes and thickness of the teeth and leaves, etc., are correct, if the pitching is incorrect. It may also be caused by a depthing too deep or too shallow, when the other points alluded to are correct. But the explanations already given illustrate what constitutes butting, viz: the interference of *two addenda* with each other, on or outside of the pitch circles of the parts.

(1,068). *Catching* is the interference of an addendum with a flank, and occurs after the interfering addendum has entered the pitch circle of the opposing flank, but before the interfering parts reach the line of centers. This term is applied only to the contact of the *back* of the addendum with the adjacent flank. In Fig 58, it would be the contact of the flank of the bottom or engaging tooth, with the addendum of the second or engaging leaf; or of the flank of either of the engaging leaves with the back of either of the engaging teeth. Catching may be caused by a pinion too large or wheel too small, the points of the teeth being too long or too full and rounded, or by a depthing either too deep or too shallow.

(1,069). *Premature Contact* is when the driving begins further before the line of centers than it should do for the number of leaves the pinion has, as already fully laid down, (1,040). It may be caused by a pinion larger than it should be relatively to the wheel which drives it, pinion leaves too thick, depthing too shallow, points of the teeth too short. The increased distance or amount of the driving before the center increases the "wedging," (1,072), and causes excessive friction, etc.

(1,070). *Late Contact.* Of course the reverse results follow from contrary errors, and the contact begins closer to to the line of centers than it should do, with low numbered pinions, from causes contrary to those above stated. When the addenda of the teeth are too long, and drive pinions of ten leaves or more, the contact may be so delayed as not take place till after passing the line of centers, in which case the gearing is almost certain to catch and stop.

(1,071). *Irregular Contact.* When the beginning of contact is irregular, occurring nearer to the line of centers with some teeth than others, it shows irregularity in either the teeth or leaves, *i. e.*, with some mechanical defect, (1,035, 1,036), which should be discovered and remedied.

(1,072). *Wedging* is somewhat similar to butting, except that butting occurs during the engagement, while wedging occurs during the driving, after proper contact has been made. It is the fault of that part of the driving which is done before the line of centers, and causes what is known as engaging friction, *i. e.*, the friction of two inclined surfaces which are approaching or passing upon each other, as distinguished from disengaging friction or that which occurs after the two surfaces have passed the center and are sliding off from each other. The difference is that between pushing a body up a wedge or inclined plane, and pulling it down the same. It is faintly illustrated in Fig. 60, where the tooth and leaf have just met. The tendency, of course, is to push the wheel and pinion from each other, and much of the motive force is wasted (decomposition of force) in useless friction and being applied in the wrong direction. Wedging is more injurious and wasteful as the distance at which it begins before the center is greater. The excessive friction and pressure wears the fronts of the teeth into those grooves we find so often, especially when the depthing is scant. Wedging is practically unavoidable with pinions of less than 10 leaves, but may be lessened by causing contact to begin nearer to the line of centers, by making the depthing deeper, the addenda of the teeth longer, their curves more full, etc. When it should or should not be lessened has already been fully explained, in previous articles.

(1,073). *Clogging* is the interference of either a tooth or a leaf with the parts on both sides of it at the same time, *i. e.*, the contact of a leaf with two teeth, or of a tooth with two adjacent leaves. If it occurs on the line of centers, either the teeth or leaves are too thick. As, in Fig. 58, if either the driving tooth or the driven leaf was thick enough to fill the space as they passed the center, they would clog. This does not often happen, but we often find gearings which fit too closely for safety, as a very little dirt would cause them to clog.

The more common variety of clogging is illustrated by supposing that the tooth *A N*, Fig. 58, was thick enough to touch both the leaf *O*, and the one above it, at the same time. We should then say that the driving tooth clogged. If the tooth below the center touched both the leaf *O* and the one below it, the engaging tooth would clog.

(1,074). But when the tooth *A N* touches its leaf with its point, as shown, and the engaging tooth touches the leaf below it with the back of its point, both occurring at the same time, there is no clogging at all. The former tooth is driving, and the latter is *catching*, which is quite different from clogging. When clogging is not caused by teeth or leaves unnecessarily thick, the points of the teeth may be too long, or the curves too full. If they are correct, it can be remedied by making the depthing more shallow. If it is the pinion leaf

which clogs, the pinion is probably too large—by which we mean that it is larger, in proportion to the wheel that drives it, than corresponds to the ratio between the numbers of the pinion leaves and the teeth ol the wheel. The error in their relative sizes remains the same, whether the actual error consists in the pinion being too large or the wheel too small. (See article No. 56).

(1,075). *Bottoming* or *Striking* occurs on the line of centers, and means that the points of the teeth or leaves strike the bottom of the spaces in which they lie. For example, if the leaf *w*, in Fig. 60, touched the web of the wheel at the bottom of the space between the two teeth, it would be called "bottoming" or "striking;" or. if the tip of the tooth should strike the heart or core of the pinion in passing the center. The remedy, of course, is to cut the spaces deeper, if bottoming is the only fault. It may, however, be caused by a depthing too deep, or addenda too long. Actual bottoming is rare, but the same effect is produced if the spaces are filled with dirt, etc., so that the points bottom or strike on that. There should always be clearance enough for safety.

(1,076). *Pointing* is driving by the tip of the tooth, instead of by the curve of the addendum. The curve is intended to be properly shaped for driving the pinion leaf uniformly, but the tip of the tooth has no such power. Pointing is therefore a positive proof of irregular driving. In Fig. 59, we see that the curve *N d*, on the tooth *A N*, drove the pinion leaf from the line of centers up to *i*, (as explained in previous articles,) and that from *i* to *d* the driving has been done entirely by the tip *d* of the point. To a certain extent, pointing is practically unavoidable with pinions of less than 10 leaves, without causing contact to begin further before the line of centers and thereby increasing the wedging and engaging friction—which would be a worse evil than the original one. It does not always call for repairs, therefore, but serves as an index to other faults. But when pointing is accompanied by "slipping," a correction of the gearing is demanded. Aside from the errors which cause slipping, (1,077), pointing may be caused by the addendum curves being too flat, and its injurious effects would be lessened by making them more full, as previously explained.

(1,077). *Slipping* is an irregular driving—a rapid but nearly useless motion of the wheel. The tooth passes quickly over a considerable surface of the leaf, but drives it very little forward. It is shown by each tooth moving more rapidly, just before it parts from its leaf. In Fig. 59, the point of the tooth *N M* has advanced from *i* to *d* in order to drive the leaf forward 10°, and of course has moved through a greater space than it previously did to drive the pinion leaf an equal distance, *i. e.*, it has moved further and more rapidly than before, while the pinion has only kept up its usual motion. A tooth of the shape marked inside of the other, would move the entire distance from *i* to the pitch circle, to carry the pinion leaf to its present position. The waste of motion is shown still more clearly in Fig. 51, where the point *b*, of the addendum curve *N b*, in advancing from *o* to *b* has driven the leaf *a b c* through 60°. But if it were to continue on from *b* to the pitch circle, a distance greater than from *o* to *b*, it would only carry the pinion leaf about 8° further. Supposing the pinion to move uniformly, we see that the point of the tooth would hurry forward faster and faster, till it passed off the pinion leaf. This illustrates the nature of slipping. In practice, it may be caused by a pinion too small relatively to the wheel, by the addenda of the teeth being too short, or by a depthing either too deep, or too shallow—especially too shallow. The proper remedies are obvious.

(1,078). *Dropping* occurs when the driving tooth passes off from the driven leaf before the following tooth has come up to its leaf, so that there is a space or interval between the latter at the moment when the driving tooth passes off from its leaf. The fall or advance of the tooth through this space till it strikes the leaf is called the "drop." Drop is therefore a loss of so much motion of the wheel—of so much of the motive force. The greater the drop, the greater the force of the blow when it strikes, the greater the strain on the gearing by the sudden stoppage of the wheel tooth, the greater the friction, wear, etc. But, although a serious fault, it does not cause stoppage, like butting or catching; and many workmen consider a slight, just perceptible drop as not only not objectionable, but as a "good sign"—showing that the gearing is free from more serious errors, and that the wheel is relatively too large for the pinion—which as we have seen, is preferable to having the pinion relatively too large. But it is not a trustworthy "sign," because drop may be caused not only by a wheel too large or pinion too small, *i. e.*, the pitch of the pinion being shorter than that of the wheel, but also by a depthing too deep or too shallow, or by the addenda of the teeth being too short. If the drop is at all marked, or even is easily to be seen, the proper corrections should be applied, according to the cause of it.

(1,079). *Scraping* is the rough feeling noticed when running the gearing rapidly backward and forward with the tweezers or a bit of peg wood, to test the smoothness of its action, after remoing the escapement. It comes from the same condition which causes the noisy rattling sound which is heard when the gearing is run down rapidly; when felt, it is called "scraping," when heard, "rattling." This roughness may arise fro n most of the other faults enumerated as a gearing in action. But if the fault is either catching, wedging, characterizing pointing, slipping, dropping, or a scant depthing, it may not cause stoppage unless it is quite serious, or the movement dirty or worn. A gearing may scrape, and yet go, while clean, because the motive power is so strong as to pull it through in spite of the excessive friction and resistance. But it is not a proper condition to leave it in.

(1,080). *Testing by Touch* is based on the resistances felt in scraping, but is applied a little differently. We press a piece of peg wood on the end of the pivot of the pinion, in the gearing we are testing, or even press gently against the smooth pinion arbor, or clasp it very lightly in the tweezers—or in any other way very slightly retard the motion of the pinion. While holding it thus, we press with another piece of peg wood upon the wheel which gears into the pinion being held, and move the wheel slowly forward in the same direction as it usually runs. If there is any roughness or "scraping," it of course proves some error in the gearing. If it runs smoothly a part of the way round the wheel, then scrapes, the fault is local, and shows some "mechanical defect." But even if the wheel runs softly and smoothly all the way around, and several times around, it does not prove a correct gearing, for the depthing may be much too scant, or other serious errors may exist. This is merely a quick test, to find whether the gearing is free from any defects which are likely to cause immediate stoppage, but it should not be relied upon alone, for, as before stated, the wheel and pinion may run smoothly to the touch, and yet be very far from being a good gearing.

(1,081). *The Examination* should be as thorough and complete as practicable. Look at the gearing in every way, in order to get the best views of the action and detect every fault—and while the movement is running, if possible. The inexperienced workman should note down every fault or peculiarity he discovers. Having examined the action thoroughly, as described in section (1,064), and ascertained the presence or absence of all the different faults, (1,066), also the freedom, (by carefully testing the wheel in every position of the tooth, while the pinion is held still,) the next step is to find which ones, out of the *possible* causes of the faults observed, are the real causes in this particular case. This is done by comparing the possible causes, and eliminating those which are inconsistent. For instance, if one of our observed faults may be caused by a scant depthing, and another by a depthing too close, we must cross out one of these possible causes, because both cannot exist at the same time in the same gearing. Which one is the real cause we find by comparison with the other faults. The one which is incompatible with one or more of the faults observed, we exclude, retaining the one which harmonizes with all of them. In general, however, we can easily decide without much comparing, and as experience increases, it becomes more easy to perceive during the examination itself, where the trouble lies. But all this will be more fully explained when considering our illustrations of faulty gearings in action.

Spectacles and Eye-Glasses.

BY W. J. SUTTIE.

BEFORE proceeding further I might introduce a few remarks pertaining to the phenomena of vision. Few persons know that, in order to see a body distinctly, the rays of light must come from that body to the eyes, and that an inverted image of the object must be made upon the retina. This inversion is caused by the rays of light being refracted by the cornea and crystallyne lens, and made to converge to a focus at the back of the eye and form an image upon the retina. The optic nerve here conveys to the brain in some way not known to us, a knowledge of the object. Why we do not see an object inverted, as the image is inverted upon the retina is a question that has been considerably discussed. The following solution has been given: "An object appears inverted only when compared to other objects which are erect, and as all images on the retina hold the same relative position to each other, none can be said to be inverted." We might now ask, why do some people need spectacles? Why are the glasses of one person of no use to another? Why do some people need convex while others require concave lenses?

The normal eye needs no glasses, it performs its functions properly.

The abnormal eye needs glasses inasmuch as there are certain irregularities or obscurities in it.

Some of these come within the domain of the optician, viz: those that can be rectified in some degree by the application of lenses; some people are near-sighted (myopia) owing to the conformation of the eye, the image is not properly impressed upon the retina, but in front of it, and a concave lens is used in order to cause the image to be thrown upon the retina; the degree of concavity can be better ascertained by trying glasses of different curvatures and selecting those which best answer the purpose. Far-sightedness (presbyophia) is also owing to a change in the form of the eye and can be corrected by using convex lenses. In the manufacture of lenses we need a substance that will readily permit the rays of light to pass through; of all the substances with which we are acquainted, glass answers the purpose better than anything else, it is cheap, easily ground to the required curvature, and transparent. Another substance, known as Brazilian pebble, is used; this is a hard transparent stone which requires more labor to work and is consequently more costly. Pebbles if thoroughly clear, make the better lens, as they cannot be scratched by the minute particles of sand that adheres to them, and which we remove by using our handkerchiefs.

The method of preparing pebble lenses are somewhat similar to the manufacture of glass lenses.

Any transparent substance would readily answer the purpose as it is not the substance but the curvature that causes the refraction of the rays of light. When we do not see an object clearly, some disturbance has taken place in one or the other of the above conditions or perhaps in both. If the disturbance takes place in the retina, in the optic nerve, or the brain, the disease belongs to the domain of amblyopia or amaurosis.

If no image be formed, or the image be clouded, through diffusion of light in the eyes, obscurities in the way of radiation of light in the eye, is the foundation of the mischief. Again, if the image of objects, placed at the ordinary distances of distinct vision be not formed on the retina, or even through abnormity in the curving of the surfaces, no well defined object is produced, anomalies of refraction or of accommodation are developed.

The lesions of vision, for each eye separately, may therefore all be referred to three principal classes: Amblyopia obscurities, anomalies of refraction, and of accommodation. If the power of vision of an eye be impaired, one of these three causes of disturbance must necessarily exist. Now if we look into such an eye with the opthalmoscope and see that no abnormity in the light refracting media exists, we may safely infer that amblyopia or a disturbance of refraction or of accommodation is there, but, if after trying convex glasses, no perfect image can be seen at any distance, the case is one of amblyopia; but if on the other hand, the patient can see at any distance a clearly defined object with a convex glass, we have only to deal with a deviation of refraction or accommodation.

The disturbances of accommodation have their foundation in the abnormal action of the internal muscles of the eye. In the normal eye the focus of the lens of the eye is exactly in the retina, and objects are distinctly seen. When looking at near objects the rays proceed in diverging directions, and their point of union in the normal eye lies behind the retina, and yet the organ is enabled to see clearly. It therefore follows that the eye has the power of bringing at will, rays of different directions in union on the retina. This is the power of accommodation, or in other words, we cannot at the same time see near and distant objects; for example, hold a veil at a few inches from the eye, and some printed matter at a greater distance; we can see either the printed matter or the veil, but cannot see both at the same time. If we read the paper, the veil only obstructs a little light, but if we examine the texture of the veil, we cannot read the print. The greater the progress which have been made in the investigation of the affections of the refraction and accommodation, the more evident has it become how essentially necessary it is, that they should be thoroughly and scientifically studied. I would therefore impress the student, after he has become conversant with the theoretical portion of the subject, that it is only by a practical and oft-repeated examination of a considerable number of cases, that he can acquire the necessary facility in the examination of the state of refraction and of the range of accommodation, in order to prescribe the proper lenses. To those who may consider these subjects as somewhat abstruse and difficult, I would reply that the difficulties lie only on the surface, and that a little perseverance and practice will soon enable a student to overcome them.

The refractive power of the emmertropic eye is such, that rays which emanate from a distant object and impinge in a parallel direction upon the cornea, are brought to an exact focus upon the retina, and the eye receives a distinct image of such an object. The dioptric system of the eye, which causes this refraction of the rays of light, consists of a certain media, which taken conjointly acts as a biconvex lens. These refractive media are the cornea, aqueous humor, crystalline lens, and vitreous humor.

On account of the slight thickness of the cornea, the parallelism of its two surfaces, and the fact that the refracting part of the cornea and aqueous humor are nearly equal, we may assume that the two form only one refracting surface.

The index of the refraction of the vitreous humor is almost the same as that of the aqueous. But the refraction by the cornea and and by the aqueous and vitreous humors would not suffice to bring parallel rays to a focus upon the retina in an emmertropic eye, as the focus would lie considerably behind it, and the lens is required to render the rays sufficiently convergent. The axis of the dioptic system is called the optic axis, the anterior extremity of which corresponds to the center or apex of the cornea and the posterior extremity, to a point situated between the yellow spot and the entrance of the optic nerve. By the term usual line is meant the line of direction drawn straight from its object to its image formed at the yellow spot.

It was formerly supposed that the optic axis and the visual line were identical, but this is not so, for according to Helmholtz, the visional line outside the eye lies somewhat above and to the inner side of the optic axis and its posterior extremity on the retina consequently lies a little to the outer and lower side of the axis. This fact will be found of practical importance with regard to the question of real and apparent strabismus. In the normal or emmertropic eye the visual line impinges upon the cornea slightly to the inner side of the tropical axis, forming with it an angle of about 5°. But Donders has shown that in the hypermetropic eye it lies still more to the inner side, so as to form an angle of 8° or 9°, whereas in myopia the visual

line may correspond to the optic axis, or even lie to the other side of it. These differences in the relation between the optic axis and the visional line often give rise to an apparent strabismus.

The best subjects for testing the range of accommodation are Snellen's test type or Von Graefe's wire optometers ; but as the latter requires some exactitude and intelligence on the part of the patient, it is more practical to use the test types. If whilst the patient is reading number one we move the type a few times alternately nearer to and further from the eye, the nearest and furthest point of distinct vision can be readily ascertained.

Von Graefe's optometer consists of a small square iron frame, across which a number of delicate, vertical, parallel wires are stretched. This frame can be attached to a brass rod (graduated in inches and feet) upon which it is movable ; or it maybe fastend to a graduated tape. One end of the rod or bobbin of tape is placed against the forehead of the patient, and the frame moved to the nearest point at which the individual can clearly distinguish the wires ; the distance of the point from the eye is read off from the graduated scale, and put down as the near point ; the frame is then removed to the greatest distance at which the individual wires still appear sharply defined, and this is noted as the far point. The distance between the nearest and the farthest points give the range of accommodation.

The wires only appear sharply defined when the eye accommodates itself perfectly to them. When there is the slightest deviation from this perfect accommodation (the frame being too far from or too near to the eye) the wires appearindistinct, or colored double images of them may appearin the transparent interstices.

With the test types the examination is still easier, the nearest point at which number one (Snellen's) can be distinctly and comfortably read, is measured and noted as the near point, and then the farthest point is measured and noted. Snellen's types are numbered according to the distance that they ought to be clearly seen, viz : number one should be clearly seen at one foot ; number ten, ten feet, and so on, by a normal eye. In concluding this article it might not be out of place to say that great improvements have been made in the manufacture of glasses. The great variety of eye-glass frames to conform to the various shapes of noses ; some require frames that will not fall off when they see fit to indulge in a laugh ; others require spectacles that they can see through when they read, and look over when they wish to look at distant objects. In conclusion let me add, happy is he or she who needs no spectacles, and still more happy are we who make them that we find so many that need spectacles. In the next paper I will endeavor to explain a few of the technical terms used by opticians.

The South-African Diamond Fields.

THE Diamond Fields of South Africa, though now comparatively unheard of, present a busy and wonderful contrast to the rest of South Africa generally ; they support a population of from fifteen to twenty thousand inhabitants, of various nationalities ; and although the excitement of the first discovery of diamonds has long since passed away, a sketch of the Fields at present may prove interesting to many readers of the CIRCULAR.

The first discovery of diamonds took place on the Vaal River, and caused the burden of the immigration to set towards there, where during 1869–70, hundreds of tents might be seen pitched, the diggers for the most part doing all the manual labor themselves, instead of relying on Caffir labor, as at present. The method of working was very primitive, and consisted merely of washing a sieveful of the diamondiferous soil in a hand sieve, to clear it of mud ; then turning it over on the sorting-table, and laboriously searching for the hidden gems. This style of work was sometimes the means of enriching a digger ; but the majority of them lost more than they made, the diamondiferous soil worked by each digger in a week being comparatively trifling. In 1870–71 the dry-diggings at Dutoitspan began to be talked of ; and the river-diggings were gradually deserted, until now they support a very trifling population, the most of the work being concentrated on what is still called the Fields—namely, the four mines, Kimberly, De Beers, Dutoitspan, and Bultfontein ; all lying within a radius of three miles, about midway between the Vaal and Modder rivers, in the territory known as Griqualand West, on the western border of the Orange Free State. The most productive of these mines up to the present time has been that of Kimberly ; but as the depth of this mine increases, the difficulties of working it become greater, so that during the last year or two the neighboring mines have been more worked than formerly, the lesser quantity of diamonds being compensated for by the lessened cost of obtaining them.

The Kimberly Mine as it now is, consists of a slightly oval form, about ten or eleven acres in size, and about three hundred feet deep at the deepest point. The walls of this huge quarry are formed of non-diamondiferous rock, or reef as it is called, and are a fruitful source of annoyance and loss to the diggers, as they are perpetually crumbling and falling upon the top of the diamondiferous soil, causing much expense in hauling out and carting away ; the work thus done being utterly unremunerative. The diamondiferous ground in all the mines for the first eighty or hundred feet deep, consists of a sandy soil intermixed with gravel and pebbles ; below this the ground changes to a bluish color, and has to be subjected to various processes before it is fit for the extraction of the diamond ; in addition to which the blue soil is much harder to excavate, and is for the most part disloged by blasting ; the sale of explosive forming no inconsiderable item in the merchandise of the Fields. The diamondiferous ground is divided into claims of thirty feet square, the value of which varies from one hundred to six thousand pounds, the richest ground producing, as a matter of course, the best price.

The system of working—not to troubie the reader with too much detail—is briefly as follows. The ground being picked loose by natives and broken up, is hauled out of the mine in tubs running on inclined wires ; from these tubs it is transferred to a sifting cylinder, which removes the coarser stones ; the remaining soil being mixed with water and slowly stirred in a flat pan of circular form, by means of arms fitted with teeth ; this pan varying from six to fifteen feet in diameter according to the amount of work to be done. The effect of this is to leave the diamonds, which are the heaviest, at the bottom ; the lighter soil escaping over the edge of the pan, to be taken up by a dredger, and trucked away. At the end of the day's work, the contents of the circular pan are cleaned out and washed up in hand-sieves ; when in turning over the sieve on the table, the diamonds be at once seen from their brilliance, some being of most perfect octahedron shape and as clear as crystal. In the case of the blue soil, the process of washing is the same ; but the latter has this disadvantage, that it has to be exposed to the sun and sprinkled with water for some weeks before it is fit to be washed, which of course increases the expense of manipulation. The value of the yellow soil varies from two to fifteen shillings per load of sixteen cubic feet, and the blue soil from five to thirty shillings—in some cases in Kimberly, even reaching sixty and seventy shillings ; so that a claim-holder who can wash from three to four hundred loads per day, has a fair chance of a good profit ; the cost of working the yellow soil being about three shillings, and the blue six to nine shillings per load.

It is almost needless to remind the reader, that diamonds when first taken from the earth are in a rough state, and are destined to lose much of their weight by the after-process of "cutting." Those found are almost invariably below ten carats in weight, the average being about the size of a pea ; indeed in the Bultfontein mine, a ten-carat stone is looked upon as a curiosity, though specimens exceeding a hundred carats in weight have on rare occasions been secured. The value of a stone depends entirely on its color, shape, and freedom from spots or flaws ; those of the faultless shape and perfect whiteness taking the precedence of all others. The diamonds ex-

ceeding twenty carats in weight are mostly of various shades of yellow, a large white diamond being a comparative rarity.

The natives who work in the mines are of various nationalities and tribes of Kaffirs, Zulus, Basutos, Bechuanas, Baralongs, &c.; and receive about three pounds per month in addition to their food. On the whole, they work fairly well, although many of them have no hesitation in appropriating a diamond and selling it by night to one of the numerous illicit buyers, who are the greatest pest on the Fields. These illicit buyers generally pursue some ostensible calling, amongst the claim-Kaffirs for diamonds, sometimes buying for a few pounds a secreted stone which may be worth two or three hundred; the profits being so enormous, that no punishment seems to deter them. Until some means of removing the soil from the mines by other than Kaffir labor is discovered, this will always be a drawback to the profits of digging. There can be no doubt, however, that a large working community like this being planted in the centre of South Africa has done much to civilize the natives and bring industrious habits more into vogue with them, as during the last ten years they have increased much in worldly comfort, and become large purchasers of cattle, their chief recognised standard of wealth.

The system of government on the Fields is by means of an Administrator and a Legislative Council, consisting partly of elected and partly of official members; but as the official vote is always in excess of that of the electors, it does not give universal satisfaction. But this and other anomalies may disappear with the annexation of Griqualand West, which is announced to take place in October next. The various mines are managed by Boards elected by the diggers; and Kimberley has an organized Town council with a Mayor and various municipal officers.

The people of the Diamond Fields are of most varied nationalities, the Jewish people forming a large portion of the community, most of the diamond-buying business being in their hands; but there are representatives of all countries—France, Germany, Russia, Turkey, India; and a great proportion from Holland, the chief town of which (Amsterdam) is the great emporium of diamond cutting. The language most in use is English; but Dutch, or rather Cape Dutch, is spoken to a far greater extent than one would suppose in an English colony. Very few of the natives speak anything but their own language; and to those with whom they are employed, this is a source of great difficulty.

The cost of living is very great, and the Diamond Fields cannot therefore be recommended as a field for emigration; the country producing absolutely nothing but meat, maise, on which the Kaffirs feed, and a few vegetables, which realize enormous prices, five and six shilling being no uncommon price for a good cabbage or a cauliflower. The greater proportion of the food is in the shape of tinned provisions, which come from all parts of the world. The cost of transport is also very great, as all goods are brought by bullock-wagon, a fifty or sixty days' journey from Algoa Bay, at the rate of twenty to thirty pounds per ton. Those readers who are conversant with the weights of machinery, can form some estimate of the cost of bringing up a twenty or thirty horse-power engine at this rate. The railways are slowly approaching from the Cape Colony; but it will be years before they reach the Fields.

The population mainly reside in the towns of Kimberly and Dutoitspan, about two miles apart. The buildings are mostly of galvanized iron lined with brick; and considering the amount of population, there are quite a number of places of worship—three English churches, three Weslyan, two Dutch Reformed, two Roman Catholic, one Presbyterian, one synagogue, one Mohammedan and four Kaffir churches; and a place of worship of some unknown denomination frequented by the Indian coolies, of whom there are a good number here.

Copper money is not in use, the smallest transaction being of the value of threepence, commonly called a "tickey;" and change is very scarce, the principal monetary transactions being by checks and notes. The natives, however, must be paid in gold, and mostly convey it to their own homes, the value of a sovereign being known as well at the Zambesi as here. On no account will a native take paper money; it possesses no value for him.

Water and fuel are amongst the dearest articles; the water supply being mainly derived from wells sunk at a great expense in the hard rock, at a cost of from one to four pounds per foot. Firewood is brought from a distance of sixty or seventy miles by bullock-wagon, and costs from three to four pounds per ton. The supply of fuel is one of the most serious questions for the future, as most of the mining works now being carried on by steam power necessitate the use of a large amount, and the supply is rapidly being exhausted. Coal of fair quality is found in the Transvaal about two hundred miles north; but the cost of transport precludes its use at present.

In the matter of recreation and amusement, the Diamond Fields are about the worst place one could be in. There are no rivers near, and the mines stand in the center of a vast undulating plain, without tree or shelter of any kind for miles, so that promenading or driving has no particular attraction. A few enthusiasts go in for coursing, but as the game is scarce and the prairie or *veldt* full of holes made by the mere-cat, a ride after the dogs is more to be remembered for the bother of dodging the holes, than the pleasures of the chase. Athletic sports are not much indulged in, the temperature for the greater part of the year being too great. Kimberley has a tolerable theatre, in which performances are given ocasionally by wandering companies, who make this the limit of their African travels.

Taking everything into consideration, the Diamond Fields are not a desirable place of residence. Plenty of money is made and lost here, as elsewhere; but there are few, if any, who seem to think of making them a permanent residence; although, from its position, Kimberley must long continnue to be the centre of a largein land African trade, even if the mines were to be worked out altogether. This, however, is not likely to be soon the case; as in Dutoitspan alone, at the present rate of working, it would take thirty years to bring the whole mine to a depth of three hundred feet; by which time, no doubt, other mines will have been discovered in this vast region, which as yet has been only imperfectly explored.

IN copper-plating on zinc, the use of cyanide baths has the double disadvantage of being poisonous and expensive. Hess has overcome the objections by rendering the cyanide bath unnecessary. This he accomplishes by the use of an organic salt of copper, for instance a tartrate. Dissolve 126 grammes sulphate of copper (blue vitriol) in 2 liters water; also 227 grammes tartrate of potash and 286 grammes crystalized carbonate of soda in 2 liters of water. On mixing the two solutions a light bluish-green precipitate of tartrate of copper is formed. It is thrown on a linen filter, and afterwards dissolved in a half a liter of caustic soda solution of 16° B., when it is ready for use.

The coating obtained from this solution is very pliable, smooth, and coherent, with a fine surface, and acquires any desired thickness if left long enough in the bath.

Other metals can also be employed for plating in the form of tartrates. Instead of tartrates, phosphates, oxalates, citrates, acetates, and borates of metals can be used, so that it seems possible to entirely dispense with the use of cyanide baths.

THE following directions for drilling glass were contributed to *Design and Work* by an optician: First make a saturated solution of camphor in spirits of turpentine; then make a *spear-shaped drill* the size of the hole required; heat the drill to a white heat and plunge into mercury, and it will then be *very hard*; sharpen on an oil-stone, knock drill in a brad-awl handle, dip the end of drill into the above solution, and work it as if you were working it through wood. It is no use fixing the drill in a drill stock, because the motion all one way won't do. Keep the drill well moistened with the solution, and sharpen it when blunt. A file dipped into solution will file the hole larger and will not get blunt.

Repairing and Restoring Old English Clocks.

IN our large cities, and also in the populous districts of the older settled States, a great many of these clocks are to be found, that were either imported into the country in its early history, or have been manufactured here after the English model. In Massachusetts especially, these clocks are to be found in large numbers, and are becoming quite fashionable among the wealthy classes in all our large cities. Although they are cumbersome, when it become necessary to move them about, no piece of household furniture adorns a hall or staircase better, or is more useful than an old English eight-day clock.

A student of Horology can find no better model for the elementary studies of his business than one of these clocks ; although, when we look from a high standpoint, in some instances the workmanship of the clocks, whether they have been executed in the United States or in England, is open to criticism. Still, the *construction* of the whole machine is the best that has yet been designed for reliable time-keeping. The solid construction of all its parts, and the regular geometrical proportions of its wheels, so far as their numbers and revolutions are concerned, and above all the seconds pendulum, and the long fall given to the weights, combine qualities which, notwithstanding the rude execution we may sometimes meet with, give better results than any other class of clocks made for household purposes.

Very few of the younger portion of the present generation of watch-makers, wherever they may have served an apprenticeship, have had sufficient opportunities afforded them to learn to repair one of these clocks thoroughly. In fact, of the many who undertake the repairs of these clocks, we know of only one firm in the country where they are thoroughly and conscientiously repaired with a view to restore them to their original condition, and in the repairing to study to retain as much of the old parts as is possible ; for, when the clocks are relics, their owners generally desire this to be scrupulously attended to. To those of our young readers interested in the subject, and lacking the necessary experience, we propose to give a few hints on repairing this class of clock.

If the clock be very old, it is very likely that the repairs necessary to restore it to its original condition will be very heavy; because it is characteristic of these clocks, that if made in a manner only moderately accurate, and set going under conditions moderately favorable, when once set going they will run themselves almost to pieces before they stop. The pivot holes, the pivots, and the pinions, and and the pallets, will all be found to be badly cut and worn. It is but seldom a new pivot will require to be introduced, because, as a general thing, the pivots were all left thick enough originally to allow them to be reduced and polished when worn ; but should a new pivot be necessary, either from the effects of wear, or from being broken accidentally, there are none of the pinions in a clock but what will admit of a new one being inserted. If the new pivot has to be put at the end of the arbor where the pinion head is, it will be best not to soften the pinion ; but if at the other end, a small part of the arbor may be softened with impunity. If you have not a lathe with a chuck that will take hold of the pinion, to centre and bore the hole for the new pivot, you may centre it with a hollow drill, or in a ruder method by using a common drill, or a centre punch, always trying if the arbor be true. Before you commence to bore, try it in a pair of turns, with sharp centres, and alter the centre of the pivot hole till it be true ; but care must be taken in this rude method, which must only be resorted to when no other means can be used, not to take anything from the shoulder of the old pivot, because too much end-shake to the pinion will be the result. After the pinion is centered, if it cannot be bored in the lathe, catch a split collet on it and turn it round with the drill-bow, with the drill stationary in the vice. Bore the hole well up, and clean the oil and chips of steel out of it thoroughly, and fit in the steel that is to make the new pivot. Fit it very carefully, and in such a manner that, when put in its place, one tap from a light hammer will send it home, and be tight enough for every purpose. If fitted too tight, the arbor will be liable to be split ; and if too loose, it will not hold , therefore the necessity of fitting it with care in the first instance will be apparent. Should an arbor happen to get split, there is no other remedy but to put on a collar or ring over the split part, or solder the pivot in ; but do not solder a pivot unless as a last resource, and when you do solder it, be sure always to dip the soldered part in oil before it cools, to prevent rust from breaking out. The piece of steel being fastened in its place, from which the new pivot is to be formed, the rest of the operation will be comparatively easy. Centre it in such a manner that the pinion, or its arbor, will run exactly true, then turn the new pivot to the desired size, polish it smooth, and round off the centre.

In clock-work, when pivot holes are wide, never attempt to close them with punches. The frames are usually so thick that a solid hole cannot be made all the way through if they are punched. We have seen old clocks that had the pivot holes closed by making deep marks with a centre punch all round the hole in order to close it. This kind of treatment is "botching" in its worst form, and under no circumstances should it be resorted to. If a pivot hole be so wide that a smaller one is desirable, the object will be accomplished more satisfactorily, and a naturally expert workman will do the work about as rapid, by putting in a new bush. The best way to proceed is to make the old pivot hole three or four times larger than its original size, being careful to have it a straight and round hole, widest towards the outside of the frames, and the edges of the hole carefully indented with a small round file. The hole is now ready to receive the bush, which should be made eccentric, so as to admit of it being turned round to that position that will make the depth between the wheel and pinion most accurate. An eccentric bush can be made with ease and great rapidity, in any lathe that has a chuck that will hold a piece of wire. Catch the wire, which ought to be tough brass wire, in the chuck, and turn it to fit the hole already made in the frame ; then set it a little out of truth, just as much as the bush is desired to be eccentric, by tapping it with a hammer, or otherwise ; next centre the bush, as it runs in its new condition, with a graver, and bore up a hole of the desired size ; now cut off the newly made bush by turning the end of it just a little longer than the thickness of the frame, undercutting it a little at the same time ; afterwards open up the hole with a broach till it fits tight on to its pivot, and put the new bush in its place, and the necessary wheels into their places, and turn round the bush till the depth be right. The bush may now be riveted, and if fitted well, and not left to project too far above the level of the frame, a few taps of the hammer will tighten it, and the whole operation may be done in less time than it takes to write these directions. After riveting, the hole must be again broached out to give the necessary freedom to the pivot, and afterwards the hole polished with a round broach, the new bush properly countersunk, so as to retain the oil, and the frame polished, where the bush was inserted with blue-stone, and afterwards with rotten-stone and oil on a woolen cloth.

If the leaves of the pinions are badly cut, there is no use filing the marks out, because if the pinion has been right at first, filing will make them too thin, and the pitching will be bad any way you can set it, and it is better to shift the action of the wheels that work into them. This is easiest accomplished by turning the necessary quantity off the shoulder of one of the pivots, and putting in a *raised* bush to fit the pivot at the opposite end. By this method two actions can often be shifted by one alteration, and it is always better than disturbing the wheels or their arbors, which in old clocks are usually fastened to collets soldered with hard solder.

Sometimes it happens that a leaf gets broken out of a pinion, which is a serious matter when it is desirable that the old pinion be retained. In this class of clocks, where small solid pinions of 7 or 8 leaves are used, there is no other way of saving the pinion except by fastening two rings near to the pinion-head, and to these rings fasten a new leaf to take the place of the broken one. In the case of the

centre and third pinions, where the wheel is riveted on to the pinion head, it will only be necessary to fasten one ring to hold a new leaf, because the wheel itself can be used to take the place of the other ring.

In the very oldest clocks we seldom see much wear on the teeth of the wheels, if the depths have been right when the clock was new. Sometimes a tooth, or a few teeth, get broken by accident, and these can be easily replaced in most instances. When a tooth or teeth have to be replaced, the most desirable method is to dovetail a piece of brass into the rim of the wheel, of the requisite size, and fasten it by soft solder that will flow at a moderate heat. We must confess that soldering, in the present instance, is better than riveting, because in riveting, an inexperienced person, and also the most experienced in some instances, will stretch the wheel and put it out of round, whereas soldering, if a moderate heat be used, is entirely harmless; and if care has been taken to fit the brass exactly to the dovetail, the solder will not show much when the sides are polished off. The tooth or teeth may now be formed in the new brass that has been inserted in the wheel, and if done agreeable to the above instructions, the wheel, for all practical purposes, will be equally as good as when new. Sometimes, when a tooth or teeth are broken, small holes are drilled in the edge of the wheel, and pins driven in to take the place of teeth. This plan is very good as a temporary method, and we have ourselves practised it in temporarily repairing a clock when it could not at the time be removed to the workshop; but although proper under such circumstances, it is not to be commended as an example to follow when a clock has been removed to a workshop for thorough repair.

In repairing the escapement, probably in some instances there will be a difficulty in retaining the original parts. If the escapement has been in action for a long time without oil, the points of the teeth of the scape-wheel may be worn. In most cases the wheel can be restored and rendered as good as new by putting it in the lathe and topping the teeth with a smooth file or a graver till they are all of equal length, and then dress them up with files to the proper shape; but should the wheel have any inequalities in the division of the teeth, there is no use troubling with it. Make up your mind to put in a new one at once, for this part of the clock cannot be saved and do justice to the other parts. A new wheel can be made very easily by any person who has a cutting engine, and understands how to use it. The pallets will be sure to be badly cut, because invariably they are the first part of these clocks to wear out Still, if they are recoiling pallets, in most instances they can be repaired, if judiciously managed. First soften, if they be hard, and file out the marks that have been worn in them. Then close the pallets by bending them till they closely embrace the number of teeth they originally did. This is done with the greatest safety by placing them between the jaws of a vice and closing the vice gently. It will be noticed that by this method of closing pallets, the part nearest the movable jaw of the vice will bend first; so, after closing them a little, it will be well to reverse the pallets in the vice that they may be closed evenly. We consider this method of bending better than that of using a hammer; the strain does not come on the steel so suddenly, and we very seldom, if ever, saw pallets break when closed in this manner. After the pallets have been filed and closed in the above manner, when they are placed in the frames along with the scape-wheel, it will be found that the "drop" on the perpendicular will be considerable. This drop can only be reduced by altering the front pivot hole of the pallets, or by taking the steady pins out of the back cock and moving it down, or by both methods, care being taken to steady-pin the back cock in its new position after moving it. The "drop" of the horizontal pallet can only be altered by bending the pallets in the manner already described. The acting faces of the pallets, if it be a recoiling escapement, should be shaped so as to produce a slight recoil, or retrograde motion of the scape-wheel, after a tooth has escaped from the one pallet on to the other.

It is difficult to describe in writing just exactly the precise shape that these pallets should be. The shape is one of great importance, and if the workman is not conversant with the subject, his safest course is to notice and preserve the precise shapes the acting faces were *before the pallets were bent*, and file them to the same shape afterwards. If this be carefully attended to, and the drops adjusted, as we have described, the escapement will be as good as it was when the clock was new. If the escapement be a dead-beat one, and the pallets be much cut on the circular part, it will be difficult to make a good escapement and retain the old pallets; for after the marks are taken out of the acting faces they will be too thin—a certain amount of thickness being necessary. In some instances, when they are not deeply worn, they may be repaired so as to last many years. The same directions for closing the pallets and altering the drops apply to this form of pallets as well as to recoiling ones; and the inclined planes, or impulse faces, have to be filed so that the teeth of the wheel will strike just beyond the edge of the angle.

The time part of the clock having been repaired, it will be necessary to take a look at the striking part; and this part may be found to be considerably out of order. The method of lifting the hammer is one of importance, and the action of the hammer spring is but seldom right, especially if it be a spring bent over to a right angle at its point. If there are two springs, one to force the hammer down, after the clock has raised it up, and another shorter one, fastened on to the pillar, to act as a counter-spring, and prevent the hammer from jarring on the bell, there will seldom be any difficulty in repairing it; and the only operation necessary to be done is to file out worn parts, polish the acting parts, set the springs a little stronger, and the thing is done. But if it be one of the first mentioned construction, some further directions will be necessary, because the action of the one spring answers the purpose of the two in the last named method; and to arrange it so that the hammer will be lifted with the greatest ease, and then strike on the bell with the greatest force, and without jarring, requires some experience. That part of the hammer stem which the spring acts on should never be filed beyond the center of the arbor, as is sometimes done, because in such a case the hammer spring has a sliding motion when it is in action, and some of the force of the spring is thereby lost. The point of the spring should also be made to work as near to the centre of the arbor as it is possible to get it, and the flat end of the spring should be at a right angle with the edge of the frame; and that part of the hammer stem that strikes against the flat end of the spring should be formed with a peculiar curve that will stop the hammer in a particular position, and prevent it jarring on the bell. This curve can only be determined by experience; but a curve equal to a circle six inches in diameter will be nearly right. The action of the pin-wheel on the hammer tail is also of importance. The acting face of the hammer tail should be on a line with the centre of the pin-wheel, or a very little above it, but never below it, for then it becomes more difficult for the clock to lift the hammer, and the hammer tail should be of such a length as to drop from the pins of the pin-wheel, and when it stops be about the distance of two teeth of the wheel from the next pin This allows the wheel-work to gain a little force before lifting the hammer, which is sometimes desirable when the clock is a little dirty. We might also mention that in setting the hammer spring to work with greater force, it is always well to try and stop the fly with your finger when the clock is striking; and if this can be done it inditates that the spring is stronger than the power of the clock can bear, and it ought to be weakened, because the striking part will be sure to stop whenever the clock gets the least dirty.

The repeating work, or that part of the mechanism that regulates the number of blows to be struck on the bell, may be in disorder, and worn in some parts. The rack which must be considered as the sequent of a wheel, should have its first tooth a little longer than the others, so that the other teeth will not grate on the point of the rack catch, and make a disagreeable noise when the clock warns before

striking. The "tumbler," or gathering pallet, that works into the teeth of the rack, will be very likely to be split or worn out. The figure 6 is a good model to make a new one after, and it should be made so as to lift one tooth and a very little of the next one at each revolution. It is necessary to cause the tumbler to lift more than one tooth, and let it fall back again, to insure that one will always be lifted; because if such was not the case the clock would strike irregular, and would also be liable to strike on continually till it ran down. If the striking part is locked by the tail of the tumbler catching on a pin in the rack, the tail of the tumbler should be of such a shape that will best prevent the rack from falling back when the clock warns for striking the next hour; and of course the acting faces must be perfectly smooth and polished. A guard pin ought to be put in the frame, if one does not already exist, to prevent the rack from going farther back than is necessary for it to strike twelve o'clock; for sometimes, when the clock runs down, and the striking part happens to run down first, the rack-arm rides on the snail on the hour wheel, and the teeth of the rack are then in some instances allowed to go out of reach of the tumbler, and when the clock is wound up, of course it will keep on striking till it runs down, or the weight is taken off, or the rack again put in action. It is necessary for the rack-arm to be made so that it will ride on the snail easily, it the striking part, from any cause, should be stopped and the other part going, because if it did not ride, the clock would stop altogether between the hours of 12 and 1. Therefore, we recommend a guard pin, as already stated, because in our business it is necessary for our fair fame to guard against every possible contingency. The teeth of the rack may require dressing up in some cases, and to allow this to be done the rack may be stretched a little at the stem, with a smooth-faced hammer, on a smooth anvil; or, if it wants much stretching, take the pin of the hammer and strike on the back, with the front lying on the smooth anvil. The point of the rack catch will be much worn, and when dressing it up it will be safe to keep to the original shape or angle. The point of the rack catch is always broader than the rack, and the mark worn in it will be about the middle of the thickness; so enough will be left to show what the original shape or angle was.

The collet in front of the hands is a little thing, but it is seldom that we see one right; one that will hold the hands firm, and allow them to be moved small portions of space with ease and certainty.

Before making a collet, first straighten the minute spring, and put it on its place on the centre pinion, and put the minute wheel on its place on the top of it, and then the minute hand on its place; you will now see the space there is from the surface of the hand to the pin hole in the centre pinion. Make the collet so high that it will just cover the hole, and then cut a slit in the collet just as deep as the hole is wide; make the slit to correspond with the hole in every way, and in such a manner that when the pin is put in it will fit without shake. A collet made in this manner will last as long as the clock, and when the minute spring is set up the hands will always be firm, and at the same time move easily, and not affect the motion of the clock when they are set backward or forward. The square on the pipe of the minute wheel, sometimes projects through the minute hand, and the collet presses on it in place of the hand. When this is the case it should be filed down, because the minute hand can never be held firm unless the collet be very much hollowed at the back, which is not always advisable to do.

The suspension of the pendulum, the pendulum spring, and the action of the crutch or back fork on the pendulum, are all of the most vital importance. The spring should be perfectly straight, and should fit into the slit of the cock without shake, and the slit should be perfectly straight, and at right angles to the front of the dial, or frames of the clock.

The back fork should fit easily and without shake, and the acting part stand at right angles to the frames. The pendulum bob should swing exactly in a plane with the frames and the dial; and after a clock has been put in its case, before putting on the head, it is well to get up high enough and look down to see that all these parts work as has been described.

In restoring the dials and brass work on the cases of these clocks, we do not advise those inexperienced in the processes to attempt doing the work, but get the bright work, especially, done by a brass founder, or in particular cases the brass work may be gilt. Those who are not afraid of spoiling their clothes, or making their hands yellow, may dip the brass pieces in nitric acid, and rinse in clean water, after the old laquer has been taken of by first boiling them in potash. The nitric acid will clean and bring the brass to its original color, and which must be laquered afterwards.

Such are some of the hints necessary to an inexperienced workman when repairing and restoring an old-fashioned clock. We have never seen a clock of this class, however old, but could, with judicious care, be put in condition to do service for another generation, and preserve to their owners all the hallowed memories of the past that may be associated with the old clock.

Malleable Nickel.

A PROCESS has recently been perfected in Germany, by Dr. Fleitmann, for producing nickel in a malleable form, which has been recently introduced with great success at the nickel works at Iserlohn, and also at the works of MM. Gaspard and Belle, at Lizy-sur-Ourq. A paper on this subject was lately communicated by M. Troost to the Societe d'Encouragement pour l'Industrie Nationale. Metallic nickel obtained from the decomposition, by a battery, of the sulphate of nickel and of ammonia, is a very malleable and ductile metal, with a tenacity, according to M. Saint Claire Deville, far higher than that of iron. On the other hand, nickel cast for the purpose of being rolled loses most of its useful qualities, becomes porous and very brittle, it cannot be hammered, breaks up in the rolls, and cannot be drawn out into wire of small diameter. Up to the present time, nickel has been very largely used for deposition on iron and other metals, but hitherto it has been impossible to obtain large pieces which can be rolled down into plates, or drawn out into wire. The Fleitmann process appears successfully to have overcome this difficulty. In treating the nickel by his method, the metal is first reduced to complete fusion, and carefully cleaned of scoriæ and other impurities; small quantities of zinc and metallic magnesium are then added and well combined. The metal can then be cast into ingots, and will be found to possess high qualities of ductility, and can be rolled out into very thin plates. It can also be readily welded, either to itself or to plates of any other metal. By taking advantage of this property, iron plates are covered with nickel much more cheaply than by the ordinary method. The following illustration may be given of its adaptability: A plate of nickel, $\frac{1}{12}$ inch in thickness, may be welded to an iron plate by bringing both to a red heat, and then passing them through rolls or under a hammer, and the compound sheet may be reduced until the nickel covering is only $\frac{1}{1000}$ inch in thickness. In the same way iron wire coated with a film of nickel may be readily drawn down. This process adds much to the present resources of mechanical arts.

Tempering Steel.

A PIECE of steel heated to a temperature of 430° gives a very faint yellow; a temperature of 450° a pale straw color. These impart a hardness suitable for hammer faces, drills for cutting stone, etc. A temperature of 470° gives a full yellow color; at that of 490° a brown color. These give a hard and inelastic temper suitable for shears, scissors, turning tools for hard metal, etc. A temperature of 510° gives the steel a brown appearance with purple spots and that of 538°, purple. These temperatures are suitable for cutting wood and soft metals, etc.; 550° gives a dark blue and 560° a full blue color. A temperature suitable for tools requiring strong cutting edges without extreme hardness, as cold chisels, axes, cutlery, etc.; 600° gives a grayish blue verging on black; a good spring temper.

Proceedings of the Horological Club.

A Distinguished Body of Watch and Clock Makers.

Seventy-eighth Discussion.—Communicated by the Secretary.

(Notice.—Correspondents should write all letters intended for the Club separate from any other business matters, and headed "Secretary of the Horological Club." Direct the envelope to D. H. Hopkinson, Esq. *Write only on one side of the paper*, state the points briefly, mail as early as possible, as it must be received here *not later* than the eighth day of the month in order to be discussed and reported in the Circular for the next month.)

REMOVING THE BALANCE TO PIVOT THE STAFF.

Secretary of Horological Club:

I wish to ask of your members, which is the proper and more workmanlike way to pivot a balance staff, to leave the balance wheel on the staff, or take it off the staff? I read your monthly discussions with pleasure and much profit. J. F. M.

Mr. Uhrmacher replied that it is more workmanlike to remove the balance, if the staff has to be heated to lower the temperature for drilling. This is especially important with an adjusted expansion balance, as it would be seriously injured and perhaps ruined by the flame reaching the rim, or even by being unduly heated by conduction or otherwise.

But in this matter, like all others, circumstances must be considered. With a cheap balance, of steel, brass, or other material not having the rim cut through, it would often be better to leave the balance on, than to go to the trouble of driving it off the staff, staking it on again, truing it up, &c. Sometines, when the balance staff is long, and the lower end is the one to be pivoted, the temper can be sufficiently drawn without heating the balance at all. In such case it may be left on the staff. The point to be considered is that if there is risk of injuring the balance by heating, or by careless handling while pivoting, it should be removed from the staff, as it must be protected from injury, no matter how much trouble it may require. And the finer the balance, the greater care must be taken to avoid injury. By reading the chapters on Compensatiun, in Excelsior's Practical Treatise, it will be seen how delicate a thing a compensation balance is, and the many ways in which its accuracy and value may be lessened or entirely destroyed. sometimes without showing any change in its appearance—as well as the proper methods for guarding against such accidents, or remedying them, when a remedy is practicable. In all work about watches, the rule should be to be over cautious, rather than run any risk—or, as Excelsior puts it, to always err on the side of safety. One will make better time and do better work by going a little slow, than by having damages to repair.

ENAMEL FILLING, AND HARD ENAMEL.

Secretary of Horological Club:

Will some member of the Club be kind enough to let us know what are the component parts of black wax, for filling lettering, that the engravers use on nickel watch plates. Also please refer us to best authority upon *hard enamelling*, its composition and application. S.

Mr. Ruby Pin said that there were a number of different materials used for filling engraved lines. Several kinds of hard cements could be colored black by lampblack and used for filling lines in wood, ivory, and similar substances which would not bear much heat. Many workmen use shoemakers' "heel ball" or "black ball," rubbing it in hard, to completely fill the lines, then rub off and polish with a woolen rag, pressing hard.

Others use good black sealing wax; warm an iron enough to soften the wax and make it stick, but not hot enough to burn the wax or ivory. Work the lines full and solid by rubbing the hot iron upon the wax. When all full and covered, rub off the surplus wax with pumice stone, and polish off with powdered pumice stone and water on a flat stick.

On metal plates, either of the foregoing can be used, warming the articles and rubbing in the filling—or the black enamel used for repairing watch dials can be melted into the lines, and finished off like the sealing wax. These soft enamels are understood to be made of white shellac, colored to suit.

As for hard enameling, the various processes and recipes have been given in the columns of the Circular, about a year or so ago. Possibly there are other good recipes in use by practical enamelers, but it is not likely that they would give away their trade secrets.

MORE USES FOR MACHINE NEEDLE BLANKS.

Secretary of Horological Club:

I have found two other articles these sewing machine needles make good ones of, besides drills. Quite frequently one wants a small punch, with heavy shank; cut one off short, temper it, and it works well. Then to made screw taps, file one slightly on opposite sides, cut your thread, temper it, and you have a splendid tap, made easily, and of the best of steel. E. W. R.

TOOLS WANTED.

Secretary of Horological Club:

Can you tell me if there are any of the hair spring tools in the market, such as used by Excelsior, and described on page 38 of his Treatise on the balance spring? If so, what is the price and where can they be obtained? I want a tool as near perfect as can be. Can bell metal polishers be found all fitted for use, in sets for conical pivots, straight pivots, pinion leaf ends, &c.? If so, what is the price per set, or piece? Please answer the above questions soon as possible. J. H. M.

Mr. Isochronal believed that Excelsior's hairspring-fitting tool was not in the market for sale—though why it should not be he couldn't see. It is certainly an extremely convenient and valuable tool, and a great assistance in doing accurate work. We often have inquiries for them, but know no way in which Mr. M. can get one except to make it himself, according to the directions in Excelsior's work.

The same thing must be said in regard to the bell metal polishers, &c. They are not a standard article of trade, already finished, as anyone who could keep them in order could shape them up for himself. Mr. M. should buy the slips and make them into such forms as he needs. They will want frequent refiling while in use, to keep them even and true as they wear away. Full directions for shaping and filing have been published in the Circular from time to time and can be found in back numbers.

HEIGHT OF MERCURY IN PENDULUM.

Secretary of Horological Club:

Can your honorable body tell me what is the approximate height of mercury required in a two-jar mercury pendulum that beats seconds? Calculating from the expansion of mercury and steel as given in Appleton's Cyclopedia, I would make it 5.37 inches (approximately) at 60° Fahr. Am I right or wrong? A. E. A.

Mr. Regulator replied that Mr. A. does not give us sufficient data to enable us to answer his question definitely. To make an approximate estimate it is necessary to know the material of the rod, plan of construction of the pendulum, material and inside diameter of the jars, their weight, the weight of the rod, &c. if heavy, and the details of the suspension spring.

The column of mercury in steel jars ranges from seven to nine inches in the pendulums of different makers, according to their construction and proportions. The *exact* height can only be found by trial of the pendulum, or one exactly like it. A person versed in the higher equations can arrive at very nearly the exact height by calculation, but it is generally easier to make your pendulum on the plan you prefer, leaving the jars long enough to admit of some considerable alteration of the mercury column, and then adjust its height by actual trial of its performance. If a very fine performance is desired, there are some things which calculation cannot provide for—as the proportions and elasticity or stiffness of the suspension spring, &c., will affect the final result. It is even said by some that the extent of the oscillation of the pendulum affects the height of the mercury column required, but he had never tested this by experiment, but always adjusted the compensation for the entire finished pendulum as it stood.

In adjusting a pendulum, Mr. A. doubtless understands that the point to be observed is the *variation* in the rate under the influence of heat and cold—not the amount which the clock gains or loses. It may gain or lose a half hour per day, but if it gains or loses the *same amount* right along, both in heat or cold, the compensation is correct, and the clock only needs regulating. In adding to or lessening the amount of mercury, an ounce of mercury is considered to make a change of about $\frac{1}{10}$ second per day. A cubic inch weighs about $\frac{1}{2}$ lb. A small bulk of mercury will therefore make quite a change in the compensation.

Chronometer Bankings.

At a recent meeting of the Horological Club the conversation happened to turn to the subject of bankings for the chronometer escapement. Until then I was quite unaware of the many plans that appear to have been devised for the purpose. That the information afforded by this interchange of thought may not be lost, I venture to give some of the descriptions :

The arrangement shown in Fig. 1 consists of a loose moveable collet, fitted with end as well as side shake, on the staff ; a tight plug driven over it on the staff keeps it in its place. On this loose collet is a small arm which banks against two pins, one of which is fixed on the balance and the other in the cock. It will be seen that by this means the balance can make two turns before being stopped. The objection to this is the closeness to the center of the pins and consequent liability to injury of the pivots at the moment of banking, as well as the liability of the friction from the loose collet to affect the rate.

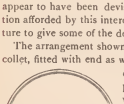


Fig. 1.

Brockbank seems to be credited with the form shown in Fig. 2. On the upper turn of the cylindrical spring is pinned a small and very light arm, and in the balance arm is fixed an upright pin far enough from the center to free the end of the small arm when the spring coils inwards, but near enough to lay hold of the arm when the spring expands. On each side of this arm are two banking pins or a stud fixed on the cock for taking off the strain of the spring or arm at the moment of banking.

Fig. 2.

Mr. J. T. Towson, of Devonport, in 1826, communicated to the Society of Arts the ingenious banking represented in Fig. 3. There is a balance spring stud tapered so as to yield to the side pressure of the spring. Fixed on the balance staff is a piece of steel, the edge being turned up and formed into a segment, embracing about 80°. This turned-up edge passes through a notch in the face of the elastic spring stud referred to as long as the stud is in the middle position as it is shown in the drawing. But when the balance vibrates 330° on either side the balance spring draws the elastic stud sufficiently on one side to insure the turned-up edge striking the face of the stud instead of passing through the notch. The turned-up edge and the notch are shown separately to make the action clearer. Mr. Towson claimed that the yielding of the stud reduced the side friction of the pivots and induced a longer vibration. He also pointed out, as an additional advantage, that by his proposal the balance was prevented from overturning in either direction, whereas in Brockbank's, and most other forms where the outward expansion of the spring only was made use of for banking, the balance would still be free to overturn in one direction.

Fig. 3.

The late Mr. Nicole introduced a banking (Fig. 4) which is somewhat similar in principle to Brockbank's, only that instead of a pinned on arm the spring is bent out into a small hooped projection which touches a pin in the balance arm.

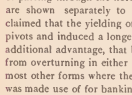


Fig. 4.

The next engraving, (Fig. 5) shows a banking, the invention of which was attributed to Mr. Walsh. It consists of a thin barrel surrounding the spring from top to bottom, and of such diameter inside that when the spring is expanded nearly one full turn it stops against the inner surface of the small barrel.

Fig. 5.

Mr. Kulberg introduced a modification of this principle. Instead of the barrel there are two upright pins (Fig. 6.) in the arm, one on each side of the spring, at a sufficient distance from the centre to allow the spring to touch when expanded nearly one full turn. If the upper ends of these pins are slightly nearer the center, the velocity of the balance will be stopped gradually, until when reaching the last turn the momentum of the balance is entirely exhausted.

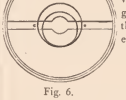


Fig. 6.

A MEMBER OF THE HOROLOGICAL CLUB.

—*British Horological Journal.*

Those Gold Bearing Springs.

THERE has been an absurd report afloat to the effect that the Arkansas Hot Springs carried gold in solution, and that some scientific person was making a fortune extracting the gold by a process known only to himself. The absurdity of such a report is fittingly shown up by Mark Twain in the Hartford *Evening Post.* His letter is as follows :

I have just seen your dispatch from San Francisco, about "Gold in Solution" in the Calistoga Springs, and about the proprietor's having "extracted $1,000 in gold of the utmost fineness from 10 barrels of water" during the past fortnight by a process known only to himself. This will surprise many of your readers, but it does not surprise me, for I once owned those springs myself. What does surprise me, however, is the falling off in the richness of the water. In my time the yield was $1 a dipperful. I am not saying this to injure the property in case a sale is contemplated ; I am only saying it in the interest of history. It may be that this hotel proprietor's process is an inferior one—yes, that may be the fault. Mine was to take my uncle—I had an extra uncle at that time, on account of his parents dying and leaving him on my hands—and fill him up, and let him stand 15 minutes to give the water a chance to settle well, then insert him in an exhausted receiver, which had the effect of sucking the gold out through his pores. I have taken more than $11,000 out of that old man in a day and a half. I should have held on to those springs but for the badness of the roads and the difficulty of getting the gold to market.

I consider that gold-yielding water in many respects remarkable, and yet not more remarkable than the gold-bearing air of Catgut Canon, up there toward the head of the auriferous range. This air—or this wind, for it is a kind of a trade wind that blows steadily down through 600 miles of gold quartz croppings during an hour and a quarter every day, except Sundays—is heavily charged with exquisitely fine and impalpable gold. Nothing precipitates and solidifies this gold so readily as contact with human flesh heated by passion. The time that William Abrahams was disappointed in love, he used to step out doors when that wind was blowing, and come in again and begin to sigh, and his brother Andover J. would extract over a dollar and a half out of every sigh he sighed right along. And the time that John Harbison and Aleck Norton quarreled about Harbison's dog, they stood there swearing at each other all they knew how—and what they didn't know about swearing they couldn't learn from you and me, not by a good deal—and at the end of every three or four minutes they had to stop and make a dividend ; if they didn't their jaws would clog up so that they couldn't get the big nine-syllabled ones out at all ; and when the wind was done blowing they cleaned up just a little over $1,600 apiece. I know these facts to be absolutely true, because I got them from a man whose mother I knew personally. I do not suppose a person could buy a water privilege at Calistoga now at any price ; but several good locations along the course of the Catgut Canon Gold-bearing Trade-wind are for sale. They are going to be stocked for the New York market. They will sell, too ; the people will swarm for them as thick as Hancock veterans—in the South.

The Art of the Silversmith.

BY W. HERBERT SINGER.

As the use of wine became more general in the Church of England, so the chalice increased in size. In many places we find a kind of grace cup, or hanap, amongst the Church plate, probably the gift of some rich parishioner. These large cups, with covers, were silver gilt, with ornamented open work forming the stems. These vessels, which have, as yet, received but little attention, considering their interest and beauty, are mostly of the first quarter of the seventeenth century. A very fine one is to be seen at Yarlington, in Somersetshire, and another at Horsington, in the same county. The height of the Horsington cup is 20 inches, and the bowl is five inches in diameter, this being about the usual size for these vessels. The ornamentation on the cover is similar to that in the Yarlington cup, showing a common type. These hanaps were probably used as a supplemental chalice, when the ordinary vessel would not hold enough wine. No doubt many of these interesting specimens would be found, were our country churches searched.

In the reign of Charles I. was continued, and probably for the last time practised, a custom most beneficial to this industry. On every New Years Day each noble, each noble lady, and every member of the Royal household, down to the knight, was accustomed to offer the king a present, according to their station. At this time, in fact, all the Royal servants of gentleman's rank gave a New Year's gift, in proportion to the rank they held, generally doing so in kind; that from the nobles, however, being in money. Thus Dr. Harvey (the discoverer of the circulation of the blood) gives a box of marmalade, and he has sent him in return a present of 24 ounces of plate, each person receiving as an acknowledgement some work in silver, according to the largeness of their offering. In 1640, forty-two persons, members of the household, had presents in silver. The sergeant of the scullery gives a basket of coals, and receives 10 ounces of plate; and one giving a red Turkey carpet received a present weighing 300 ounces. The gift from the king was usually half the value of the present he had received from his subject—the honor of giving an offering to so exalted a personage having to compensate the donor for the other half.

By means of this custom, a considerable number of works in silver were annually scattered over the country. In the manuscripts of Sir Henry Mildmay, the keeper of the jewels for Charles I., is recorded the weight of every present given by the king during his tenure of office. Amongst these same records, there is one dated Sept. 23d, 1647, which curiously illustrates the mode of living at that time, being the order from the Committee of Revenue to Sir Henry Mildmay, to send the following articles for the king's use, when a prisoner at Hampton-court:—One gilt salt "Tobias;" 12 gilt trencher plates, crowned E; two knives; one fork, gilt; two saucers, white; two spoons, gilt. Thus we see at this time even the king had only one fork allowed him, although 12 silver plates were deemed necessary.

The civil war of this period caused great destruction to domestic silver work. The Reformation had swept the Church plate away, and now to supply means with which to carry on the determined struggle in this disastrous war, an enormous quantity of plate used in the household was consigned to the crucible.

We now come to the age of Queen Anne, sometimes called, in England, "the Augustan age." Certainly, during her reign, great excellence was reached in this art, whether as regards her coinage, or silver work in general, for all purposes but that of the Church. At this period, the chief means of decoration were chasing, fluting, and ribbing, with a large use of the acanthus leaf.

The introduction of tea led to a great development of silversmith's work. The greater number of the tea caddies (lately so much sought after) are mostly of this date. Cream jugs, tea-pots, tea-urns, and tea-kettles naturally followed the demand for the novelty, and led to a considerable manufacture of new designs.

But, although domestic silver-work made a great progress in style, the Church plate became more and more debased, and, by 1720, the chalice had lost all beauty, and somewhat resembled a large wine-glass.

Most of the work of this century was done by men of small means, who had usually two or three workmen only. It was not until quite the end of this period that large factories were formed for the production of silverwork. Amongst the first of these was that of Rundell and Bridge, who employed Flaxman to design for them.

Few industries have had to struggle through more difficulties, restrictions, and penalties than that of the silversmith; difficulties beginning so far back that their origin is obscure, but they were much felt in the fifteenth century, still more so in the sixteenth, when it was forbidden to work in a back street. In the seventeenth and eighteenth centuries the law was again more strict, making the crime of forging a die-mark to be punishable by hanging, and forbidding any exportation. With such numerous hindrances, it is wondrous how the silversmith's art has flourished at all in this country, and produced such works as it has. If, with all these restrictions, so much has been accomplished, how much more might have been done had the trade been as free as other art industries. Of one thing we may be certain, that, whatever preservation or value marks are to plate, the decadence of modern times commenced as soon as a tax was levied on silver-work. This had its beginning in the time of George I., with 6d. an ounce, and went on—with a short interval between 1758 and 1784—increasing up to 1814, since which year it has been 1s. 6d., with also a tax on every one dealing in silver; so that, in fact, there is a double tax.

In Germany, some very fair work is produced, but chiefly of a heavy character, chased in the Renaissance of classical style. Italy and Spain may be classed together, each being clever in small objects, and the latter country is particularly famous for her damascened productions. France is deserving of high praise for her nineteenth century plate; the figures with which French artists enrich their work being admirably designed and modeled. America is at present making the most rapid advancement in the silversmith's art; from her we have much to learn, if not to fear.

I have spoken of the excellence obtained by the Greek artists, and of the perfection of the silversmith's art in Italy, and also of our own success at the time of Queen Anne, but it is not so easy to speak of our present or future greatness in this art.

There may be many opinions as to the reasons of this decadence, but there can be no difference as to a fact, which all must admit, that since the art has been subjected to the trammels of the Excise, it has degenerated. In mentioning this, it is not to tie anyone to the opinion that it is through this connection of a tax with labor, but simply to note a concurrence; and if it can be shown that other nations are making progress, and have not this tax to contend with, and that this art has been degenerating in England ever since we have had a tax, the question may then be fairly left for everyone to answer according to the bias of his own mind. I may be permitted to remark that the bias of my own mind is very distinct upon this point. But there are so many conflicting influences, as to make it difficult to get at the real truth of the case. Thus, I know one silversmith who wished the tax to be twice as much as it is now, and that simply because it might prevent any opponent from having established near him. Now, this man stated exactly the usual protection ist feeling against all rivalry; but the spirit of the age is for open competition, as no art, no profession, nor any industry can ever become general if surrounded with restrictions and difficulties. It so happens that the work of the silversmith—the industry always placed before every other art-industry—is the only one now subjected to the control of the tax officer, and to the penalties and endless fines which in some form or other, harass the worker in the precious metals. That they are serious impediments to art progress is my earnest conviction. We are all acquainted with the liberal professions and the

liberal arts, but we hear nothing about the liberal trades. A man is proud to be thought a doctor, a lawyer, a clergyman, or a painter, and why should we not be proud to be an art silversmith? Without doubt, the question will soon have to be solved, how are we to rectify this error? The doctor has his medical school and hospital, the clergyman his college, and the painter his academy, in which to insure a careful training, but where is the silversmith to learn his liberal art?

In France, or Germany, the master is often artist, workman, manufacturer and merchant combined; technical education being more common in those countries than with us. But in England the master is generally a man who does nothing himself but receive the orders given to him; he hands these on to his foreman, who distributes the work amongst the workmen. Naturally, individual skill and merit occasionally comes to the front, and from our division of labor great success has been obtained in various processes; but as to the certainty of a good result, who would think of apprenticing his son to a silversmith, if he had any other branch of life open to him? And thus, the result of our doings in modern times have been, that during the reign of George IV. we had the "king's pattern" epoch, and that now we have come to the "fiddle pattern" era, and this we can only manufacture in three or four places in England, whereas a steam-engine can be made in hundreds of towns and villages of this kingdom.

Now, this state of things can, as far as I am able to see, be only obviated by, firstly, the repeal of the duty, and this is irrespective of the question of hall-marking. Hall-marking existed long before the duty, and there is no reason why it should not continue long after the tax has been removed, if it should be thought advisable. My hope is that, at no very distant time, a thorough reform may be effected. I ask for nothing less than perfect freedom. I would then suggest that a great change should be attempted in the teaching of apprentices to this art, it being now too often learnt by the rule of thumb.

We have, as I pointed out, schools for instruction in the liberal professions, and if this art is to be great in England, we must have a grand central school, in which a thorough education can be given to the silversmith—a veritable college for metallic art. With such a college to train those who wish to follow this beautiful art, we may reasonably hope that the silversmith's work of the Victorian age would soon be found worthy to rank with the noblest works of ancient Greece and Italy.

Niello Work.

THIS beautiful class of work, which is so much made in Russia, and especially in the Caucasian provinces, is a sort of enameling upon silver, with a paste consisting chiefly of the sulphide of the metal itself. The following account of the process is given by Dr. Percy: Take 4 drachms of silver, 2 oz. and 4 drachms each of copper and sal-ammoniac, 3 oz. and 4 drachms of lead, and 12 oz. of flowers of sulphur. Make a paste of the flowers of sulphur and water; put it into a crucible; afterwards melt the metals, and pour them into the crucible which contains the paste; re cover this vessel in order that the sulphur may not take fire, then calcine over the fire until all the superfluous sulphur is driven off; afterwards finely pulverize the mass and make, with the addition of a solution of sal-ammoniac and paste, which introduce by means of rubbing into the parts intended to be enameled; then clean the article and place it in a furnace, where it is sufficiently heated to melt the paste which fills the engraved parts and make it adhere to the metal. That done, moisten the article with a solution of sal-ammoniac, and heat it in a muffle to redness, after which you may rub and polish the article, when it has become cold, without fear of either altering or detaching the enamel; it remains always of a very fine black color.

English Plate Marks.

CONTINUED.

WE now pass on to the Hall-mark, which, with the exception of that short interval when it was replaced "by the figure of the woman called Britannia," has been from the earliest times a leopard's head crowned. Should anyone choose to call this mark a lion's head crowned we shall not quarrel with him. No doubt it, too, came out of the Royal arms of England, and we shall be content to wait before affirming it to be either a leopard's or a lion's head until the old controversy as to whether the beasts which figure in the Royal arms were originally lions or leopards is finally decided. We are inclined to think that the day on which this decision is made will be one of the Greek Kalends. Be it so. We are content to wait till then. But whatever be their right names, there is no doubt they are called leopards in the earliest statute which confers the right of assaying the precious metals when manufactured into plate to the Goldsmith's Company of London. This was in the year 1300, in the 28th year of Edward I., when by cap. 50, commonly called *Articuli super Cartas*, after saying that "no goldsmith nor anyone else within the King's dominions shall cause to be made any manner of vessel, jewel, or any other thing of gold and silver, except it be of the true alloy, that is, gold of a certain touch and silver of the sterling alloy, or of better at the pleasure of him to whom the work belongeth, and that none work worse silver than money, and that no manner of vessel of silver depart out of the hands of the workers until it be assayed by the wardens of the craft, and further that it be marked with the leopard's head, and that they work no worse gold than the touch of Paris," of which, as a MS. of the year 1378, in the possession of the writer, says, "*Laquelle touche passe tous les ors dont l'on ouvre en tous pays.*" This famous touch of Paris gold varied at various times, but in 1300 it was, as we have seen, as fine as the English touch for gold coins—that is to say, 24 carats, or pure gold. At the same date, as we learn from the same statute, English silver plate was to be equal to sterling coin, which word sterling is said to come from "Easterling," that is to say, silver used by the merchants of the Great Hanse Towns League on the shores of the Baltic or East sea. English sterling silver always consisted of 11 oz. 2dwts. of fine silver in the pound Troy, except when the standard for plate was raised as we have seen in 1697. It is very likely that the Company of London may have been appointed to regulate the assay of plate even before the year 1300, but they have certainly exercised it ever since, and there never has been a time for the last five centries when the mark of the leopard's has not been stamped by them on plate made within the metropolitan district. At first it would seem that the mark was only a simple leopard's head. It is so styled in the *Articuli super Cartas* and in Edward III.'s Charter to the Goldsmith's Company in 1327, and it is remarkable that that Charter speaks of "the stamp of a puncheon of a leopard's head," as of ancient time it has been ordained. Now, if the mark had not been older than the year 1300 it could hardly have been called ancient only 27 years later. We, therefore, see in the words of the Charter proof that the leopard's head was in use before 1300. And here let us remark that the term "puncheon" is only a mistranslation of the word "poincon," which means not a puncheon but "a punch," and that the words of the charter mean a stamp from a punch bearing or on which is engraved a leopard's head. Finally, in the Company's Ordinances of 1336 we find it enjoined "that none do work gold unless it be as good as the assay of the mystery—that is, of the Company—nor in silver unless as good or better than the King's coin or sterling and that when done it shall be brought to the Hall to be assayed, and that such as will bear the touch shall be marked with the owner's and sayer's marks, and afterwards be touched with the Liberdshede crowned." Mr. Chaffers thinks, and he is probably right, that the sayer's mark, or assay mark, here named, was the alphabetical letter, which we do not find till long afterwards mentioned by name, not, in fact, till 1597, when it occurs in the Records of the Company along with the other marks

then in force—Her Majesty's lion, the leopard's head, limited by statute, and the alphabetical mark approved by ordinance among themselves, and which are the *private marks* of the Goldsmiths' Hall. If so, the alphabetical letter in early times was what may be called the mark of the private assay, as the leopard's head crowned was undoubtedly the public or Royal mark on manufactared plate. While we are on this part of our subject let us add that while in France in 1377 the authorities were content to forfeit the pieces manufactured of less alloy than the law required, and only inflicted a fine after the third offense, the English law was far more severe in 1597, for two goldsmiths, having been found guilty of a similar fraud, were sentenced to stand in the pillory at Westminster, with their ears nailed thereto, and with papers over their heads stating their offence to be "For making false plate and counterfeiting Her Majesty's touch." After that they were again placed in the pillory at Cheapside, had one ear cut off, were taken through Foster-lane, where Goldsmiths' Hall still stands, to the Fleet Prison, and fined 10 marks. In Flanders this punishment was slightly varied. There the goldsmith convicted of like frauds was led to the market-place, where his ear was nailed to a post, where he remained until he made up his mind to release himself by leaving a piece of his ear behind him.

We have now only one out of our original five marks to mention. We have explained the origin of the sovereign's head, of the date letter, of the lion passant, and of the leopard's head crowned; there now only remains the maker's mark, which unquestionably was the first of all marks, as it often is on foreign and English provincial plate, the only mark to be found on examination. At first, before the days of law compelling him, the master workman, when he had finished a piece to his mind, put his mark on it to show that it was his work. Thus we may be sure that it was with Elegias or St. Eloy in France, the Saint-Smith of the 7th century, who rose from being a simple artisan to be the most remarkable man of his century, and whose virtues were rewarded with canonization. We may be sure that some of the many pieces of goldsmith's work ascribed to the saintly bishop and treasurer of Dagobert, and which existed in 1792 in various monasteries, and especially at St. Denis and the Abbey of Chelles, were marked with his mark. So it was, we may be sure, with Dunstan in our land. But when masters and workmen multiplied, frauds arose, and what had before been a mere matter of pleasure or pride to a master in his art was now turned by statutes and ordinances into a legal precaution against deceit. In the earliest ordinances and statutes of the "Confrairie St. Eloy," as the famous Guild of Paris Goldsmiths was called, *estre orfevre* and *avoir poincon a contresaing*—that is, having a punch with which to make his countersign on the pieces he manufactured—were convertible terms. "Aussi quelconques orfevres ne porront tenir lever forge ne ouvrer en chambre secrete, se il (for *ilz*) ne saperent approuvez devant les maistres du mestier et estre tesmoignez souffisanment de tenir forge et davoir poincon a contresaign, et autrement non." This we quote from the same precious MS. mentioned before, which bears on its binding "C'est le livre dos Ordonnances des Orfeves (*sic*) de ceste Ville de Paris, S. E. (for Sancte Eloy), 1576. It begins with the Letters Patent of Charles V. in 1376, and contains charters and confimations and extracts from the decrees of Parliament down to the 16th century, and was purchased a quarter of a century ago in Sweden, whither it had found its way when the Confrairie de St. Eloy disappeared with all its documents before the Revolution of 1789. But to return to our Goldsmiths and their marks. By the Letters of Charles V. the Masters-General of the Paris Mint were to take security in six marks of silver from every goldsmith before they allowed him to have a new punch. At the same time, they were to call in and destroy all the old ones, and to see that the new ones were better and larger than those used before. In England, though the maker's mark is not mentioned in the *Articuli super Cartas* of 1300, we may feel sure that such a mark, as well as the leopard's head then first mentioned, was to be found on all London plate of the period. It is not till the year 1336 that the owner's mark is mentioned, along with the sayer's or assayer's and the Liberdshede crowned. Again in 1363, the 37th of Edward III., chapter 7, it is provided that every master goldsmith shall have a mark by himself, which was not to be put on the plate made by him till the assay had been made, and the King's mark, that is the leopard's head crowned, had been first put on it. Again, in 1379, it was enacted that "every goldsmith should have his own proper mark." The same provision was enacted by various Statutes, and by they Ordinances of the Goldsmiths' Company of London it was prescribed that in what was called the Assay office at their Hall in Foster-lane should be exhibited a set of tables made in alternate columns of lead and vellum. On the leaden columns were struck the makers' marks, and on the corresponding one in vellum were entered and written the owners' names according to the intent of the words of the Statute 2d of Henry VI., cap. 14., "that the sign of every goldsmith be known to the wardens of the craft." It seems certain that these public tables began at least as late as the year 1423, but "unfortunately," as Mr. Chaffers says, "none of these tables have been preserved," though the practice continued till the year 1678, in which year we find them mentioned in *News from the Goldsmiths, or a Tryal of Gold and Silver Wares*, by W. T. Goldsmith. We are, however, informed that one very interesting relic of the practice is still in existence—"namely, a large sheet of copper, closely stamped with makers' signs only, of large and small sizes though nothing is known of their use or the names of the workers who used them, "They appear," says Mr. Chaffers, "to be of the end of the 16th or beginning of the 17th century." It certainly speaks little of the care of this wealthy company that on one of their most important privileges which has been exclusively and continuously confided to them since the year 1300, so little information should be afforded by the inspection of documents and records connected with London plate. It would be very desirable that this copper sheet, the solitary relic of the makers' marks of the metropolis, should be lithographed and published, as by its help the date of many a piece of plate might be identified. With regard to these makers' marks we have already seen when discussing the new standard of 1696 that in 1697 the makers' mark was bound by law to be the two first letters of their surnames, and that in 1739 it was enacted that the makers' mark should be for the future the initials of their Christian and surnames. This provision has remained in force ever since. But, in earlier times, the goldsmiths were free to chose any mark which their fancy dictated. It was usually some emblem, as a bell, a rose, a crown, a hawk's jesse, a star, in the earliest times without, but in the 16th centuries generally with, the goldsmith's initials.

We have now enumerated and explained the marks which Londonmade plate bore, ascending to the earliest times according to the number of marks. After 1784 five marks—the sovereign's head, the lion passant, the leopard's head, the date letter, and the maker's mark, and after 1540-45 four—the lion passant, the date letter, and the maker's mark. At some time about 1545 the lion passant, as we have shown, first appears. Before that time—the precise year has not been ascertained—three marks only are found—the leopard's head, the date letter, and the maker's mark. These three may be traced, as we have seen, up to the year 1438. Before that period, though it is certain that the leopard's head, the maker's mark, and in all probability the alphabetical mark, changing annually, had been used for centuries, the order of the alphabets cannot be identified owing to the rarity of English plate at that time now in existence. It is the great merit of Mr. Chaffers, aided, it must be owned, very much by the researches of Mr Octavius Morgan, that the plate collector now treads under his guidance over pretty safe ground so far as the marks on London-made plate since 1438 are concerned. Mr. Chaffers had an invaluable opportunity for perfecting his inquiries by the splendid collection of English plate brought together by the special Art Exhibition at the South Kensington Museum in 1862. From this and other sources he was able to compile a chronological list of English plate verified by actual examples, which we must say we have observed with suprise has been omitted in the last edition of his work.

We trust he will not fail to reinstate it in his next, as it is unquestionably the most valuable portion of his book. He says of it himself, "with very few exceptions, all these examples of English plate were exhibited at the special Exhibition of Works of Art, on loan, at the South Kensington Museum in 1862," and it seems most extraordinary that, after having made use of these pieces to construct the ladder by which he arrived at his knowledge of London hall marks, Mr. Chaffers should kick it down after he had climbed up, and so deprive collectors of the advantage derived from the chronological list. But, as Mr. Chaffers has omitted them, we feel it only a duty to give some of the precious pieces from his earlier editions, adding some fine pieces which are not in Mr. Chaffers' list, which have come under our notice in private collections. Here, under date 1445, we find the Grace Cup of St. Thomas a Becket, the cup and cover of ivory, but mounted in silver gilt. This precious piece is the property of Mr. Philip Howard, of Corby, to whose family it was presented by a late Duke of Norfolk, to whom it came along with the Arundel collections. To Lord Arundel it was given by Queen Katharine of Aragon, to whom it came from the treasury of the saint at Canterbury. This pedigree we derive from the catalogue of the collection exhibited in 1862 at South Kensington, where it is given on the authority of Mr. Soden Smith, but we cannot help thinking that for Katharine of Aragon we ought rather to read Katharine Howard on whose marriage with Henry VIII., Becket's treasures were confiscated by the bluff monarch. Under the same year we find exhibited the silver spoon of the ill-fated Henry VI., left, as we have already said, on his flight after the disastrous fight at Hexham, at Bolton, and now in the possession of Captain Pudsey Dawson, of Hornby Castle, Westmoreland, where it is preserved with the greatest care. The cycle in which these precious pieces are contained ended in 1458. Of the next cycle, between 1458 and 1478, no piece exists, unless it be the famous spoon now exhibited by Mr. Dunn Gardner at South Kensington. The history of this piece is curious, as showing the price which collectors will give for a rarity in silver. Originally bought at a sale of pledges at Debenham's auction rooms three years ago for 10*l.*, it passed through the hands of more than one dealer at an increased rate, until Mr. Dunn Gardner bought it for more than 80*l.* We can pronounce from inspection that it is a very remarkable piece, and in all probability if it were sold to-morrow it would not be bought for the price which Mr. Dunn Gardener is said to have given for it. It is what is called an Apostle's spoon—that is to say, it has the figure of a saint at the top of the handle. In this case the saint is St. Nicholas, the patron of children, and especially of the boy bishops, and he is represented as praying or blessing a knot of children at his feet. To add to its interest the shaft of the spoon has this legend in old English, "St. Nicholas, pray for us." It is London made, with the leopard's head stamped on the bowl, as was usually the case with English spoons down to the time of the Commonwealth. On the shaft is the date letter H in a peculiar alphabet, and if we are right in assigning it to the unknown cycle between 1458 and 1478, the date of this beautiful spoon will be 1465. In the third cycle Mr. Chaffers' examples are the Anathema Cup, as it is called, belonging to Pembroke College, Cambridge, so called from the form of execration in the legend on the cup against any who should alienate the gift of the founder; and a curious low bowl with an inscription in Gothic letters around the rim. When Mr. Chaffers compiled his chronological list, this cup belonged to Mr. Louis Huth, but it is now the property of Mr. Dunn Gordon, and may be seen by the curious, along with the spoon above described, in the fine collection of plate exhibited at the present time by that gentleman at South Kensington. In cycle No. 4, from May, 1498, to May, 1518, we find many fine pieces; of the year 1499, Sir Thomas Leigh's cup was exhibited by the Mercers' Company; of 1500, an apostle's spoon by the Painter-stainers' Company; of the year 1506, Bishop Fox's spoons—of gold we believe, though Mr. Chaffers does not mention this, with owls at the tops of the stems. His magnificent crozier, except Wykeham's crozier in New College, is the most magnificent piece of goldsmith's work in England. This crozier is said by Mr. Smith to be of English work, and it may be so, though Mr. Chaffers has omitted it, and other eyes have failed to discover an English mark on it. While speaking of croziers, we may add that Wykeham's crozier, which is finer than that of Fox, is supposed to be of French make. But to return to our chronological list.

Of the year 1507 it contains a silver-gilt cup and cover said to have been given by the Countess of Richmond to Christ's College, Cambridge, and a pair of silver-gilt salt-cellars in the shape of an hour-glass, also presented by her to that college. In 1510 Mr. Chaffers mentions the mounting of a mazerbowl exhibited by Mr. Franks, of the British Museum. Of the same year, and not in Mr. Chaffers' list, are three fine apostle's spoons, now exhibited in a private collection at South Kensington, two of which fall little short in interest to Mr. Dunn Gordon's spoon already mentioned. Of the year 1515 Mr. Chaffers' list contains Bishop Fox's cup and cover in the shape of a tazza, silver-gilt, and ornamented with a stamped pattern of roses and fleur-de-lis. It is their founder's cup exhibited by Corpus Christi College, Oxford, who also exhibited a second pair of spoons belonging to their founder. This pair have balls at the end of the stems, and bear the date mark of 1516.

So the alphabetical list proceeds, enumerating the precious objects on which, as actually existing, Mr. Chaffers' calculations and identifications of each alphabetical series are based. Of course, as we have shown, this list may be much enlarged, and some of the precious objects contained in it may have changed hands since 1862, but that is no reason why such a valuable help to collectors should be omitted in a work professedly for their assistance, and, as we have said, we hope to see it restored and extended in any future editions of Mr. Chaffers' work.

Modern Alchemy.

A CORRESPONDENT sends to a contemporary the following recital, which may fairly be called an astounding one:—"Large as have been the drafts of late upon our scientific credulity, there has hardly been one which makes so heavy a demand on our powers of faith as is involved by the statement that Mr. Norman Lockyer has realized the alchemist's dream, the transmutation of metals. Strange, incredible as this may appear, there is sufficient evidence of this having been effected to make us at least suspend our judgment and await the results of further experiment before absolutely refusing to believe. What seems certain is as follows:—Some time ago, in the presence of a small party of scientific men, Mr. Lockyer, by the aid of a powerful voltaic current, volatised copper within a glass tube, and caused the deposit formed within the tube in hydrochloric acid, and then showed, by means of the spectroscope, that the solution contained no longer copper, but another metal, calcium, the base of ordinary lime. The experiment was repeated with other metals and with corresponding results. Nickel was thus changed into cobalt, and calcium into strontium. All these bodies, as is well known, have ever been regarded as elementary, that is as incapable of being resolved into any components, or of being changed one into another. It is on this basis that all modern chemistry is founded, and should Mr. Lockyer's discovery bear the test of further trial, our entire system of chemistry will require revision. The future possibilities of the discovery it is difficult to limit. The great object of the old alchemists was, of course, to transmute base metals into gold, and, so far as our knowledge goes, there is no reason why copper should not be changed into gold as well as into calcium. The means at present employed are obviously such as to render the process far more costly than any possible results can be worth; but this is the case with most scientific discoveries before they are turned into commercial facts. I am not, of course, holding out any probability that such will ever be the case; but an attitude of incredulity is by no means justifiable in the matter. Mr. Lockyer is one of our best living spectroscopists, and no man with a reputation such as his would risk the publication of so startling a fact as he has just announced to the scientific world without the very surest grounds. He is known by his friends as somewhat sanguine, and he does not pretend to be an accomplished chemist, but he was supported by some of our leading chemists, all of whom admitted that the results of his experiments were inexplicable on any other grounds but those admitting the change of one element into another, unless, indeed, our whole system of spectrum analysis is to be upset, the other horn of a very awkward dilemma. He has already made a communication to the Paris Academy of Sciences on the subject, and he is about to read a paper before the Royal Society, in which we may hope to learn the results of his latest experiments, made since the paper was read in Paris.

Some of the Optical Properties of Crystals.

BY PROF. W. GRYLLS ADAMS, F. R. S.

If we use a wedge of selenite, there will be a gradual change in the colors from the violet to the red end of the spectrum, arising from the increase in the thickness causing the interference of the successive colors in going away from the edge of the wedge.

Some beautiful effects are produced by employing two wedges of selenite with the axis of one parallel, and the other perpendicular to the thin edge, and placing them over one another in different positions.

We may illustrate some of the characteristics of the passage of waves of light through crystals, by means of three strings, of different sizes and lengths, attached to one another at a point, and stretched by different weights, so that each of them will vibrate in unison with a tuning-fork, to which one of them is attached. The tuning-fork will set the first string in vibration ; the waves arriving at the junction with the other strings, will set the denser strings in vibration, provided their tensions and directions are properly arranged, their lengths being proportional to the velocities of the waves along them. Thus, the passing of the wave, from the thin string to two other thicker strings, represents the wave of light entering a crystal and dividing into two waves, which proceed in different directions through the crystal with different velocities, the velocity in a given direction depending on the elasticity or tension in that direction ; thus one wave may be retarded behind the other. The difference in length represents the retardation, and to this is due the interference of the light, and the production of the colored bands in selenite or other doubly-refracting crystal. By means of smooth guides, the thick vibrating strings may be made to vibrate in planes at right angles to one another to represent the vibrations of two plane-polarized beams of light. The action of Nicol's prism or analyzer may be represented by continuing the strings, and again joining their ends to the end of a thin string equal to the first, and controlling its vibrations by means of a guide representing the position of the principal plane of the analyzer.

Now, let us examine the effects due to interference when a beam of light passes through unaxial crystals, which are cut perpendicular to the optic axis. We shall see that, in two planes at right angles to one another (the principal planes of the polarizer and analyzer), the darkness still remains on inserting the crystal, so that there is a black cross, but in other parts of the field, which are illuminated by rays which have passed somewhat obliquely through the crystal, the difference in the retardation of the two beams gives rings of interference, just as in Newton's rings, with the colors arranged in the same order, depending on their wave lengths, the shortest being those which are nearest to the centre. This is the appearance presented by all unaxial crystals, the size of the rings being greater as the thickness of the crystal diminishes.

In the three remaining systems of crystals—the right-rhombic, the clino-rhombic, and the anorthic—there are two optic axes. Suppose a crystal cut perpendicular to the line bisecting the optic axes. When the plane of the two optic axes coincides with the principal plane of either the polarizer or the analyzer, when they are crossed, there will be a black cross ; but in other parts of the field the forms of the interference rings will be modified by their relation to the two optic axes, and will be curves called lemniscates.

When the crystal is turned in its own plane, the points for which the vibrations are parallel to the principal plane of the polarizer, or analyzer, will lie on hyperbolas passing through the two optic axes. In all other parts of the field there will be colored rings and lemniscates indicating the lines of interference of the several colors. These phenomina of polarized light are very difficult to describe, and the exhibition of a few crystals cut either perpendicular to the line bisecting the angle between the optic axes, or perpendicular to one of the optic axes, will show the forms of the rings, and reveal some of the most beautiful effects of the interference of polarized light.

Quartz is an unaxial crystal, which is entirely exceptional. When it is cut perpendicular to the axis, the black cross does not pass through the center of the field, but within the rings the field is of one uniform tint, the tint depending on the thickness of the crystal. This arises from what is termed rotary polarization ; and we regard the vibrations as being transmitted by the successive motion of adjoining particles in circles, the two waves transmitted with different velocities by means of right-handed and left-handed circular motions giving a plane wave. That a wave may be transmitted by the circular motions of the particles is readily shown by Powell's wave machine. We may have right-handed rotation where the particles move over from left to right, like the hands of a watch, or like a corkscrew ; and left-handed rotation when they move over from right to left, as the wave progresses away from the observer. Now, imagine two sets of waves formed by circular motions in opposite directions existing together, the particles in one set performing a complete rotation quicker than those of the other.

We shall get from this some idea of the transmission of waves through quartz, in the direction of the optic axis. The waves were transmitted with different velocities. In consequence of this, on coming out of the crystal, the two sets of opposing circular motions are combined in the Nicol's prism into a radical motion, giving a plane-polarized beam, the plane of the vibrations being inclined either to the right or left of the principal plane of the polarizer by an angle depending on the retardation of one of the rays behind the other. The rotation of the plane of polarization depends on the interval of retardation, and therefore is different for the different colors. The rotation also depends on the thickness ; so that, for the same position of the analyzer, the colors will be different for different thicknesses. The rotation of the plane of polarization is greatest for the more refrangible rays ; so that, in a right-handed crystal, we get the colors red, orange, yellow, green, blue, and violet in order, on turning the analyzer from left to right, supposing we are looking in the direction in which the light is going.

A corkscrew is right-handed, the light supposed to be going away from the observer. Some crystals of quartz are right-handed and others left-handed, and if two such crystals of the same thickness be placed side by side in the field, they will be of the same tints when the Nicol's prisms are parallel, or when they are crossed at right angles, but on turning the analyzer from one position to the other, the colors will change in opposite directions in the two crystals. On turning to the right, the colors will change through red, orange, green, blue, &c., in the right-handed crystal, and through violet, blue, green, orange, &c., in the left-handed crystal.

By a slight modification of these crystals, we may get bands through the field, which are continuous when the Nicol's prisms are parallel or perpendicular, but which travel in opposite directions across the field, when the analyzer is turned. It is found that certain liquids have this power, which is possessed by quartz, of rotating the plane of polarization. Almost the only means of distinguishing between tartaric acid and racemic acid is by their different powers of rotary polarization. Most of the essential oils rotate the plane of polarization. Oil of turpentine rotates the plane of polarization in one direction, whilst oil of lemon and solutions of cane sugar and glucose rotate the plane of polarization in the opposite direction. Cane sugar and uncrystallizable sugar rotate the plane in opposite directions. The strength of these substances may be measured by the amount of rotation. In sugar refineries this property of rotating the plane of polarization is made use of to distinguish different kinds of sugar, and to determine the strength of such solutions. The instrument used for the purpose is called the saccharimeter. The biquartz is made use of to detect with greater certainty the amount of rotation of the plane, and a left-handed rotation produced by the liquid may be balanced by an opposite rotation produced by a right-handed quartz plate of proper thickness, and the rotations of different liquids may be so compared.

In the saccharimeter a more delicate arrangement than an ordinary biquartz is employed, so as to give more minute changes of position of the analyzer. Two plates of quartz, cut at an angle of 45° to the axis, and crossed so as to give interference bands, called Savart's bands, are sometimes employed as in this saccharimeter. Sometimes two quartz wedges, crossed and so arranged that one can slide over the other, are employed, so as to give rapid changes of color for slight motions of the analyzer, the object being to determine as exactly as possible the change of position of the plane of polarization of the beam of light.

A very beautiful and very delicate effect is produced by crossing over one another two plates of quartz, and, according to the relative positions of the crystals and the angles at which the plates are cut, we may get a series of ellipses, or straight lines, or hyperbolas.

Endless varieties of arrangements may be made by varying the thicknesses and positions of quartz wedges placed over one another. With one arrangement, we may cause the series of hyperbolas to change their positions as we shift one of the pieces over the other.

In conclusion, I thank you for your kind attention whilst I have tried to compress into one lecture what might far more easily be spread over a course of considerable length.

"Tempus Fugit."

A LADY living in a Western city, who, in addition to a vast amount of ignorance, possesses a mania for gathering together antique bric-a-brac, ancient furniture, old crockery, etc., a short time ago wrote to a clock manufacturer in this city to know if he could inform her when a clockmaker named "Tempus Fugit" lived, as she had recently purchased an old clock having his name on it and she wished to ascertain about how old it was! The lady referred to is not the only one possessed of this mania for old clocks; indeed, it is not confined to the West, nor to any particular section or hemisphere. In Europe the demand exceeds the supply, while in America, the country has been ransacked for horological montrosities of a pattern similar to that which stopped so short "when the old man died." Over in Jersey recently, a wealthy lady was driving through a bleak and sandy section of that foreign land, when she came upon the lonely cabin of one of the natives. She went in to rest and get a drink—of milk, when her eyes were gladdened and her soul rejoiced by the sight of an ancient and venerable clock. It had not been in serviceable condition within the memory of man—probably having stopped stopped on the decease of the venerable gentleman referred to by the poet—its wheels and things were made of wood, a few of the cogs of the wheels were gone, the case was worm-eaten, and it was generally in a dilapidated condition. Its days of usefulness were exhausted when Adam was on earth the first time. But the lady had been educated in the mysteries of antique clocks, so that the more decayed a clock is and the more it won't go, the more valuable it is in her eyes. She immediately desired to buy the clock which had been thus revealed to her vision, and, on making her desire known to the native Jerseyman who owned it, was informed that another lady had been looking at it and offered him $50 for it. Of course, lady No. 2 then wanted it more than ever—it is characteristic of the sex to be always "dying for" what they can't have—so she offered $60 for it. The virtuous Jerseyman, however, couldn't sell it for any price without giving lady No. 1 an opportunity to buy it for the highest price named. He promised to communicate with her at once, and report. As a consequence, that wily native of Jersey sandbanks played one lady against the other, until finally No. 2 captured the prize for $150 and triumphantly took it home in her carriage, having to walk part of the way herself in order to make room for the cumbersome thing. Then she sent for a watchmaker, who whittled out some new cogs and things, set the alleged clock running, and charged $50 for his work. Now the lady was delighted; she had secured an ancient and venerable clock, had triumphed over a rival, and her soul was filled with peace and happiness in consequence. But a few weeks ago, a friend who dined with the family was called upon to admire this valuable relic of olden times, and in doing so, immediately identified it as one he had seen a little Dutchman making in a dingy shop in the upper part of New York! That clock is now for sale.

A lady in Brooklyn also has a mania for gathering old clocks. She recently bought one at auction for $125—the wily auctioneer having succeeded in pitting another lady against her in the bidding. It was an astronomical affair, having a moon and stars that rose and set at irregular intervals—their coming and going being intermittent, like fever and ague. It also had the remains of a music box in its bowels, and a reputation of having ground out tunes in former days. She took her treasure home, and also sent for a watchmaker to make needed repairs. (This mania is a good thing for clock repairers) The sagacious watchmaker knew too much to undertake to repair mechanism that was past all surgery, so he went to a clock factory, bought new works entire, and surreptitiously injected them into the diaphragm of that clock, which was too old to make any resistance. He also bought a new music box and put that in for chinking, set the thing to running and playing tunes, and sent in his bill. The lady is charmed with her acquisition, and never fails to extol its virtues and its antiquity to her many visitors. But when that clock gets to playing such tunes as the "Sweet By and By" and "Babies on our Block," some of her visitors have been seen to indulge in a skeptical smile while the fair owner expatiated upon its great age.

This rage for old clocks is one of those incomprehensible freaks that fashion indulges in so frequently. As timekeepers they are valueless, and in appearance they are generally hideous, being great, lumbering affairs, more nearly resembling coffins than respectable clocks. But it is an ill wind that blows good to no one. As a result of this mania for antique furniture, clocks, etc., several new industries have been developed, and many workmen find steady employment making antique articles that are glibly warranted to be two or three hundred years old, and sold to buyers who remain in blissful ignorance of the fraud perpetrated. We are waiting for the day when old hats and boots shall become of value on account of their antiquity; we have quantities of them that we are saving up so as to supply the market when the demand comes.

Effect of Sunlight upon Oils.

SAYS a writer in the *Chemist and Druggist*: "Some time ago we conducted a series of experiments for the purpose of determining the changes which took place in olive oil under various conditions, and we there found that a few hours' exposure of the oil to a summer's sun, in bottles hermetically sealed was sufficient to produce serious changes in their nature and constitution. These changes were not at first perceptible, either to taste or external appearances, but they passed rapidly into a second stage, in which the oils dimmed in brightness, and to the taste assumed a distinct *nip* or *bite*, instead of the sweet, nutty flavor distinctive of the fresh oil. The same, or at least a very similar *bite*, is very rapidly produced in the cod-liver oil under like conditions, and in both oils the change is much more rapid, quickly passing into decomposition, if they are exposed in open or loosely-covered vessels. It is, therefore, nothing short of ruin to these oils to place them, as is frequently done for show and purposes of sale, in windows or other exposed positions.

MR. BRYCE-WRIGHT writes to the London *Times* that numbers of false turquoises have of late come from Vienna, and are still arriving. Their detection are somewhat difficult, the backs of every specimen having been pecked out, and the holes filled with a black cement, to imitate the matrix of La Vieille Roche. They are, however, a little lighter than the real turquoise, the specific gravity being 2·4, while that of the genuine stone is 2·6 to 2·8. The easier method of distinguishing them, is to use a penknife to the false matrix, whith can easily be removed, revealing the artificial perforations.

Views of Correspondents.

This department of THE CIRCULAR is open for communications relating to the jewelry trade, but the editor does not hold himself responsible for the sentiments expressed by contributors. We invite correspondence, but require that it shall be free from all personalities, and the writer's integrity guaranteed by the disclosure of his true name to the editor. Anonymous communications will not be noticed.

To the Editor of the Jewelers' Circular:

In the September number of the CIRCULAR, I notice a communication from Fair Play, in regard to the base practices of a great number of drummers in the jewelry business, who stock up the regular dealers and then sell what they can to outsiders. Fair Play has taken a step in the right direction; but still he is liable to buy goods of some drummer that sells to outsiders in some other locality, thus patronizing houses who are not perfectly square in their dealings. Most all the drummers will agree not to sell to any outsider in a town if the jewelers will buy of him; but the jewelers cannot buy of them all; hence, in certain towns where the jewelers are good customers, they will deal with them alone, while in other towns on their route, they have no jewelers for customers, so they sell to outsiders. In this way, one set of drummers deal with the jewelers in certain localities, but go outside for trade in others, while still another set just changes places with them, selling to outsiders in the towns where the first set sells to the legitimate trade, and to the regular dealers where the others sold to the outsider. Fair Play says he has made up his mind to stop buying of those who sell to outsiders; but *how* does he know *who* to stop buying of?

Your advice to "let those drummers severely alone," is good, so far as it goes; but it does not begin to cover the whole ground, as you can see from the above illustration.

In Illinois, Iowa, Michigan, and Wisconsin, the retail jewelers have formed Protective Associations, for the purpose of correcting the very abuses of which Fair Play complains; and it is our intention to carry out more fully the same resolution he has made, which is to stop dealing with all jobbers who sell to outsiders, and we have pledged ourselves to each other not to buy a dollar's worth of goods of any house caught in the act of selling to any outsider in any locality; and all the members are instructed to notify their secretaries of all outside dealings they become cognizant of.

It is for the interest of every retail jeweler in the whole country to have these infamous practices stopped; consequently the retail jewelers' interests are identical, and every one in the trade should be willing to join their several Associations, and live up to the rules, thus, not only benefitting themselves, but every one in the profession.

If Fair Play lives in a State where there is an Association, I would suggest that he join it, and take an active part in correcting these abuses; if he does not, if he will write to me, I will furnish him with such circulars and other documents as have been used in this State for the purpose of organizing, which he can use to give him some idea how to go to work to get up an Association in his State.

Hoping an association for mutual protection will be formed in every state in the Union, and every legitimate retail dealer will unite with their respective Associations, and every Association work in harmony with each other, until we finally succeed in our efforts, I remain,

Yours Respectfully,

W. H. THORP,
Sec'y. Wis. R. J. P. A.

To the Editor of the Jewelers' Circular:

Have you a vacancy in the editorial department of your paper for a young man who has wasted three years of his life at the watch bench in a country jewelry store, trying to learn a trade that is getting to be no better than a blacksmith's. Now, I must confess that I would like something easier, where one would have a chance of improving himself, and a fair prospect of bettering his condition. Will you tell me what will be required of a young beginner, the amount of compensation, and the chances of my getting on some good paper. I would be willing to pay liberally for a soft position with good wages.

C. T.
INDIANA.

It is hard to tell from this distance whether you are fitted for the hard life of a newspaper writer or not. That is the only question to be decided, for qualification is quite immaterial. You must be prepared to rise from your bed as early as 10 A. M., in order that you may have finished reading your private mail by noon. Lunch is always paid for by the office, but you have got to accustom yourself to but five courses and but two kinds of wine—some papers stand three, including champagne, but they are the exceptions rather than the rule. At 2 P. M., you are expected to read the morning papers; and, if you are not too much exhausted by the effort, you can have a game of billiards, for no well-regulated newspaper office is without a well-appointed billiard room. At 7 P. M., you are expected to tell the editor where you will spend the evening, so that he can send for you in case your friends call, and then you can go to the theatre, opera, ball, or dog-fight, to which tickets and carriage will be provided. If you think you can stand such laborious work, come on and we will see what we can do with you; but you must understand that there is none of the luxury to which you have been accustomed in a newspaper office. Plain velvet carpets are good enough for this class of laborers; lounging chairs are, of course, indispensible, but they are upholstered in plain satin, with no tidies. Only one roll-top desk and four gold pens are furnished by the office; if you need any more, you will be expected to buy them yourself. Only one sofa and one silver drinking cup are allowed to each man, so you can see that there are some discomforts to be put up with.—ED.

A QUESTION OF RIGHTS.

To the Editor Jewelers' Circular:

Having become entangled in a very peculiar case of late, with one of the very best of New York firms, with whom I have been on the most friendly footing for nearly two years, and who, I am sure, would not intentionally wrong any one; yet, not being able to settle the same satisfactory all around, I take the liberty to lay the subject before you and your readers, with the request that you as well as they decide the equity in the matter through your columns. I do this the more freely, as similar disputes are liable to arise at any time between buyers and sellers, and it is well enough to settle the matter authoritively.

Last November, I bought of the above mentioned house, a No. 50 Elgin movement, at regular price. Last spring I discovered that this No. 50 movement had the patent regulator attached, which mine had not. I wrote to the Elgin Co., and have their answer, that in September last—two months previous to my purchase—they put the No. 50 movements on the market with patent regulators, had continued to make them so ever since, and had *not* changed price. I returned the movement to the house, requesting them to exchange the same for one with a patent regulator, but received it back with the reply, that as the company did not take them back from them, they could not take them back from their customers. The cost of putting on the patent regulator on a movement would be $5, equivalent to a depreciation of the movement I bought, of that amount. I forbear further comment at present. Respectfully,

OTTO WETTSTEIN.

Rochelle, Ill., Sept. 1880.

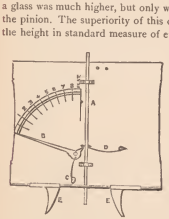
A Shrewd Divine.

IT is related, says the *Journal Suisse D'Horlogerie*, of an eminent English divine, that the idea struck him to embellish his church steeple with a handsome clock. He went to a far-famed clockmaker of the city of London, and without delivering his name, asked what a clock of such a pattern would be worth. The clockmaker replied, £150. The reverened gentleman thereupon, withholding his name, dilated upon the advagtages of furnishing said clock for a renowned steeple, in the way of advertisement, and the clockmaker, whom we will call Smith, at once saw the chance for spreading the name of his business, agreed to do it for £75. The divine requested time to think of it, noting the price in his diary. He then goes to Brown, a rival. Mr. Smith made me such an offer. "Oh, in that case," replies Brown, "I would do it for £50." The price is noted down, and time asked for to "think of it," Mr. Jones, a noted member of the trade, is sought out. Names and prices are quoted to him. "I will do it for nothing." More time is asked. Thence to Mr. Robinson. Names and prices are stated to him. "Competition is the life of trade." "If these three gentlemen can make such magnanimous offers, I can afford to be more liberal still. I will furnish and set up the clock, and give £50 to the church beside." The reverend gentleman was too crafty to at once close with the offer, but it is, perhaps, needless to state one of Mr. Robinson's clocks now ticks in the steeple, to the great wrath of Smith, Brown, and Jones.

Glass Height Gauge.

THIS gauge answers the two-fold purpose of giving the height of a canon pinion and also that of a glass, in the sizes which are on the labels of Geneva glasses. It is useful to manufacturers to enable them to make a canon pinion to take a given height of glass, or for glass fitters to find the height of glass which a watch requires. It will also test the accuracy of the label on a glass.

In vol. xv. of the *British Horological Journal*, page 28, a gauge somewhat similar is described, but its only use consisted in enabling a glass to be tested for *sufficiency* of height; it did not register either the height of the glass or of the canon pinion, nor did it show whether a glass was much higher, but only whether it was *high enough* to free the pinion. The superiority of this one lies mainly in that it it shows the height in standard measure of everything it ganges.



Description—A is a slide which moves freely up and down upon a plate of brass, and is kept in its place by the two bridges shown. B is an index whose tail connects with the slide by a pin which is fitted into a hole in the slide and projects far enough to rest on the side of the tail. The spring C acts upon a little pin in the index so as to keep the point at zero and to make the tail follow the slide as it moves up or down. D is a spring which connects with the slide to keep it up. E E are two feet which slide on a ⊥-shape base at right angles to the slide, to or from the center. When the top of the slide A is level with the plane of the top edge of the plate, the lower extremity is level with the bottom points of the feet, and the index is at "*flat*." If the feet be adjusted to stand in the groove of a bezel with the lower end of the slide at the center, the top will rise as much above the plate as the bottom rises to get upon the canon pinion, and the index following the slide will indicate the height on the scale. This gives the height of a canon-pinion of a full-plate watch, or the hand of a ¾ plate.

To gauge a glass correctly it is better to have a wider surface to rest upon than the edge of the plate at the top. I have screwed a piece of sheet brass at the back and bent it out so that its edge forms with the plate the shape of a V. The glass then rests on a triangle when it is being gauged, and the slide A touching the glass in the center gives its height as indicated on the scale. If the top edge of the plate were bent at right angles it would form a table for the glass to rest upon, which would answer the same purpose as the piece screwed to the back. But there must be something of the sort, or the glass cannot be gauged correctly to within half a size. The scale is divided to correspond exactly with the Geneva standard; thus a 4-height glass would register 4 on the gauge, and if the label were lost the glass could be gauged and re-labeled correctly.—*British Horological Journal.*

The Minnesota Retail Jewelers' Association.

THE Minnesota Retail Jewelers' Association held a very successful meeting at Minneapolis, on the 8th of September. Members were present from different parts of the State, and all were impressed with the importance of the work to be accomplished, and enthusiastically put their shoulders to the wheel to carry it on. Mr. Birkett, the President, made a very interesting address, and is thoroughly in earnest in the work he has undertaken. Mr. Damon, from Rochester, a member of the Executive Committee, and one of the veteran jewelers of the State, gave the meeting some very good counsel. A large number of new members were admitted, which places the Association in splendid working order. Resolutions were passed instructing the Secretary to correspond with Secretaries of other State Associations to the advancement of mutual co-operation and good of the trade. The next Regular Meeting will be held at Owatonna, on the third Wednesday in January, 1881, and all the Jewelers in the State are cordially invited to be present.

Business Notes.

E. R. Shellman has cast anchor at McKinney, Texas, and opened a neat little jewelry store in that town.

J. W. Spence, of Racine, Wis., has recently moved into more commodious quarters, and has now one of the neatest jewelry stores in the State.

Edward Seyforth, of Lanark, Ill., has invented an ear-piercer that pierces ears so quickly and painlessly that it is pronounced to be a real pleasure to undergo the operation.

Spiess & Rosswog, manufacturers of fine jewelry and diamond goods, continue to supply the trade with their novel attractive lines. Their stock, which is carefully designed, is full of novelties, from which purchasers can make satisfactory selections.

Bernays & Roeck, of Little Rock, Ark., are among the live jewelers of the West. They have a handsome store, well stocked with choice goods. They are counted among the enterprising citizens of Little Rock. Travelers always find it a pleasure to call upon them, although not always successful in selling them goods.

F. Kroeber, manufacturer and importer of clocks, No. 8 Courtland street, has recently received numerous invoices of fine French clocks of new and original designs, and also many novelties in this line from Vienna, Berlin, and other places celebrated for their clock manufactures. He offers a large and extensive assortment of goods, which cannot fail to satisfy the most critical purchaser.

The Meriden Britannia Co., Union Square, N. Y., call attention to their large and varied assortment of new designs in silver plate. Merchants visiting the city are especially invited to call and examine the new patterns in tea sets, cake baskets, butter and pickle dishes, jewel cases, vases, and many other novelties suitable for holiday gifts. In the new patterns of plateware, attention is called to the "Lorne," which for excellence of design and finish is unsurpassed.

William S. Hedges & Co., importers of diamonds, are constantly receiving fresh invoices of new goods selected with special reference to the requirements of this market. It is a well known fact that America absorbs all the finest diamonds, and our diamond merchants find great difficulty in finding goods fine enough for critical buyers. One of the members of the above named firm recently visited the principal diamond markets of the Old World, and succeeded in securing several parcels of exceptionally fine gems, which they now offer to the trade.

The well known house of Taylor & Brother, importers of clocks, bronzes, and fancy goods, offer a large and carefully selected stock of novelties in this line. In a recent issue of THE CIRCULAR an error crept into their advertisement representing them as offering faience bronzes as a novelty. As this class of goods is by no means a novelty, the error becomes annoying. We have no desire to resurrect fashions in fancy goods, certainly not before they have enjoyed their traditional seven years' sleep, and therefore apologize to Messrs. Taylor & Bro. for a "typographical blunder." Our Mercury has expiated his offence, although we are not positive that he was responsible.

The use of expletives is generally condemned, and a device which will prevent the use of language more forcible than polite, should be hailed as a blessing. Any one who has experienced the vexation attendant upon adjusting the old-fashioned sleeve button in a stiffly starched cuff, can bear witness to the great temptation to relieve their minds by the use of profane lauguage; and it is confidently believed that a recent invention will have a tendency to economize the use of profanity, and perhaps prevent it altogether. The device in question is called the "Parisian Lever" sleeve button, and the manufacturers state that it is "the most easily and quickly adjusted in the cuff, of any sleeve button ever made." The "Parisian Lever" sleeve buttons are for sale by the jobbing trade. The "Horse-shoe and Clover," and the words "Parisian Lever," are the registered trade marks of the manufacturers.

Foreign Gossip.

B. Laval, formerly a well-known watchmaker at Chaux de Fonds, Switzerland, is now at the head of a large watch factory in St. Petersburg, Russia.

A French inventor proposes to establish a central depot for supplying electricity for pianos. Owners of electric pianos might thus have tunes laid on like gas and water.

M. Mennier claims to have produced spinal crystals, and thinks he has also discovered periclase and corundum by the action of steam on aluminum chlorich, at a red heat in pisesnce of magnesium.

M. David, the well known engraver of precious stones, has been commissioned by the administration of fine arts, Paris, to execute a large allegorical cameo in commemoration of the *fete* of July 14th.

The watch industry at Besancon, France, is rapidly assuming large proportions, and threaten to become formidable competitors of the Swiss. The watches, however, made at Basancon are mostly cylinders.

A London jeweler has brought out some registered designs for sets of jewelry which are ornamented with mice. The bracelets have three little mice clinging to the back by their tails, the earrings each have one mouse, and another occupies the place of a stone upon a ring.

M. L. Sonderberg, watchmaker, of Copenhagen, has constructed a clock which is wound up by the aid of an electric battery. An electro-magnet keeps a spring in tention, and thereby secures the constant motion of the clock. It is said that a clock can be made to go in this manner for about a year, and all that is needed is to look after the elements once or twice during the whole time.

The new Imperial Patent Office of Germany was opened on the first of July. A circular explaining the principles upon which it is based, and inviting patent authorities in other countries to forward information in regard to their systems, in ordcr that the German office may profit by the experience of older institutions, has been issued. The German Patent Office is to issue a periodical gazette, similar to that issued by the United States Patent office, containing descriptions of all new inventions.

The crown jewelers which the French government is anxious to sell, consist in part of objects which have neither artistic value nor historical associations. The Minister of Fine Arts states that the sum of ₹1,500,000, which it is estimated they will fetch, would enable him to fonn a reserve fund for the occasional purchase of works of arts for the national museums. At present, the Administration of Fine Arts has the disposal of a sum of ₹500,000, voted by the Chambers every year; but the force of routine is so great that the Minister is obliged to spend the whole of this within the twelve months, whether there are favorable opportunities for buying or not, and cannot exceed the sum by a single franc when there are several important sales during the year.

The champion jack-of-all-trades belongs to England, and lives near Chichester. He has served as seaman in the four quarters of the globe, and acted as stewart, sailmaker, cook, mate, and navigator. He now hangs out his sign as "Prof. Pullinger, contractor, inventor, fisherman, builder, carpenter, joiner, sawyer, undertaker, turner, cooper, painter, glazier, sign painter, wooden pumpmaker, paper hanger, bell hanger, boat builder, clock cleaner, locksmith, umbrella repairer, china and glass mender, netknitter, wireworker, grocer, baker, farmer, taxidermist, copying clerk, letter writer, accountant, surveyor, engineer, land measurer, house agent, vestry clerk, assistant overseer, clerk to the Selsay Sparrow Club, clerk to the Selsay police, assessor and collector of land tax and property income tax, and collector of church and highway rates.

The commercial travelers of France number about eighty thousand. Cloth and stuffs take up about 12,000; the *articles de Paris*, including cravats, toys, perfumery, 8,000; wines and spirits, 12,000; book-trade, 1,000; stationery 800; hardware and agricultural implements, 1,000; the rest are divided amongst different specialties, The travellers in metallurgy and the mechanical specialties form the aristocracy of the corporation. They are generally pupils of the Ecole Centrale, or the Ecole des Arts et Métiers, and do not associate much with the humbler Gaudissarts. There is a distinction to be drawn between the Parisian and the provincial travelers. The provincial travelers work always in the same circuit, and travel with a horse and gig. They are great "swells" in their way, and are much respected wherever they go. The Parisian travelers travel by railway, readily change their specialty, and are severely judged by their more staid provincial brethren. M. Tirard, the Minister of Agriculture, is said to have begun life as a traveler in jewelry, and Mr. Greppo, deputy for Paris, was a *courtier* in spirits.

Workshop Notes.

To Remove the dark spots in watch-cases, pour a drop of oil of turpentine on the part affected; let it remain a few moments, and wipe it off. Rubbing them with a rag dipped in the oil will effect the same thing.

To Preserve the white and polished appearance of manufactured steel while tempeting it, enclose it in a tube filled with anhydrous linden wood; heat it until the coal becomes red-white, and temper in a basin containing water and calcined bone, care being taken that the piece during removal be not exposed to the air. To render the coal anhydrous, it must be heated to a bluish gray color; then let it cool.

Astounding.—The balance-wheel of a watch strikes 5 vibrations per second; 300 per minute; 18,000 per hour; 432,000 per day; 157,784,700 per year (365d. 5h. 49m.) If a watch were kept going for a century, its balance-wheel would vibrate 15,778,470,000 times! To give the reader an approximate idea of this astounding number, we add that a milliard (1,000,000,000) of minutes has not yet passed since the commencement of the Christian era.—*Journal Suisse D'Horlogerie.*

Spiral Springs.—"When the spiral spring has become entangled," says the *Deutche Uhrmacher Zeitung*, "which often happens while taking it from the spiral stud, I would recommend the following:—Carefully remove the pin which holds the spring in its stud, and draw out the spring; lay it in a good-sized, flat box and shake it horizontally. A trial of this simple remedy will always have the desired effect, loosening the intertwined windings of the spring, without rendering it necessary to employ other mechanical means."

New Method of Tempering Steel.—The director of the chemical laboratory of St. Thomas de Aquinas, France, has successfully introduced a new method for the tempering of steel. Instead of a piece of steel is generally tempered, and then annealed more or less, in accordance with the hardness or elasticity desired. The sudden immersion of the red-hot steel into cold water exposes it to the grave danger of springing cracks and fissures, hurtful to the resistance of the metal, and sooner or later, these cracks, invisible at first, augment, and finally cause a fracture. To overcome this risk, he proposed, if it were not more advisable, in place of cooling off, and reheating, to cool off less, without re-heating, and thus produce on the steel, at a single operation, the effect of plunging and annealing combined. His expectations have been realized. The metal, heated to a red heat, is immersed in water heated to about 55 degrees. The result is that a temper is produced whose resistance and elasticity may compare favorably with that obtained in the usual manner without exposing the metal to the danger of springing cracks and fissures.

Advantages of Hard-soldering Gold and Watch-cases.—A correspondent in the *Deutsche Uhrmacher Zeitung* publishes the following directions about hard-soldering, and says that they are not commonly known to the trade. The cleanliest, and, at the same, most commodious support for articles to be soldered, is a roll of binding-wire hammered flat, and laid in a pan provided with a wooden handle. It is sometimes difficult for the not very experienced eye to decide what kind of solder was used in prior repairs, and it will be safest to use silver solder; but I would advise the workman to use it as sparingly as possible, because the quality of solder, does not add to the strength of the repairs, and makes the article appear clumsy and unsightly. To solder neatly, lay the pieces to be joined as close as possible together, and secure them with clasps or wire. To fill a crack in an article, the best way to close it is by means of solder-plated gold plate. To prepare this, take a piece of gold plate, coat its one side with silver solder, turn it and repeat the operation on the other side with hard solder; then boil it in a solution of one part sulphuric acid to twenty parts of water, which removes the adhering borax; then hammer the plate thin, and finally pass it through the rollers, until the desired thickness is obtained. Of this plate cut a small piece, a trifle larger than the crack desired to be filled, insert it in the fissure, which has previously been well cleaned by brushing with borax water and solder, whereby a neat and workmanlike piece of work is produced. An operation performed in this manner needs far less cleaning than one obtained in the old style by means of silver solder. To prevent the paleness of the article, often produced by the soldering heat and boiling, coat it with a paste of equal parts of pulverized borax and charcoal, whereby it retains its original color. When articles already soldered require a re-soldering, it is necessary to keep this from running, which is best effected by a coating of dampened cerocus or Parisian red, care being taken, however, not to bring it too closely to the edge of the fracture, thus hindering the solder from running.

Trade Gossip.

Whipple & McMillan, of Omaha, succeeds Whipple & Co.

A clock with Westminster chimes was placed in position recently in the Dutch tower in the Newport Casino court.

B. Kistler, of Dubuque, Iowa, is, we are pained to say, dangerously ill. Little hopes are entertained of his recovery.

Theo. L. Parker, for several years with Brainard, Steele & Co., is now in the employ of Martin, Copeland & Co., of Providence, R. I.

It is a pleasing thing to see an English advertisement of "coin necklets, two rows, 1s. 11d." America does not wear all the sham jewelry.

Miniature shot-guns are among the latest novelties in scarf pins. They are probably designed to intimidate jewelry and spectacle peddlers.

A recent fire at Los Vegas, Colorado, destroyed Richmond's and Seiwald's Jewelry stores, and considerable of the business portion of the town.

There are a great number of southern and western buyers in town, and every enterprising house in the trade has plenty of bu iness to attend to.

Goodwin & Parmelee, of Des Moines, have moved into more extensive quarters on Walnut street, where they display a carefully selected stock of rich goods.

F. D. Jordan, a well known jeweler, of Savannah, Ga., was recently drowned in the surf at Tybee Island. His body was immediately recovered, but life was extinct.

If some of the smart scientific men would turn their attention to trying to improve off-color diamonds, they might add greatly to their own wealth and that of the world.

The official statement of the value of precious stones imported for the fiscal year ending June 30, 1880, gives a total of $6,698,478, against $3,842,007 for the year 1879.

It appears, says the *Parisian*, that the ladies have grown tired of suspending little gold and silver pigs around their necks and wrists. The latest fashion is a little elephant.

The Jewelers' League has just received notice of the death of its second member. Members will receive their notification and it is their duty to respond as promptly as possible.

The braided finish for hollow silver ware, is one of the latest novelties in the finish of this class of silver. It is introduced by Wood & Hughes, who were the designers of the basket-finish, which has been quite popular.

Several Providence rolled plate and gilt goods manufacturers are busily engaged at present making goods exclusively for the export trade. The goods are not sold direct, but through the commision houses of New York.

The emaciated form of our friend, Otto Young, of the firm of W. B. Clapp, Young & Co., is once more to beseen upon the Chicago rialto, he having returned from a long summer vacation, which he took to recover his health.

The firm of Van Cott, Clark & Co., Yankton, D. T., have dis solved partnership. Mr. Clark continues the business. Mr. Van Cott has opened a jewelry store in Chicago, and Mr. Hubbard is casting about for a location.

Charles W. Schumann & Co. have two of the finest pearls ever imported into this country. They are marvelously beautiful, without flaw or blemish, and are held at a very high price. The firm has also many rare and exquisite gems of great value.

A French engraver has discovered that the engraving tool will cut into metals which were unimpenetrable, if the tool is occasionally dipped into petroleum The hardest steel may be incised easily, if the engraving tool is dipped into a solution of two parts petroleum with one part of terebinthine.

William Brain, a returned diamond-hunter from Africa, called upon a friend in Chatham Street, drank several schooners of beer and became sadly demoralized. On reaching the side-walk, he quietly laid himself down in the gutter, and tried to wrap the curb stones around him. He dreamt that he was dwelling in marble halls, and on waking up found himself in the Tombs police court. The police sergeant was astonished to find on his person several valuable diamonds worth at least $2,000, and $300 in money. The thieves who frequent Chatham Street are ready to kick themselves because they neglected to improve "the shining hour."

The watch which originally belonged to Major John Andre, and which was in his possession when he was captured in 1780, is on exhibition in a show window in Broadway. The fact that Andre's father was a Swiss watchmaker may account for the great number of watches alleged to have been owned by this distinguished spy.

Charles Loeb, of the firm of Loeb & Co., exporters, whose recent extraordinary failure is severely commented upon, has been arrested at the instance of the E. N. Welch Manufacturing Co., and Jerome & Co., large creditors of the bankrupt firm, charging him with misrepresentation in obtaining a loan. Loeb was released on giving bonds in the amount of $10,000.

In Paris the latest thing in scarf pins for gentlemen is the "epingle vieux Saxe." It is simply an irregular fragment of china set in gold. The real amateur who has broken a priceless cup or saucer will have the pieces mounted as scarf pins and distributed among his friends. Those who are not amateurs or friends of amateurs can buy "epingles vieux Saxe" in enamel, a base imitation of the genuine article.

A French chemist is said to have condensed the body of his wife into the space of an ordinary seal, and had her highly polished and set in a ring. He made a nice income by betting with lapidaries and others that they could not tell the material of the set in three guesses, and, after pocketing the money, would burst into tears, and say: "It is my dear, dead wife. I wear her on my finger to keep alive pleasant remembrance of her."

Dealers are receiving quite a number of letters from persons in foreign countries asking them to send samples of their goods for introduction. Our dealers have learned by experience not to put their trust in foreign correspondents, and are not likely to send out valuable goods unless fully convinced that there is some prospect of payment for them. These foreign adventurers must regard Americans as an exceedingly confiding class of business men.

Tiny gold and silver moons are the fashionable talismans in Paris at present *vice* the miniature pig which has lately been suspended to nearly every bracelet or watch chain, and is now only used for a shoe-buckle. Neckles of small crescents are supposed to avert the evil eye and bring good luck—an old Roman superstition. The cock is also a favorite emblem, and large fans are painted with the chanticleer's head in natural colors, the English salutation, "Good morning" flowing from the beak.

Diamond cutters in this country have become so expert that they far excel those of Europe. They have studied the agency of light in lending brilliancy to the stone, and cut diamonds so as to obtain greater brilliancy than ever before. It used to be considered that the diamond cutters of Amsterdam were the most skillful in the world, but lately Amsterdam cut diamonds have frequently been re-cut by American workmen. What is lost in weight by recutting is more than compensated for by the increased brilliancy of the stone, and consequent enhanced value.

R. L. Paul Henne, a watch-maker from Schleswig, came over as an emigrant passenger on the *Suevia*, of the Hamburg line. He had with him three large packing-cases, which he represented to contain tools and household goods. When these were to be examined, he handed Inspector Wertheimer $10 and asked him to pass them without too much scrutiny. The inspector opened one of the cases. On top were a lot of old tools and rubbish. Underneath, concealed in odd corners, were 16 gold and silver watches, and the remainder of the case was filled with valuable clocks, music-boxes, opera-glasses, spectacles, boxes of watch crystals, and similar articles sufficient to stock a jeweler's shop. On Henne's person were six more gold watches and fifty gold chains. The three packing cases were sent to the seizure-room of the Custom-house.

There is scarcely a steamer arrives at this port but some of the passengers are detected smuggling gold goods of some kind, or foreign made watches. Some of our American tourists have an idea that if they can buy watches or jewelry abroad and bring them to this country without paying duty, they are doing a very smart thing. The fact is, this propensity for smuggling is well understood abroad, and foreign manufacturers are prepared with cheap and almost valueless goods to supply it. Cheap goods are manufactured in large quantities in Paris for the very purpose of imposing on American tourists. Watches that are of little value are put up in attractive form and sham jewelry is sold in abundance. Good and trustworthy goods cannot be bought in Paris as cheaply as in New York, and, as regards watches, there is no foreign market that can compete with New York in style, quality, and price of goods. It always does us good to see the brilliant tourist smugglers caught by the revenue officers. It is unfortunate that more of them are not captured, for there is a great amount of smuggling of this kind going on.

THE

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THE

JEWELERS' CIRCULAR AND HOROLOGICAL REVIEW

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Tenement House Workmen.

A PRACTICE recently introduced into the jewelry trade has grown to considerble proportions, and is working great injury to the legitimate trade and to regular workmen. A great number of foreigners have located in New York, and having a little knowledge of the jewelers' trade, have converted their rooms in tenement houses into workshops. A number of unscrupulous manufacturers, who thrive by imposing upon the public, and by defrauding honest workmen of their dues, give these tenement house workmen certain cheap work to do, paying them only starvation wages. These workmen press into the service their wives and children, and contrive to turn out a bungling class of work which their employer forces on the market. The system is substantially the same as that carried on by some cigar makers, who give out material to be worked up in tenement houses at very low rates Not long since there was a great howl of indignation over this irregular cigar trade, and the papers were occupied some time in exposing the abuses of the system, whereby women and children were forced to work for almost nothing in the unwholesome rooms of tenement houses. The board of health interfered to some extent to prevent the work from being done in this way. In this free country, it is a delicate matter to interfere between employer and employed, but when such employment leads to the demoralization of a large fraternity of workmen and to swindling the public, it becomes a legitimate subject for interference.

The manufacturers who employ these tenement house workmen are those who live by swindling the public. They make cheap goods out of degraded material, and palm them off upon the public for genuine goods. Manufactured articles composed of seven to ten carats of gold goods are sold as fourteen or eighteen carat goods; filled goods for solid, and articles that are boldly backed with brass sold for all gold. The manufacturers issue the material to these tenement house workmen, whom they pay scarcely enough to keep soul and body together, and expect the workmen will deal honestly by them. But many of these are experts in the adulteration of metals, and find opportunities for still further degrading the degraded metal furnished them by the manufacturers. They contrive to steal a portion of the gold, substituting base metal for it. They maintain the proper color, and account to the manufacturer for the full weight of the material issued to them, but the quality has been degraded. Thus the manufacturer who would swindle the public, becomes himself a prey to the dishonest workmen. It is useless to waste sympathy on such characters, and if the matter ended with the robbery of this particular kind of employer, we should have nothing to say. But it does not, as in all cases of this kind, it is the public that, in the end, is the victim.

The true remedy for abuses of this character is the adoption of a standard of quality, and the imposition of severe penalties for the manufacture of goods that are below the grade represented. In order to do this, it is necessary for the government to establish a standard for wrought gold, specifying the number of carats that shall constitute pure gold, and to what degree it may be alloyed and still be merchantable as gold. Of course, if the English standard should be adopted, providing that 24 carats constitute pure gold, then metal degraded below 12 carats would cease to be gold, but would be classified as base metal. This would rule out of the trade a vast amount of cheap and worthless goods. But to purify the trade entirely, it should be provided that every manufacturer should either stamp upon his goods the quality of the gold of which they are made, or certify to the quality in some way; and any false stamping or false certificate should constitute a misdemeanor, punishable by fine and imprisonment. As an incentive to the prosecution of fraudulent manufacturers, informers should be entitled to one-half the fine collected from persons against whom they give information. This would soon break up the practice of stamping 14 carat goods as 18 carats fine, or selling 10 carat goods as 14 carat. The stamp or certificate of quality should be exacted of every manufacturer, and in every case where the stamp or certificate was fraudulently given, severe penalties should be inflicted. For the purposes of government interference, a bill of sale should be constructed as a certificate of quality. In this way, and in no other that we can conceive of, can these fraudulent practices in the jewelry business be prevented. While a majority of the trade are honestly inclined, selling their goods for just what they are, there is still another class that relies upon the ignorance of the public to enable them to palm off as genuine gold goods articles that have been so degraded as to have lost the right to be called gold—the semblance may be left but the value has been destroyed.

It would not be feasible to introduce here the system of hall-marking that prevails in England, as it is open to many objections; but it is feasible, and entirely within the province of Congress, to establish standards for wrought gold, and to provide penalties for anyone selling goods of a quality inferior to the standard represented. There is a class of men who pride themselves upon successfully deceiving the public. This class can only be controlled by the strong arm of the law. At present they are under no restraint whatever, and, consequently, the jewelry trade suffers from their swindling transactions. It is high time the law was invoked to suppress them and their nefarious business.

Responsibility as to Apprentices.

THE day that a young man completes his apprenticeship to a trade marks an important era in his life. He is then prepared to step forth into the world a man among men, to assume the cares and responsibilities adhering to all men, and to do a man's work in advancing the prosperity of the nation. All prosperity, whether of an individual or of a nation, is based upon labor. The millionaire's income and his luxuries are as much dependent upon labor successfully performed as are the daily wages and the daily bread of the commonest laborer. Human happiness is also dependent upon labor, for no one can enjoy all the blessings that pertain to true manhood, unless he provides mental and physical employment for mind and body. His term of apprenticeship completed, the young man just entering upon a man's career, is in a position to decide whether his future shall be honorable to himself and those around him, or a reproach to the community in which he lives. Honest labor is always honorable; idleness is a reproach to the individual, and is sure to end in disgrace. If the apprentice has improved his opportunities while learning his trade, made himself a careful and trustworthy mechanic, he will have little difficulty at any time in finding plenty of employment, and earning sufficient to support himself comfortably. If he is prudent, also, he can speedily save enough to warrant him in taking a wife, and assuming that position which nature designed all men to fill, the head of a family. Persistent and conscientious labor, frugal habits, and strict integrity will inevitably win for him an honorable position in any community. Whether he will accept the lot for which he has prepared himself, or whether he will degenerate into an idler, a vagabond, a tramp, is for the young man to decide when his apprenticeship is ended. If he is endowed with moral courage and innate honesty, and has been properly instructed during his apprenticeship, he will choose the life of honorable toil to that of idleness and vagrancy; but if he is selfish in his instincts, lazy by nature, and wedded to self-indulgence, the world is not likely to get much good of him.

"What will become of our apprentices?" is a question that every employer should keep constantly before him. "As the twig is bent the tree is inclined" is a truism they should religiously bear in mind. The training a boy receives in the shop or factory is generally what shapes his future. It is too often the fact that employers take boys to learn a trade simply for what they can get out of them, taking no pains to instruct them, but using them more as errand boys, hewers of wood and drawers of water, than as persons regarding whom they have any responsibility. They teach the boy just enough to make him useful to them without any regard to perfecting him in the mysteries of the calling he has adopted, and from which he expects to derive his future subsistence. The boy is merely "a cub," in such an employer's estimation, whose duty it is to do the odd jobs and take all the abuse of the shop. It does not occur to the master that he is morally bound to fully instruct that "cub" in all the technicalities of the trade, and to make of him a thorough workman; on the contrary he is apt to be offended if the boy learns too fast, and fearful that he will demand more wages. It is too often the case that apprentices are kept doing "chores" all through their time, and what they learn of their trade is picked up in spite of "the boss" rather than by his good will. When such an apprentice is out of his time he knows little more of the real merits of his trade than he did when he commenced, and must go elsewhere to gather the instruction he needs. This is frequently done after he has started out as a journeyman, and at the expense of his new employers.

When a boy engages to learn a trade—unfortunately, the old apprenticeship system is nearly obsolete—there is an implied, if not a written, contract, to the effect that the boy shall give faithful service, and that the employer shall fully instruct him in his trade, so that at the end of his time he shall be a competent workman, and thereafter able to earn his living by his expertness at his trade. The employer who fails to so instruct his apprentice is guilty of a wrong to the boy and to the trade of which he is a representative. It is because employers are negligent in this matter that the jewelry trade is overrun with incompetent workmen. They are not so much to blame for their incompetency as the masters who failed to instruct them during their apprenticeship. Being incompetent workmen, they fail to obtain steady employment, drift into vagabondage, and frequently into criminal ways. Employers have a great responsibility regarding their apprentices, and this responsibility is far reaching, involving not only the future of the individual, but the welfare of society. It is, of course, troublesome to instruct apprentices, requiring both time and patience, but this trouble must be assumed or we shall have no workmen. Every competent workman, whether at the bench or in the office, had to have his instructor, and it is but fair that he should return the compliment by faithfully aiding those who are struggling to gain an entrance into an honorable calling. Much rests, of course, with the apprentice himself, but be his intentions ever so good he cannot learn the use of tools and how to do creditable work with them without instruction. He is entitled to such instruction, and the employer who withholds it from him commits a robbery, and inflicts irreparable injury upon the apprentice. Both parties to the contract have rights in the matter, and the apprentice's right is to be thoroughly instructed in his trade that he may thereafter earn an honorable living by it.

The Watchmakers' and Jewelers' Guild.

THE Watchmakers' and Jewelers' Guild of the United States is the title of an organization in the west, formed for the protection of the interests of the retail jewelers. In it is the germ of an association that can, if properly directed, be made to exercise a powerful and beneficial influence on the trade. There are many abuses from which the retailers suffer that can only be overcome by continued effort. If the Guild intelligently comprehends its mission and devotes itself exclusively and energetically to its performance, the manufacturers and jobbers, who are, either directly or indirectly, the authors or promoters of these abuses, will find it to their advantage to conform to the requirements of the Guild. But before the Guild can exercise an influence upon those who are charged with fostering abuses, it must first gain the confidence of the retailers, who are the sufferers from irregular practices. To this end, it is necessary for the Guild to clearly set forth its aims and objects, and, in its actions, confine itself to working out those objects. Thus far little practical work has been done by this organization. It has held conventions, where much high sounding eloquence was indulged in, and much immaculate business morality preached. But words are not deeds, nor will the sensible retail dealers mistake the one for the other. There have also been indications that the Guild was being used by a certain class of men to secure its endorsement of their methods of doing business and of their goods. The moment the Guild permits itself to be used as an advertising medium by anyone, its influence in the field of reform is at an end. What is needed to give the Guild strength is earnest work to correct the evils from which the trade is suffering. When it shows by its acts that it means business, dealers in all sections will heartily co-operate with it, and use every exertion to strengthen its hands. The principal efforts of this national organization should be directed towards building up State and local associations, inducing every dealer to become members of them, and bringing them all together for united and harmonious action. We hope to see the Guild and all State associations so effectually organized as to include in their membership every retail dealer in the country. We are satisfied that the manufacturers and jobbers will meet them half way in any movement for the betterment of the business regarding which there is a harmonious sentiment expressed. The Guild should be able to do much towards interesting dealers in their local and State organizations, and indicating a policy for enforcing much needed reforms upon which all can unite. The idea of such an association, combining the influence of all the State Associations, is a grand one, and should be energetically pushed to the fulfilment of its early promise. We do not propose to criticise at this time what it has done or what it has omitted to do, but simply to suggest what it is possible for it to do in the future.

The Necessity for Life Insurance.

THE Jewelers' League was recently called upon to pay its second death loss since its organization. Thus far the mortality among the members of the League has been exceptionally small, and the cost to each of his life insurance during the period, has been so trifling that it was scarcely felt. Yet each member of the League has been conscious of the fact that he has been insured all the time, and, in the event of his death, those dependent on him would have received in the neighborhood of $1,500 as the result of his membership. Life insurance has, because of its successful prosecution for many years, come to be regarded as one of the most beneficent institutions of our day. It has ceased to be experimental, for the problems involved have been reduced to mathematical certainties. It is not a luxury, designed for the wealthy, but is essentially a necessity for those of moderate means, especially for him who has a wife and children or other kindred dependent upon his daily labor for their support. The compensation he receives is barely sufficient to supply them with the necessaries of life, and to properly educate his children. As he looks forward to the time when, deprived of his labor, his widow and his children may be left wholly unprovided for, and be compelled to go into the labor market and work for such compensation as is given to women and children, the prospect is not pleasant to contemplate. It is the unmistakable duty of men so situated to insure their lives, in such manner as to give them the assurance that a liberal sum will be provided their families when death shall have taken them away. No man has a moral right to neglect this duty, and to run the risk of leaving his family to become paupers.

The fact being conceded that every prudent man will insure his life for the benefit of his family, it becomes a question as to where he will get such insurance. To those who can afford to pay the premiums charged by the regular insurance companies, and are *positively sure* that they can pay the premiums promptly at the times stipulated in the contract, these companies offer better inducements than any other. But no man can be certain of his ability to pay his premiums at the precise time when they become due, and if he does not, he forfeits not only his insurance, but all the premiums he may have previously paid. The contract is all in favor of the companies, and the statistics show that only ten per cent. of those insured (or their heirs) derive any benefit from life insurance. The other ninety per cent. either permit their policies to lapse, losing all they had paid, or surrender them for a merely nominal consideration. Companies have grown rich upon the proceeds of lapsed policies, and officers of companies have become millionaires by being able to draw freely from the same source. That the regular life companies recognize such organizations as the Jewelers' League—and every trade and secret organization has some kind of a benefit society—as the power that is rapidly drawing their business away from them, is shown by the fact that every insurance journal, depending upon the insurance companies for patronage, is at present engaged in waging war upon co-operative life insurance. They pronounce it wrong in principle, and predict that everyone who becomes a member of a co-operative society will lose his money. It is claimed that as the members of these benefit socities grow old, the death rate among them increases and the assessments to pay death losses come so fast that members refuse to pay them, preferring to sacrifice their membership. It is true that quite a number of co-operative associations have failed, but their managers sought to imitate the managers of the regular life companies and grow suddenly rich out of the funds intrusted to them. But how is it with the regular companies? We have before us a list of 144 regular life insurance companies that have failed within the past few years. These companies had issued 239,911 policies, and the amount of insurance represented by these was $66,178,878. All the money paid for these policies by the confiding public went to fill the pockets of insurance "wreckers" lawyers, referees, and the rest of the gang of harpies who are always on the lookout for prey of this kind. When the regular companies throw stones at the co operatives and charge them with mismanagement, they should put up the blinds to prevent their own windows from being smashed.

But admitting that the regular life companies continue in business, and are not given over to the wreckers to plunder, the number of persons who derive benefit from the insurance they offer is comparatively small, about ten per cent. as we have before stated. We have taken the trouble to compile a few figures from the last report of the Insurance Commissioner of this State, showing what becomes of the policies issued by the companies. The figures given below are taken from the sworn reports of five of the principal life insurance companies, and cover a period of ten years, from 1870 to 1880:

NAME OF COMPANY.	No. of Policies Issued.	Amount Insured.	POLICIES TERMINATED. By Death.§ No.	By Death.§ Amount.	By Maturity. No.	By Maturity. Amount.	By Surrender. No.	By Surrender. Amount.	By Lapse. No.	By Lapse. Amount.	Not Taken. No.	Not Taken. Amount.
Mutual Life.....	114,769	$462,236,423	9,085	$37,645,163	2,149	$8,838,570	39,089	$135,576,740	24,835	$66,285,288	12,348	$43,667,290
Connecticut Mutual..	64,664	166,883,094	8,524	24,615,854	1,050	2,590,457	20,631	65,491,410	21,672	66,712,613	6,376	21,165,285
New York Life.....	74,275	228,615,846	4,998	15,462,095	1,066	2,224,567	18,293	64,343,872	8,211	25,866,833	9,392	30,559,804
Equitable Life.....	91,837	345,638,850	4,281	19,216,682	401	1,785,696	20,652	101,196,662	35,200	126,961,065	15,889	68,108,581
Mutual Benefit.....	34,576	97,451,539	5,178	18,639,934	495	1,724,052	3,703	11,248,355	11,209	33,707,324	9,413	44,704,966
Totals.....	380,121	$1,296,166,641	32,066	$115,578,829	5,071	$16,157,232	102,068	$377,856,039	101,128	$317,533,124	53,518	$216,005,926

Policies that expired by death are the only ones where the full benefits of the insurance were obtained by the beneficiaries, or heirs of the person insured; those terminated by maturity were endowment policies, the insured realizing the amount of their policies; those ter-

minated by surrender, were those where the insured gave up a life policy for a paid-up policy, realizing a small proportion of what they had paid; the lapsed policies were those where the insured could no longer pay premiums, and the companies confiscated all that had been paid previously. The column "not taken" explains a little of the trickery of the companies. As the time approaches for them to make their annual reports, their agents are sent out into the highways and by-ways to induce their friends to make applications for policies, so they can show a large volume of business. These policies are issued, the Insurance Commissioner is deceived by the report, and the companies get credit for doing "a rushing business." But the policies are not taken, and the companies never realize a cent from them.

From the above figure it will be seen that the number of lapses is enormous, amounting for all companies for the past ten years to nearly 600,000, insuring $1,446,190,589. The premiums paid upon these policies, aggregating an immense sum, was a total loss to the persons paying it. After such an exhibit, compiled from the sworn reports of the companies, the managers of the regular life companies should be careful of asserting that members of co-operative societies will not continue paying assessments. Experience demonstrates that there is not sufficient cohesion in the regular companies to keep the great majority of policy holders within the fold. But the weakness of the regular companies constitutes the strength of the co-operative or benefit societies like the Jewelers' League. There is a bond of sympathy among the members, arising from the fact that they belong to the same business fraternity, having the same objects and aspirations in life, and using their energies in the same direction. The same is true of the numerous trade benefit societies, and the various other associations of other special callings. The fact that members are bound together by their business calling or by their social ties is a very good guarantee that they will faithfully observe the obligations towards each other imposed on them by their membership in these benefit societies. The old style of life insurance companies may suit at the benefit system, but the grand principle of mutuality is the foundation upon which communities and nations exist, and was first discovered by Adam and Eve in the garden of Eden. The extravagances, abuses and extortions practiced by the old line companies forced prudent men, seeking to make provision for their families, to apply the benefit system to life insurance, and thus far it has made a record for honesty and fair dealing far superior to that which marks the career of the regular life companies. So long as men are dependent, as all are, upon one another, and sympathize with each other in prosperity and adversity—in short, so long as human nature is human nature, the grand principle of co-operation is bound to live and flourish.

Burns has said that "Man's inhumanity to man makes countless millions mourn," buthe co-operative benefit societies that are springing into existence everywhere are calculated to do away with that inhumanity, to make all men brothers, to relieve the distress of widows, and to brighten the lives of thousands of orphans. The Jewelers' League is doing its share of this good work, and, we are glad to say, is increasing rapidly in popularity in thetrade, and gaining new members every day.

An Important Decision.

THE case of Miller Bros. *vs.* Albert J. Smith and Dutee Wilcox, for infringement of patent, has just been decided by the Circuit Court of the United States, Judge Clifford rendering the decision, in favor of complainants. This case was one of considerable importance to the trade, involving the patentability of designs for jewelry. Miller Bros. obtained a patent for jewelry on which the letters of the alphabet were placed in rustic design, embracing raised leaves and other ornamentation. This design was applied mainly to sleeve buttons which became quite popular in the trade. The defendants infringed upon this patent, producing similar goods, without having obtained a license from the patentee. Miller Bros. brought suit against the defendants, and the case has been pending in the courts for a year or more, and is now settled by the decision of Judge Clifford. This decision is very full and complete, the case having been tried on its merits. It affirms that designs of the character described are patentable; that the inventor has the right to keep secret for two years the fact of such invention having been made, and such delay does not bar him from applying for and receiving a patent for such design; also, that letters patent when introduced in evidence, afford *prima facie* presumption that the allegation of priority of invention and originality is correct, and it rests with the defendants to disprove the facts thus assumed. The defendants set up as their defence lack of originality, and previous public use of the designs in question. The court says this defence was not sustained by the evidence, but it was made clear that a palpable infringement of the rights of the complainants had been made by them. The conclusion of the court is that the complainants are entitled to an accounting from the defendants.

Miller Bros. are entitled to great credit for the persistent manner in which they have pushed this case to a final judicial decision. It settles the long mooted question as to property rights in special designs, and declares that such designs cannot be pirated with impunity. It was in evidence by the testimony of leading jewelers, that this patent was a valuable one, and the court holds that the complainants are entitled to a decree in their favor for the profits made by the respondents in the violation of their exclusive right to make, use and vend the improvements secured by the letters patent. This decision will, doubtless, put an end to one of the great abuses practiced in the trade, viz., the pirating of valuable designs and their reproduction in deteriorated material. The trade is under obligations to Miller Bros. for the energy and determination with which they have insisted upon their rights, and maintained them as a matter of principle.

The Jewelers' League.

At a meeting of the Executive Committee held Oct. 1st, five applications were referred for correction, and the following twenty-nine applicants were admitted to membership:—Fred. L. Baker, with Wheeler, Parsons & Hayes, New York City; John R. McAllister, with Wheeler, Parsons & Hayes, New York City; James H. Noyes, with Wheeler, Pasons & Hayes, New York City; Thomas G. Baker, with Gorham Mfg. Co., New York City; Wm. H. Barnet, of Newark, New Jersey; Joseph Beyer, Erie, Penn.; Lucius S. Cady, Kansas City, Missouri; Walter Cobb, Jr., Boston, Mass.; Wm. K. Cobb, Attleboro, Mass.; Frank H. Coffin, Peterboro, Mass.; Frank N. De La Mater, Honeoye Falls, N. Y.; Edward R. Ferriss, New York City; Herman T. Jarecke, Erie Penn.; Millard F. Many, Rcd Bank, N. J.; Aug. S. Mathey, Hoboken, N. J.; Chas. E. Millin, Providence, R. I.; J. H. Mulholland, Springfield, Ohio; James K. Osgood, Houlton, Maine; George F. Ransom, Cleveland, Ohio; Ambrose D. Ruth, Fayettevile, Tennessee; Charles L. Ruth, Montgomery, Alabama; John W. Ruth, Shelbyville, Tennessee; John H. Smith, Revere, Mass.; Wm. Smith, Jr., of W. Smith & Co., New York City; John R. Stone, San Francisco, Cal.; Gustav Strift, Rochester, N. Y.; James P. Tryner, Denver, Colorado; Walter E. White, Providence, R. I.; Benj. F. Williams, with D. F. Conover & Co., Philadelphia, Penn.

Proofs of the death of the late member, Mr. Barker, were presented to the Secretary of the League on September 28th. The Executive Committee examined and approved of them on October 1st, and on October 2d the sum of $1599.80 was paid to Mrs. Barker.

The League had received from Mr. Barker during his membership $7.00.

An assessment of two dollars (the first one in two years), was ordered by the Executive Committee, which is being responded to promptly and cheerfully. The effect has been to awaken a greater interest in the League among its members than has been shown for a long time.

Stephen P. Cox, of the firm of Cox & Sedgwick, George N. Wilcox, of Courovisier, Wilcox & Co., W. J. Erve, W. F. Cory, W. C. Hodge, S. E. Fisher, and several members connected with the house of Wheeler, Parsons & Hayes, have sent in several applications, and there is abundant evidence of work being done by a great many of the members.

In sending out so many open notices at once through the mails it is probable that some may have miscarried or have been lost in transmission. The Secretary has been notified of a few who have been missed, and he will be gratified to receive complaints, advice or suggestion that will tend to make the League complete in all its workings. The following communication will speak for itself:—

BROOKLYN, Oct. 2, 1880.

To the Secretary of the Jewelers' League.

DEAR SIR:—I have to-day received your check on the Union Trust Company for Fifteen hundred and ninety-nine 80-100 dollars, being in full of all my claims against the Jewelers' League as beneficiary of my deceased husband.

I desire to thank you for the sympathy you have shown during the preliminaries necessary to this payment, and to return through you, to each individual member of the League, my own and the gratitude of my little ones, for the benefit which is by your association so promptly and ungrudgingly given.

My earnest prayer is that your League may continue to prosper and be the means continuously of ameliorating the condition of those suddenly deprived of their means of support.

Sincerely and respectfully,

FANNY ELIZABETH BARKER.

A Few Words About Watches.

FOR the following sensible remarks upon watches, we are indebted to Mr. K. Houdin, a Frenchman, whose hints we have translated into English, and offer to our readers.

"We have always," he says, "observed the embarrassment under which persons labor in buying a watch. In most cases, and for very obvious reasons, this piece of business assumes serious proportions. In fact, it is not a mere jewel or toy, which fashion or caprice may cause us to change, but rather a faithful and devoted servant, which is long to be attached to our persons.

"The watchmaker to whom we may go when purchasing a watch should possess two essential qualities—honesty and knowledge; honesty alone affords no sufficient guarantee. In fact the vender who has not the requisite experience to be a judge of a watch, is compelled to trust to oth-rs who may deceive him; thus he may deceive you while deceiving himself.

"The following advice may prove serviceable to those who have to rely on their own unassisted judgment in selecting a watch: 1. While adhering to taste and elegance, chose a watch thick enough. In a watch too thin or too little, the parts are too feeble, and have not sufficient space to work well. Watches as large as a penny-piece, or those that are about as thin as a fourpenny-piece, are mere experiments of skill, which should rather be regarded as master-pieces of patience, from which there is more vanity than utility to be derived. 2. Avoid in watches that construction which fashion has often prescribed, but which good sense condemns—such as those that point the days of the month, and so forth. These extra pieces necessitate additional parts, which occasion friction, and encumber a space already too limited; though here it may be observed, that complicated watches such as chronographs, repeaters, etc., are now brought to a high state of perfection, at, of course, a correspondingly high cost. 3. Do not allow yourself to be attracted by the supposed advantages of new escapements. In watches for ordinary purposes, the lever and the horizontal escapements are generally adopted, as giving the best results. 4. The watchmaker who is conscientious will point out to you the limits beyond which a watch ceases to have the qualities necessary to go well. A watch procured for the design of its case may be covered or set with chasing and gems; it is then simply a jewel; but that which is bought for its utility, ought to be as plain as possible, and this plainess itself is, as a rule, a distinguishing characteristic of its good quality.

"We will now say a few words as to what we ought to do, and what we ought to avoid, to preserve a watch in good condition. Having obtained a really serviceable article, you should, in order to produce satisfactory results, follow out these rules: Wind up your watch every day at the same hour. This is generally done at the hour we retire to rest; or perhaps, better still, at the hour we rise. Avoid putting a watch on a marble slab or near anything excessively cold. The sudden transition from heat to cold contracting the metal, may sometimes cause the main-spring to break. Indeed, the cold coagulates the oil; and the wheel-work and pivots working less freely, affect the regularity of the time-keeper. When we lay our watch aside, we ought to slope it on a watch-case, so as to keep it nearly in the same position as it has in the pocket. In laying aside your watch, be sure that it *rests* on its case, as by suspending it free, the action of the balance may cause oscillation, which may considerably interfere with its going. If you would keep your watch clean, you must be quite sure that the case fits firmly, and never put it into any pocket but one made of leather. Those pockets which are lined with cloth, cotton, or calico give, by the constant friction, a certain quantity of fluff, which enter most watches, even those the cases of which shut firmly. If the watch is not a 'keyless' one, the key should be small, in order that we may feel the resistance of the stop-work; then we can stop in time without forcing anything. It is also necessary that the *square* of the key should correspond with that of the watch. If it be too large, it may in a short time cause the wind-up square to suffer too much from wear and tear; the rectifying of which is rather expensive. The hands of an ordinary watch can be turned backwards without much risk. It is, however, always better to move the hands forward to adjust your watch to correct time.

"Watches, by reason of their fragile construction, and the variations to which they are liable, can after all only obtain a limited perfection in their performance; therefore, we must not be astonished to find them subject to certain variations. These variations, which are easy to correct, need not prejudice the quality of a watch, as will be proved by the following example. Two watches, we will suppose, have been put to the same time by an excellent regulator. At the end of a month, one of these watches is a quarter of an hour too fast; the other is exactly the right time. To which of these two watches would we give the preference? Perhaps to the one which is exactly right. But in making such a choice, we nevertheless incur the risk of abandoning a good watch for a bad one. The first watch has, we assume, gained thirty seconds a day; and according to this rate, it has gained a quarter of an hour in thirty days. What must be done to make this watch go well? After the regulator inside from fast to slow, or get a careful watchmaker to do it for you, thereby altering its daily rate. Let us now admit that the other watch has been affected during a month with irregular going, which has occasioned it sometimes to gain, at other times to lose to a certain extent daily. It may easily occur that at the end of a month, this gaining and losing compensate each other, and by this means, the watch indicates the exact hour at the time we look at it. Such a watch can never be relied upon.

"The fact is, that the watch which gains in a *regular* manner or loses in a regular manner, is superior to any whose variation is uncertain; and where its variation comes to be familiar, the little companion may vie with the most delicately adjusted ship's chronometer.

"A skilful watchmaker one day thus reasoned with a customer who complained of his watch. 'You complained,' said he, 'that your watch gains a minute a month. Well then, you will congratulate yourself when you have heard me. You are aware that in your watch, the balance, which is the regulator, makes five oscillations every second, which is four hundred and thirty-two thousand a day; so that your watch, exposed to all the vicissitudes which heat and cold occasion it, the varying weight of the air, and the shaking to which it is subjected, has not gained more than a minute a month, or two seconds a day. It has only acquired with each vibration of the balance a variation of the two hundred and sixteen thousandth part of second. Judge then what must be the extreme perfection of the mechanism of this watch!'

"A watch cannot go for an indefinite period without being repaired or cleaned. At the expiration of a certain time, the oil dries up, dust accumulates, and wear and tear are the inevitable results to the whole machinery, the functions becoming irregular, and frequently refusing to act together. A person possessing a watch of good quality, and desirous of preserving it as such, should have it cleaned every two years at least. But care should be taken to confide this cleaning or repairing to careful hands; an incapable workman may cause injury to a watch even of the simplest construction.

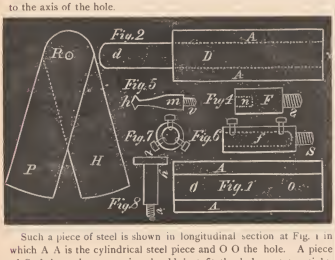
"There is in the generality of watches a regulator for fast and slow, with a movable index. The two words "Fast" and "Slow," engraved at each end of this regulator, leave no doubt as to which way the index should be moved in order to make the watch lose or gain. It is easily understood that if the watch gain, the index should be pushed towards the slow; and when it loses, toward the fast. This operation should be performed with a good deal of care and attention, in consequence of the susceptibility and fragility of these regulating pieces. It would be impossible to give any information as to the effect existing between the degrees of this regulator and the variations of the watch; it is therefore only by trial that we can arrive at the precise point at which to bring the time to its fullest accuracy. When a watch varies only a little, we content ourselves with touching the index one degree. We then wait twenty-four hours to judge of the effect, and act according to the result obtained. In the event of the variation being greater, for instance, than ten minutes in advance in a day, we ought to push the index to the end of "Slow," even if we have to retrace our steps the next day. But if in this state the watch gained again, it would be necessary for the watchmaker himself to undertake the regulation of it.

"It would be useless to attempt to correct a variation of one or two seconds in a day, or a minute in a month. Even supposing that the going of such a watch did not vary more than a second a day, this would be perfect enough, as it would be extremely difficult to produce a correction slight enough for an error so trifling. The difference of time can generally be adjusted by a comparison with mean time as registered daily in nearly every large town; or, as we have already said, if the watch be regular in its habits of irregularity, it is virtually equivalent to a perfect time-keeper."

Gem Engraving.

BY AN EXPERT.

THE general principles of stone engraving can quite easily be acquired. And in these days when so many of one's customers require initials and monograms cut on stone rings, lockets, sleeve buttons, etc., it is no little bother and expense to send such jobs to a distant town and incur double express charges in addition to paying for the work. It is in view of these considerations that I would say to those who feel inclined to learn this art that they will find it by no means so difficult as they might be disposed to imagine, especially when so many watchmakers use foot lathes. In this and subsequent articles I will give detailed instructions for cutting simple letters, and extend the lessons to monograms and cameos or intaglios. Also for the benefit of such watchmakers as may be interested in the articles, I will describe in detail the process of jewel making to the extent that will enable any person who will carry out the instructions to grind and polish pallet jewels, also locking and impulse jewels for chronometers. The tools are, as a rule, very simple, and many will suggest themselves to the learner as he feels the want of a special tool for a special purpose. Most of the cutting tools are of soft steel, and the abrasive material diamond dust. The reader need not get scared at diamond dust, for it is not going to cost anything princely; in the first place diamond *bort*, or coarse diamond dust, is worth about six dollars per carat (four grains), but this expense need not be incurred at first as old diamond or jewels are always to be come at about an old established watch repairing shop. I will proceed now and describe how they can be crushed and reduced to dust. The best instrument for this purpose is a piece of round steel five-eights of an inch in diameter and two inches long; this is to be drilled through from end to end with a hole the size of a number one Stubs' steel wire, and the ends turned off flat and at right angles to the axis of the hole.



Such a piece of steel is shown in longitudinal section at Fig. 1 in which A A is the cylindrical steel piece and O O the hole. A piece of Stubs' number one wire should just fit the hole, not too tight, but about like the back center of a well fitted lathe. A piece of Stubs' number one wire should be cut three inches long and one end rounded up as shown at *d*, Fig. 2, the other end squared as shown at b. A female screw should be cut at one end of the steel cylinder A half an inch deep, into this is to be fitted the plug B, this plug should be of steel and fited off smooth with the end of the cylinder A, but it should be slotted at the end *x* so as to be unscrewed and taken out if necessary. The piece *c* is a piece of a number one Stubs' wire half an inch long cut off square at each end. In order to cut these pieces of wire off exactly square, the following plan can be adopted. Before the screw in the end of the cylinder A is cut at B the piece D is pushed through the hole O until it slightly protrudes at *x*, it is now to be filed with with a fine file flat with the end of the cylinder A. The piece C is to be squared up in the same way. After the pieces are all fitted, the steel cylinder A, the plunger D, and plug C, are to be hardened as hard as possible. The pieces should be protected by some of the many anti-scaling compounds, or in absence of these they can be covered with a paste of Castile soap like thick cream; dry this on slowly and when dry heat to a full red heat and plunge into cold water This temper should not be run down, for it is desirable to have it as hard as possible. The instrument should go together as shown in Fig. 2. The piece of diamond to be crushed is placed in the tube O between D (at b) and C. The end of the cylinder *x* is set firmly on an anvil or some large solid piece of iron and the end *d* struck hard with about an eight ounce hammer. Revolve the plunger D say half way round, then give it another blow, and so on for eight or ten blows. On removing the plunger the diamond will be found pulverized. A little clock oil should be added to the diamond dust. As good way as any is to put a drop as large as a pin head with the piece of diamond to be broken. A young friend of mine, to whom I gave instructions in jewel making, improvised a simple device for making diamond dust, which he pronounces "bully." It consists of two pieces of French clock spring twisted together as shown at Fig. 3, the rivet R is not so tight as to prevent the pieces being turned away as shown in the cut. A piece of diamond to be broken is moistened with oil and placed at H, and the part P turned over it. Now lay the end H on a smooth flat piece of steel or iron and strike the spring directly over the diamond hard with a good sized clock hammer; move the piece P a little back and forth so as to bring the coarsest particles of diamond into a new position, striking hard each time, after ten or twelve blows the pieces can be turned apart as shown at Fig. 3, and on each piece will be found clinging the fine particles of diamond held by the oil. This plan is only a make-shift and not near as good as the regular diamond mortar described above. Now comes the method of using this diamond dust. If you use an American lathe prepare a large piece of steel wire of the size and shape of a wax chuck as shown at Fig. 4, S is tapped so as to fit your lathe chuck, at *n* is drilled a hole, as shown in the dotted lines, the size of this hole depends on the size of the lathe you use. Perhaps the best way to make myself understood is to explain the use of the chuck E, the whole use of this is to do away with the necessity of turning and fitting large pieces of wire to make small tools. Select the largest steel wire your lathe will take in a split chuck, we will suppose the wire to be the size shown at *m* Fig. 5. Turn the pin v so as to leave a fair firm shoulder at *m*; now drill at *n* Fig. 4, of such a size that when the screw is cut on *v*, and into the hole *n*, they will run together nicely, cut off a piece of about the length shown in Fig. 5, screw *v* into n, insert F into the lathe chuck and turn up as shown in Fig. 5. If your lathe is a Bottum or Swiss a chuck as shown at Fig. 6 will serve to turn up the steel tools; to make such a chuck take a large piece of brass wire and turn it as shown in Fig. 6, drill a hole large enough to receive steel wire like Fig. 5, this hole is drilled nearly the whole length of the chuck as shown in dotted lines *f* Fig. 6. Two sets of set screws of three each are put in as shown in Figs. 6 and 7. (The reader will of course see that with these set screws he can make the piece of steel wire run perfectly true.) Such a chuck in conjuction with Fig. 4 and you are all right.

The great variety and number of these small steel tools make such an arrangement indispensable. When the tools require a large head as shown at *t* Fig. 8, a button of soft steel can be riveted on as shown in the cut. Such button tools could be made to screw on, but such a method would not be desirable; one sufficient reason is, these tools should never be touched with the fingers where the diamond dust and oil is applied. A box large enough to contain the tools in use, beside room for your diamond mortar and other necessities is inaispensable, as it protects everything from dust. Such a tool at Fig. 8 is used for cutting wide, flat-bottomed incisions, such as the heavy bars of Roman letters, while the hair lines are cut with such a tool as shown at *s* Fig. 5. After the tools are turned up nicely and hardened, followed by a pivot file or a slip of Arkansas stone, a smooth piece of *hard* flat steel should be provided; say a piece of an old burnish file three inches long and three-fourths of an inch wide; this is to be set into a piece of a wood like an old stone. This piece of steel is used to charge or fill your cutting tools, the way it is to be used is as follows: Take a little of your diamond dust and oil and smear it on the center of your flat steel, say a streak an eighth of an inch wide, and one inch and a quarter long. Next provide a handle for your tools. Take a piece of brass wire the size of Fig. 4 and four or five inches long and drill and tap it as at *n* Fig 4, screw the screw *v* Fig. 8 into it, hold the brass wire horizontally in the right hand, apply the edge *t* Fig. 8 to the diamond and oil and roll back and forth. A strong steel tool like a clock screw driver held in the right hand and applied at *y* will serve to help hold down; for this process of rolling has to be done with such force as to imbed the fine particles of diamond into the surface of the tools.

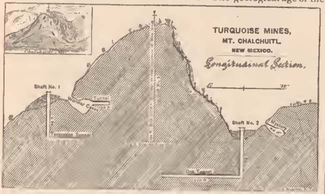
Turquoise of New Mexico.

BY B. SILLIMAN.

[*Read before the American Association for the Advancement of Science at Boston, August*, 1880.]

THE existence of this comparatively rare gem in New Mexico is a fact long known—the chief locality being at Mt. Chalchuitl in Los Cerillos, about twenty-two miles south-west of the ancient town of Santa Fe, the capital of that territory. We are indebted to Prof. Wm. P. Blake for our first detailed notice of this ancient working in an article published in 1857, in the American Journal of Science.* It was subsequently visited by Dr. Newberry and mentioned in one of his reports, and by others. I have lately had an opportunity of examining this very interesting locality, since it has been laid open in the old workings, and by the recent explorations of Mr. D. C. Hyde, and thus rendered accessable to observation.

The Cerillos Mountains have lately come into notice from the partial and as yet, superficial exploration, of very numerous mineral veins which are found to intersect them and which carry chiefly argentiferous galena, with some gray copper, rich in silver, giving promise of mines of value when opened in depth. I have elsewhere spoken more particularly of these veins and of the rocks that contain them. These rocks are all eruptive or plutonic rocks of the family of the *Augite Trachytes*, the microscopic study of which reveals the interesting fact that they are of the same family which, the world over, carry the richest and most permanent ores of silver, with some gold, and which there is good reason to believe are here penetrated by true fissures which may be followed to any depth, without exhaustion. In the center of this district, which is not more than about six miles by four in extent, rises the dome of Mount Chalchuitl, the summit of of which is about 7,000 feet above tide, and is therefore almost exactly on a level with the Plazza of Santa Fe, across the valley of the river of that name, to the north-east. In the other direction this mountain has its drainage into the valley of the Galisteo, which forms the southern boundary of the Cerillos district. The geological age of the



eruption of these volcanic rocks is probably Tertiary. The rocks which form Mt. Chalchuitl—the Indian name of the turquoise—are at once distinguished from those of the surrounding and assoitated ranges of the Cerillos by their white color and decomposed appearance, closely resembling tuff and kaolin, and giving evidence, to the observer familiar with such phenomena, of an extensive and profound alteration, due, probably, to the escape through them, at this point, of heated vapor of water and perhaps of other vapors or gases, by the action of which the original crystalline structure of the mass has been completely decomposed or metamorphosed, with the production of new chemical compounds. Among these the turquoise is the most conspicuous and important. In the seams and cavities of this yellowish-white and Kaolin-like tuffacious rock the turquoise is found in thin veinlets and little balls or concretions called "nuggets," covered on the exterior with a crust of the nearly white tuff, and showing on cross fracture the less valued varieties of this gem, more rarely offering fine sky-blue stones of higher value for ornamental purposes. It is easy to see these blue stains in every direction among these decomposed rocks, but the turquoise in masses of any commercial value are extremely, rare and many tons of the rock may be broken without finding a single stone which a jeweler, or virtuoso, would value as a gem.

The observer is deeply impressed on inspecting this locality with the enormous amount of labor which in ancient times has been expended here. The waste or debris excavated in the former workings cover an area which the local surveyor assured me, by his measurement, extend over at least twenty acres of ground, and which it is easy to see has a very large bulk. On the slopes and sides of these piles of rubbish are growing large cedars and pines, the age of which—judging from their size and slow growth in this very dry region, must be counted by centuries. It is well known that in 1680 a large section of the mountain suddenly fell in from the undermining of the mass by the Indian miners, killing a considerable number, and that this accident was the immediate cause of the uprising of the Pueblos and the expulsion of the Spaniards, which happened in that year just two centuries since.

The accompanying vertical section of the mountain from east to west will give a good idea of the old workings and of the shafts and tunnels projected and partly carried out, by Mr. Hyde, who kindly permits me to use it. The irregu'ar openings, named by Mr. H. as "wonder caves" and the "mystery," are the work of the old miners, and the whole hill-side from the flag staff to the "mystery" was worked out by them also. It was this sharp slope of the mountain which fell. In these chambers, which have some extent of ramification, were found abundantly the fragments of their ancient pottery, with some entire vessels, some of curious workmanship, ornamented in the style of color so familiar in the Mexican pottery, and associated with these numerous stone hammers, some to be held in the hand and others swung as sledges, fashioned with wedge-shaped edges and a groove for the handle. In one case a hammer weighing over twenty pounds was found, while I wss at the Cerillos, to which the wyth was still attached, with its oak handle—the same scrub oak which is found growing abundantly on the hill-sides now, and quite well preserved after at least two centuries of entombment in this perfectly dry rock.

The stone used for these hammers is the same hard hornblende Andesite or Propylite which forms the Cerro d' Oro and other Cerrillos hills, very hard and tough. With these rude tools and without iron or steel, using fire in place of explosives, these patient old workers managed to break down and remove the incredible masses of these tuffaceous rocks which form the mounds already described.

That considerable quantities of the turquoise were obtained can hardly be questioned. We know that the ancient Mexicans attached great value to this ornamental stone as the Indians do to this day. The familiar tale of the gift of large and costly turquoise by Montezuma to Cortez for the Spanish crown, as narrated by Clavigero in his history of Mexico, shows the high value attached to this gem. It is not known that any other locality in America has furnished turquoise, in any quantity—the only other place outside of Los Cerillos where it is found at all, being that near Columbus District in Nevada, discovered by Mr. J. E. Clayton, and this has not been worked as yet.

The origin of the turquoise of Los Cerillos in view of late observations is not doubtful. Chemically it is a hydrous aluminum phosphate. Its blue color is due to a variable quantity of copper oxide derived from associated rocks. I find the Cerillos turquoise contains 3.81 per cent. of this metal. Neglecting this constituent the formula for turquoise requires: Phosphoric acid, 32.6; alumina, 47.0; water, 20.5. Total, 100.1.

Evidently the decomposition of the feldspar of the trachyte, has furnished the alumina, while the apatite, or phosphate of lime, which the microsocpe detects in the thin sections of the Cerillos rocks, has furnished the phosphoric acid. A little copper is diffused as a constituent also of the veins of this region, and hence the color which the metal imparts.

The inspection of thin sections of the turquoise by the microscope, with a high power, shows the seemingly homogeneous mass, of this compact and non-crystalline mineral, to consist of very minute scales, nearly colorless and having an aggregate polarization, and showing a few particles of iron oxide.

The rocks in which the turquoise occurs are seen by the aid of the microscope and polarized light in thin section to be plainly only the ruins, as it were, of crystalline trachytes showing remnants of feldspar crystals, decomposed in part into a white kaolin-like substance with mica, slag and glassy grains, are of quartz with large fluidal enclosures, looking like a secondary product. There is considerable diversity in their looks, but they may all be classed as trachyte-tuffs and are doubtless merely the result of alteration as already indicated, of the crystalline rocks of the district along the line of volcanic fissures. In fact there are in the north-east direction other places, one of them at the distance of probably two to three miles, where the same evidence of decomposition is found, and in the rocks at this place I find also the turquoise in forms not to be distinguished from that of the old mine. Col. Hyde has shown me lately in New York a large number of the Cerillos turquoise polished, and among them a few of good color and worthy of consideration as gems, some of them an inch in length and quite thick, but they are not of faultless beauty.

*[II.] xxv. 27.

A New Combined Barometer and Thermometer

THE ENGRAVING shows a short-leg mercurial barometer and thermometer combined. It consists of three tubes about half full of mercury dipping into a sealed cistern, B, full of the same. The tube A is open to the air; the tube C has at its top a sealed globe, D, full of air. Now, taking these two tubes alone, any variation in the atmospheric pressure would cause the mercury in A to rise or fall, communicating its movement to the mercury in C; but any variation in temperature would also move the mercury by expanding or contracting the air in the globe, D. To counteract this influence, which would in some cases materially alter the readings of the barometer, another tube, E, is arranged with a long bulb, F, something like a Sixe's thermometer; this tube, E, is, like the other, about half full of mercury, the rest of the tube and the bulb being

filled with spirits of wine. Now the action of this thermometer for an increase of temperature is as follows: The spirits expands and drives the mercury into the other two tubes, but the air in the globe also expands by the heat and prevents the mercury rising in the tube leading to it. All the rise of the mercury, therefore, takes place in the open limb, and exerts a greater pressure on the air within the globe, and thus prevents it from expanding; the height, therefore, of the mercury in the limb leading to the globe is not altered by differences of temperature, and it gives the reading of the barometer. A decrease of temperature acts in an opposite direction; the spirit then contracts, draws the mercury from the open limb, and reduces the pressure upon the air within the globe, which is thus prevented from contracting, so at all all temperatures the volume of gas remains the same. Practically it is not altered by differences of atmospheric pressure, as the space in the globe is some hundreds of times larger than the space occupied by the variation of the mercury. The tube, E, also serves as a thermometer, for the spirit is, of course, incompressible. We have not yet heard how far the compensation is practically effected, but the design is certainly very ingenious.—*E. H. Hills, in English Mechanic.*

Improvement in Eye-Glasses.

MR. RODENSTOCK, in Wurtemberg, has made an improvement in eye-glasses which, says the *Schw. Uhrm Ztg.*, is calculated to attract the attention of opticians and spectacle using persons. At present the glasses are incorporated with the frame in such a manner that an admittance of sideward rays through the glass is permitted, and anyone who is condemned to the use of spectacles will know the discomfort and pain caused by this defect, especially if the eye was sensitive. Rodenstock has added screens to spectacles, perce-nezs, and lorgnettes, like the diaphragms of telescopes, microscopes, &c., and achieves thereby the advantage of excluding all extraneous reflexes, and confining the visual organ to the matter under examination, which permits the eye to see clearer and sharper than with the glasses now in use. All spherical aberration is reduced to a minimum; the visual range viewed through spherical, concave and convex glasses becomes almost achromatic, because the eye, being thus confined, only sees through the middle of the glass. The advantages enumerated should secure the universal introduction of the improvement.

The Coral Signet of the King of Italy.

THROUGH the courtesy of our esteemed contemporary, *The Scientific American*, we present to our readers the following beautiful example of coral work, exhibited by Messrs. Mazza, Guiseppie Figli, of Torre del Greco, near Naples, at the Berlin International Fisheries Exhibition, and which attracted much attention.

This exquisite piece of workmanship is cut from a bright red coral, and is a representation of the royal family of Italy. On the top we find the portrait of the late King Victor Emmanuel, below him, at the right, the present Queen Margaruite, at the left the present King Humbert, and below the latter two their son, the Crown Prince, surrounded by flowers and emblems. The firm of Mazza presented this signet to the King, who accepted it, but who desired to have it exhibited at the Berlin Exhibition before taking permanent possession of it.

This firm also exhibited a branch of coral weighing eleven pounds, valued at $3,000, and another branch in three colors—white, pink and red—and which has been in the hands of the family for two hundred years. Also an exquisite coral necklace, valued at $6,000. The latter is said to have been purchased by a well known London jewelry firm for one of their noble patrons.

Refining Copper.

A NEW process for refining copper has been invented in Germany, and is thought by those who have had an opportunity to observe its results, to be very promising. In copper, as ordinarily found in commerce, there is more or less oxide, which renders it more or less brittle, and the process referred to eliminates this defect. The process is based upon the energetic affinity of phosphorus for oxygen. The phosphorus is introduced in the form of phosphite of copper. The metal, when taken from the furface, is said to represent a very different texture from the ordinary copper of commerce. While the former could readily be broken off with blows of the hammer plied in one direction, the latter can only be broken after repeated bendings to and fro. The color of the fracture was salmon red, and of a silky lustre characteristic of chemically pure copper. The specific gravity of the original metal was increased from 8.731 to 8.906. The percentage of oxygen was reduced in the ratio of 19 to 4. It is thought by foreign technical journals that this process is destined to assume a very important position in the metallurgy of copper.

ANOTED modiste periodical of the continent, being at a loss for want of novelties to introduce among its fashionable lady readers, bethought itself of the ornamentation of the ancle! This fashion, which has already found great favor among the aristocracy (to whose ranks we sincerely hope it will remain confined) owes its existence to the short hall dresses in vogue. The carefully worked and tastefully embroidered hose, the luxriously ornamented shoe of the present, are too tame for the titled belles, and, at the same time, too elegant to remain unnoticed, and some additional means of attracting attention to that part of the female anatomy had to be provided; no toilet will henceforth be complete without that *ne plus ultra* of the ancle ornament, embellished with gold and jewels.—*Deutsche Uhrmachar Zeitung.*

Spectacles—How their Use Changes the Expression of the Face.

AN observant person can scarcely have failed to notice how much and how variously the use of glasses alters the expression. With some people glass look what they are, mere instruments; but with others they seem part and parcel of their faces. Although the wearing of glasses always effects a person's face, we scarcely notice that they are worn by certain people. Yet there are cases in which the glasses are more conspicuous than their wearers, and we feel as if we were talking to the spectacles rather than to the human being behind them. The lenses seem to have life and spirit, and we should almost fancy we were committing manslaughter if we were to break them. Some people's spectacles have a peculiarly objectionable and impudent expression. Their wearers throw their heads back to look at one, and there is an unblushing and staring appearance about the whole arrangement, man and spectacles, which is decidedly offensive. We feel at a disadvantage, too, for it is impossible for the naked eye to assume a like air of intolerable impertinence. Then there are, on the other hand, abject spectacles, which seem cowed in one's presence. Their owners drop their heads, or slowly raise them up on one side like ducks in a storm. There are strong and uncompromising looking spectacles which it would evidently be unpleasant to dispute with, and there are weak looking spectacles which one fancies might be easily bamboozled. There are some spectacles which look as if they wished they were not spectacles, and others which seem to take a pleasure in being spectacles, and to wish everyone to be aware of the fact.

Like other things spectacles have moved with the times. The glasses worn by our grand-parents were something like spectacles. Those, for instance, which are depicted in the portraits of Sir Joshua Reynolds by himself, are instruments which few would be brave enough to use in these days. Their only living representatives are the heavy spectacles which are sold in out-of-the-way village shops; things with great wide rims made of tortoise shell or brass with double springs or holes at the ends by which to tie on the whole apparatus at the back of the head. The spectacles of fifty years ago were heavy, cumbrous machines almost circular, and broadly rimmed. They were about as formidable looking as the umbrellas of the same period. In former days little trouble was taken to make glasses become, because they were seldom used except for old and dim eyes; for the art of being short-sighted was not discovered until some time after the invention of spectacles. Among the rural poor, even now, glasses are seldom used except by the old and dim sighted. Among cottagers there seems to exist a superstition that the use of spectacles gives an air of respectability if not of piety to the wearer. An open Bible with a pair of spectacles laid across it is supposed to be conclusive evidence of the sanctity of the owner, and to be more than the hardest-hearted curate or district visitor can resist. There is also something clerical in well-ordered spectacles. A parson may be most parsonic in his bearings and appearance, but his parsonification is intensely parsonified by the addition of spectacles. He has no sooner put them on his nose than he seems at once to have sprung from one to forty parson power. His views may have been sound before, but he looks much sounder when he has put on his spectacles. His influence is also much increased by this addition, for a creature all black cloth and gleaming spectacles is a formidable object, especially to children. Glasses again have their scholastic uses. There is a way of eyeing small boys through spectacles which is very awe-inspiring. Even looking over spectacles has been known to alarm people before now.

We have known charming women who wore spectacles, but, as a rule, we do not consider glasses becoming to ladies. They are apt to give a semi-masculine, semi-scholastic, semi-clerical appearance to female wearers, which is not particularly prepossessing. A stern look is unpleasant in a woman, and glasses generally give this look more or less to the wearer. We are not fond of extremes, and although we are far from agreeing with the prudish old adage that a woman should never look straight into the face of a man, we are not fond of being deliberately stared at by a spectacled lady. Most ladies' noses are not very well fitted by nature for carrying spectacles, consequently when they use glasses they are obliged to throw their heads slightly back in a manner which appears, at first sight, a little supercilious. In most cases, of course, this appearance is unavoidable; but we fancy we have known instances where women have gladly availed themselves of the excuse of spectacles for looking imperious. When women dislike each other they have a method of staring at one another through their spectacles which conveys more meaning than it would be possible for language to express. Glasses rarely increase the benignity of the countenance, but women can look benignant through spectacles with a disagreeable expression which is beyond the power of the male sex. We have observed that many short-sighted ladies who never use glasses before men make unblushing use of the most uncompromising spectacles when they are, or imagine themselves to be, exclusively in the company of their own sex. At any rate they will often merely use an eyeglass or *pince-nez* in general society, but wear regular spectacles among women. The *pince-nez* has become wonderfully fashionable of late years. If you place one alongside of a pair of spectacles on a table, both appear equally harmless, but upon the nose the difference of effect is extraordinary. It seems amusing to meet a person whom one has been accustomed to see in regular spectacles wearing a *pince-nez* for the first time. You hardly recognize your friend. The face looks but half clothed, and it wears a rollicking expression which is in strong contrast with the sobriety of its old spectacled days. In years gone by there were times when instruments existed somewhat similar in their construction to the *pince-nez*. They were even more hideous than the old spectacles, and were called by the euphonious name of "goggles." They stood much in the same relation to spectacles that the ancient blunderbuss did to the gun of the period.

Of late years the practice of putting children into spectacles has increased with alarming rapidity. It is melancholy to notice the number of children in the streets and schools with glazed eyes. Spectacling them may be a wholesome preventative; but it seems as if England would soon surpass every itself in its proportion of spectacle-wearing inhabitants. Happily there is still some shame left in our country, and there are people who are very shy about bringing out their spectacles. It is very entertaining to drop upon such as these unexpectedly. They snatch their glasses from their noses when discovered as rapidly as a monkey would do it for them if he were to get the chance, at the Zoological Gardens; and there is a scuttling, a hiding, and a pocketing which is deeply suggestive of the guiltiness of the wearer's conscience. We have known people who would never fairly put their spectacles on, but would hold them the wrong way, or squint through them with the springs folded, and, in fact, do anything rather than incur the terrible odium of being supposed to "wear spectacles." This has always seemed to us almost greater affectation than the habit of wearing an unlensed eyeglass; and it has been quite a relief to turn to the simple—though in one sense rather complicated—honesty of an esteemed friend who uses blue spectacles, an ear-trumpet, and a respirator. We own that we prefer meeting him when walking rather than when riding or driving; for, although naturally a nervous old-looking man, when armed with the above mentioned weapons he is an object at which a horse might excusably shy.

It is disputed point whether artists in painting portraits of those who habitually wear glasses ought to introduce in their pictures the spectacles of their sitters. It is objected that when they do so the natural expression is concealed or altered, and that spectacles give an unpleasant effect. It is further urged that the artist has the right to do all he can to present his sitter in the most favorable light, and that he may even portray him in some ancient costume instead of modern dress with good effect. On these grounds there is doubtless a great deal to be said against introducing the spectacles. On the other hand, it seems desirable that a portrait should, of all things, recall the subject to our memories, and that it should present him to posterity as he appeared to his contemporaries; therefore, when a person wears spectacles it seems most reasonable to let him wear them in his picture. Again, if you make a man who is accustomed always to wear glasses take them off, his eyes feel uncomfortable and out of focus, so that if you paint them as they then seem the effect is anything but agreeable. Perhaps of all people spectacles sit least well on Asiatics, and as they are often short-sighted, they are much given to the use of glasses. In general savages regard spectacles as choice personal adornments. We lately heard of a native chief in South Africa whose sole "garmenture" consisted of an old dress coat, a pair of green spectacles, and a toothbrush stuck behind his left ear.—*Saturday Review.*

On the Reduction of Silver in the Wet Way.

EVERY chemist is familiar with the reduction of chloride of silver in the form of powder by means of metallic zinc in the presence of a little free acid. It is not easy to bring two such substances as the silver salt and the metal into close contact, and after the work is accomplished the removal of the excess of zinc has its difficulties. Dr. Grager suggests a modification of the old method that ought to be more generally made known. The chloride of silver is dissolved in ammonia and poured into a well-stopped bottle, and into this is introduced an excess of metallic zinc, in not too small fragments, so that any reduced metal adhering to it may be readily washed off.

The decomposition begins immediately, and is rapidly accomplished, especially if the contents of the flask be well shaken up. Three hours will suffice to reduce one-quarter of a pound of chloride of silver. It is easy to ascertain when the reduction is ended, by testing a portion of the ammoniacal solution with hydrochloric acid. As soon as no cloudiness or curdy precipitate is formed, the work may be regarded as completed.

A slight excess of ammonia is said to be favorable. The reduced silver must be washed with water until all odor of ammonia has disappeared. The pieces of zinc are removed by pouring the contents of the flask through a funnel, the opening of which is too narrow for the passage of the zinc fragments, while the reduced silver can be easily washed through. The finely divided silver can be digested in hydrochloric acid to restore it to a pure white color, and it is then ready for solution or fusion, and will be found to be perfectly pure. In dealing with large quantities it would be economical to recover a portion of the ammonia by distillation. In this same way an ammoniacal solution of nitrate of silver may be reduced by zinc, and the silver obtained pure, even when the original solution of the nitrate contains copper—provided a small quantity of silver be kept in the bath.

It is better where copper is present not to take all of the zinc that may be requisite for the reduction of the silver. It will prove a great convenience to be spared the necessity of converting the silver into the chloride, as it is no easy task to wash out this salt on filters—and it will be found to be applicable to alloys which do not contain more than 25 per cent. of silver.—*Prof. Joy, in the Journal of applied Chemistry.*

Comparative Compilation of Thermometer Scales.

IN order to compare the different thermometer scales, it is necessary to ascertain the number of degrees in which they are divided, *i. e.*, from the freezing to the boiling point. The scale of Reaumur is used in Germany, and embraces between the two points just named 80°. The French use that of Celsius, who most sensibly divides his scale between the two points into 100°. The most peculiar of all, however, is that of Fahrenheit, a German philosopher of high merit, who manufactured the first scales agreeing with each other, in Holland, one hundred and seventy years ago, by which a comparison of observations between different points became possible. He does not start from the point of the freezing of water, but establishes a point, as it were, of his own, and which retains its constancy by using a mixture of snow and sal ammoniac. This scale has several advantages : 1. That the regular temperature of the temperature zones moves within its extremities, and does not require the use of + or —, (the freezing point of the other scales being placed at + 32° F.) 2. The scale is preferred on account of its fine graduation, since the use of fractions to express a close observation is not necessary.

When we compare the scale of Fahrenheit with the other two, we will find that it is divided between the freezing and the boiling point into 180°; such a degree is equal, therefore, to $\frac{4}{9}$° R. and $\frac{5}{9}$° C. If it is necessary to express a temperature of F. in one of the other scales, first deduct the 32° lying below the freezing point ; multiply the rest with $\frac{4}{9}$ if centigrades are wanted, and $\frac{5}{9}$ if Reaumur.

For example :

$$80° \left.\begin{matrix} \\ \\ \end{matrix}\right\} = [(80-32).\tfrac{4}{9}]° R = 48.\ \tfrac{4}{9}°R.$$
$$\left.\begin{matrix} \\ \\ \end{matrix}\right\} = 21.3°\ R = (48.\tfrac{4}{9})°C. = 26.7°\ C.$$

The following table will be found convenient where one has to compare English or American with European observations. They have been prepared from the most delicate scales, used for scientific purposes, and may be relied upon :

C	*R*	*F*	*C*	*R*	*F*	*C*	*R*	*F*
—30	—24.0	—22.0	—20	—16.0	4.0	—10	—8.0	14.0
—29	—23.2	—20.2	—19	—15.2	5.8	— 9	7.2	15.8
—28	22.4	—18.4	—18	—14.4	0.4	— 8	6.4	17.6
—27	21.6	—16.6	—17	—13.6	1.1	— 7	5.6	19.4
—26	20.8	—14.8	—16	—12.8	3.2	— 6	4.8	21.2
—25	20.0	—13.0	—15	—12.0	5.0	— 5	4.0	23.0
—24	19.2	—11.2	—14	11.2	6.8	— 4	3.2	24.8
—23	18.4	— 9.4	—13	—10.4	8.6	— 3	2.4	26.6
—22	17.6	— 7.6	—12	— 9.6	10.4	— 2	1.6	28.4
—21	16.8	— 5.8	—11	— 8.8	12.2	— 1	—0.8	30.2

C	*R*	*F*	*C*	*R*	*F*	*C*	*R*	*F*
0	0.0	32.0	34	27.2	93.2	68	54.4	154.4
1	0.8	33.8	35	28.0	95.0	69	55.2	156.2
2	1.6	85.6	36	28.8	96.8	70	56 0	158.0
3	2.4	37.4	37	29.6	98.6	71	56.8	159.8
4	3.2	39.2	38	30.4	100.4	72	57.6	161.6
5	4.0	41.0	39	31.2	102.2	73	58.4	163.4
6	4.8	42.8	40	32.0	104.0	74	59.2	165.2
7	5.6	44.6	41	32.8	105.8	75	60.0	167.0
8	6.4	46.4	42	33.6	107.6	76	60.8	168.8
9	7.2	48.2	43	34.4	109.4	77	61.6	170.6
10	8.0	50.0	44	35.2	111.2	78	62.4	172.4
11	8.8	51.8	45	36.0	113.0	79	63.2	174.2
12	9.6	53.6	46	36.8	114.8	80	64.0	176.0
13	10.4	55.4	47	37.6	116.6	81	64.8	177.7
14	11.2	57.2	48	38.4	118.4	82	65.6	179.6
15	12.0	59.0	49	39.2	120.2	83	66.4	181.4
16	12.8	60.8	50	40.0	122.0	84	67.2	183.2
17	13.6	62.6	51	40.8	123.8	85	68.0	185.0
18	14.4	64.4	52	41.6	125.6	86	68.8	186.8
19	15.2	66.2	53	42.4	127.4	87	69.6	188.6
20	16.0	68.0	54	43.2	129.2	88	70.4	190.4
21	16.8	69.8	55	44.0	131.0	89	71.2	192 2
22	17.6	71.6	56	44.8	132.8	90	72.0	194.0
23	18.4	73.4	57	45.6	134.6	91	72.8	195.8
24	19.2	75.2	58	46.4	136.4	92	73.6	197.6
25	20.0	77.0	59	47.2	138.4	93	74.4	199.4
26	20.8	78.8	60	48.0	140.0	94	75.2	201.2
27	21.6	80.6	61	48.8	141.8	95	76.0	203.0
28	22.4	82.4	62	49.6	143.6	96	76.8	204.8
29	23.2	84.2	63	50.4	145.4	97	77.6	206.6
30	24.0	86.0	64	51.2	147.2	98	78.4	208.4
31	24.8	87.8	65	52.0	149.0	99	79.2	210.2
32	25.6	89.6	66	52.8	150.8	100	80.0	212.0
33	26.4	91.4	67	53.6	152 6			

TABLE OF POINTS OF FUSION OF DIFFERENT BODIES.

Mercury melts at	40° C.
Ice "	0°
Tallow "	34°
Beeswax "	60°
Alloy of Tin 1 part, lead 1, and bismuth 4 parts, melts at.	94°
Alloy of tin 3 parts, lead 5, and bismuth 8 parts, "	100°
Sulphur melts at	110°
Tin "	230°
Bismuth "	260°
Lead "	315°
Zinc "	360°
Native Antimony melts at	450°
Brass "	900°
Silver "	1000°
Cast iron "	1050°
Copper "	1150°
Gold "	1200°
Steel "	1300°—1400°
Wrought iron "	1500°—1600°
Nickel "	1600°
Platinum "	2500°

Pinions.

PINIONS well made, as to truth of centering, of division, of form of leaves, and polish, are, as the trade well knows, of vital importance to the value of the time-piece.

The making and finishing is one of the most troublesome, as well as most expensive of all the processes in watch work. The nature of the material renders it difficult, as it approaches so nearly in hardness to the tools used in cutting. In the ordinary Yankee clock the *lantern pinion* has entirely superseded the solid leaf, which substitution was the greatest element of success in their cheap construction. The lantern pinion is really a nearer approximation to the required anti-frictional form than a majority of cut pinions in ordinary clocks. In the process of manufacture of the cut variety, the first consideration is the quality of the steel to be used. For this purpose it should be carefully selected by trial, thus ascertain its fineness, uniformity, softness when annealed, together with its capacity for taking a good temper, with the least amount of springing during the hardening process. Very few pinions are cut from a solid piece—the drawn pinion wire being quite good enough, when milled and finished, for the ordinary run of watch work.

The steel wire having been selected, the first process is to cut it up in lengths a trifle larger than the required pinion. The separated pieces are then centered with care, and having been placed in a lathe the staff and pivot are turned up to nearly the required gauge, leaving a portion of the whole piece the full size for the leaves. They are now taken to the milling tool to have the proper form given to the leaves. As this form is of the highest importance, it may be as well here to give the reasons. Supposing a wheel of 60 teeth, depthing into a pinion of 8 leaves, it can be readily seen that the arc of the motion of the wheel tooth is of greater radius than that of the leaf of the pinion, and it follows that if the teeth of the leaves are made in taper form with straight sections, there must occur a sliding motion on the surfaces of both—the power thus absorbed being totally wasted ; but if we curve the surfaces we may approach a form so nearly perfect that the wheel teeth, being motors, really roll on the leaves, avoiding almost entirely the friction caused by sliding : the necessity for this curvature becoming greater the more the wheel exceeds the pinion in diameter. This curve, which has been demonstrated by very profound mathematical researches, is the "epicycloidal ;" theoretically it should give no more sliding motion than the surfaces of two plain wheels revolving on each other. To obtain this perfect form, very great pains have been taken and expenses incurred, especially by the makers of the best time-keepers.

In the American factories the cutters are very elaborately made, the section being an object of great solicitude—it being an exact counterpart or the space between any two leaves, and also of one-half the top of the leaf from the curvature to the point, so that in milling, the space made by the cutter is its shape, leaving the leaf of the proper form. Generally the pinion passes under two cutters ; the first to strike down the rough stock, the other to dress it to size and shape, with a light cut. The care and skill required to make these is certainly very great, and it is a proof of the wonderful ingenuity of man that they are made so perfect as to shape and cutting power.

A very ingenious device is used for dividing the leaves under the cutter, which revolves at a moderate speed over a slide, carrying a pair of centres, between which the turned up piece of pinion wire is placed. The slide is now pushed up to and under the cutter, and in its passage as much of a cut is taken as is desirable ; in drawing back the slide the fresh cut space passes under a flat piece of thin steel, screwed on the frame, and set at a slight angle to the axis of the centers. On moving the slide toward the cutters for a fresh cut, the steel plate takes the last cut, and in passing by it the pinion is turned just as much as the angularity of the plate, which must be just one leaf. By this very clever device the division is effected without an index plate. This process, however, is not good enough for work intended to be very accurate—the pinion wire not being always, indeed rarely correctly divided, the original error will be perpetuated in all the subsequent processes. These are all milled, with oil or soda water for a lubricator, and it follows that the speed of the cutter is regulated to get the greatest cut without dulling the tool. When dull, however, the mill is sharpened on the *face* of the cutting tool, by means of small grinders of iron, using Arkansas oil-stone dust for the first grinding, and giving the necessary delicacy of the edge by means of crocus, or sharp, followed, when fine work is needed, by rouge.

It is necessary that this care should be taken, for if the edge is left coarse it will become speedily dulled, and leave a very unequal and rough surface on the cut of the pinion, which in the subsequent grinding gives rise to error in shape and size. The pinions, thus cut to gauge, are dried in sawdust, hardened, and tempered ; the staff and pivots are now turned up to size, and then pass to the polishers. In the factory they are finished by means of what are called *Wig-Wags*, which it may be interesting to the reader to have a general description of.

Two Vs are arranged as centers, the pinion is placed between them, the circular parts resting in each V, but free to turn on its own axis. Immediately above the Vs is a frame on which a slide, carrying the polisher, may traverse—generally about two inches. This slide is movable vertically so as to accommodate itself to the pinion ; attached to the slide is a connection which leads to a vertical lever, which is put in motion from a crank on the counter shaft. The grinding is effected by bringing the grinder, charged with oil-stone-dust in oil, in one of the spaces of the pinion, which, of course, is so arranged as to bring it parallel and central with the grinder. The power being applied, the slide takes a very rapid reciprocatory motion, and the face of the grinder, so charged, rapidly reduces the uneven surface left by the cutter to what is called the *gray*.

The form of this grinder must be as perfect as the cutters, and the care taken to get the requisite parallelism is in equal proportion, and and in all the best polisheres is planed up while in its position. The grinder is composed of tin and lead, with sometimes a slight admixture of antimony, rolled to an even thickness, cut off in suitable lengths, and then mounted in the carrier of the Wig-Wag to be planed up to shape. There are too many minute adjustments in the machine to render a full description in this article admissible. It is large compared to the work it has to perform, but it is very admirably made, as indeed all the tools are, in the American factories.

The polishing of the leaves is the next step, and this is effected by means precisely the same as grinding. In each stage the pinions are thoroughly cleansed before entering on another. The polisher is made precisely like the grinder ; but instead of oil-stone dust, crocus mixed with oil is substituted. Owing to the less cutting quality of the material used, the polisher loses its form sooner than the grinder, and has to be more frequently re-shaped. In very fine work the crocus is succeeded by fine well-levigated rouge to bring up that jet black polish, which is considered a mark of quality by chronometer and watch makers.

With the exception of turning up the staff and pivots all the work hitherto described has been expended on the leaves—a very tedious process, yet done, when the tools and materials are in proper order, with marvelous rapidity ; but tedious as these have been, there are two others quite as much so before the leaves are finished.

The ends are to be faced—they must be flat (that is a true plane) and receive the same finish that the leaves took and is effected by the wig-wag ; only the pinion revolves between centers, at a high speed, the grinder being brought up to the turned face. Two motions operate—one rectilinear, the other circular—the result being a compound motion which prevents the grinder from touching the same spot twice in succession. To effect this more surely, the operator gives the grinder a slight vibratory vertical motion. The polishing of the two faces is effected in the same manner as the grinding

..tting face of the grinders and polishers being kept in a plane perpendicular to the axis of the pinion, both vertical and horizontal.

The staff and pivots, being in the same condition they came from he lathe, the next step is to grind and polish them. Before, however, we treat on this process, it may not be amiss to give the general watch repairer a process by which the facing may be done on a small scale.

As a rule, when the watch repairer has to replace a pinion he selects one from the material dealer, finished in the leaves, but not on the ends or faces. The following operations are simple, and anyone may finish these faces with little trouble. Having turned up your pivots and squared down the face of the leaves with the turning tool, grind it in the lathe by means of a ring of metal, the inside diameter being somewhat larger than the diamcter of the staff. This ring is held between two centers, thus allowing it a vibratory motion, so that when it comes up to the face it accommodates itself to its plane, and thus has no tendency to force it out of a true flat; the ring, being larger than the staff or pivot, admits a small lateral motion, enough to effect a continuous change of surface. The same little tool may be used for polishing by substituting another polisher and using crocus and rouge. For the repairer, perhaps on general work the rouge would be superfluous. Vienna lime, used with a little slip of boxwood, brings up a very fine and brilliant polish, and in replacing new work in an injured time-piece, the steel may always be polished with great rapidity by using the lime on the gray surface left from the oil-stone dust; being quickly done and affording a very handsome finish.

To resume the consideration of the pinion, the last stage is the polishing of the circular portions. Here again the wig-wag is the most useful tool, but it operates somewhat differently, for the grinder or polisher is pressed down by the finger of the operator, the pinion being held between the centers of a small lathe attached to the wig-wag; the staff is first ground and polished as the leaves have been before, and this is the last operation performed with the pinion between centers.

From this stage it is chucked in a lathe very peculiarly fitted, the mandril being hollow; and in it is fitted what is called a pump-center, which is movable in direction of the axis of the mandril, and capable of being securely fastened at any desired point. On the nose of the mandril is secured a hollow steel chuck, the two sides of which have been filed out, thus leaving an open space between the end of the pump-center and the end of the chuck. On this end a small steel plate, extremely thin, is fastened by means of shellac, and a hole drilled in the plate capable of taking in the chamfer on the shoulder of the pivot. The pump-center being drawn back, the pinion is introduced into the chuck, the pivot placed in the hole in the steel plate, and the pump-center is drawn forward until it forces the chamfer to fill the hole; the pivot projecting from the chuck is now ready for all the grinding and polishing processes. Here the wig-wag steps in again, and from the delicacy of the pivots is modified to suit the case; this is done by having a polisher hung in the wig-wag on centers, so it may revolve; when in operation one side of the polisher rests on the pivot, the other on a ruby placed in a screw, and which screw enables the operative to insure the parallelism of the pivot. The ends of the pivots are next rounded off and finished in another set of tools. The pinion is now ready for use, assuming it to be of the proper gauge. In the American watches the scape and fourth wheels are generally staked on the staff-pinch tight; the third and center are staked on the pinion leaves, a rebate having been turned down on the ends, the wheel set on the shoulder, and the projecting ends of the leaves riveted down. This has not been designed as an exhaustive article on pinions; it is merely intended to open the subject as pursued in the factories. There is much more to be said; and the various processes on the small scale, as performed by the Swiss and English, together with their tools, will bear more than a general description, as they are applicable at any watch bench.—*American Horological Journal.*

Composition of Bronzes of Art with various Recipes for Coloration.

WE cull from *Le Technologiste* the following details of the manufacture of bronzes of art, written by M. Grinanel, manufacturer of bronzes, Paris:

The fabricant gives the general details of the article desired, its style, proportions, &c., to the artist, his first and chief *collaborateur*, who takes potter's clay, models it, fashions it, makes it assume a thousand different forms. As soon as the general shape of the article is obtained, the details, figures, ornaments, arabesques, &c., are developed until all parts harmonize, and the idea is embodied.

The fabricant rectifies the outlines, corrects the proportions, and makes all needed alterations, to facilitate the work of the founder, mounter, and turner. After the form has been finally accepted and passed, the sculptor studies each part, in detail, and makes the plaster mould.

The fabricant than passes the mold to the founder, carefully indicating to him by means of pencil marks all those parts which must be cast thicker, without disarranging the general outlines; and marks those parts which must be separated in the molds, to facilitate the mounting. He carefully denotes, by means of hard molding wax, all the pieces which will be bolted, &c.

The model is generally cast in half-red bronze, in the following proportions, (its body is rather hard, but easier to work): copper, 91.60 per cent.; zinc, 5.33; tin, 1.70; lead, 1.37. These are the proportions employed by those celebrated founders of the time of Louis XIV., Keller Freres. Objects intended to be gilt, demand a little more zinc. The copper of Corocora (Bolivia) is very fine, (it melts at 900°) and very convenient, on account of its lamination; but the refined copper of Chili, which is less pure, and somewhat "greasy," answers well for works of art, figures and ornaments. It enters into the composition of bronzes, at the rate of: 92.00 per cent. for medals; 91.60 for Keller's bronze;" 90.00 for French canons; 80.00 for cymbals and tom toms; 78.00 for clocks; 75.00 for clock bells; 70.00 for bronzes of commerce; 69.00 for telescopes; 60.00 for bronze of hardware.

The tin employed comes either from British India, Straits of Malacca (Oceana), from Batavia, or Cornwall. This latter is by far the best, and is the only kind used in chef-d' œuvres (it melts at 228°). It enters into the different bronzes at the rate of 33 per cent in telescopes; 25 in clock bells; 22 in bronze clocks; 20 in cymbals; 10 in canons; 2 in medals; 1 in statuary bronze; 1 in bronze Keller.

Zinc from Silesia and Vieille-Montague is generally used in the foundries. Its heat of fusion is 360°. The latter is sometimes preferred on account of its fineness. It enters as an alloy in bronzes at 40 per cent. in articles of hardware; 30 in bronzes of commerce; 5.33 in bronze Keller.

The models which we have traced thus far, are molded in earth of Fontenoy-aux-Roses. The molding-boxes are then baked in an oven, heated to 300°, then firmly closed for the running of the metal, the heat of which varies from 1500° to 1800°.

Of the colors which may be given to bronzes, and which are obtained by different processes of oxydation, we subjoin the recipes mostly in vogue:

The dead color of bronze medals is produced by brushing with a mixture of blood-stone and graphite; to obtain antique green, wet the article with a moisture of marine salt, cream of tartar, and acetate of copper, each 19 grammes, dissolved in 200 grammes of vinegar, and thirty grammes of carbonate of soda; Florentine, by green vitriol (sulphate of iron) and rubbing it with wax; for bergamot, a mixture of blood-stone, lamp-black, and oil is used; verdigris is produced by means of salt of ammoniac, then rubbed with wax; the old bronze green is produced by melting with an acid, and rubbing with wax; the smoked color is produced by inclosing the object in a bundle of damp hay or straw, which is set on fire; let it stand, that the oxide so formed may penetrate the metal; or it may be exposed to turf smoke, and rubbed with wax; then wiped with essence in order to smooth the rough coating.

The Art of the Goldsmith in England—I*

BEFORE the close of the fifteenth century many causes were combining to bring about a change in the arts of painting, sculpture, and architecture. The taking of Constantinople by the Turks, the Council of Florence, and the reunion of the Greeks brought the Greek language and literature to the knowledge of the Italians. Printing was invented, and the works of the ancient poets and writers, Greek and Latin, known heretofore only by manuscripts, were put within reach of the learned and welcomed with enthusiasm. This was the "Renaissance," or revival of the ancient learning. We have in our day but a faint conception of the delight and excitement which this revival produced throughout all Europe, more especially in Italy. It must be enough to say that the arts, and that of the goldsmith with others, were engaged wholly in the new range of thought and of aspirations which possessed the rising generation.

The revival made quicker progress in England in jeweis and goldsmith's work than in Architecture. We seem to have been indebted to Flemish, German, and Italian artists for the first changes from Mediæval types, and the old traditions lingered long in the country. Henry VII. came to the throne at the close of the long and savage Wars of the Roses. During the continuance of the struggle the nation went back in many ways from the refinement of the fourteenth century. The cultivation even of home fruits ceased with the ruin of houses and manors, and with the desolation of orchards and gardens the population dwindled; the arts lost their vigor and beauty. The architecture, sculpture, the metal work were not equal to what they had been, and fresh life was needed when peace was once more secured. The reign of Henry was peaceful and prosperous. He gathered riches, encouraged learning, built much, invited foreign painters to his court, and made the beginning of a collection of books paintings, plate, and other furniture of his houses, some of which remains in our royal palaces and in the British Museum to this day. Though careful of his money, Henry VII. knew how to show royal splendor on fitting occasions. At the marriage feast of his son Prince Arthur, in the Palace of the Bishop of London, Princess Katharine of Aragon was served on gold plate set with precious stones and pearls, valued at 20,000*l*.

When Henry VIII. succeeded he inherited a large treasure, and his reign was rich and splendid, especially in all that relates to the present subject of gold and silversmith's work. That he had Italian goldsmiths under his orders is more than probable, after the example of his royal brother of France. A George or jewel for the Garter belonging to this period, and now in private hands, is said to have been made for him by Cellini. It is of fine gold, set with jewels. Some idea of the richness of his dress and personal ornaments may be gathered from the notices met with in Hall and other writers of the pageants and banquets of the court. At a dance in his palace of Westminster the king invited the ladies to pluck off the golden letters H and K with which his dress was covered. On this the citizens who were allowed to look on broke in, took the jewels from the ladies and the letters and ornaments from the king, who was stripped to his doublet and drawers. One shipmaster got 3*l*. 18*s*. 8*d*. for the letters of beaten gold which fell to his share.

The accounts of the festivities prepared for Anne Boelyn illustrate the sumptuous living of the court. Gold cups of assay (standard gold) were used by the new queen at her coronation feast, and given as fees to those whose office it was to hold them. Henry had already given her nearly twelve hundred pounds value of cups, flagons, bowls, trenchers, covered cups, spoons, salts, chandeliers, and a chafing dish when he created her countess of Pembroke. He took her with him when he went to meet Francis. The banquet hall was there hung with cloth of silver, raised with gold. The seams were covered with wreaths of goldsmith's work set with stones and pearls A cupboard with seven stages (the reader will remember more than one painting of Paolo Neronese in which silver and gold plates are represented set out in this way) was covered with a plate of gold, and no gilt plate. Ten branches of silver gilt and ten of white were hung over the table by long chains of the same metal, and bore wax lights each.

The splendor of the royal table was not without imitators among the great lords and dignitaries of the kingdom. The treasure of Cardinal Wolsey, of which an account was given in by his goldsmith Robert Amadal, in 1618, with the weight and cost annexed, consisted of such items as "an image of our Lady" of 300 ounces of sterling silver. Six great candlesticks made at Bruges, with leopards' heads and cardinals' hats, chased in gilt, weighed 298 ounces. Among the cardinal's service of plate were three "chargeours," 197 ounces; twenty-five plates, 968 ounces; twenty-two dishes, 451 ounces. The usual weight of platters was from 36 to 40 ounces each; dishes, 20 to 25 saucers, 12 to 16; a cup of "corone" gold, 64 ounces. According to Cavendish, his biographer, "there was at great banquets a cupboard as long as the chamber was in breadth, with six deskes in height, garnyshed with guilt plate, and the nethermost deske was garnyshed all with gold plate, having with lights one paire of candlesticks with silver and gilt, being curiously wrought, which cost three hundred marks. This cup was barred round about that no man might come nigh it, for there was none of all this plate touched-there was sufficient besides."

Such table plate was not confined to the households of persons like the cardinal, or the very greatest noblemen of the early sixteenth century. John, Lord Dynham, in 1565 bequeathed to his wife fifty hundred and ninety ounces of plate. Apostle spoons among other items named in the will of Amy Brent, who bequeathed in 1 "thirteen silver spoons, with the figure of J'hu and His twelve apostles."

Holbein designed cups, arms, and jewelry during this reign. A drawing by him of a cup for Queen Jane Seymour is kept in the Print Room of the British Museum of Basle, notably one of a dagger with a Dance of Death in tiny figures. Torrigiano had been already employed by Henry VII., and designed candelebra and other decorative metal-work belonging to the goldsmiths' craft. In the Privy Purse expenses, published by Sir H. Nicholas, the name of John Baptist the king's Italian goldsmith, occurs more than once, and that of Cornelius, probably a German or Swiss.

The privy purse expenses of Queen Mary give a detailed list of the jewels and precious goldsmith's work in her possession while princess On the occasion of her wedding feast there was a sideboard of nine stages of gold cups and silver dishes. Philip of Spain gave her jewels worth fifty thousand ducats, and sent a treasure to London that filled ninety-seven chests, each a yard and a quarter long, loaded on twenty carts.

The age of Elizabeth was a period of great expenditure in jewels and goldsmiths' work, especially such as could be carried on the person. The dresses of the queen were extravagant both in fashion and cost, as we see by tolerably exact representations in her portraits. Her courtiers were expected to make her continual presents, and these were generally of jewels. There is a miniature case in the Kensington collection, No. 4,404, '57, a fine example of enamel work, made perhaps for a present to be given by herself. Without referring to private collections we may quote several pieces of table plate preserved by colleges and corporations which belong to the latter half of this century: a cup and cover, a tankard, a set of apostle spoons, and salt-cellar, at Corpus Christi College, Cambridge, the gift of Archbishop Parker; an ewer and salver belonging to the Corporation of Norwich; and other pieces belonging to several City of London companies. In the Kensington Museum there is a sugar or pepper caster, of silver, with a medallion on it of St. George, and an inscription to the sovereign of the order; like those commonly used from the seventeenth century to the present time. In 1559 the Earl of Arundel entertained her Majesty sumptuously in the palace of Nonsuch, and gave her the cupboard of rich plate that she had used for supper. This example, as well as that of giving jewels, had to

owed by other noblemen and courtiers of the queen. She herself a cupboard of plate to James VI. on the occasion of the baptism Prince Henry. Some of the gold cups were so heavy that Sir mes Melville, to whom they were delivered, could hardly lift them. ney were soon melted down.

Rich church plate was occasionally made for ceremonial occasions ; for example, on the occasion of the baptism of James VI., when lizabeth sent Queen Mary Stuart a font of gold worth a thousand ounds. Generally sixteenth century chalices for the reformed hurch were in the shape which continues to the present day.

The age of Queen Elizabeth was not free from superstitious notions bout alchemy, a science supposed to lead to the discovery of chemical agents which could dissolve all substances, re-combine the component parts of metals, and make gold out of them. Cornelius Lanoy, a Dutchman, was committed to the Tower for making delusive promes on this subject as well as about the elixir of youth, magic mirors, and other wonders then popularly believed. On the other hand, Dr. Dee, a divine of the Church of England, and a professor of these irts, enjoyed and retained the queen's confidence.

The goldsmiths' style underwent but few changes of fashion for the first part of the seventeenth century. Much of the magnificence ith which the art of the revival had filled the castles and palaces of ly had become by that time familiar to all the North of Europe. or instance, the castle of Kronenburg, so far north as the entrance the Sound, to which place the Earl Marischal of Scotland went to ceive Anne, the future Queen of James I., was "very richly furhed with silver statues and other articles of luxury."

During the reign of James I. gold and silversmiths' work followed this country much the same changes as have been noticed. Of clesiastical plate there was scarcely any produced worth descripn, except the pieces among the regalia in the Tower of London. ilets of silver became the fashion. Several pieces of the toilet serces now kept in Knole Park, Kent, are electrotyped, and may be seen in the Kensington Museum. There are others in private hands. The great county families of England were probably never more prosperous than during the reign of James I. The king encouraged the residence of his subjects on their estates, and the many pictures of old English baronial interiors (such favorite subjects with modern artists) show how often people look back to those days as a kind of golden age. Vast tankards and salvers are constant details in these popular compositions, doubtless with perfect propriety. Rich people must have possessed great quantities of silver for the table. Indeed, Charles I., in his wars, drew most of his resources from this class of his subjects, and much hard money from the country plate-chests and college butteries was contributed to his treasury in Oxford. The greater part has gone since then to the melting pot, and there remain w pieces of plate of the reign of the Stuarts.

The fondness for rich arms and armor was kept up in England in he seventeenth century, as in Italy, France, and other countries. In 1606 Christiern, King of Denmark, brother of Queen Anne, visited his country, and, among other costly presents made on board his hip at Gravesend, gave James I. a rapier and hanger worth 7,000*l.*, et with gold and jewels. The hammered and gilded suit of armor given by the armorers of London to Charles I., is familiar to visitors of the Tower of London.

The coronation plate, with the exception of the spoon before described, and one or two sixteenth century salt-cellars, is not older than the restoration of Charles II., in 1660. The old Crown jewels were taken to pieces and sold by the Parliamentary commissioners after the death of Charles I. A small ivory sceptre, with mounts of gold and enamel, commonly called that of Anne Boleyn, was probably made for Queen Anne of Denmark. The queen consort's crown and jeweled sceptre were made for Mary of Modena, the rest for William and Mary. The present great crown has been taken to pieces and re-made more than once. Probably the ampulla, for holdthe oil at coronations, though not older than the seventeenth century, may represent an earlier piece.

At the restoration of Charles II. French fashions ruled the day at the English Court, if not in the country houses. The king's rooms in Whitehall Palace, and even those of the maids of honor, were furnished with silver toilet services, mirror frames and basins, and every article of use was of that metal. They were melted by William III. after the death of Mary, under the same necessity that had caused the destruction of the sliver of his mortal enemy, Louis. But the silver toilet service of Queen Mary Beatrice continued to be laid out for her at St. Germains, with four candles, till the days of the French Revolution. A few silver tables, fire-dogs, and other pieces, are still among the furniture of Windsor castle.

Beautiful beaten and engraved work was produced in England till the close of the reign of James II.

The standard of silver in England was raised during the last years of the seventeenth century from 11 ozs. 2 dwts. to 11 ozs. 10 dwts. fine in the lb. troy, and plate of this standard was Hall-marked with a figure of Britannia. The table plate of the reign of Queen Anne is much prized ; it is massive, simple, and seems to exhaust the feeling for Renaissance decoration so long maintained, and with so much propriety, by the sixteenth and seventeenth century goldsmiths.

Some tureens and other plate made for Prince Frederick, son of George II., are kept among the royal treasure at Windsor ; and electrotype casts of several effective pieces are in the South Kensington Museum.

Efforts were made by George IV. to have silversmiths' work from the best artists. Flaxman designed the well-enown Wellington Shield and some vases and salvers. There are in the Kensington Museum casts of plate now in the collection at Windsor Castle, designed by Flaxman and Stothard, and executed by Rundell and Bridge.

How to Make Neutral Terchloride of Gold.

THIS very important salt, used so much in gilding and galvanoplasty, is only successfully made by the observance of the utmost care. The description of the process, as given in chemical treatises, is very meagre, and almost wholly wanting in practical details of the manipulation upon which success largely depends. A writer in *Design and Work* has taken up the subject, and given minute directions, of which we avail ourselves for the benefit of our readers. He says :

"In practice I have found the mixture of one measure (say one fluid ounce) of nitric acid with three measures of hydrochloric acid to give the best results. This, when good, will easily dissolve one ounce of pure gold. It is best to use only enough acid to effect the solution of all the gold, or to add as much gold as the acid will dissolve.

I will now give direction for dissolving a quantity of gold, and describe the apparatus used by me for the purpose. In most books on the subject the operator is warned not to breathe the fumes given off from the mixture during the operation, for they are undoubtedly poisonous and injurious to health. They produce headache, dizziness and indigestion in healthy persons ; whilst to persons with weak lungs, or suffering from bronchial or ashmatic affections, they are positively dangerous, as the fumes irritate the air passages, producing spasms and other distressing symptoms. As I found that those fumes could not all be carried out of the workshop, even by the aid of a strong draught up the chimney, I devised an apparatus which thoroughly protected me from their influence.

I had a bench made, of the following dimensions : 8 ft. in length, 2 ft. 6 in. wide and 3 ft. in height. A raised rim was formed around the bench, and the top covered with sheet-lead. In the centre I arranged a row of small gas stoves, each surrounded with a salt-glaze cylinder ; over these I had a cupboard erected, lined with sheet-lead, and terminating in a conical top, which communicated with a lead flue 5 in. in diameter. The front of the cupboard was made of a framed sheet or glass, sliding in grooves, and which could thus be ad

justed to regulate the draught, or shut close to prevent all fumes from escaping. Sand baths were placed over the gas stoves, and on these large beakers of Bohemian glass, in which the solution of the gold and the evaporation of the excess gas was effected. All the vapors and fumes were carried up the leaden flue, whilst the operator could watch the process through the glass in front, and regulate the heat by controlling the supply of gas. The lead lining was found to be proof against all vapors arising from the operation, and in this way superior to wood or iron. The salt-glaze cylinders, however, were not proof against the heat from the gas stoves, for they all cracked and fell to pieces; I therefore recommend in their stead those made of plumbago and fire-clay, or crucible clay. Such an apparatus can be used for any offensive chemical operations; and the lead-covered wings of the bench afford space for the vessels which are used in filtering, precipitating, and decanting.

With care to avoid the fumes, of course, the operation may be conducted over any source of artificial heat, but I have found a gas stove best for the purpose.

I will now give directions for making a quantity of terchloride of gold; and as the method should be the same in large or small quantities, no difficulty should be experienced in following them, for it is obvious that persons wishing to make small quantities may do so by reducing the size of the parts or measures I may mention, and the capacity of the vessels they may require. To reduce one ounce of gold we shall want one thin Bohemian glass beaker, lipped for pouring, of about 8 oz. size; one glazed porcelain evaporating dish or capsule holding 10 oz.; one glass funnel for filtering purposes; a few sheets of best Swedish or French filtering paper; a few lengths of glass rod, and a pair of leather gloves. It is well, also, to have a graduated 10 oz. glass measure, a filter stand and a round ring of twisted hemp or felt on which to place the capsule while the liquid is cooling. All the vessels must be perfectly clean, and distilled water used in all the operations where water is directed to be used, unless otherwise indicated. All being ready, measure out one part (or ounce) of nitric acid and pour it into the beaker, and into the same pour three parts (or ounces) of hydrochloric acid. Place the beaker on the sand bath and light the gas. Whilst the acid is getting hot, weigh out one ounce of gold (this should be in the form of grains, leaf or ribbon) and proceed to divide it into small pieces, if of leaf or ribbon, with a pair of stout scissors or shears. When the acid is hot, put in the gold in small quantities. Heavy brown fumes will arise as the gold dissolves, and appear to flow over the sides of the beaker; a violent action will also be observed, resembling the boiling of the liquid. If this becomes too violent, and threatens to throw out spurts of acid, lower the gas and put in less quantities of gold. Soon the acid will become less turbulent and change its golden color to a redder tint, but the operator must continue to add gold until the last little fragment refuses to dissolve. Then prepare the filter by inserting a cone of filtering paper in a glass funnel, an placing that in the filter stand above the evaporating dish; moisten the paper with a little water, and then, armed with leather gloves, pour the gold solution from the beaker into the filter, and allow it to trickle slowly into the dish below. If any gray powder or white grains remain at the bottom of the beaker the first may be one of the rare metals found with gold, such as osmium or iridium, whilst the white powder is probably chloride of silver. In this way these metals can be separated from gold, and thus an alloy of gold and silver parted, for only the gold enter into solution. The capsule containing this solution is now to be placed in the sand bath, and heat applied to drive off the excess acid by evaporation. When this has proceeded until the liquid assumes a reddish-brown tint, and become thick, it will require some care and attention to complete the operation. It must be frequently stirred with a glass rod; care must be taken not to overheat it, and as it thickens and darkens the gloves must be drawn on, the capsule taken in the hand and frequently turned around to make the liquid flow around its sides and crystallize there. By thus patiently turning it about all the liquid will finally crystallize in a ruby red mass, and the operation is now complete. If too much heat is applied the crystals will assume a brown bronze hue, lose their chlorine, and metallic gold will be reduced on the sides of the capsule. If this accidentally happens, a brown powder will be found after the crystals have been dissolved in the water, and this may be treated with *aqua regia* as before. If the gold salt is to be immediately made up into cyanide of gold, it may be advantageous to thus drive off the free chlorine and dissolve the product with a strong solution of cyanide. This is frequently done by persons using small quantities of gold-plating solutions, and, providing the gold and acids are pure, I see no great objection to the practice. It is true that any quantity of chlorine present will enter into combination with its equivalent of potash or potassium, which is not good in gold-plating solution; but the quantity of chlorine left is small, and thus the objection reduced to a minimum.

If the object of the operator is to preserve the terchloride of gold in the form of crystals, great care must be taken to regulate the heat; for if allowed to arise to about 356°, the terchloride $AuCl_3$ will lose a part of its chlorine, and be transformed into a protochloride AuCl, which is a pale yellow, unstable compound, of little or no importance in the arts,

I have thus entered into minute details concerning the operation of dissolving gold, for the benefit of the amateur electro-gilder and the numerous class of querists applying through our columns for information on the subject. *Gold terchloride*, or *auric trichloride*, $AuCl_3$, combining weight 303.6, is the most important compound of gold known, as from it all the other useful preparations of gold are made. When crystallized, the crystals are very fusible, and deliquesce (absorb moisture and become watery) on exposure to the air. It is very easily decomposed by heat, light, organic substance, and al deoxidizing or reducing agents. Hence, if the fingers or writing-paper are touched with the solution they become stained of a violet color when exposed to the sun's light, and hence, also, its occasional use in photography. It is soluble in water, in alcohol, and in ether, and this latter solution is sometimes used for gilding small steel articles. When properly made, $AuCl_3$ contains 97 parts of gold and 106.5 parts of chlorine. Both it and all other sorts of gold are *poisonous*, its action on the stomachs of men and animals being nearly analagous to that of chloride of mercury; even one-tenth of a grain has been known to cause violent fever. In the hands of skillful physicians it has been employed as a medicine with some success in the treatment of virulent diseases. Its antidotes are the same as those of mercury.

A Useful Family Clock.

MR. DARIUS L. GOFF has at his home on Walcott Street, Providence, according to the Providence (R. I.) *Journal*, a remarkable clock. The clock, in the first place, has a history, being an heirloom of the carpenter family, of Rehoboth, in whose possession it has been for at least two hundred years, and perhaps longer. It came into possession of Mr. Goff a few years ago, he being a connection of the family, and since his ownership of it it has developed powers which for two centuries had lain dormant and unknown. It is an old style, tall clock, and occupies a position in the front hall of Mr. Goff's house, where it regulates the entire household. The clock never requires winding, the front door, as it is opened and shut during the day, performing that work. Within the dial is also an ingenious mechanism by which the light in the front hall is turned up as darkness approaches, and again is lowered as the orthodox bedtime draws nigh. As morning dawns, and it is time that the servants bestirred themselves, the faithful clock rings a bell in the back hall, summoning them to their daily labors. An hour later a bell in the front hall warns the family that it is time to rise, and a half-hour still later another peal of the bell summons them to breakfast. Beside these arrangements, the clock is connected with another in Mr. Goff's sleeping-room, whereby the two are struck simultaneously. All these ingenious attachments, in which, of course, the aid of electricity is invoked, are the invention of Mr. Goff himself. Among other things he has invented a very servicable machine, which is in use in the braid factory in which he is interested, for winding the braid on the spool or core. In the office of the company is also a thermometer with electrical attachment so arranged that a bell is rung when the temperature of the room is above or below a certain point.

Proceedings of the Horological Club.

A Distinguished Body of Watch and Clock Makers.

Seventy-ninth Discussion.—Communicated by the Secretary.

[Notice.—Correspondents should write all letters intended for the Club separate from any other business matters, and headed "Secretary of the Horological Club." Direct the envelope to D. H. Hoskinson, Esq. *Write only on one side of the paper*, state the points briefly, mail as early as possible, as it must be received here *not later* than the eighth day of the month in order to be discussed and reported in the Circular for the next month.]

THE HOROLOGICAL POCKET DICTIONARY.

Secretary of Horological Club:

I send you a copy of Mr. Grossmann's new Dictionary, which I think you will take pleasure in recommending to the craft. H. D.

Mr. Regulator said he had already received a copy by mail from some friend, and had examined it carefully. It was a volume of convenient size, giving the technical terms in use in watch and clock making, the indispensible denominations of the auxiliary sciences, and a few expressions belonging to commercial pursuits and workshops in general. The terms are given in English, German and French, so that anyone can find the proper words in each of those languages. As foreign workmen are now so common, as well as foreigners for customers, the convenience of such a book in enabling each to make himself understood to the other will be manifest. It is also indispensible to the artisan who wishes to read foreign books relating to his specialties. It supplies a long felt want, and being from the pen of M. Grossmann, of Germany, the well known watch manufacturer and horological writer, is a guarantee of correctness and reliability. He believed it could be obtained at the office of the Circular. The price he was unable to state.

DOES ALTERING A HAIRSPRING CHANGE THE COMPENSATION FOR HEAT AND COLD?

Secretary of Horological Club:

Will some one of your honorable body please do us the favor to inform us in the next Jewelers' Circular, whether the taking up or letting out of a hairspring (instead of altering the timing screws at the ends of the center bar) interferes or disturbs the heat and cold adjustment of an adjusted balance? D. P. & S.

Mr. Isocronal responded that the question propounded by our correspondents is one that has puzzled almost everyone, as soon as he got to understand the theory of compensation and tried to reason about it. It is well known that the effect of heat and cold upon the hairspring is the most important thing to be considered and compensated for. It would, therefore, naturally be supposed that the alteration of the hairspring, making its length greater or less, must have a great effect upon the compensation, and would require the adjustment of it to be gone over again, to make it correspond. But experience shows that such a change does not disturb the compensation. The question arises, how can that be so? If we adjust the balance so as to compensate correctly for the hairspring, how is it possible for the compensation to be uninjured?

The most lucid explanation he had ever seen was given by Excelsior in his popular "Practical Treatise." After fully explaining the nature and theory of the compensation for changes of temperature, how to practically adjust and correct the compensation, etc., in part sixth of his book, he then alludes to this very point, on pages 128 and 129, and shows that the balance is adjusted to compensate for the proportion or ratio in which the effective strength of the spring is changed by heat and cold, and that although the spring may be made longer or shorter, a change of temperature effects its strength in the same *proportion* as before. Consequently the compensation is not disturbed. But of course the *rate* or time is changed whenever the length of the spring is changed. And although taking up or letting out the spring does not disturb the adjustment for heat and cold, it *does* disturb the adjustment for isochronism.

It would be impossible to publish in these proceedings the whole of his remarks which bear on this subject, and it might not be satisfactory to give only a part. Our correspondents will find this and all other points on compensatian treated in this work in plain language, and made intelligible to everyone—as well as the adjustments for isochronism and positions, making and fitting hairsprings, regulating or rating without regulators, and endless other points interesting and valuable to every watchmaker. It is the most useful compendium of information for those who, whether actually working at the bench or not, wish to know just what to do, how to do it, and the philosophy of what they are doing, that he knew of. Every workman who wants to be well informed, should by all means have this book at hand for reference whenever in doubt on any point. Our correspondents can obtain it for $3.50 at the office of the Circular, where it is published.

ELECTRIC CLOCKS.

Secretary of Horological Club:

I have invented an improvement in electric clocks and wish to get the opinion of the Horological Club as to its merits, and whether such an invention will be of practical use and benefit to the craft, and to such parties who use a number of clocks in offices at different points and want them to keep exact time with the main office regulator.

The invention consists of a simple device attached to the main regulator, by which the electric circuit is opened and closed each second or minute, as desired; this acts on the device in the electric clocks, and causes all clocks in the circuit to beat in perfect unison with the main regulator.

The invention is cheap, simple, durable, and not liable to get out of order. Any jeweler can set them up and put them in operation. It is the most simple and cheap clock for jeweler's street clock that has ever been invented. With it a jeweler can keep perfect time with his store regulator, and all the connection required is a wire to connect the electric current. Any number of clocks can be on one line, all being connected with an insulated wire, to prevent the interference of atmospheric electricity. The device can also be used to wind a spring regulator, or in other words to keep the spring at the same tension all the time, and will work in this way as long as the elements of the battery will last. W.

Mr. Electrode said the letter was too indefinite. Mr. W. tells us what his invention does, but no opinion can be formed as to its merits without knowing *how* it is done. There are already a number of similar inventions in the market. Some of them are being used to a moderate extent, but none of them very generally, nor will any such device be likely to have more than a limited adoption into actual use. If Mr. W's method is simple, cheap, sure, and accurate, he could probably find a reasonable demand, provided it is not anticipated by something already patented or known. That can only be ascertained by employing a competent patent solicitor to make a search, or by applying for a patent. We could not undertake to advise Mr. W., because we know nothing about the device itself, and if we did, Mr. W. himself is the only one who could form any correct opinion about what is best to do with it. We can only say that there is no fortune in such an invention, but if perfect and successful it is possible to build up a reasonably good business upon it.

PECULIAR WATCH DIAL.

Secretary of Horological Club:

A gentleman recently showed me a watch with the following peculiarity: The hour hand made its circuit in twenty-four hours, which were marked on the inside circle of the three which were on the dial. The next circle contained the minute marks as on an ordinary watch. Outside of this was still another circle, which was divided into ten equal parts, marked by figures. These divisions were sub-divided by ten equal parts, which divided the circle into one hundred equal divisions.

What was the outside circle for? Does the peculiarity of making indicate anything in regard to its age, and, if so, what was its probable age? The watch had a verge escapement. W. S. W.

As no one replied, our correspondent's letter is published, and any of our readers who can give him the desired information is invited to do so through our proceedings.

BALANCE HOLE JEWEL OUT OF LEVEL.

Secretary of Horological Club:

I have just been examining a watch to see if I could find the trouble, and I think the top balance hole jewel is out of upright.

If not too much trouble, will you please inform me through the columns of the CIRCULAR, of a good way of finding out whether it is or not, and oblige,

APPRENTICE.

Mr. Horologer thought that "Apprentice" probably meant that the jewel was out of level, or not in the same plane with the plate, so that it stands edgeways or inclined when on the pivot. The usual way is to judge by the reflection of the light from the plane surface of the jewel, as compared with that from the surrounding surface with which it should be parallel. An experienced workman will instantly detect a jewel which is very slightly out of level.

If the pivot is perfectly free in the hole, a slight error of this kind is not likely to cause trouble enough to arrest attention. The trouble is more likely to be that the jewel is loose in its setting, or the setting loose in its seat. That is a more serious error, and a very common one. Applicant should look to that point, and also see if the hole is well polished, the pivot free in all positions, and does not rub on its shoulder when deepest in the jewel. If all these points are correct, the trouble is probably elsewhere than in the pivot. Apprentices can have no better guide, in examining watches to find out their defects, than Excelsior's Practical Hints, and he should not fail to study them thoroughly.

CAUTION TO THE TRADE—DRILLING GLASS.

Secretary of Horological Club:

In the October No. of the JEWELERS' CIRCULAR, page 191, a correspondent offers to furnish glass covers for clock. I sent him an order for one enclosing $2.00, which he wrote it would cost, but have not received the shade, nor any answer to letters sent him on the subject. If you should publish this, it may prevent others from being victimized by the party in Blossburg, Pa. Would some correspondent be kind enough to give a process for drilling glass quickly?

Yours, &c., J. R. MURDOCK.

The Secretary said he was very sorry that any of our readers had sustained loss on account of letters read before the Club, but as it appeared to be all right the letter in question had been published in our Proceedings. It was a serious charge to make, and he hoped it might yet turn out that there had been some mistake.

As to drilling glass, the most common way is to make a three-cornered drill, not too pointed, and use in a drill stock which will make it cut in both directions. Turn slowly, keep it well flooded with spirits of turpentine, containing as much camphor as it will dissolve; drill from both sides of the glass, be very careful when the point comes through, and finish the hole with a file flooded like the drill. Don't put the file in far enough to become tight in the hole, or you will crack the glass. Polish with emery, then rotten stone.

READY-MADE MATERIAL FOR AMERICAN WATCHES.

Secretary of Horological Club:

After reading the proceedings of the Club in the September number of the CIRCULAR, I had about made up my mind to drop the subject of "Ready-made materials for American Watches"—not because the arguments on the other side had convinced me that my position was untenable, but because I thought there was a certain amount of unfairness on the part of *someone* in not publishing certain parts of my communication, and yet allowing one or more of the members to partake of the *forbidden fruit*, while others were not aware that there was any such fruit upon the table. Had the whole communication been published, as well as the remarks of Mr. Ruby Pin on the *repressed* parts of it, so that the readers of the CIRCULAR might judge of the merits of both for themselves, I would find no fault, even though I had been badly worsted in the comparison, but when only one side of an argument is presented and a great portion of that given to criticizing the writing rather than in discussion of the subject under debate, where is there any chance for benefit to the trade to come in? Besides not being a member of the Club, I felt that I might be taking up too much of their valuable time in the reading of my communications. At the request of a mutual friend, however, I will say a little more. The "good of the order" was in my mind when I wrote my *first*, as it is now in writing this—perhaps my last.

There was one *omitted part* in my last communication, which according to Mr. Ruby Pin's own confession, referred to him as well as to Mr. Waltham—for he claims to be "personally interested in the sale of the Elgin Watches"—yet he says never a word about that, although he has taken the pains to hunt up the "original letter" and read over the "omitted parts."

In that letter there was a proposition to the Club something like this—though not published—that, in order to test the question as to the interchangeability of the different parts, they should take several watches of different grades manufactured by these "two companies" which Mr. Waltham and Mr. Ruby Pin seem to represent, have them taken down before the members of the Club, and attempt to interchange the parts. If the feat can be successfully accomplished I would acknowledge the corn, &c. I will now add a little more to that proposition, and that is, that I will furnish two good workmen—at no expense to the Club—to take these watches down and put them in as good shape as they were in when taken in hand, then let the result be published in the regular proceedings. And here let me reiterate what I have said in other communications, that *I do not* oppose the *general principles* of duplicate parts, or interchangeability to a *certain extent*. I am aware that these duplicate parts can be used in some cases with slight alterations, while in others they require *much* more work. Neither have I taken grounds against the idea of supplying these parts to the trade. I consider it a great advantage to watchmakers as well as to the owner of the watch, but I have endeavored to impress upon the mind of the "Boss" that he stands but a poor chance of duplicating the broken or lost part *so closely* that his repairman will have little or nothing to do, but to put the new part in the watch and set it running, *particularly*, if he orders the new piece by the *number of the watch*, rather than by sending the old or broken part—or better still—by sending to the manufacturer the necessary parts to have a new one fitted. The latter I consider by far the most satisfactory to all concerned.

Now in regard to some of the remarks of Mr. Ruby Pin. In eloquent strains he seems to have—as the street gamins say—"shot off his mouth" in accusing me of insinuating that "the deliberations of this Club were governed by the advertising columns of the CIRCULAR." If he had given his attention to *reading* what he had said so much pains to *find*, he would have seen that there was nothing in my communication that could have been construed to mean anything of this kind unless terribly distorted.

I did say that the "Proceedings of the Horological Club" was a medium for advertising certain companies to the detriment of other 'smaller' or 'inferior' companies" (see Mr. Waltham's remarks in July number) or words to that effect. I have this impression still. If I have been correctly informed, the object of these meetings is to discuss subjects of interest to the trade and to disseminate knowledge through the proceedings, that would be of benefit to all. "Pro Bono Publico," hence my surprise when I read Mr. Waltham's remarks in the July number of the CIRCULAR.

There is one company that I know of, which, though smaller, is the *Father* of them all, it can hardly be called an "imitator." This company does not advertise that their material is interchangeable, yet I am informed that they *suffer* just the same from this mistaken idea, and frequently receive orders for material by the "number of the watch." I am also informed by one who for a long time was intimately connected with one of the "two companies" mentioned, that he quite often found it very difficult to duplicate the parts without more or less work, even when the *watch* was sent him to fit a new part. Is "B" then the only one who finds trouble in replacing broken or lost parts? Mr. H. P. B. says in his letter (see number) that it would require a "large assortment" to have *one* suitable and that the *original* cock and foot holes are *frequently* replaced with others. If the *original* cock and foot holes have been replaced with larger or smaller holes, how can the manufacturer tell by looking over his records, what sized pivots to send, or in fact can he send *any* but *one size*, if they are exact duplicates. If they are *not* duplicates then comes the work to fit them, either by reducing the pivots to fit the jewels, or selecting new jewels to fit the pivots, and rejuvenating them. If the labor is done by the workman and the "Boss" is not a practical workman, then comes the very thing which "B" complains of—a chance to find fault because he was longer in doing the job than the "Boss" thought he ought to be.

There may be single instances like that of the nephew of Mr Ruby Pin, when a part sent may fit exactly and "the watch put together in *perfect running* order within fifteen minutes after receiving the staff by mail," but they are *exceedingly rare*, and it is not *often* to say the least, that a workman can be found who can stake on a balance, time it up, try its poise, put on his hair spring and roller, put it in the watch and have it in "*perfect running order*" within fifteen minutes from the time it was received by mail.

If Mr. Ruby Pin is a practical man and has never found a case when he has sent for a staff, and when he received it, found the balance shoulder *too small* to fit the hole in the balance, or the staff *too small* to fit the hole in the roller, or the pivots *too small* for the jewels, or the endshake not just right, being too much or too little—he has

indeed been a lucky watchmaker and I heartily congratulate him, (for such lucky ones are seldom to be found) but he ought not to pronounce as "absurb" cases of this kind, which have occurred in the experience of many others less fortunate than himself. X.

Mr. Ruby Pin said he would answer the points of Mr. X's letter in their order. First, as to the unfairness, he would say that the "forbidden fruit" was not then on the table, but had been carried down cellar after the previous meal,and that he had gone down there and pawed over the remnants, to find what the Secretary referred to. He hoped there was nothing "unfair about that—especially as Mr. X. has now told us exactly what was on the plate when he sent it in to us. Secondly—the "test" proposed by Mr. X. would amount to nothing practically, because it would be only repeating what every workman has already done and found in his own experience. The companies do not claim that the parts of "several watches of different grades" will interchange. And even if several watches of the *same* grades were tested, and failed to interchange, it would prove nothing except as to those particular watches. Every man of experience would scout at such an experiment as settling anything, and say that his own experience would cover a dozen such tests. Experience in actual business is the only true test. Mr. X. then admits that the principle is good, and that it works well in practice to a certain extent, that is with exceptions. There seems to be no dispute about the advantageous operation of the idea, but only as to the degree of perfection with which it is carried out in practice. If one insists on *absolute perfection*, even when tested by micrometers and other tools which measure to the thousandth of an inch, then he may claim that interchangeability is impracticable. But if he refers to the conditions which prevail in actual business, with 9 out of 10 workmen and 99 out of 100 watches, then we may safely challenge the trade at large to say whether the principle is not a practical success As for a "boss" who is so ignorant about watches that he can not understand why a job takes time, even after the workman explains it to him, it is not worth while to worry about what he does or does not think. A man who knows nothing about watches is unfit to deal in them. Judged by accepted business maxims he is an intruder, and we hope to see the day when such interlopers may be frozen out, along with botch workmen and other excrescences. A watchmaker who understands his business has a right to it, and ought to be allowed to follow it without being disturbed by mere speculators. It may fairly be questioned whether the trade is damaged more by these men who go into it because it is a "nice business," or by the botches.

Leaving the point at issue, Mr. X. then goes into personalities, and refers to the insinuation that our deliberations are governed by the advertising columns. He feared that Mr. X. had not only "shot off his mouth," but had also shot off his head at the same time—else he would have let the matter stand as it was. The insinuation as originally described was certainly less heinous than the version which Mr. X. now says is the correct one. But it is equally untrue, in either shape. We stand ready to commend any and all watch companies, which have any merits to be commended, and have expressly stated that our Proceedings are free to all to prescnt their claims. If Mr. X. will set forth the merits of the company he "represents," we shall be happy to allow them all the credit that is due them. If we do not, Mr. X. may *then* charge "unfairness"—until then the *onus* must rest on himself.

Mr. X. was requested to name the company to which some of his statements referred, but contents himself with saying that it is the "Father" of other companies. Now, paternity is a very uncertain means of identification, in these days. If we knew the *mother*, and knew that her lawful spouse is the father, then we may feel confident that we can find out who the "father" is. Otherwise, the claim of paternity is rather too indefinite to take the place of the name. In a recent will case, the matter of paternity was so extensively distributed around, that it was impossible to tell which *was* the guilty man. If it is all the same to Mr. X., we would rather have some easier "clue."

Mr. X. also affects to doubt his nephew's statement. Well, his nephew was no slow-mope, neither was he one of these "quick-motioned fellows," who can fly all to pieces in seven seconds and put themselves together in eleven seconds more—but who never know, during their whole lives, whether they are all there or not. He was a cool, careful, and methodical man. He had the watch all completed and put together except the staff, and the correct positions for the hairspring and roller marked on the balance. When the staff came, it took but a moment, with a micrometer, and a record of the sizes of the holes and the length of staff, &c., to find whether it was a fit or not; and with good tools it was a short job to stake on the brlance, turn the hairspring and roller at once to their proper positions, oil the holes, and screw on the cock. The balance would require no poising, and with a well fitted staff and skillful work, it should require little or no truing up. Perhaps Mr. X. could not do it in fifteen minutes, but there are a great many who can, and probably do.

Finally, Mr. X. makes a trifling mistake, and charges the speaker with pronouncing the idea "absurd," of getting a balance staff and finding the shoulder too small, *or* staff too small, *or* pivots to small, and so on. What the speaker pronounced absurd was, the idea of finding the shoulder *and* staff *and* pivots *and* endshake wrong—that is *all* wrong in one staff. Mr. X. should give "more attention to *reading*," and in his next, kindly spell out the name of that happy "father" he wrote about. Mr. Ruby Pin then said he observed that Mr. Waltham had returned, and he would yield the floor for that gentleman to pay his respects to Mr. X.

Mr. Waltham thought that both sides of the question had been pretty fully stated, and that no benefit could result from prolonging the controversy. As Mr. Rubr Pin had well said, the trade at large were the only proper judges, and he would leave the decision to them, with perfect confidence as to the result. With regard to the remarks personal to himself, they were of no importance. The matter seemed to have become one of personalities, which could not be of any interest to our readers, and he thought it had better be dropped.

"Nothing New Under the Sun."

AN interesting illustration of the above affords a discovery recently made in an old Chinese Encyclopedia, under article "Ye" (Paintings) which proves that luminous paint was known and in use more than nine hundred years ago, and is related as follows: "A certain Su Ngoh during his travels in Japan bought a large picture representing an ox, which left the frame in day time, to return at night to sleep. This picture came into the possession of Emperor Tai Tsung of the Sung-Dynasty (966-998 of present era) who convened a court of Mandarins to elicit an explanation to the strange phenomenon, which no one was able to afford, until a learned Buddhist Priest stated that the Japanese prepared a substance of calcined oyster-shells mixed with sulphur for a paint, which possessed the property of shining at night and be invisible in day time if painted on white ground and thus satisfactorily explained the apparent leaving and returning of the ox on the picture.—*Extracted from "Die Gartenlaube" by H. Bush, Hull.*

HERR BOTTGER says that there is no method so convenient and sure as that by glucose in alkaline solution for reducing the salts silver. Take, for example, chloride of silver freshly precipitated and of well washed, suspend in it a sufficient quantity of diluted caustic soda, and add a small portion of glucose. In a few minutes, upon boiling, the reduction takes place. The silver can be collected, washed, and slightly calcined, in order to obtain the metal pure under the form of a light sponge of a dull white. The same method furnishes an exceedingly active platinum black, and with the salts of copper it gives an oxide of a beautiful red.

Of Depthing in the Depthing Tool.

THE following is from Hermann Sievert's "Guide for Watchmakers' Apprentices," and as it may contain matter of interest to the watchmaker and repairer in general, we reproduce it in English :

The workman who has no rounding apparatus at his disposal, will see himself reduced to the necessity of leaving the wheel-teeth alone, and any correction of the depths has to be done by way of driling new holes. Examine the depths, and, if wrong, close the holes by screw bushes. Next place the fourth-wheel depth into the depthing tool, and rectify it, and with it draw a circle from the pivot hole of the escape wheel in the plate, as near as possible in the middle of the turn-out, but exactly on the line of the circle mark and drill the hole. Now ascertain if the depth has become right. In the same manner treat the depths of the center wheel and minute wheel, and drill the hole exactly at the intersection of the two circles. It is not, however, to be recommended to locate both the depths of the center wheel and the fourth wheel at the same time in watches with second hand. The fourth wheel might become displaced.

THE CYLINDER ESCAPEMENT.

The escapement is the most considerable part of the watch, because the correct going depends upon it. The cylinder, of all other escapements, is the most faulty ; it should, however, be the aim of the watchmaker to produce a correct rate by using the mechanical means at his command. To overcome these defects, he must be thoroughly acquainted with the principles and conditions of this kind of movement.

The power of the wheel intensifies the motion of the cylinder and balance during the lifting, which motion, at its conclusion, is retarded by the friction upon the rest. The decrease of speed will gradually become greater when the oil thickens, and only such a cylinder movement will remain unchanged in its rate of going, where the mechanical decrease of speed caused by such thickening of the oil is balanced by the gradual loss of power of the impulse and consequent lessening of the vigorous vibrations. It is clear that for the counterbalance between hastening and retarding a certain thickness of wheel-pivots is necessary, and it has long ago been a recognized fact that a watch whose wheel-pivots are too thin, is not a good timekeeper. For the same reason, the pivots in a watch with eight stones must be somewhat thicker, because the friction on these thin and smooth stones does not increase in the same ratio with the thickening of the oil ; and to still further preserve the above mentioned counter-balance, a certain well-defined size of escapement wheel is necessary. Many watchmakers endeavor to make this wheel as large as possible in proportion to the fourth wheel, which is rather reprehensible, because a wheel with its greater size and radius, added to its natural inertia, requires more power to set in motion. It exerts, moreover, a damaging influence on the cylinder.

Let us suppose a cylinder wheel to be twice as large as of right it should. Of course, the cylinder must stand in the same proportion to the wheel, and must consequently be twice as large as one of right size. By the same inpelling power, the power at the circumference of a wheel decreases in the same ratio as the length of its radius increases, *ergo*, the doubled cylinder wheel exerts one-half of its power on the doubled lever arm of the cylinder, wherefore, not to take into consideration the natural *vis inertia*, the power of impulse has remained unchanged. But it stands in a different relation with its friction upon the rest. It is true, the teeth-points only exert one-half of this power upon the doubled radius of the rest-plane of the cylinder, but the extension of the rest-plane is, by the same vibration, twice as large. The effect of this greater expansion will be that the slowing of the rest will be greater than the acceleration of the balance wheel by the impulse, and the rate of a watch will be significantly slower after a short time. The true size of the escapement wheel cannot be exactly fixed by means of calculation, and even the size of a wheel whose diameter has been found practicable for some watches, will not serve for all, since other circumstances are brought to bear, such as size of mainspring, inclination of teeth, size of pivots, and size and weight of the balance, which will exert their influence. But the satisfactory size of the escapement wheel is hardly ever exceeded ; should it be too small, however, the extra friction would be damaging to the pivots.

THE BALANCE

should stand in a certain proportion to the diameter of the cylinder. Its regulating power lies especially in its largest possible circumference, by placing too great a weight near too small a balance, even if sufficiently heavy, is influenced to a greater extent by the accelerating and retarding motion than a larger one, while, the weight of both being equal, the friction of its pivots remains the same. Its size is further limited by the endeavor to prevent the so-called "setting" (the defect, when a watch being wound up does not resume going of itself.) A large balance requires an increased power of balance spring. Experience has established that the diameter of the balance to the cylinder shall stand in the proportion as 16 : 1, one smaller than this would not insure a better rate of going, it may be rather a trifle larger. The correct size, assuming that wheel and cylinder stand in exact proportion to each other, is when the wheel teeth are barely visible around its circumference. Also its weight is limited in both directions. One of insufficient weight, like one too small, is easily influenced by disturbing causes, beside the danger of too lengthy a vibration ; one too heavy, like one too large, is apt to produce the afore-mentioned "setting." Experience will indicate both the right size and weight ; care, however, should be taken to place the greatest weight in the periphery, making both the shank and eye only strong enough to be compatible with durability.

An undue change of known results takes place in small watches—say in those of about 40 millimetres in diameter. The regulating power of the balance, by the proportionate decrease of the other parts of the watch, lessens in a grater ratio than the power of the mainspring. Owing to the contracted space the balance cannot be increased in size, and since an additional weight would produce the effects mentioned as to be avoided, the height of the lifting surface is increased considerably to produce, by the increased lifting, a lengthened influence upon the movement of the balance by granting a freer exertion to the power of the mainspring, as opposed by a greater dilatation caused by the friction of the rest and pivots. It is not to be regarded as a error if the wheel teeth of a lady's watch should heave an inclination of more than 18 degrees. Since the regulating power of the balance as well as the strength of its spring decreases rapidly in smaller watches, the mainspring is well enabled to overcome the increased lifting.

THE ADJUSTMENT OF A CYLINDER MOVEMENT.

Next scrutinize, after having removed the spiral by taking off the disc, by a revolution, whether the cylinder runs exactly true in its acting part and pivot. An untrue cylinder gives rise to a motion of the wheel, while it lies on the rest, and under these circumstances cannot go well. Should it merely be caused by a bent pivot, the defect is easily rectified by straightening it with a pair of tightly-closing tweezers, without a blow ; but if the plugs are turned in untrue they must be replaced. Then examine the counterpoise of the balance in the balance scale (two horizontal edges, which may be raised or lowered by means of a screw, for the admission of the pivots). The testing by means of revolution is less accurate. Next try pivots and holes. The pivot must be well polished, and fit in the holes thus that perhaps 1/6 of the hole diameter remains for play room. The most suitable thickness of the cylinder pivots is 1/8 or 1/4 of the diameter of the cylinder. It is to be presumed, of course, that the jewel hole is located true and perpendicular to the plate. Pivots which have no play may after a while occasion the standing still of the watch and give rise to other defects.

To try the escapement, place all wheels, from the centre wheel to the escapement wheel, in their place. The lower cylinder cap jewel must be screwed tight, but take out the upper one with all its belong

ings ; then put in the cylinder and examine first, if the lower pivot rests well upon its cap jewel ; also that the shoulder does not approach too closely to the jewel hole. For that purpose loosen the screw of the cap jewel and examine if the cylinder raises itself sufficiently by the pressure upon the mounted cap jewel. If this is not the case, owing to being placed too deep, file the brass plate level with it. Perhaps the jewel hole lies too deep, and in that case the turning in of the cock must be turned in deeper nearly down to the stone. Should, however, the pivot be too short, that is, should it not penetrate sufficiently through the jewel hole, the shoulder has to be turned farther back, a labor which, by help of the security pulley, is easily performed. A loose cap jewel, or one which is sprung, ought to be replaced by a new mounted one. In like manner must the cylinder pivot penetrate through its hole, so far that the penetrating end be equal in length with its thickness.

A second very important point is the right height of the cylinder. No touching or rubbing of the wheel bottom in the watch must in any manner take place. To lower the cylinder, it is permitted to make a few elevations on the inner side of the lower cock, by means of a sharp three-cornered punch, in case the cock should not already reach up to the dial plate. Hammering on the cock disfigures it, and is, therefore not permissible. If the cylinder stand too low, turn the turning-in of the plate deeper. .It is better always when the cylinder pivots are too long, to shorten and re-turn them. This should invariably be done on the upper pivot, because a change of the bottom surface of the cock always entails an insecurity of the same, and proclaims the bad artisan. The end play room of the cylinder should, like that of the escapement wheel, be but scant, so as not to endanger the free passage of the wheel bottom through the notch. Where this is very broad, it might happen that the tooth passes under its set face. This probability must be guarded against. Next in order follows the examination of the depth of the motion. Of course it is not possible to ascertain by a mere ocular inspection, or even by measuring, if the lifting surface passes with the centre of its chord through that of the cylinder. The examination can be best done after the rest. For this purpose insert a small piece of paper under the balance and push it slowly forward up to the drop of the notch, while moving the centre wheel with fingers. If the cylinder is then moved back until the lifting begins, a little practice only is necessary to determiue whether the necessary rest is there. Let it serve as a landmark that for a rest of 6 degrees, which must be at the small lip, a movement of the balance equal to one-twentieth of its diameter must take place, from the drop of the tooth back until the beginning of the lifting. A point, therefore, on the periphery of a balance of 16 milimeters will, by such a test, move about 0 8 milimeters.

Silver in Artistic Forms.

THE Gorham Manufacturing Company has now on exhibition at its establishment, No. 37 Union Square, a remarkably fine collection of solid silver ware. In the art-room, which is handsomely fitted up, is an array of special pieces carefully designed, which have occupied the greater part of the past year to manufacture. These are placed there on exhibition, and will not be delivered to purchasers until after the public have had an opportunity to examine them, as they are nearly all hand-wrought and there are few duplicates. Among the handsomest vases is a Japanese vase with repousse work in parti-gilt, representing a whirlwind and rainstorm ; another Japanese vase has the older design of storks and reeds in repousse. A vase with colored engraving has a wreath of morning glories in natural colors. An interesting piece is a reproduction of an antique Cryriote jug, which has the appearance of having been buried for centuries. A pair of vases that attracts much attention from connoisseurs is of dull copper with inlaying of silver ; the design and the work are of much interest.

Another vase of exquisite workmanship represents an old stone wall broken in one place to reveal a pond with a stork among the lilies ; and in another a glimpse of sky with swallows on the wing. A vase in repousse, the design of a branch of roses and leaves in natural colors, is of the most delicate finish. Another vase in satin finish, with a design in repousse, represents a falcon striking a heron in mid air ; the blood of the victim is skillfully represented by an inlaying of copper. A plate with a field scene, with children gathering flowers, effectively brought out in colors, is one of the finest pieces of colored work exhibited. A child's bowl illustrating the story of the "plough-boy's luck" has a border with the design in repousse in parti-gilt. An odd plate, and one of rich design, has an inlaying of various metals, producing a mottled effect ; around the edge are small fishes and birds. A plaque of artistic design an exquisite workmanship represents Sir Oliphant at the mercy of the faries, whose tiny faces are peeping from flowers and grasses.

A handsomely chased plaque has a bunch of poppies and leaves delicately shaded, applied so naturally that they look is if they had only just been carelessly thrown on the side of the plate. A soup tureen, in the new oblong shape, is of hammered silver with border in repousse, the design being taken from the Elgin Marbles. A set of fruit spoons, with each of the handles twined and formed by different flowers and fruit in natural colors, is exquisitely done. One of the handsomest of the sets, comprising knives, forks and spoons, is called the "Eglantine" set, and all the handles are beautifully ornamented with this flower and its foliage.

A Notorious Receiver Dead.

JOHN D. GRADY, a notorious receiver of stolen goods, died recently in this city of pneumonia. Ostensibly his business was that of a diamond broker, but the police of this and other cities have known for years that he was the banker of many noted criminals, disposing of the proceeds of their robberies, keeping their money for them, and making loans to them as their necessities required. His relations with the police were of such a peculiar nature that, although his real character was known, he was seldom if ever molested. At times he had given important information to the authorities, and at other times had shielded criminals from the clutches of the law. It is broadly intimated that some of the police officials in times past shared his profits, which. fact accounted for the immunity he has enjoyed. He was a short, thickset man, with a typical Irish face, a strong accent, and an insinuating address. He was, as a rule, ill-attired—wore a soiled shirt with a "head-light" diamond in the front, "scarcely ever wore a shirt-collar. He usually carried a shabby satchel, and at times this contained diamonds, jewelry, and watches worth much money. He has boasted that on several occasions the satchel had in it property worth $125,000 to $150,000. It is asserted that Grady was the confidant and friend of every criminal whose daring and success had raised him above mediocrity in his "profession." Among the men for whom he watched or planned, to whom he lent money and from whom he received interest, scurities, money, and property to the value of many hundred thousands, may be cited the Northampton Bank burglars, Robert Scott, "Tom" alias "Shang" Draper, John alias "Red" Leary, "Jim" Brady, William Conners, and James Dunlap, all experienced felons ; Johnny Dobbs, "Sam" Ferris, alias "Worcester Sam ;" "Abe" Coakley, George Leonidas Leslie, alias George Howard, alias Allison, alias Green, murdered by comrades in Brooklyn, and whose body was found at Tramp's Rock, near Yonkers ; Michael Kurtz, alias "Sheeny Mike," the smartest jewelry store burglar in America ; Peter Conroy, "Big Frank" McCoy, George Miles, "Ike" Marsh, William O'Brien, alias Porter, alias Parks ; John Irving, alias Parks, alias Condit, and Gilbert Yost, alias Spencer, the Patchen avenue burglars : Edward and Washington Goody, "Joe" Dollard, and George Mason. These criminals were of the elite of Grady's clientage.

The score of men named have, within the past decade, been more or less accurately identified with burglaries in banks, jewelry stores, and dry goods houses, which secured plunder valued by the losers at from $10,000,000 to $12,000,000. Nine-tenths of the plunder was in money and bonds, and the sum netted by the thieves could not have been far short of $3,000,000. Grady, when all danger was past, was fond of boasting about his part in criminal transactions, and of taunting police officers on their failure to unravel criminal mysteries. Grady was notoriously associated with the robbery, in 1876, of $20,000 worth of jewelry from the store of Frank Horton, No. 42 Fulton street. The burglars, Porter, Irving, and Michael Kurtz, and perhaps George Leonidas Leslie, forced open a safe on a Sunday, and Grady received the goods. A politician prominent in "Ring" times was employed as negotiator, but Mr. Horton would not accede to the terms, and the booty was broken up. The metal was sold for $1,200. For the past two years Grady had not been prominently identified with crimes. He had been robbed of diamonds, and had devoted nearly all his time to pursuing the thieves. A woman whom he trusted implicitly swindled him out of diamond jewelry and other valuables, and it is whispered that men who had found out a secret the revelation of which would imperil Grady's liberty, had bled him to nearly a condition of financial distress. He began life in New York 35 years ago as a painter, and for the past 20 years his fortune has been variously estimated at amounts ranging from $25,000 to $500,000. His estate, when settled by thePublic Administrator—he died intestate—will not be more than $50,000.

The Action of the Chronometer Balance Proven by Arithmetical Progression,

SINCE writing my former article on the "Compensation Error," as published in this journal for June last, I have become acquainted with the theory as used by Mr. Hartnup of the Bidston Observatory, and find it identical with that of Mr. Crisp's Prize Essay. The late Professor Bond of Boston also published the same. I am now enabled to completely refute it and prove that, contrary to their assumption that the error is not in arithmetrical progression, that it is really so; as Galileo said, "it does move though." The supposition that the theory of the pendulum and the balance are the same induced Mr. Hardnup to publish a formula for calculating the intermediate rate of a chronometer when its rate had been ascertained at two different points of temperature, viz: 55° and 85°. He found by adopting the theory that the action of the balance was as the square of the temperature, that the chronometer must have an intermediate rate of six-tenths of a second faster than at the other two points. He never tried at seventy degrees, but deduced its rate from the above theory and so fixed it. Were the theory correct it would be as he fixed it—that it is wrong I can indisputably prove. It is admitted that the compensation error at 85° is about 2.5″, at which point Mr. Hardnup fixed it. But by using his formula for 105° its falsity is exposed. The error of a good chronometer at 105° is well known to range between four and five seconds but his formula makes the error amount to 7.5″—here is an error of 2.5″. Again the error at 130° is between 8 and 9 seconds whilst the squaring theory makes it as much as 16″—about double the amount.

It is singular that he did not test the theory, as I have done, when the test is so simple. Chronometers are not used in much higher temperatures than 85°, so I suppose his faith in the theory was all that was required. Bnt his faith did not satisfy me, though many chronometer makers, and some in this city, have taken it for Gospel. The theory is now demonstrated and it is not necessary to more openly expose its fallacy. There hes been too much gas in it and it exploded when a light was applied to it. It made the intermediate error to be six-tenths of a second when by its ratio being in arithmetical progression it amounts to one-tenth only. A chronometer maker of good repute in this city places the error at between three and four-tenths. No one can determine its amount within two or three tenths of a second in a trial with chronometers, nor can anyone determine the absolute thermal error at two different points within that amount. The result is better obtained in the formula for calculating the rate of the increase of the compensation error, as acting in arithmetical progression. I never tried to find out its value, always supposing it to be exceedingly small.

It may be as well to here remark that when the two temperatures of 55° and 85° are equalized, the compensation is doubled at all points below 55°, so that at 30° it amounts to four seconds, and by the square theory the intermediate error at 40° would amount to 1.2″. If anyone now wants to try and make out its value he had better try a chronometers so adjusted. By making a chronometer go two seconds a day faster at 80° than at 55°, the intermediate error will be 1.8″, and so on. There is a chance for anyone who is incredulous. The views expressed in my former article have not satisfied some chronometer makers, but "truth is a conqueror and will prevail." Some say the running of a chronometer is better than any formula, but I deny it, and here is a case in print.

They cannot fix the intermediate error so exactly as the mathematician. In adopting the square theory he was right in his estimate. Finding the square theory to be false he will now adopt that of the action of the balance as being in arithmetical progression and fix the intermediate error more exactly than any chronometer can possibly do. So much for mathematics; its rules must not be despised. Mr. Hartnup will not regret that his theory has proved to be a fallacy, he had rather the chronometer have the best of it; nor need anyone complain because I have done justice to the chronometer, and proved that it has more merit in it than some have given it credit for.

Mr. Hartnup's ratio of the compensation error

At.....	55°	60°	65°	70°	75°	80°	85°
Daily rate 0.0″	—0.07″	0.28″	0.62″	1.12″	1.75′	2.5″	

Adding for the compensation +1.25 gives +0.63″ for the error.

The balance acting in arithmetical progression

At.....	55°	60°	65°	70°	75°	80°	85°
Daily rate 0.0″	0.38″	0.76″	1.15′	1.60′	2.05″	2.5″	

Adding for the compensation +1.25 gives +0.1″ for the error.

By adding the half of 2.5″ for compensation at 70° the cause of the intermediate error is apparent, being the excess of compensation required to make up for the loss at 85°. The utter worthlessness of Mr. Hartnup's formula is seen in its ratio making the last five degrees so much as ten times the first five.

In the table showing the action of the balance in arithmetical progression in the order of temperature, 14° of temperature makes a loss of one second per day in the rate of a chronometer. It is divided by 7 and its quotient taken from it which gives the number of degrees for the next loss of a second, and it is so worked through the whole range.

Table showing the ratio of compensation error as affected by temperature:

55°	69°	81°	91.3°	100.1°	108.7°	115.2°	120.8°	125.6°	130°
Daily rate:									
0.0	−1.0	−2.0″	−3.0″	−4.0″	−5.0″	−6.0″	−7.0″	−8.0″	−9.0″
Difference:									
	14.0°	12°	10.3°	8.8°	7.6°	6.5°	5.6°	−4.8°	4.1°

This above table is based upon the principle that each successive ten degrees of temperature bears the same proportion to the preceding ten that the first ten do to the second.

The subjoined figures show the results of a table having 0.9″ for the first number and 1.05″ for the second. The divisor is 6, and it is worked like the table for temperature—the difference between them, 0.15″, shows the double intermediate error. If the results are high enough for the error found on trial with a chronometer at 105° or higher then the intermediate is not larger than it represents.

	55°	67°	80°	92°	105°	117°	130°
Daily rate 0.0″	—0.9″	—2.05″	—3.22″	—4.65″	—6.31′	—8.25″	

The first figure 9 can be divided by 5 or 6, but the second figures should mark the difference in the quotient. Whatever be the numbers the two ought to represent the compensation error, which is two seconds at 85°. The difference between the numbers is double the sum of the intermediate error.

New York. ROBERT MOLYNEUX.

Result of Diamond Making.

THE result of artificial diamond making, thus far, notwithstanding all that has been said of the Glasgow experiments, is really of but slight importance. In practic, according to the latest and most successful method, a hydrocarbon gas—such as marsh gas, for instance, which is composed of hydrogen and carbon—is put into a stout iron tube of considerable thickness; a nitrogen compound, presumably cyanogen, is also introduced, with a view to the nitrogen combining with the hydrogen, and leaving the carbon free, a diamond consisting, as is well known, of pure crystalized carbon. The gas in the iron tube is subjected to enormous pressure to liquify it, the tube being heated to aid in the work; the liquefaction of oxygen by T. Pictet, so well known, was effected by pressure in this way. The pure carbon passes under pressure from a gaseous into a liquid form, and finally crystalizes, in which condition it is found when the iron tube is opened; the diamonds, however, are of the most minute size.

Workshop Notes.

To repair the dial of a watch, take a little pure spermaceti, melt it with white of silver, and carefully fill the injury of the dial ; rub it smooth with a linen rag, ann finish with silk paper. Spermaceti is better for the purpose than white wax.

The smallest watch in the world, perhaps, is in the possession of an Englishman in Berlin, who offered it to the German Emporer for sale. It is the most diminutive timepiece that has ever been manufactured, and is set in a seal ring.

Hard solder, for gold : Gold, 18 k (6.75 fine) silver 10, pure copper 10 For silver : Silver 60, copper 23, zinc 16. For platinum : Pure gold, with ½ per cent. alloy of platinum and iridium. For aluminium, bronze : Gold 88.88, silver 4.68, copper 6.44 ; or, gold 54.4, silver 27.0, copper 18.6.

A French engraver has discovered that the engraving tool will cut into metals which were unimpenetrable, if the tool is occasionally dipped into petroleum. The hardest steel may be incised easily, if the engraving tool is dipped into a solution of two parts of petroleum with one part of terebinthine.

To remove stains from statuary marble, take equal parts of fresh oil of vitrol and lemon juice; shake up these substances very thoroughly in s bottle; wet the spots with the mixture, and in a few minutes afterwards rub with a soft linen cloth, and the spots will be found to have entirely disappeared.

Covering small pieces of steel with brass.—Plunge them in a solution of six grammes of sulphate of copper and six grammes of chloride of tin in a quart of water. To whiten silver articles boil them in a solution of one part of cream of tartar, two parts of salt, and fifty parts of water, until they assume a fine unpolished white.

I have tried all means which were recommended to me to produce a dull polish on the steel parts of my clocks, and have not succeeded as well with any agent as with finely powdered oil-stone, rubbed together with spirits of turpentine. I have discovered this agent solely by patient trial, using fluids, &c., and I may assure the reader that I have tried a great number of nostrums.—F. Bean, in *Revue Chronometrique*.

Imitation of old silver. The *Review Industrielle* gives the following process for imparting to silver plated or silver articles the characteristic appearance of antique silver. The article is dipped in a bath of water containing about 10 per cent. of sulphide of ammonium and then scratch brushed with a brush made of glass threads or "bristles," when afterwards burnished with an agate tool its surface becomes a beautiful dark grey color.

French Polishing Rags, a new article of commerce for readily imparting a bright polish to metals, and extensively advertised as "Serviettes Magiques," are made by saturating pieces of woolen cloth about 70 centimetres in length and 10 centimetres in width with a mixture made by dissolving 4 grammes Marseilles soap in 20 grammes of water, adding 2 grammes tripoli, and coloring red with a little fuchsin; the cloths are then allowed to dry.

Kaft's alloy for medals and coins—a composition which melts at 104° C.: Bismuth 5, lead 2, tin 1. Honberg's alloy, for same, melting at 122° C.: Bismuth 3, lead 3, tin 3. Rose's Alloy, for same, melting at 93° C.: Bismuth 2, lead 2, tin 2. An amalgam to varnish plaster casts is made of tin 1, mercury 1, bismuth 1. The mercury is added to the molten metals, well united by stirring, and rubbed through the white of an egg. It forms a liquid mass, which is laid on with a small brush.

Alloy for small figures : Bismuth 5, zinc 3, lead 13 parts. This alloy melts at a low temperature, and is pretty hard without being brittle. They are first melted in a crucible or spoon, poured out and then remelted. The metal assumes the greatest conciseness of the mold, and if the figures are exposed for a short time to a thinned solution of nitric acid, then washed in water, and rubbed with a woolen rag, they will assume a beautiful appearance. One hundred parts contain, bismuth, 27.27, lead 59.00, zinc 13 64.

A soldering fluid which does not occasion rust is prepared in the following manner ; small pieces of zinc are immersed in muriatic acid and left in it until the acid is saturated with it, which may be known by the cessation of ebullition of the acid, and also by the zinc, added after that stage, being left undissolved ; add spirits of ammonia, about one-third of the quantity of the acid ; thin with a like quantity of rain water. When, at the time of adding the zinc, the muriatic acid is heated to a low degree the solving of the zinc will be achieved sooner. This fluid does not cause rust on iron or steel, and is excellent for all purposes, even for tinning.

Business Notes.

Giles Bro. & Co., of Chicago, are about to issue a fall catalogue for the use of the trade exclusively.

Burger Bros. & Co. have become the proprietors and sole importers of Albert H. Potter & Co. celebrated watches. The agency of these goods has been removed from Chicago to No. 12 John Street this city.

Levy, Dryfus & Co. offer an attractive line of opera glasses, and optical goods generally, to which they invite the attention of buyers. These goods have been imported with a special view of meeting the requirements of the holiday trade.

L. Sauter, of 65 Nassau Street, has published a book of 300 numbers of selected patterns of hair jewelry. Dealers can have it by remitting 50 cents, which will be refunded on first order. His stock of solid stone rings is very attractive.

Lapp & Flershem, of Chicago, recently received a severe shower bath, in consequence of a fire occurring in the building on the floors above them. Cold water, however, could not dampen their ardor nor abate their enterprise, for they were soon as bright and active as ever, and fully prepared for business. Their stock was not seriously injured, and the places of damaged goods have been filled with new stock.

G. W. Chase & Co., of Winterset, Iowa, have recently moved into new and commodious quarters, being a corner store in a fine brick building. Their show windows are of plate glass, and well calculated to display their goods. They have a choice stock of goods, and their new store is one of the most attractive in the place. The firm is composed of live, energetic men, who are well known to the trade in this city, and who have an excellent reputation for fair dealing.

Messrs. Simons Bro. & Co., the well known manufacturers and dealers in jewelry of Philadelphia, now occupy the first floor of their magnificent buildings Nos. 611 and 613 Sansom Street. They have fitted up their offices and show rooms in the most artistic and substantial manner, and the good taste every where displayed in the decoration of the rooms reflect great credit on the owners of the building and lends an additional charm to the artistic excellence of their production.

Aikin, Lambert & Co. present in this number of the CIRCULAR an illuminated page of designs of new goods that they now offer to the trade. These consist of pencil cases, charms, etc., which, it will be seen, are new in style and of superior workmanship. This firm keeps an extensive stock of fine jewelry on hand at all times, embracing all the latest designs in gold goods, and including precious stones of all kinds. At the recent exhibition at Sidney, one of the first medals was awarded to Aikin, Lambert & Co., for the superior quality of the goods exhibited by them, and for the excellence of the workmanship that characterized them. Their store is one of the most attractive in Maiden Lane, and the utmost courtesy is extended to all visitors.

The emblamatic show card, 14 x 18 inches, issued by the manufacturers of the Ladd patent watch case is, like all of their work, a highly creditable affair, and is quite a study in itself. The design introduces prominently the various occupations of wearers of the Ladd watch case such as mining, railroading, telegraphy, commerce or navigation, manufactures, science, and constitutional government, represented by the nation's capitol, fitly crowned by the national eagle and the starry flag of our country, all artistically wrought in the picture with excellent effect, in twelve different colors. It will be sent to every dealer in the trade free of cost on application to the manufacturers of the case with business card and address.

Henry Abbott, of No. 7 Maiden Lane, offers to the trade a new patent stem-winding device for changing watches from key to stem-winders. The parts are all finished, and are fitted to each other in such a manner that the winding device is attached to the watch as a whole, and by a single operation, instead of fitting the parts one at a time, as is done in all methods in use heretofore The stem is made sufficiently small to allow it to pass through the neck of almost any pendant that is made, and the crown is of the proper shape to fit a round pendant, so that it will very seldom be necessary to send the case to a case-maker for alteration. This winding device will, without any alteration, fit any one of the "American Full-Plate" watches, and it may be modified so as to apply to a great many different kinds of watches. Full directions for fitting to American watches accompany each set of material.

Jewelry and Fancy Articles in Europe.

JEWELER, United States Consul at Stuttgart, writes as follows:—"It is a surprising fact that goods of this description imported from the United States in large quantities, by dealers in many, who, until a recent date, have been chiefly engaged in importing America with similar articles of luxury. Fancy rubber goods in great variety, gold and aluminium pencils, gold pens, lockets and Volume rings, chains, cast iron in combination with glass, ink-stands, and many other specialties, are found in nearly all of the better class of shops here, while the export of jewelry to the United States from Pforzheim and Hanau (the two great jewelry centers) has substantially ceased. A few facts regarding the former importance of this export trade, and the apparent cause that led to its decay may be of interest. The volume of business between the United States and Southern Germany in this particular branch has, in the past, been very large, and seems to have reached it greatest dimensions in the year 1873, when it suddenly began to decline in such a rapid manner that, of more than a dozen firms engaged in this line of business, only two or three now remain, and even these are compelled to manufacture in the United States, or be driven out of the market altogether. For various reasons Germany can no longer compete with New York, Newark, and Providence in the manufacture of jewelry suitable for the American trade. The period immediately following that of the great American rebellion created an immense demand for all articles of vertu in the United States, foremost among which was that of jewelry of every description. Germany, being an old manufacturing country, became a very large contributor to the demands of the United States, and remained so as long as cheap labor alone was the important factor in producing marketable wares; and, although the United States impose a duty of 25 per cent. *ad valorem* upon all jewelry brought into the market, the German manufacturers were, nevertheless, able to compete with the American producers. The great demand for this class of goods, however, stimulated the American manufacturers to produce new and ingenious inventions in machinery which took the place of hand labor. At the same time the continually growing competition stimulated to emulation until they produced articles superior in taste, workmanship and style to the European goods, and at a less relative cost. This rivalry among the American manufacturers did not cease with the decline of business, which virtually commenced in the fall of 1873. On the contrary, it seemed to stimulate them to renewed efforts, until now they have no superiors in the art of manufacturing jewelry. As a natural consequence of the decline in trade, the price of labor began to fall correspondingly and has continued in its downward tendency until it has reached as low a figure, probably, as in any other manufacturing country that could compete with the United States in the production of jewelry. With the greatly reduced price of labor, and the continual introduction of new labor-saving machinery, New York, Newark, and Providence (the three great jewelry manufacturing points) made great progress in the production of fine goods. Germany, on the other hand, introduced but little new machinery, and, in some instances where a few of the more enterprising manufacturers did attempt to improve their productions by using tools similar to those used in the American workshops, they were met with such decided opposition on the part of their workmen, that they were compelled to discontinue their use, and again resort to old methods, under which the business has declined to a mere fraction of its former importance. With no important improvements in tools and machinery, and in the absence of cultivated and refined taste in a large portion of their goods, it was impossible for German manufacturers to longer retain their former position in the markets of the United States, and, as the result has shown, they are now buyers instead of sellers, and take their lessons in artistic manufacture from the younger apprentice whose superior genius and skill has been developed by adhering to liberal and progressive ideas in his relations to men and the business he controls."

Destruction of the Ansonia Clock Company's Factory.

THE Ansonia Clock Company's immense factory in Brooklyn was entirely destroyed by fire on the morning of the 27th ult. This factory was but recently finished, and was considered the most complete and extensive clock factory in the world. The building, which covered an entire block of ground, was filled with new and valuable machinery, some of which was novel in its construction, and to be found in no other factory. The fire bears evidence of having been the work of an incendiary. It originated in the coffee room or kitchen, not readily accessible, and where carelessness in regard to fire was not likely to occur. The night watchman discovered the smoke, and traced it to this room. He used every exertion to put out the flames, but without success. Some 1,000 men were employed in the factory, and, on the day previous to its destruction, it had turned out 2,500 completed clocks, ready for shipment. These employes will be thrown out of work until the factory can be rebuilt. The factory was insured, but to what extent we are not informed at this writing. The loss is estimated at $500,000, which is largely in excess of the insurance.

Silvering by Cold Rubbing.

MAKE paste by thoroughly grinding in a porcelain mortar, out of the light, water, 9 to 5 ounces; chloride of silver, 7 oz.; potassium oxalate, 10½ oz.; salt (common table) 15 oz.; sal ammoniac, 3¾ oz.; or, chloride of silver, 3½ oz.; cream of tartar, 7 oz.; salt (common) 20½ oz.; water to form a paste.

Keep in a covered vessel away from the light. Apply with a cork or brush to the clean (metallic) copper surface, and allow the paste to dry. When rinsed in cold water the silver presents a fine frosted appearance, the brightness of which may be increased by a few seconds' immersion in dilute sulphuric acid or solution of potassium cyanide. The silvering bears the action of the wire brush and of the burnishing tool very well, and may also be oxidized. Should a first silvering not be found sufficiently durable after scratch-brushing, a second or third coat may be applied This silvering is not so adhering or white on pure copper as upon a gilt surface.

For the reflector of lanterns the paste is rubbed upon the reflector with a fine linen pad; then, with another rag, a thin paste of Spanish white or similar substance is spread over the reflector and left to dry. Rubbing with a fine clean linen rag restores the lustre and whiteness of the silvered surface. The paste is sometimes mixed directly with the whiting and left to dry, or nearly dry, then rubbed down as described.

WE desire to call attention to the advertisement of Le Roy W. Fairchild, manufacturer of gold pencils, charms, etc., which appears in this issue of THE CIRCULAR. This advertisement appeared last month, but, owing to a typographical error, the various designs were numbered. There should be no number used to designate these different goods, but in ordering, they should be specified by naming the character of the design wanted. Mr. Fairchild is constantly introducing novelties in his line, and has taken numerous premiums at various National exhibitions for the excellence of his goods, and the attractiveness of the new designs he presents to the trade.

J. GARNIER has reported to the French Academy of Sciences his method for producing malleable nickel of different degrees of hardness. Melted nickel is rendered by holding a larger or smaller quantity of oxygen in solution. M. Garnier removes this oxygen by the addition of phosphorus. Nickel containing not more than three-thousandths of phosphorus is soft and malleable, but when it contains more its hardness increases at the expense of its malleability. One method used for incroporating the phosphorus is to add to the melted metal in suitable proportions a nickel phosphide obtained by melting together a mixture of calcium phosphate, silica, coke, and nickel,

THE following substitute for oil in sharpening tools is given by a French paper: Instead of oil which thickens and makes the stones dirty, a mixture of glycerine and alcohol is used, The proportions of the mixture vary according to the instrument operated on. An article with a large surface, a razor, for instance, sharpens best with a limpid liquid, as three parts of glycerine to one parl of alcohol For a graving tool, the cutting surface of wnich is very small, as is also the pressure exercised on the stone in sharpening, it is necessary to employ glycerine almost pure, with but two or three drops of alcohol.

Trade Gossip.

"*Astore*" is now the rival word to "Mizpah" for engagement rings, and it means "My darling."

The latest novelty in bracelets are of white kid, hand painted and mounted with narrow strips of gold.

Burns, the poet, died in fear of a jail. Had he seen the Steel statue in bronze, he might have lived to satirize it.

Many a jewelry and spectacle peddler has discovered that the "welcome" on a door mat refers to the third house around the corner.

Chas. D. Rood, of the Hampden Watch Co., has led to the hymenial altar, Miss Caroline C. Abbe, one of Massachusetts' fairest daughters.

Scarfpin novelty: An owl on a silver disk ogling the man in the moon, who is smoking a meerschaum pipe and around whom twinkle tiny stars.

Achille Seligman, accused of smuggling diamonds, was taken before Commissioner Shields and gave bail in $5,000 to appear for examination.

Mr. Cross, of the firm of Cross & Beguelin, has returned to business with health fully restored. His genial countenance beams upon the Lane now daily.

Jet and onyx bracelets are extensively worn in England. The demand for these goods is so great that manufacturers are unable to keep up with their orders.

The partnership heretofore existing between Bernays & Roeck, jewelers of Little Rock, Ark., has been dissolved by mutual consent. Mr. Bernays will continue the business.

E. P. Chester, of Lawrence, Kas., and L. F. Cornwell, of Canon City, Col., have formed a copartnership under the firm name of Chester & Cornwell, and will shortly open with an attractive line of jewelry at Canon City.

A firm of watchmakers in Switzerland employed trained carrier pigeons to carry small watches into Rome. They were successful for a time until the Custom authorities discovered them, when the trade was broken up by the officers shooting the winged smugglers.

A watch which had not gone for two years, and defied the best efforts of the watchmaker, was recently struck by lightning in the course of a severe storm near Vienna, and now a Vienna paper announces with the solemnity of truth that the watch has kept excellent time ever since.

The excitement consequent on the discoveries of new diamonds in the Free State of South Africa, according to the latest intelligence, has not abated in intensity. Three new rushes have been reported. A gem of the first water, weighing fifty carats, and worth $30,000, had been unearthed at the Jagersfontein diggings.

Conch pearls, comparatively unknown in the trade in this country, are highly prized by English and French jewelers. They are valued at from $15 to $25 a carat, according to quality and shape. The bright pink being the favorite shade, is of course exceedingly rare, and consequently commands a fancy price. These pearls are found in the rivers of South America and among the Bahama Islands.

"What's the use," asks the San Francisco *Post*, "of talking about art culture in San Francisco, when it is an open secret that a certain rich mining man recently sent to Florence for a copy of the Venus of Milo, and when the statue was delivered actually sued the Central Pacific Railroad Company for mutilating a work of art, and, what is more, recovered damages?"

"Say, mister," as he walked up to the proprietor of a jewelry store who stood behind the counter, "have you got any of these here finger rings—these here—these—oh, I forgit what you call 'em?"

"Gold rings?" asked the proprietor.

"No, not quite gold rings—oh, yes; hypocrite gold rings; that's it."

"I can't understand what you mean by that," said the proprietor, with a stare.

"I mean," said the young man, "this kind of gold that looks like gold and isn't gold; this here kind that most everybody is wearin' nowadays. I want a ring for my girl, and I want you to scratch on the inside 'Jim Brown to Sallie Jones.' Don't care what it costs. You can go as high as halt a dollar for it if you want to. It's a betgagement ring."

The boss took it all in and soon fixed him off with a "hypocrite" gold ring, done up in the softest cotton.

A Brooklyn genius has recently been going about
ing up old played out movements of American n-ll catalogue
has succeeded in accumulating several bushels of ti
has a number of tinkers at work putting them in orde
sufficient life into them to make them tick. When this importare to be sent to South America and sold as American w agency
don't know of any law to prevent this being done—more- John

Recently the store of Bernays & Roeck, of Little Ro
was robbed of upwards of $1,000 worth of jewelry. Two and
were engaged in the robbery, one of them sneaking behind the s
ter in daylight, while the person in charge was engaged, and op
the show case, abstracted the goods therefrom. Both thieves w
subsequently caught at Helena, while perpetrating another robb
and most of the goods recovered. Mr. Bernays rewarded the offic
who made the capture by presenting him with a fine cluster diamond pin.

Mr. Streeter, F. R. G. S., a well known jeweler, writes to an English paper that there should no longer any misapprehension as to the quality of some of the stones found at the Cape of Good Hope. The statement that "the best Cape diamond is a slightly yellowish and certainly inferior stone to the best Indian diamond," he says, is incorrect, as it is acknowledged that many Cape diamonds are of the finest quality known, more especially those from the celebrated Jagersfontein mine, and their specific gravity is greater than that of the Brazilian stones.

For some time past quantities of gold have been stolen systematically from the firm of Carter, Howkins & Sloan, in Newark. The whole force of employes was put under surveillance, and the result has been the indictment of John Nenninger and his wife Mira, and Henry Harris for larceny. Nenninger was the melter and watchman, and lived with his wife in the factory building till recently. Harris was the engineer in the factory. There are two indictments against each. They, with Nenninger's wife, were arraigned before Judge McCarter and placed under $1,000 bail each, to appear for trial.

W. J. Suttie, who has been contributing to THE CIRCULAR a series of articles on spectacles and eye-glasses, notifies us that we will have to get along without his article this month, because he has just been getting married. While we do not like to miss his contributions, we suppose we shall have to excuse him this time under the circumstances, provided he will promise not to get married again this year. The interesting event took place Oct. 6th, at St. Patrick's Cathedral, in Newark, and the name of the young lady who has made our friend happy was Miss Marie Rutherford. We congratulate him on his second venture.

The Chicago Jewelers' Association is an organization comprising in its membership the leading manufacturing and jobbing firms of that city, and is exercising a beneficial and wholesome influence on the trade of the West. Its object is to correct as far as possible the abuses that creep into business. Information gathered by any member of the association of interest to the trade is made known to other members, and such use made of it as is calculated to best serve their interests. The association was organized in 1876, was incoporated in 1880, and under the leadership of Pres. Herman F. Kahn and Sec. Elisha Whitehead, has done excellent service.

James U. Poole, of London, an earnest advocate of the hall-mark ing system, has recently been writing a series of articles for the local press favoring hall-marking, in preference to the simple trade marking by individuals. He takes the ground that that the hall-mark is a guarantee of quality, and is placed on the goods by experts other than the manufacturer himself. We are in hearty sympathy with Mr. Poole on the point of having a fixed standard for manufactured goods, and would be glad to see the English system, within certain limitations, introduced in this country. It would be the simplest and cheapest method that could be adopted to drive out of the market unscrupulous manufacturers and base metal goods.

The cradle of the infant Princes of Spain is of polished ebony, inlaid with silver; its form is that of an open shell; the curtains are of silver gauze enameled with white velvet flowers, the coverlet of white satin on which are embroidered in brilliant colors the arms of Spain. One lady *grandesse* of Spain stands at the foot of the cradle during the royal infant's slumber to watch the precise moment of her awakening; another *grandesse* stands at the head armed with a huge feather fan to chase away the flies. The royal Spanish crown, which in silver gilt hangs in front of the cradle, is the work of Fromen, the great Parisian goldsmith. The cost of the cradle, without the hanging of fine lace and garniture of marabout feathers which surround it, is estimated at $1,400.

THE

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THE

JEWELERS' CIRCULAR AND HOROLOGICAL REVIEW

The recognized organ of the Trade, and the official representative of the Jewelers' League.

A Monthly Journal devoted to the interests of Watchmakers, Jewelers, Silversmiths, Electro-plate Manufacturers, and those engaged in the kindred branches of art industry.

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Review of the Year.

THE jewelry trade, in all its branches, has reason to congratulate itself upon the amount and character of business done during the year 1880. The beginning of the year found manufacturers and dealers in doubt as to the future, and undecided whether to spread their sails in anticipation of prosperous breezes, or to prepare for the rough weather of continued business adversity. During the fall of last year there had been a little spurt of business activity, and THE CIRCULAR, studying the signs of the times, predicted a prosperous year. But demoralization had overshadowed the country so long, that many doubted if the time had yet come for a business revival. Consequently there was doubt and hesitancy throughout the trade, and it was not until orders came flowing freely in upon them that manufacturers were fairly aroused to a realization of the fact that good times had come to stay, and that they had not made adequate preparations for the event so long looked for. The predictions of THE CIRCULAR have been fully realized; the volume of business transacted has not been equalled in many years; the number of failures have greatly fallen off; and the demand for the better grades of goods has wonderfully improved.

One of the most noticable features of the improved condition of the trade lies in the fact that there has been a large and steadily increasing demand for fine goods, artistic in design, and rich in material and workmanship. More diamond goods have been sold during this year than ever before in a single year, while precious stones of all kinds have found a ready market. In the diamond trade the demand has been largely for the choicest gems, and Europe has been ransacked by our importers to obtain the best stones that were purchasable. Many of the cheaper varieties of stones have also found a ready sale. But for all classes of fine artistic jewelry, the demand has been unprecedented, showing that as the people of the country recover from the disastrous effects of the panic and the years of business stagnation that followed, they are anxious to indulge their taste for the beautiful and the artistic. The æsthetic taste of the American people has undergone a wonderful degree of cultivation within the past decade, owing largely to the great number that have visited Europe and enjoyed the privilege of studying the art treasures of the older countries. They have returned with a higher appreciation of art in all its forms, and a willingness to recognize it whether presented by the painter, the sculptor, or in matters of personal adornment. Hence, our manufacturers of jewelry have been actively employed during the year in perfecting new designs and originating novelties in fine goods to supply this desire for artistic work. As the country grows richer year by year, it will be but a short time before we shall excel the European countries in the production of all art work, for when the desire for it is once stimulated, it grows with the capacity to satisfy it.

In the cheaper grades of goods there has also been a large and unexpected demand. Manufacturers hesitated so long to accept the indications of returning business prosperity, that they were unprepared to fill the orders that poured in upon them during the first part of the year. Many of them were forced to run their factories night and day, and still could not catch up with their orders. From the beginning of the year to the present time, there has been scarcely an intermission in the rush of business. As a consequence, the wholesale trade finds itself short of goods now, and the close of the year will see them with a shorter stock than they have ever carried over to the beginning of the new year. In solid and plated silverware the demand has been quite as active as in jewelry. Manufacturers have had their hands full all the season, and have been exceedingly industrious in getting up new and elegant designs for their wares. The degree of excellence attained in the past few years in the manufacture of this class of goods is something marvelous. It has surprised our English neighbors, who find themselves excelled in an industry of which, but a few years ago, they apparently had a monopoly. In the watch trade there has been the same activity displayed as in the other lines referred to. With their extensive factories and unequalled machinery, the watch companies have not, at any time during the year, been anywhere near even with their orders. If orders were to cease coming in to-day, it would require months for them to fill those they now have on their books. Here, too the demand for the better grades of goods is increasing, and some of the companies have been obliged to duplicate their machinery for the production of their best watches. This, of course, has kept the casemakers busy, and they, too, have had an active season. In this branch, however, there has been a tendency to overproduction, and there are now more cases in the market than there are movements to put in them. Of course, with an overstocked market, the margin of profit is reduced, and the casemakers have not fared so well during the season as workers in other branches of the trade. Importers of watches, too, have done a thriving trade as a rule, finding here a ready sale for all the regular goods they have brought over, more especially for those of the cheaper grades.

It is generally conceded that the year during which a President is elected is not a good year for business, but 1880 has been an exception to this rule. During the few weeks immediately preceding the election, when the political excitement and party feeling were at fever

heat, there was something of a falling off in the volume of business, but, notwithstanding this, when the books are closed for the year it will be found that the amount of goods sold has been enormous, exceeding the transactions of the previous year by at least one-half. It is also a fact that during the year there has been less complaint of irregular practices in the trade. While all have been legitimately employed in supplying a legitimate demand for goods, and having but a short supply of the goods most wanted, there does not seem to have been that desire among the members of the trade to resort to questionable and unbusinesslike methods to obtain custom. The general prosperity of the trade has had a tendency to breed good morals in the prosecution of the business. Perhaps a few more years of activity will entirely eliminate from the trade those irregular practices we have had such frequent occasions to condemn. With a ready market for all the goods that are produced, there is little temptation for those holding them to run an acrimonious tilt with their competitors to secure trade, and there is, consequently, less friction. The margin for profit should be larger, likewise, and we are sure that when the books are balanced the trade will find that a healthy, wholesome competition is to be preferred, even from the dollars-and-cents standpoint, to a bitter rivalry that pays little heed to cost and expenses.

1880 closes with a good record, so far as the jewelry trade is concerned. Its advent let in the first gleam of sunshine that had been visible for many years, and, as the weeks and months rolled by, the promises of its infancy were redeemed both in its manhood and its old age. It fades from our view now with the bow of promise still brightly shining, lighting the way for 1881, reluctantly laying down its good work for the new year, with its youth and vigor, to pick up and push forward to a happy fruition.

Pirating Patented Designs.

IN the November issue of THE CIRCULAR we alluded briefly to the fact that Miller Bros. had triumphed in their suit against Albert J. Smith and Dutee Wilcox. This case is one of so much importance to the trade, and has been tested to such a degree of stubbornness, that it is entitled to more than the passing notice we were able to give at that time. The case, briefly stated, was as follows: Miller Bros. designed a series of rustic letters, to be used as initial letters for sleeve buttons, and other articles of jewelry; these letters represented the trunks and branches of trees, on which were leaves in relief; the designs included all the letters of the alphabet, and for these designs they obtained letters patent. The defendants adopted the designs, and made goods in accordance with them, which they sold extensively to the trade. Miller Bros, applied for an injunction to restrain the defendants from infringing upon their patent, but at the preliminary hearing, the Court refused to grant the injunction. Miller Bros., however, pressed their case, and the final decision of the Circuit Court of the United States, Judge Clifford delivering his opinion, not only fully maintains the validity of the patent, but requires Smith and Wilcox to make an accounting to the complainants of all goods made by them in violation of the patent.

The defense set up was, 1st, that the complainants were not the original and first inventors of the alleged improvement. 2d, that the charge that the respondents had infringed was untrue. 3d, that the alleged improvement was in public use, and on sale in the United States more than two years before their application for a patent. Leading jewelers in the trade were called as witnesses, and by these it was shown that rustic letters of the kind designed by Miller Bros., were not known in the trade previous to the introduction of those patented by them. They also testified that the patent was a valuable one, as the goods at once became popular, and were sold in large quantities. On this point the Court said: "Sufficient appears to show that the complainant's were jewelers, and that for a series of years they had been endeavoring to produce an initial letter sleeve button, which would be more ornamental and better suited for ladies' wear. Proofs were introduced showing many such experiments, and giving a history of the efforts to that end, and an account of the time and expenses incurred for its accomplishment, all of which resulted finally in producing the patented design. Experienced witnesses testify that they know of no other design relating to this class of goods which has been as successful as the subject of the patent in controversy; and the Court is convinced that the invention is highly acceptable to the public and profitable to the patentee."

Referring to the defendants' evidence to show that similar designs had been in use in the trade before a patent was issued to the complainants, the Court said the testimony of experts was clear as to "the difference between figures in actual relief, such as are the subject of the patent in question, and figures where the effect is produced upon the eye merely by linear representation, or artificial shading, as shown in several examples submitted." In concluding, the Judge said: "Speaking in the general sense, it is doubtless true that the test of infringement, in respect to the claims of a design patent is the same as in respect to a patent for an art, machine, manufacture, or composition of matter, but it is not essential to the identity of the design that it should be the same to the eye of an expert. If in the eye of an ordinary observer, giving such attention as a purchaser usually gives, two designs are substantially the same, if the resemblance is such as to deceive such an observer, and sufficient to induce him to purchase one, supposing it to be the other, the one first patented is infringed by the other. Apply that rule to the case before the Court, and it is so obvious that the charge of infringement is sustained by the proof, and by the comparison of the opposing exhibits, that it is scarcely necessary to give the matter any further examination. Both the testimony of the complainants' expert, and the comparison of the exhibits made by the Court, are decisive that the manufacture by the respondents is, in the sense of the patent law, substantially the same as that of the complainants, which show that the complainants are entitled to an account."

Numerous designs for jewelry have been patented in the past, and have been pirated by unscrupulous manufacturers with comparative impunity. Either the amount involved did not warrant litigation, or the inventor was doubtful of maintaining his patent, in view of the unsettled condition of the patent laws and decisions, that they failed to prosecute the infringers. But in the present case, the infringement was so defiantly made, that Miller Bros. resolved to prosecute to the end as a matter of principle. If a patent conveyed any rights, they thought the trade should know the fact; if not, then it was time to stop paying the Government for patents that afforded no protection. It was to ascertain whether patented designs were to be reckoned as valuable assets of the patentee in the future, or the common property of whoever chooses to steal them, that they prosecuted the suit with so much trouble and expense. The decision in their favor virtually settles the question that patents are property, and entitled to the protection of the Courts; further, that novel designs are patentable quite as much as machinery or any mechanical device. It has been a common saying that a patent conveyed no rights upon its owner, except the right to be involved in expensive litigation. It has, also, been the practice to throw the burden of proof upon the patentee to show that the thing patented was original with him, the fruit of his genius, and was of value to the community. Judge Clifford holds that the patent itself is *prima facie* evidence of the originality of the thing patented, and that it rests with the infringer to overthrow this evidence. This may have been the purport of previous decisions, but the popular belief has been that the burden of proof was imposed on the patented. If it shall be thoroughly understood in future that all proper tribunals will accept a patent as *prima facie* evidence that the owner thereof is entitled to the protection of the Court, we shall have fewer cases of infringements of patents. But a patent should be worth more than this—it ought to entitle the owner without further evidence, to an injunction to restrain infringers from pirating the thing patented. The Courts are coming more and more to regard a patent as something of value to the owner, and a thing to be protected by law; when this is clearly understood, the field for American genius and ingenuity will be very much widened and made far more profitable to inventors.

Conscience and Wages.

A REMARK frequently heard in the trade regarding some individual is "he is a good man, but high priced." This should be construed as a compliment to the person referred to, for it may be taken for granted that he is proficient in that branch of the business to which he has devoted his attention. It is a pretty sure indication that he has mastered his business thoroughly and conscientiously; that he has compared his work with that of others in his line, and is conscious of its superiority; that he is high-priced because he knows his value. It may be taken for granted that the man who demands full compensation for his labor, puts heart and conscience into his work. The cheap man, who is willing to work for any sum offered, will seldom render more than eye-service—he will work while you watch him, but when your back is turned, slights his work and gets through with it with the least possible trouble to himself. It makes no difference to him whether customers are satisfied or not; his only interest lies in getting around to pay day as quickly as possible. The man who thoroughly identifies himself with the interests of his employer, putting his conscience into everything he does, and feeling a personal pride in the business with which he is identified, has a right to be high priced, and is worth a dozen of those who simply render eye-service. It matters not whether such a man is employed in the counting room, on the road or at the bench; wherever he is to be found, he is sure to be a source of profit to his employer. In nearly every place where there is a retail jeweler, there is pretty sure to be found one who is spoken of as a "good workman, but high priced." It is just these high priced workmen, who have thoroughly learned their trade, who refuse to slight their work, but persistently put their conscience into the labor of their hands, and demand adequate compensation for their work, that give character and tone to the trade, while those that slight their work are doing all that lies in their power to undermine it and bring it into disrepute. In the matter of watch repairing, there should never be a "low priced man." To thoroughly understand a watch and to be able to repair it properly, a man must have spent years in learning his trade; he must be intelligent, skillful and conscientious; he must be competent to make and supply missing or broken parts if necessary. Intelligence and skill of this character entitle the man possessing them to be high priced, and, if the public appreciated the difference between cheap work and good work, it would never begrudge the high priced man the compensation demanded. Unskilled, cheap labor has ruined watches innumerable in the attempt to repair them, and has brought discredit upon the manufacturers, who were entirely blameless. Had those who entrusted their watches to the cheap workman because he *was* cheap, known the value of the labor required, or the danger of ignorant persons tampering with their watches, they would have realized that the high priced man was the cheaper in the end.

There never was a truer saying than that "the laborer is worthy of his hire." He is also entitled to compensation corresponding to the character of the service rendered. The inevitable laws of supply and demand fix the maximum and the minimum prices for labor, but within those limits there is plenty of room for the exercise of discretion. He is the cheapest man who serves his employer best, and one who puts his conscience into his work, making his employer's interests his own interests, is worth half a dozen whose sole ambition is to have pay day come around quickly. A certain commercial traveler may be counted as a high priced man, but if his sales are fifty per cent. more than another's, he is entitled to fifty per cent. more compensation than that other. High priced men can safely be trusted to maintain the dignity, integrity and reputation of the houses they represent, wherever they are placed, while the cheap man, incompetent to earn the highest compensation, may just as surely be expected to bring discredit upon his employers. We have known the reputations of good houses to be seriously impaired among retail dealers because of the injudicious acts of some inexperienced traveler who had been sent out on the road because he was willing to work and travel cheaply. We have known, also, customers driven away from houses because of the discourtesy of some cheap salesman, whose salary was not sufficient to induce him to care whether he consulted his employer's interests or not. Dissatisfied with himself, his surroundings and his prospects he was not likely to be in a humor to care whether he pleased customers or not. Fair compensation for faithful service always pays best. The man who is satisfied with the amount paid him for his labor, is worth far more than one who is constantly complaining that he is not paid enough. Such a grumbler should be paid more, if he is worth it, or summarily got rid of if he is not. But when the public get into the habit of saying of a man "he is high priced," it can be taken for granted, as a rule, that he knows his business, is a skillful workman at his calling, and has too much self respect to accept inadequate compensation for services rendered. William M. Evarts, for instance, is accounted a master of his profession and a high priced man; yet, in a case requiring the best legal talent, who would think of employing a cheap Tombs shyster when Mr. Evarts could be had for any price? High priced men are the salt and the leaven of the jewelry trade, as of every other—masters of their business, distributing conscience freely through their work, and having at heart too much respect for their business and for themselves to degrade it or them to the level of common labor and common laborers. The trade should be thankful for its high priced men, and strive to cultivate more of them.

The British System of Hall-marking.

ATTEMPTS have been made during the past few years, to secure the repeal of the law that prevails in Great Britian, requiring manufacturers of gold and silver goods to have them stamped with the Hall mark. This movement for a repeal of the law has been made in the interest of a class of manufacturers who wish to see all restrictions upon free trade in spurious goods removed, and the utmost license accorded to them to deceive the public as to the quality of goods sold, the same as does the corresponding class of manufacturers in this country. Opposed to the repeal of the Hall-marking statute is arrayed the principal manufacturers of staple goods. A committee of Parliament investigated the subject at one time, took a vast amount of testimony, and, as a result of their inquiries, reported against repealing the law. The subject has been revived, however, and an interesting discussion has been going on in the papers, Mr. James U. Poole appearing as the champion of the law and honest manufacturers, while Mr. E. I. Watherson, "Hon. Secretary to the Goldsmiths' and Silversmiths' Free Trade Association" representing that class of manufacturers who would see all restrictions upon fraudulent goods removed. We have been favored with copies of a pamphlet containing a portion of this correspondence, and we are free to assert that Mr. Poole, as champion of the Hall-mark and honest goods, has by far the best of the argument. He shows that, while the Hall-mark is a stamp of value, and a guarantee to purchasers that the goods bearing it are of the precise value indicated by the stamp, the abolition of the Hall-mark would open the door to fraud, and cause the markets to be flooded with goods made of debased metal in such close imitation of the genuine goods as to utterly deceive the ordinary purchaser.

We say to the honest manufacturers of Great Britian, hold on to your Hall-mark; do not relinquish a fraction of the security it throws around honest goods; on the contrary, make the law more stringent if possible; increase the penalties for forging or evading the Hall-mark; and, further, prohibit all foreign-made goods from using the stamp; make your Hall-mark purely and essentially a distinct British institution, and preserve it for the sole use and benefit of British artisans. All the evils that the trade suffers from in this country arise from the fact that we have no stamp of value; no national symbol by means of which non-expert purchasers can distinguish the genuine from the spurious. The longer you permit our manufacturers to use your Hall-mark on the goods they manufacture for foreign consumption, the longer you delay the adoption by this country of a standard for wrought gold and silver, and the enforced use of a stamp

of quality. Every tub should stand upon its own bottom. American made goods are as distinctively American as French goods are French and German goods German. As they have their peculiarities of design, form, workmanship, and value, so they have, also, their peculiarities of quality. They should carry with them a certificate of quality—of the genuineness of the metal. This assured by a stamp of quality, persons can exercise their own judgment as to the value of the workmanship expended upon the metal. It is in the substitution of degraded metal for the pure article that the deception lies, and this deception is only discoverable by the application of tests that are beyond the reach of the ordinary purchaser. Because we have no national standard of wrought gold and silver, and no stamp of metal value, fraud and deception run riot in the trade. Goods made of 8 or 10 carat gold are brazenly marked 14 or 18 carat, and sold as such ; the best designs of our most skillful artisans in genuine goods, are fraudulently copied in debased metal, and exposed side by side with the genuine. Rolled plate and filled goods are palmed off by unscrupulous dealers for pure gold, and the public is deliberately swindled. Frequently the dealers themselves are imposed upon by the spurious articles, and made the innocent confederates of dishonest manufacturers. The only barrier now existing between the purchasing public and these dishonest practices is the reputation of the seller, and this, of course, avails nothing with strangers. A few manufacturers have adopted trade marks, but, unless the goods are bought direct from them, the trade mark is of little value, because it can be so nearly imitated without legal liability as to utterly deceive buyers.

The only remedy for these bold and outrageous swindles is the enactment by Congress of a law prescribing fixed standards for wrought gold and silver, and providing that all goods sold shall either be stamped to indicate the quality of the metal of which they are composed, or be accompanied by a certificate to the same effect, for which purpose a bill of sale should be considered a certificate. Severe penalties, embracing fines, imprisonment and forfeiture of goods, should be provided for violations of the law. Such a law need not prohibit the manufacture of cheap goods—for which there is a legitimate demand—but it would prevent the sale of 10 carat goods as 18 carat, and of rolled plate or filled goods for genuine gold. Let us have our own system of marking, our own certificate of quality, and it will not then be necessary for American manufacturers to secure the British Hall-mark upon their goods to assure foreign purchasers that they are not being made the victims of Yankee trickery. The Birmingham daily *Globe*, according to Mr. Poole, asserts that in 1878 thirty thousand American watch cases were stamped at Chester with the British Hall-mark. That is to say, American manufacturers had to get a British certificate as to the quality of the metal of which these cases were made. Without such certificate, American goods would be unsalable in foreign markets. This is a disgrace to America, and an insult to American manufacturers. No matter how much superior in point of artistic design and workmanship our goods may be, they will not pass abroad unless they have the British stamp of quality. That this is a fact, is all the evidence necessary to the value of such a system. The Hall mark of the Goldsmiths' Company, sanctioned by the laws of Great Britan, upon gold or silver goods, is received throughout the world as a certificate of quality quite as readily as is the impress of the British mint upon a gold or silver coin.

But beyond the fact that the Hall-mark is notice to all the world of standard quality, it prevents the imposition upon the public of base metal for genuine. This stamp is affixed by experts who are not interested in the manufacture ; the maker of the goods has no voice in placing the mark upon his wares ; he sends them to the designated place to be marked, and they are returned to him indelibly stamped with a symbol that indicates to all observers their quality. To counterfeit this stamp is forgery, consequently, manufacturers of cheap goods are unable to impose upon buyers as to their quality. Here the reverse is true, and while nine out of ten of our manufacturers are honest, and sell their goods for just what they are worth, the tenth man fills the market with spurious goods, and makes extraordinary efforts to sell them. There being no law to prevent him, he can lie about them to his heart's content, and, having no conscience, swears, with the utmost alacrity, that 6 carat goods are 14 carats fine, and that filled goods are solid gold. Further, he will stamp "18 k." upon goods that are nine-tenths alloy, without changing a muscle or winking an eye. By actual assay, cases marked 18 carats fine have been found to contain less than 8 carats of gold, yet the public has been deceived into paying the price of 18 carat goods. Surely, Congress owes it to the citizens of this country to protect them from such barefaced swindles as this. Mr. Poole is doing good service in fighting for the maintainance of the Hall-marking system. We wish some equally energetic champion of honest dealing would turn up in this country to urge upon Congress the necessity for a similar system here.

The Jewelers' League.

We devote this column to the interests of the League and its membership. Letters or inquiries pertinent to its business or purposes, and which might interest the trade or inquirers, will be herein answered. Address *Jewelers' League, Box 4001. P. O. New York*, or the office of THE CIRCULAR.

At the regular meeting of the Executive Committee, held on Friday evening, November 5, in precedence of all other business, addresses were made by the the chairman and several of the members, appropriate to the subject of the death of the President, and in order to show the proper respect to his memory, a resolution was passed appropriating a page of the minute records of the League which should be properly inscribed to express the feelings of the League in view of its severe loss. A sub-committee, appointed for that purpose, have prepared the following memorial :

The Jewelers' League of the city of New York, by the death of its President, Thomas Slater, has met with a loss which, sincerely as it is regretted by the members, is most keenly appreciated by the members of the Executive Committee, who from their continuous association with him, in the execution of the business of the League, had learned to regard him with the most profound respect, indnced by his many sterling qualities of mind and heart.

In him we had a President possessed of a broad, comprehensive business ability, an executive talent which qualified him eminently as a counsellor, and with the strong, manly qualities of heart, which, in a manner scarcely apprehended, drew toward him, and bound by the strongest ties of friendship, all those with whom he held business or social intercourse. These inherent attributes, together with his equable temperament, were but the sources whence emanated and which actuated his unvarying, kindly, courteous demeanor toward all with whom he came in contact.

Our sorrow for his loss cannot be measured by mere words. Whilst our sadness is deepened by the tragic suddenness of his decease, it causes us to the more deeply realize the affliction and grief of, and the more heartily to tender our sincerest sympathies to those to whom he was allied by the most sacred ties of husband and father. Such men as Thomas Slater are rare. We shall miss him and mourn him long.

Upon the resumption of the routine business of the session, and in compliance with the requirements of section 6, article IV of the Constitution, the Third Vice-President, Mr. Augustus K. Sloan, was appointed President until the next annual meeting, and Mr. Henry Hayes was appointed Third Vice-President for the same term.

Eighty-one (81) applications for membership were accepted, but on account of press of matter this month, the publishing of the names will be deferred to another month.

The assessment following the death of John James Barker was declared closed by the lapse of time and four members were dropped from the roll for non-payment within the usual limit of time. These delinquents may be reinstated upon furnishing good reasons for their default and submitting to a new medical examination.

The full membership now numbers 946, and with a proper effort by each member it can be placed at 1,200 before the next annual meeting.

As we go to press we learn of the death of George A. Harris, of of Norwich, N. Y., caused by pneumonia.

Obituary.

THOMAS SLATER.

"He was a man; take him for all in all, I shall not look upon his like again."

It has been but seldom that the jewelry trade has received so severe a shock as it did on October 29, when the sudden and unexpected death of Thomas Slater was announced. On that day he was officiating as Marshal in a great Republican parade at Newark—a parade in which all the trades and manufacturing industries were represented—when he was stricken with apoplexy, fell from his horse, and expired almost instantly. When the sad intelligence was communicated to his fellow jewelers, each one felt bereaved, as though a near and dear relative had been called away.

Mr. Slater was born in New York in 1833, and was, consequently, 47 years of age at the time of his death. At the age of seven years he lost his father, and from that time forward was dependent upon his own labors and his own industry for a livelihood. After a severe struggle for a number of years, he entered the employment of Sill & Thompson, dealers in fancy goods, where he remained several years. While thus employed, his strict attention to his duties, his aptness, his pleasant address, and his uniform courtesy, attracted the attention of Mr. Enos Richardson, who was located in the same building, and when Mr. Slater, at the age of 23, sought to better his condition, Mr. Richardson readily made a place for him in his establishment. It was in 1856 that he made his advent in the jewelry trade as a clerk, in which position he remained until 1861, when he became a traveler for the house. He was a successful salesman, pleasing in his manners and address, and by his strict attention to business, and the spirit of fairness and accommodation that characterized all his dealing, he soon won the confidence of the retail dealers whom he visited. He occupied the position of commercial traveler until 1866, when one of the partners retired, and Mr. Slater was admitted to a partnership in the firm he had served so faithfully, the firm being Enos Richardson & Co. Mr. Slater then left off traveling for the house, and became an active manager in the home office, his name being prominently associated with the business up to the day of his death.

Mr. Slater was possessed of many admirable traits of character that endeared him to all with whom he came in contact. He was more to the active members of the trade than a pleasant business acquaintance—he was a warm friend. He was genial and pleasant in social intercourse, an intelligent and cultivated gentleman, possessed of tender sensibilities and a most benevolent and generous nature; he never was known to speak ill of anyone, but was lenient to others' shortcomings, seeking rather to excuse their misdeeds than to censure them for them; he was a singularly pure man in thought, word, and deed; sincere in his friendships and warm in his personal attachments; he seemed to feel that he could not do too much for his more intimate associates, and was ever ready to extend a helping hand to those who needed and deserved it. But first and foremost among his personal characteristics was his integrity. Nothing could swerve him one iota from the right, and his business honor was treasured as his individual honor. He would countenance nothing as a business expedient that his honor as a man could not sanction.

As we have intimated, Mr. Slater was a man of excellent business capacity, possessing a keen foresight, and a lively appreciation of the necessities and demands of the trade. When insolvent debtors came to New York to compromise with their creditors, Mr. Slater was usually placed upon the committee of creditors to effect an adjustment with the debtor. In all cases of this kind, he was uniformly fair and just alike to debtor and creditor, regardless of what his personal interest might be in the case under consideration. He was a true type of manhood, honest in his convictions, and possessing the moral courage to maintain them under any and all circumstances. Mr. Slater was not a professing Christian, but if all men practised true Christianity as conscientiously as he did, the world would be better and purer than it is. Mr. Slater, however, took an active interest in St. Stephen's Church, Newark, contributing liberally of his means to its support, and attending services therein with great regularity. His sudden and untimely death has created a void in the ranks of the jewelers that can never be filled.

The funeral of the deceased took place from St. Stephen's Church, Newark, and was largely attended by the members of the trade in that city, New York, and adjacent cities. The following named gentlemen acted as pallbearers: J. C. Appleby, of Jersey City; Leonard P. Brown, Andrew Lemassena, Wm. H. Lemassena, Strafford Peshine, William R. Alling, Thomas G. Brown, David C. Dodd, Frank G. Richardson, all of Newark. Previous to the funeral services in the church there were brief services at the house of the deceased, at which the family, consisting of a wife and one daughter, and the immediate friends only were present. The members of the Jewelers' League, of New York, of which Mr. Slater was the President, were present in the church and occupied seats reserved for them. The jewelers assembled in the Newark Young Men's Reading Room on Clinton avenue, and were furnished with the usual badges of mourning, after which they formed in procession and marched to St. Stephen's Church, where seats were provided for them. The employes of Enos Richardson & Co. attended the funeral in a body.

The remains were enclosed in a plain black cloth-covered casket of the sarcophagus style. The floral tributes were very beautiful. There was a large broken column, the gift of the employes, a large cross by friends, a mound and anchor, and a cross of white flowers. As the funeral cortege arrived near the church, the jewelers of Newark formed two lines in Clinton avenue and allowed it to pass through, uncovering their heads as the hearse passed. They then closed up and followed the carriages to the church. At the church gate the employes stood in two lines with uncovered heads until the coffin and the mourners and the jewelers has passed through, when they closed up and followed them into the church. Rev. Dr. Boggs read the solemn and impressive funeral services of the Episcopal Church.

Various associations of which Mr. Slater was a member adopted resolutions indicative of the respect they entertained for him. Among those sent to the family were the following:

At the regular monthly meeting of the New York Jewelers' Association, 9th inst., the following were unanimously adopted:

Whereas, it has pleased an All Wise Providence to remove suddenly from our midst, our friend and associate, THOMAS SLATER, therefore it is

Resolved, That we, the members of the New York Jewelers' Association, have learned with profound sorrow of the death of our friend, companion and late Vice-President, THOMAS SLATER, who, by his honorable career, his kindness of heart, his gentle manly bearing at all times, his true nobility of character, and his many other manly and social qualities has endeared himself to every member of the Association, and while we mourn our loss will ever hold his name in grateful and affectionate remembrance.

Resolved, That we tender to his bereaved family our heartfelt sympathy in their affliction.

At a meeting of the Executive Committee of the Jewelers' Protective Union, held Nov. 1, the following preamble and resolutions were unanimously adopted:

Whereas, It hath pleased an All Wise Providence to suddenly remove from active life our friend and co-laborer, THOMAS SLATER; and

Whereas, We, the members of the Executive Committee of the Jewelers' Protective Union of New York City, do desire to give expression to our sorrow for his loss, our appreciation of his integrity of character and high estimation with which he was regarded by our members; therefore, be it

Resolved, That in this dispensation we mourn the loss of an associate who won our love and friendship by his many qualities of character which make the perfect gentleman and wise counsellor.

Resolved, That we extend our heartfelt sympathy to his family in this time of their great affliction and trial.

Resolved, That these resolutions be entered upon our minutes, and a copy of these be presented to the family and also be published in the daily papers of New York and Newark.

By order of the committee,

WM. R. ALLING, President,
IRA GODDARD, Secretary.

At a meeting of the Essex County Republican Committee, held in Newark, the following resolutions were adopted:

Whereas, On the 30th of October, 1880, the day of the tariff demonstration in this city, THOMAS SLATER, a member of the Jewelers' Association, who participated therein, was suddenly stricken down and expired; that this sudden taking away of a valuable citizen from among us, a loving husband, a kind and considerate father, an upright, honest, and conscientious man, we recognize the dispensation of an ever-ruling Providence.

Resolved, That the example reflected by MR. SLATER'S life, his integrity of character, his faithfulness and devotion to principle, his strict and honorable conduct in business life, by which he rapidly rose to a foremost position among his business associates is worthy of our emulation.

Resolved, That we extend to the family of the deceased, our deepest sympathy in this, their great bereavement.

Resolved, That these resolutions be spread in full upon the minutes, and a copy furnished for publication in the daily papers.

Samuel Toombs, William Steinsby, A. B. Brewster, Aaron Carter, Jr., P. T. Quinn, Geo. W. Dabbell, } *Committee.*

Similar sentiments were expressed at a meeting of the Jewelers' League, and will be found in the League column.

Banquet of the Jewelers' Association.

ON Thursday evening, November 11th, the Sixth Annual Banquet of the New York Jewelers' Association was enjoyed by the members and their numerous guests. It was provided by the well-known caterer, Delmonico, and was given in his elegant rooms on Fifth Avenue. The invitations specified 6.30 o'clock as the hour for the assembling of guests, and by seven o'clock the reception parlor was crowded by representative manufacturers and wholesale dealers in jewelry. They came from all the cities in the vicinity of New York—Boston, Hartford, New Haven, Newark, Philadelphia, etc.—to the number of upwards of 100. After a brief time spent in pleasant chat in the parlors, and the interchange of friendly greetings, the guests were ushered into the dining-hall, from whence proceeded the strains of delightful music, and where were spread half a dozen tables for the accommodation of the members and their friends. As the guests were seated each found beside his plate a card, ornamented with game or fish in relief, and bearing his name; also an elegant *menu*, printed on gilt edged card, mounted on broad ribbons of various colors. The bill of fare was printed in French, and was as follows. We will not attempt to translate it, as our French has been out of repair ever since the *hors d'œuvre* made their appearance.

MENU.

Huitres.

POTAGES.

Consommé d'Orleans. Crême d'asperges.

HORS D'ŒUVRE.

Variés Timbales Perigourdine. Variés.

RELEVES.

Saumon, Hollandaise, vert pré Selle de Chévreuil, vin d'Oporto.

ENTREES.

Suprêmes de volaille, purée d'artichauts, Mignons de filet de bœuf, aux champignons, Cailles au risotto.

SORBET.

Montmorency.

ROTIS.

Canvasbacks and Perdreaux. Salade.

ENRTEMETS.

Petis pois. Choux de Bruxelles, Haricots verts.

SUCRES.

Croûte aux ananas à l'Imperiale. Gelée aux fruits. Crême Colbart. Gateau de Venise. Coupole, Chantilly.

GLACES.

Napolitaine, Bombe Japonaise, Petis fours, Gateaux variés, Fruits and Dessert. Café.

DELMONICO.

11 Novembre, 1880.

The President of the Association sat at the head of the room, having at his right and left respectively, Rev. Dr. Newman, Hon. Luther R. Marsh, Hon. Stewart L. Woodford, Col. A. C. King, Judge Choate, Hon. Abram S. Hewett, and E. T. Bartlett, Esq., Attorney for the Association. These gentlemen were the speakers of the evening, responding to the several toasts assigned them with that ease and elegance for which they are distinguished. President Hine made a most admirable Chairman, introducing the toasts and the speakers in pleasant and appropriate language.

The following is a list of the gentlemen present :

Association Guests—Rev. John P. Newman, Hon. Joseph H. Choate, Hon. Stewart L. Woodford, Hon. Abram S. Hewett, Hon. Luther R. Marsh, Col. H. C. King, Edward T. Bartlett, Esq., D. H. Hopkinson,

Members—Ethel C. Hine, of E. N. Welch Mfg Co.; William R. Alling, D. F. Appleton, E. C. Fitch, A. Carter, Jr., A. K. Sloan, George R. Howe, M. G. Baldwin, R. N. Peterson, Taylor & Bro., (represented by Najah Taylor and W. L. Rich), Seth W. Hale, I.. J. Mulford, Joseph F. Chattelier, H. B. Dominick, L. B. Haff, Edward Holbrook, W. C. Spencer, Alfred H. Smith, Thomas G. Brown, A. J. G. Hodenpyl, P. T. Tunison, Samuel Dodd and C. E. Breckridge, of Wilcox Silver Plate Co., George C. White, Jr., C. B. Yale, D. C. Wilcox, J. G. Bacon, J. C. Aikin, Tiffany & Co., represented by Charles D. Stockwell and J. Andrews; David J. Magnin, L. L. Wooley, of Elgin National Watch Co., E. F. W. Eisenmann, John A. Riley, D. F. Conover, B. F. Williams, Seth Thomas Clock Co., represented by Franklin Underhill; New Haven Clock Co., represented by F. E. Morgan.

The following were Guests of various Members—J. T. Bailey, George Banks, Samuel Biddle, C. Weaver, J. H. Brazier (of J. E. Caldwell & Co.), John C. Kelly, W. B. Warne, all of Philadelphia. A. O. Bigelow, Benj. Shreeve, Dr. Shreeve, of Boston; D. C. Dodd, Jr., of Newark, N. J.; D. H. Buell, of Hartford, Ct.; George H. Ford, of New Haven, Conn.; Eugene Cuendet, of St. Louis, Mo., S. Hogan, of Cleveland, Ohio; Charles E. Galt and H. Semken, of Washington, D. C.; E. E. Isbell, of Cincinnati, Ohio; John Gorham, of Providence, R. I.; George Trees, of Columbus, Ohio; Edward H. Avery, of Auburn, N. Y.; Arthur Rumrill, of Springfield, Mass.; F. Greenwood, of Norfolk, Va.; Andrew Hart, of Brooklyn, N. Y.; Charles Pickslay, Robert C. Black, George H. Gale, George S. Brown, A. J. Rose, B. S. T. Nicoll, S. Cottle. R. M. Buchannan, Arthur O. Jennings, C. H. Brahe, J. S. Cooley, W. S. Sillcocks, C. Thomson, A. Chamberlain, David W. Granbery, W. C. Kimball, R. B. Kenyon, all of New York City.

The occasion was noticeable for the many venerable representatives of the trade who were present. There were more honorable gray hairs and beards in the assembly than usual. The advancing years which these betoken did not appear to detract from the enjoyment of those wearing them, nor abate the zest with which they participated in the festivities. Nearly all the prominent houses in the trade were represented, and each representative seemed to vie with every other in manifesting the heartiness of his good will towards everybody else. All fraternized in the most harmonious manner, laying aside for the nonce all business cares and responsibilities, and embracing the opportunity to make the acquaintance of a stranger or to exchange cordial greetings with old acquaintances. Restraints of business were entirely set aside, and the freedom of social intercourse was enjoyed to its utmost. Such occasions of pleasant relaxation are most commendable, and our business men grant themselves too few of them. A little more unbending and a more free dispensation among them of the social amenities and friendly courtesies of life would make their burdens lighter, their hearts more joyous, and tend to prolong their lives greatly.

The banquet was elegant and satifying in every respect, and set forth in Delmonico's best style. The wines were numerous in variety and plentiful in quantity, while the viands were most delicious. After a blessing had been evoked, the guests proceeded to do honor to the good things that were successively introduced by attentive waiters, the orchestra meanwhile playing a variety of choice musical selections. Neighbors at table continued the pleasant conversation begun in the parlor, and as the feast proceeded acquaintances exchanged salutations over brimming glasses of sparkling champagne. Two hours were spent in discussing the bill of fare and interchanging those social compliments and pleasantries befitting such an occasion. At the end of this time President Hine rapped to secure attention, and at once introduced the intellectual feast that followed. The speakers were all in the best humor, making their points with a zest and vigor that was highly enjoyed by their hearers, as they puffed their fragrant Havanas. Taken all in all, the Sixth Annual Banquet of the New York Jewelers' Association was a most enjoyable occasion, a great success in every respect, and an event to be long pleasantly remembered by all who participated. The following is a report of the proceedings in full :

MR. E. C. HINE'S ADDRESS.

Gentlemen.—Fellow-members of the New York Jewelers' Association :

We are convened to celebrate the Sixth Anniversary of our Association, and I congratulate you on the favorable auspices under which we meet.

We inherit the past. We learn from our predecessors. If we are docile, as we should be, we are guided by their experience and controlled by their advice and counsel. Yesterday our honored ex-President informed me that I should be expected to deliver an inaugural address *three quarters* of an hour in length ; be not alarmed, I will not do it. Were my ability equal to the high esteem and regard which I

cherish for my fellow members, equal to the desire I have to honor in becoming speech our distinguished guests, and fitly voice the welcome for them which I know is in all your hearts, I should make a speech which the stenographer would pant to overtake, and the printing press groan and struggle to reproduce.

I am full of the wish of the farmer's son but not unmindful of his father's advice. The son having been elected to the legislature, said to his parent, "Father, I wish to make a good impression. How can I do it?" Rather bluntly the old gentleman replied, "Shut your mouth and look as wise as you can." I intend to close my mouth at an early moment, and I submit to your calm and unbiased judgment if anything can exceed the wisdom of my looks. Still further to allay your fears, I have promised not to repeat, but only refer to that old speech of mine.

In the printed record of one of our earlier Dinners, furnished to us by our friend Mr. Hopkinson, occurs this passage: "Mr. Hine followed in a pleasant speech, taking a *hopeful* view of the future." That was a kindly notice, but my satisfaction in reading it was not unmingled with doubt as to whether it was the *long view* and *great age* of my speech, or its substantial merit which had at last compelled recognition from the metropolitan press. Tender memories hang about that old speech; the infancy of our Association was soothed by its lullaby, and its early youth inspired and quickened by it. My election to the Presidency came too late. Your devotion to the third term principle deprived me of as fine a chance to say "I told you so," as often comes to men, but it gave President Appleton the opportunity, which he embraced, to hail in fervid eloquence the fulfilment of my prophecy.

The good times so long and so persistently foretold have come; *and come* a year ago, and we meet to-night in the midst of, and in the enjoyment of an abounding prosperity, with solid assurance of its continuance as should commend the most reverent gratitude of us all. The land teems with plenty; the people are prosperous, happy, and content. Twenty-two months in which every paper promise of the Government has shown to the gleam of gold, has educated the people in sound finance, and with some emphasis they have just declared in favor of an *honest* dollar, an *honest* ballot and an *honest* count. That silent but mighty shower of ballots which fell on the second of November, not only decided momentous issues, but dropped its blessing and benediction upon the people: and out of the turbulent strife of an exciting political campaign, we have come to surrender ourselves, as it were, in a day, to the influences of every good and generous impulse, every kind and neighborly sympathy. Senator Hill and Congressman Chittenden have already embraced each other, and we only wait to see Wade Hampton and Whitelaw Reid kiss each other; while to-night, in your presence, Abram S. Hewitt and Stewart L. Woodford will shake hands across the bloody chasm.

But it is not my purpose to keep you long from the good things which are to come. It is proper for me to state for the information of those who have not before met with us the aim and object of our Association.

We are a company of gentlemen, mostly manufacturers—altogether wholesale dealers—banded together under strict and exclusive rules for mutual protection and benefit. Our aim is to promote the common interest of our members, to raise the standard of commercial integrity, to raise the standard of intrinsic value, and make it always safe to invest in our wares. The bare truth may as well be stated, that those chronic compromisers, Perkins & Smith and Moses & Abraham—those fellows, who, in figuring the ratio of their assets to their liabilities, can bankrupt the whole numerical system—compelled us to associate for protection and safety. Much good in this line we have already secured. There is a generous body to the honestly unfortunate, and we are a somewhat dangerous body when we get mad. It has been said that there is nothing new under the sun, and it is interesting to note that the same instincts and motives which, led us to combine, have had much to do in shaping and moulding the history of the world.

The vital necessity for constructing dykes taught the old Frisians and Flemings the habit of Union, good will, and reciprocal justice, because it was necessary to make common cause in the good work of mutual preservation. So well did they understand the principles of Association that they formed political clubs as barriers to the despotic violence of their more barbarous conquerors—these they called "*Gwilds*" and, if I mistake not, they were so called long before the establishment of the "Goldsmiths' Guild of London." They compelled besides covenants for mutual protection, an obligation which bound every member to succor every other, in sickness, ship-wreck, or distress. These Guilds were the sure breeders of free towns, and the principle on which they were based originated the most ancient corporations. We are told that the increasing power and influence of these social compacts alarmed the quick-sighted despotism of Charlemagne, and he prohibited them. But the imperial ban was powerless when opposed to the popular will, so the Guilds stood their ground, and within a century after their prohibition they had fairly cobwebbed Flanders with corporate towns.

So we combine primarily, for protection, and to prevent being cheated; but the influence of our Association has touched with its beneficent hand other and varied interests.

Skill in our craft is encouraged, art is lifted, enterprise is stimulated and commercial integrity pushed to a higher level, and all the things which go to make, not good jewelers only, but *good citizens* are fostered and encouraged by us. Therefore it concerns us not only as individuals, but it concerns the public welfare that this Association should long fulfil its important office; and it is, I am sure, a source of unfeigned satisfaction to all of us that we are able to congratulate ourselves on the success it has already accomplished, and the promise of increasing power and usefulness with which its future here salutes us; and we joyfully unite in the hope that its coming career may be only more full of growth than has been its past; that its influence may constantly extend as the years augment its possessions and its fame, as the city in which it has its home expands to wider splendor, and the country itself continues the inviting and affluent home of men.

There remains for me now the sad and wonnful duty to speak the name of the honored dead. I ask you to fill your glasses and drink in silence, standing, to the memory of our friend and former Vice-President, THOMAS SOATER.

After this toast had been drunk, President Hine read the following letters of regrets from invited guests who had not been able to attend: U. S. Grant, Chief Justice C. P. Daly, Whitelaw Reid, Esq., William Dowd, Esq., Hon Algernon S. Sullivan, Chief Justice J. R. Brady, Mayor Cooper, S. L. Clemens, Esq., Rev. T. De Witt Talmage, Ex-Governor Van Zandt, Hon. Isaac H. Bailey, General Horace Porter and others; also a telegram from Herman F. Hahn, President of the Chicago Jewelers' Association.

After reading the letters President Hine continued: It was suggested by the committee that your President should fill the gap occasioned by General Grant's declination. I am able, no doubt, to fill the time which he would take to make a speech, but I suppose it would take fully a week to pack into a speech as much solid sense as General Grant would give us in two minutes. [Applause.] But, gentlemen, I will not longer keep you waiting for the good things that are to happen. To honor first, "The President of the United States." I have the pleasure to call to respond to this toast the Hon. Joseph H. Choate.

REMARKS OF HON. JOSEPH H. CHOATE.

Mr. President and Gentlemen of the Jewelers' Association:

I do not know to what I owe it that I am called upon to respond to this very formidable toast. But as you insist upon it I will endeavor for a few moments to persuade the distinguished individual in whose honor this toast is propounded. Mr. Hewitt, as if to dampen my ardor on the occasion of this unusual dramatic attempt on my part, suggested to me that my title was poor but my record was very good. Well, that depends upon which side of the fence you happen to view it from. I observed, Mr. President, what you said about the prosperity of the Jewelers' Association, and was not surprised to hear that, sir, because I expected that from the even tenor of my administration. Everything good that has happened, everything that is worth of good repute I claim as the natural result of the wisdom and the prudence, and the modesty, with which this nation has been governed for the last four years. If there is anything that has happened of misfortune and disaster, I lay it to my friends who have endeavored to block the wheels of administration. I attribute lack of force of administration to Dr. Newman, and I also attribute it to apprehension with which I have nothing to do.

Mr Chairman and gentlemen, speaking presidentially, I should say that this meeting indicates the opening of a new era. It looks to me as though the Jewelers of New York, at least, have concluded to declare a truce for a while to all those bitter animosities and rivalries that have agitated the bosoms of the American people for the last six months. What a delightful truce it is to the turmoil, and agitation, and party strife we have been going through. It looks to me as though this banquet was instituted as a season of rest to the lawyers and dreayed politicians, to whom you have given the chief seats on this evening of your celebration. Now look at my friend Marsh, he is a true type of the lawyer. He would say that Jewelers and Goldsmiths are the only clients he would be willing to take his pay from in kind. There isn't a Jeweler or Watchmaker on Manhattan Island that he would not be perfectly willing to serve for a contingent fee of a good portion of his stock. And then these politicians—what a delightful rest it is for the politicians to come here to-night and partake of your viands, the best that New York can serve, and to seek relief from the terrible stress of mind and body that he (General Woodford) has been going through since the second day of June last. Why you wouldn't think it, to look at his benign and beautiful countenance, you wouldn't suppose that he has been engaged in waving the "bloody shirt." I don't know whether he has got on that cruel garment now. He looks well enough, but I suppose he wears a false front. Perhaps he has laid it away among the cherished battle flags of the Republican party. The politician's devotion to the bloody shirt reminds me of the story of the young married lady [cries of "oh! oh!"] and her first baby ["oh! oh!"]. I do not know whether there are any reporters here. I suppose I may speak my mind. She had her first baby—and you know that is the zenith of a woman's hopes and aspirations—and naturally the dear creatures think there is nothing that is good enough for the first baby that is not good enough for the rest of mankind. Well, the young and enthusiastic husband came home one glorious sunshiny afternoon, and was shocked to see the baby's napkins, or, if you must have it, baby's diapers spread out on the front of the house for all mankind to see. Well, the husband didn't know about that. He thought there was a question of taste about the matter. He went in and found the dear young lady and said, "Don't you see, my dear, all the world can see that?" But she replied, "My love, it shall hang there; it is the flag of our Union."

Mr. Hewitt has been performing the part of Sisyphus. He has been rolling that tremendous stone up the hill, which was always going to get to the top, but which somehow would slip back, and by-and-bye it fell to the bottom and carried him with it.

Well, he didn't care for that ; as long as Cooper Union lasts, Mr. Hewitt's dinner upon this island is secure. And then he is interested in all kinds of study. It is the greatest relief to a politician to have a vocation—something to distract his mind from the hard strife and questions of state and political economy—a little study of handwriting [excessive laughter]. I do not know how it is with you, gentlemen, but I must confess that the hours that I spent at writing school were most delightful. We are all liable to make blunders. One is liable to make mistakes in the post-books, but he will finally come out all right. I for one, thank you very much for affording me this relief from worldly cares. It looks as though you were trying to put in practice General Grant's great motto, "Let us have peace." I suppose Dr. Newman will tell us about what it was that inspired General Grant to bring forth that sentiment. At any rate, I will leave that to the Reverend gentleman, who has the conscience of the great nation in charge.

Now gentlemen, a word more about my administration. I had almost forgotten that. The administration which I had charge of is coming to a close. and there is no day, probably, of a President's career, that he looks forward to with so much hope and delight as the last. I want to say a word about the Jewelers' and Goldsmiths in connection with the affairs of state. In all the past history of the world, they have been nearest the conscience of the crown. In the days of the Charles', and the Louis' and the Elizabeths, the Goldsmith, beside the King and Queen, or the King's mistress, was the most powerful man in the kingdom. He came nearer to the heart of His Majesty or Her Majesty than any other living subject. It seems to me—I do not like to refer to the gentleman who speaks after me, but I have an idea that if he will just let the leading of parties alone and fall back upon the Jewelers and Goldsmiths, that everything will be right and safe. If he wants to have his affairs well kept, let him call upon the Tiffanys, and the Appletons, and the Robbins. Put them all in one cabinet and what delightful peace and harmony there would be.

I want to say a serious word before I sit down, upon the splendid record which you exhibit in your union for the purpose of elevating and fortifying the profession to which you belong. There is not a trade which does not get strength and power from union and co-operation. The profession to which I belong has tried this. For years they went without co-operation and without harmony, and everything went to sixes and sevens in the administration of the Courts of Justice. But just so soon as the lawyers of this city bound themselves together in a united body, their strength came. They now demand honor and purity on the bench and before the bar. I believe it was so with your craft. As long as you relied upon your individual skill as workmen you were comparatively weak and powerless. When you combined—when you joined for the purpose of strengthening the trade, as a profession you added to its dignity and strength as nothing else can add to it. I have to thank you very much for the patience with which so distinguished an audience has listened to me. I hope that all these politicians, these lawyers, will be victimized in turn into speaking, as I have been. And finally, I hope that you may be brought to feel that this Association has contributed something to the general welfare of the city of which it forms so distinguished a part

PRESIDENT HINE—Gentlemen. I will give you the next regular toast, "The City of New York ; the financial, commercial, and moral barometer of the western world. All consult her records."

It is my pleasure to call upon the Hon. Abram S. Hewitt to respond.

SPEECH OF HON. ABRAM S. HEWITT.

Mr. President and Gentlemen:

I confess until I heard my friend making his speech that I was at a loss to understand the significance of something that had occurred after the oysters this evening. The waiter came to Mr. Choate and said to him, "soup sir?" "No sir," said he, "I am one of the principal performers to-night." I didn't quite understand how much that meant until I saw him assume the *role* of the President of the United States. Then I saw what was happening in the future, and I envy no man who say that if we are to have, according to Macbeth's vision, this Republican succession for thirteen generations, I do not care how soon it strikes my friend Choate. I know of no man who can fill the place with more dignity. We can always go to him with a deputation and get a good speech from him. Now I am, I suppose, expected to return thanks for this exceedingly delightful dinner. It is the usual custom. I have returned thanks for a great many dinners that were not good in my time. This particular dinner is one for which all ought to return thanks. And yet I have been a little puzzled to know why I was asked to come here. I see there is a feeling of tenderness that the Jewelers have toward the few specimen bricks of the late Democratic party. They thought if we could not get anything else, a good dinner might be a consolation. I do not see much prospect of anything better. There was another delicate attention on the part of the President towards me. He was kind enough to let me eat my dinner without telling me that I was to speak. For that I was under obligation. And lastly, when I picked up my card and looked at it, and saw my name upon it, and this lovely bird with which it was stamped, I thought first my name was written upside down on the card ; but when I got it right I saw that the bird was a "dead duck." I said to myself, "this dead duck may be put on there on account of the initial letters, D D. It may be intended for my friend, the Rev. Dr. Newman, or I don't know but that he and I will have to divide it between us, unless the dead duck, as Mr. Choate has suggested to me, be of the right gender, and then it might be a *Hanneck*".

Now gentlemen, it seems to me that you are the greatest benefactors of society civilization has developed that I know of. I never walk by Tiffany's window, or the window of any other Jeweler without stopping to look in. I go through the world with the blessed consciousness that I own every one of these things. You are the good fairies who are contented to keep them for me. You display them on the loveliest of velvets, and you make them as attractive as possible, and all you ask for them is simply the payment of the sum which you have advanced upon them. I avail myself of this privilege at times—not so often as I would like to, because my lot has been a hard one—but you get your reward, if not from me, from some one else. The Jewelers' art is said to be the most remunerative and profitable way civilization can be brought to decay, by encouraging luxury and extravagance and you are looked upon as the advanced guard of the great army which is to overthrow civilization. I have the hope, however, that the Democratic party may come in time to prevent this great catastrophe. It is to this end that I have struggled. I have fought as good a battle as possible, but if it shall not occur in my day, all that I have to say is that though I may be a bad judge of handwriting in the letter, I am, I am sure, a pretty good judge of the handwriting on the wall, "*mene, mene, tekel, upharsin.*" And those Democratic principles, of which, I suppose, I am the only representative here tonight [cries of "no ! no !"], will certainly come to pass.

PRESIDENT HINE—I will now give you the third toast of the evening, "Our Nation." I have the pleasure of introducing to you the Hon. Stewart L. Woodford, who will respond to this toast.

SPEECH OF HON. STEWART L. WOODFORD.

Mr. Chairman and Gentlemen:

I am glad that you give this customary toast to our country in the words "Our Nation." I doubt if the committee on toasts really thought when they selected the words. It is pleasant that we have at last come to think of our country as one nation. The man does his best work for himself—best work for his little ones—for home, when he starts life with the thought, I am a man ! and from his manhood works out all the problems of the future. And so, I believe, that we as a people are going to do the best work that lies before us when, putting aside the struggles of the past, we one and all accept the thought, this is one nation ! And in the manhood of our nationality go forward to do all that a nation can and should accomplish. Galileo had the brains to see that the world was round, and he had the pluck to teach what he saw, and yet the statesmen locked him up in a dungeon. Through much struggle we have come to realize that all over the land, compacted out of old states, we have grown up to this standard of manhood—absolute nationality ! God help every part of the country to accept it. God help every one of us and our children in the future to believe in the absolute nationality of the American Republic.

The nation began, first, with each resident owing allegiance to the colony, and also allegiance to the crown across the sea ; then the struggle for independence followed, then the necessity which led to the constitution ; next the iron hands of Jackson, and then the terrible drama of civil war. And the dear land has come through its struggles and through its sufferings to be the nation of the United States. It is not the dream of pride that always comes with strength, but it is that dream of pride, tempered by hard experience, taught by all the stories of all the centuries, that I say, that leads every one of us to fight that this nation of ours has already begun to be—and before the close of the century will be the master nation of the civilized world. We stand half-way between the old lands and the old civilizations of Europe, and the older lands and the older civilizations of Asia. All that the past has achieved has ministered to us. All the possibilities of the present are ours to grow with our continental resources. All that is needed to shape the mechanism of the future, we have. Ore locked up in the Western hills that furnishes the delicate wares of your craft, and serves as the measure of value in the country ; and all that man can need to aid in the development of civilization in the years to come, is ours. I will not return the "bloody shirt." I do not know that my dear friend Choate would wave it if I could, and I know that my dear friend Hewitt would be like Macbeth when the spectre appeared. I shall not attempt to make political suggestions on the past, but I will tell what I know is in the thought of every merchant, of every banker, and of every skilled laborer of New York—that our metropolis is the flower of the continent. It combines all the forces that make up our nationality. Every telegraph wire that is built furnishes business as well as intelligence to our city of New York and to the nation. Every mile of railway is a wedlock that is binding the nationality together. California and Maine stand closer together to-day than the northern and southern counties of Virginia did at the time the Declaration of Independence was passed. Let us forget the things that are behind, only remembering the sad lessons that they have taught. I believe, and experience teaches us that this nationality will be a blessing upon all the states and every section, and to no section more than those states and that section which has the welfare of the nation at heart.

PRESIDENT HINE—I give you the fourth regular toast, "The Faithful Clergy : whose laborious and self-sacrificing efforts to make our citizens Honest, Truthful, and Great, we acknowledge with gratitude." It is my pleasure to introduce to you the Reverend Dr. Newman.

SPEECH OF REV. DR. NEWMAN.

Mr. President and Gentlemen:

I think it is very proper that I should appear at this time after all the slaughtering has been performed by my friend Mr. Choate, and after him the responses by

these two gentlemen who have been heard throughout all the country in the recent campaign. It seems to me that if you do not want the benefit of the clergy in the extreme, you need at least their consolation. I fully appreciate my friend Hewitt's *d d*. I think it was the President of the United States who first made that elusive expression, *d d*, the dead duck—who first tried to apply it to the clergy, calling it, "The Devil's Darling." There is another definition also: "Double Dinners." One thing seemed to me true, and that is we clergymen are not self-sacrificing. So delicate and tender a term as this should be applied to the lawyers here to-night. Why should you talk about the self-sacrificing clergymen? Look at my fair proportions—then look at the lean proportions on my right and on my left. The truth is there is a great deal of self-sacrificing on the part of the statesmen and lawyers, while there is a craving self-appropriation on the part of the clergy. That probably would have been a better epithet than *self-sacrificing*. There is no doubt about the clergymen being laborious. They labor from an excess of the size of their brains. My profession is complained of sometimes as being somewhat dull. The answer to this is that the Almighty has honored the doctors and lawyers more than us. If he would call to his profession all men of intellect and brain power, why of of course the law and medicine and statesmanship would be the losers. We can stand the loss better than they. Just take it for granted that there are just as many brilliant ornaments in the clergy as there are in the legal, medical, or political professions. It is true, however, that the clergy have a part and a great part in the construction and in the administration of society, and perhaps in no country on the face of the globe is the ministry a more powerful factor than here. For here the clergyman is the director of public thought. He is not the keeper of the public conscience; he is not the father confessor of anybody. But he is the one to intone the public conscience so that that conscience shall respond to every voice of duty and of justice. And all that is said in this highly complimentary toast is true; that it is the high vocation of the clergy to create a citizenship characterized by fidelity, honesty, truthfulness. It is not too much to say that the clergy of the country stand in the van of the clergy of the world. There was a time when France bore off the palm for sacred elements. The clergy of France could once extort what it wanted even from royal lips, and appeal to the inexorable Judge on the bench. There was a time too when the classical Chalmers and the eccentric but powerful Irving, (who could write in the light and speak in sentences of fire) held sway in England. England then bore off the palm in this respect. But it is not too much for me to say that for notable ability, for profundity of deduction, for familiarity with every branch of science, and for high culture in belle-letters, the clergy of the United States to-day bear off the palm of the world. And it is also true that for purity of character they are unsurpassed. Occasionally these lawyers get hold of a poor clergyman—and then, I do not know whether to pity the clergyman or the lawyers. I have come to this grave conclusion with regard especially to my own denomination, that whenever a Methodist preacher backslides and the devil gets into him I always pity the devil. It is true that now and then some poor wanderer may fall, but I hold that in all branches of the Christian Church, the clergymen of the United States to-day will bear the closest scrutiny as to their private morals and their public record—and these men are devoted to that old flag we love. And there is one thing that should be accepted in the South and in the North, and in the *ante legarth* of the politician; we should be one Nation and that old flag should flutter over the nation in the symbol of that unity. Occasionally these lawyers get hold first, that they keep out of politics, and secondly, keep their hands out of the public treasury. Let them never put it there under the guise of charity or religion. May their patriotism be intelligent and conscientious—let them rise above the tricks of partisanship. All this should be while they have a land like this, worthy of that union which we propose to appreciate.

You, gentlemen, it seems to me, it is for you to prepare the crown of glory to place upon the brow of the genius of our country. It is for you to bring the sapphire, the emblem of our friendly skies; the emerald; the type of the wealth of our seas; the topaz, the symbol of our glorious harvest; and then the opal, which reflects the Bow of Promise; and ruby, the emblem of that American blood shed by our brothers—it is for you to prepare this diadem. And above all, it comes within your avocation to place highest upon that diadem the diamond, the emblem of private and of public purity.

PRESIDENT HUNE.—The next regular toast, "Our Legal Friends;" to whom we commit the legalization of our contracts, the management of our causes, and the disposition of our effects—certain that effects will surely follow causes." I will call upon the Hon. Luther R. Marsh to respond.

SPEECH OF HON. LUTHER R. MARSH.

Mr. President and Gentlemen of the Jewelers' Association:

I have been called at rather an inauspicious time and under certain disadvantages, in the shadow of this magnificent eloquence which we have heard from the pulpit and the bar. I feel also as if I were called rather too early in the evening. I had expected to bottle up a few ideas from the wise remarks of others; but I am called so early that I doubt that I have enough to make a decent pop. And then there are other adverse circumstances which attend. Part of my speech has already been made most magnificently by my friend Mr. Choate, and I think I might be quite content to take my seat and leave my reputation with you and your posterity in the speech that he has made. I am most felicitously positioned here, with the Rev. Dr. Newman on one side and the District Attorney on the other—the one to point me right, the other to protect me if I go wrong. I was thinking, gentlemen, how interesting and curious it is to consider the different occupations of man; how thus it is that the world is kept alive—active—and its needs supplied. The farmer, I suppose, ought to stand over all the rest of mankind. We cannot get on without the products of the ground and field—meats, grain, fruits, roots, drink. Even our raiment comes directly or indirectly from the soil. We are fed from the ground; we are clad from the ground, and therefore, it is the farmer, he who tills the ground, that is entitled to the place of honor amongst all the avocations of men. Therefore, no wonder it is that after the great public deeds, Putnam returned to his plough, Washington to his field, and Grant to his farm. And yet there would be a large portion of this product wholly unavailable but for the miller, to grind, and the weaver, to weave, and the manufacturer to convert the raw material to forms of use. How infinitely varied are the vocations of man! Did anyone ever try to count them? The sailor brings distant countries together. He bridges the seas. He makes all climes one. He gives fruit and the growth of the equator to the man near the pole. His is a rough business but there are few more useful. The soldier stands on guard while the man of peace works. The man on builds the foundation and makes the wall, while the carpenter thatches the roof which is to shelter us from the burning sun, and from the pelting rain, and we go from them that epitome of comfort—a home. The minister stands at the fork of the road, and with index finger points out the way to the King's Highway. The lawyer—well, he is a much more useful citizen than is generally supposed. It is commonly thought that it is his business to fight and to squeeze falling pennies from the pockets of paupers, and that his business thrives best when all other business thrives worst. Not so. He rises in the general prosperity and his main duty is to keep people out of trouble by judicious advice and well-drawn papers. The lawyer is further useful sometimes at public dinners by helping to furnish a market for the countrymen. Here is your health, lawyers—May your voice always be silver and your speech golden! Then there is the philosopher and the poet. The poet idealizes life. The Jeweler is the poet of practicality. As the poet is in thought, so is the Jeweler in work. He enriches and adorns. The crowns of kings are his handiwork. The Jeweler sets the diamond, the ruby, and the amethyst. He engrings the tapering finger. It is your own art which encases and confines old time himself within the circled golden—mere companion of the pocket—and compels him to tick off every division of distance which the earth makes in its flight through ether. Gentlemen, your work is in those precious metals which are the delight and envy of the world. Most of us work for what you work in. You forge them into exquisite shapes of usefulness and art. To have these precious metals around—to see them, to feel them, to work in them, how can happiness be better defined? "Gold! gold! gold! gold! dry, hard and cold; molten, hammered, carving and rolled; heavy to get, but light to hold. Gentlemen, you are always at par; you have the standard of value with you always; you never fall below redemption or resumption point. Nobody ever heard of a Jeweler passing off paper as an equivalent for gold or silver Your art took high rank with the earliest nation. Modern research proves this. Long lost Troy and Mycaene rival each other now before us in those household and personal ornaments, which are brought to life by the devoted Schlieman and his wife. Necklaces, massive goblets of gold, flagons, temples modeled in gold—indeed, those old workmen wrought the ductile metal into almost all imaginable forms of beauty and of use. Signet rings worn by the Ptolemys are now to be found in our historical treasures—rivalling in perfection of workmanship and delicate tracery the best productions of to-day. You have, therefore, the stamp of antiquity upon your Guild. Indeed, the Lord himself in instructing Moses how to form the ephod, told him to make oches of gold and two chains of pure gold at the ends, of wreathen work, and to fasten the wreathen chains to the oches, and to set in it settings of stones, a sardius, a topaz, and a carbuncle; an emerald, a sapphire, and a diamond; a ligure, an agate, and an amethyst; a beryl, and an onyx and a jasper. The history of your order is, therefore, one of the oldest. Kings, queens, monarchs, the rich and the cultured seek its protection. The activity in your trade is a test of the wealth, and the prosperity of the people. In these annual reunions where you meet for present enjoyment and for the interchange of mutual sentiment, I should hope that some attention would be given to the gathering and to the illustration and to the presentation of the history of your order.

Gentlemen, the toast which you have assigned to me—have you got it Mr. President? (The President handed it to him) I call for it that I may refer to its special meaning; not because I didn't have a general idea of what it was. It appears to be drawn with a keen recognition of the delicacies of the language. Yes, it is true that we lawyers are your legal friends, and we carry our friendship so far that we are friends even to the material in which you work. You pay a just tribute here to the lawyers as logicians, for I think I may say there is no other class of the community that has such a regard—indeed that workshops so reverently intimate relations of causes and effects as the lawyers', some of them carry their regards for effects so high that they are almost inclined to put themselves the causes But there is one concluding reference in the toast which is calculated to bedew the cheek of our fraternity with crystal witnesses of our sorrow—it is, that we are called upon to administer and dispose of your effects. A lawyer never enters the Probate Court without a pang (though it is presided over by so genial a judge as our present Surrogate, who by the way, has no Calvinistic notions about him) when a lawyer has labored hard to help his client to make and save an estate, it is rather cruel to be called upon to distribute that estate. I trust

that you appreciate the tenderness of our feeling and the intensity of our emotion on these occasions.

PRESIDENT HINE—Gentlemen, I give you the next regular toast, "The Trades, as represented in our Association ; watches, clocks, precious stones, jewelry, silver plated ware, articles of vertu ; an abundant field for the display of clever ingenuity, artistic skill, and intrinsic values." It is my pleasure to call upon one whom we are always glad to meet—the counsel of our Association, Honorable Edward T. Bartlett.

SPEECH OF HON. EDWARD T. BARTLETT.

Mr. President and Gentlemen of the Association:

I think it was the lamented Artemus Ward that said that the hippopotamus was called sea horse because it looked like a lamb. This discriminating criticism seems to run very rife and causes me to respond to a toast which really ought to be illustrated by the learning of some gentleman who has grown gray in the pursuit of your craft. I said to myself while I was reading this toast, I will treat this subject very slightly to-night, and will confine myself to what I know. I feel that horology is my strong point. It is the science of computing time. I said to myself, I will devote my energies to that portion of the toast, and it was my intention to make this the effort of my life. I even brought my manuscript with me, and I intended to cover the ground. I proposed to begin with Isaiah, the prophet, who cried unto the Lord to put the shadow back on the dial of Ahab. I should have given you a very learned dissertation on clocks and watches, beginning with Vick's clock and ending up with the latest modern stem-winder. Under that head I had proposed to deal generally of detached levers and dead-head escapes. Then, if time had allowed, I had proposed to discuss at great length the subject of pendulums. I had proposed to discuss its oscillation around the point of suspension. There was one point I had intended to treat at much greater length than others, and that was, that the center of oscillation is always below the center of gravity, but still hanging to the pendulum. I can only say to you, gentlemen, that you have had a very narrow escape. You came very near being detained here all the evening by me. And I propose to tell you now what saved you. When I seated myself here and reflected that your President was at the head of a great clock company, I said to myself, "he knows more about horology than I ever knew," and I concluded to postpone this address until some other occasion, when Mr. Hine was not present, and as he is wholly responsible for the loss of the address, I think, perhaps you might call upon him for this discussion. He can give you the main ideas of my proposed speech with much better effect than I could. I presume that I have the same feeling in conducting a horological discussion in the presence of this gentleman, that one of you gentlemen might feel in instructing Mr. Choate in points of law. I experienced a kind of pang when I saw that I could not discuss this subject, and all the thoughts that I had in regard to jewelry went out of my head at once. Therefore I am prepared to pass.

But seriously, Mr. President, I wish to say one word. For five years it has been my fortune, by reason of your bounteous hospitality, to sit at this board as your guest. I return you my heartfelt thanks for the good fellowship you have afforded me, and I think on another occasion when you meet together like this evening, that I ought to sit down with the other gentlemen—without fear of being called on to make a speech. I think that it is a fortunate thing that there are times when you can lay aside the armor of warfare—that there are times when you can forget that you are rivals in this game of life, and come here with memories that survive rivalries—memories that will not haunt you when you stand in the presence of the Great Giver. It seems to me but yesterday that I sat in the midst of a scene like this, and on my right hand was an able-bodied, large hearted man—a man of excellent health and promise. Since then the shadow of death has borne this esteemed man whence we cannot see him, and there is nothing left to us to-night but these haunting memories that carry us in spirit to the low green tent where Thomas Slater sleeps beneath the unveiled sky. I wish to add this in closing, to the toast, which has been given in his honor, as my tribute to his worth, and to his enduring memory.

PRESIDENT HINE—We shall next honor "The Judiciary ; the pride, protection, and safety of the millions. When Justice speaks, dispute is silent." I will call upon Col. Horatio C. King to respond to this toast.

SPEECH OF COL. HORATIO C. KING.

Mr. President and Gentlemen:

I attribute my presence here to-night to the large-heartedness and broad-mindedness in politics of the Jewelers' Association. Looking among these long-lived distinguished Republicans that occupy the stage, I am glad to see that you have not forgotten some members of the late Democratic party. I am glad to see that melancholy does not sit upon Mr. Hewitt's brow. I have more to grieve over than Mr. Hewitt has. For while a generous constituency has sent him to the halls of legislation, an ungenerous one has let me stay at home. I do not know why I should be called upon to respond to the Judiciary. They never did me any harm. I feel that so important a toast should have fallen upon more experienced shoulders. Were I to attempt to enumerate the long line of distinguished men who have honored the state in the Judicial chair, I should weary your patience. We have had and still have in this state many learned and distinguished judges. While England gave a Blackstone whose wisdom and fame are known all over the civilized world, so also has the great Empire state given to the world the name of a great judge, Chancellor Kemp. Retiring from the bench at the ripe age of seventy years, full of experience, he gave to this country a treatise which will live through ages. The high character of the bar of the Empire state is known wherever the English language is spoken. Its decisions are quoted abroad and in every part of this country. Our Court of Appeals from its inception up to the present time, stands unexcelled in all its history, for the wisdom and impartiality of its rulings, through all the turmoil and excitement which has sometimes characterized our political atmosphere. I venture to say that in no single instance after sober second thought, have its decisions not been recognized as eminently wise and just. I understand very well, from experience, the dissatisfaction which sometimes prevails as the outcome of a decision. Judge Grover, one of the most eminent, as well as well as one of the most eccentric of the Court of Appeals Justices, used to say that there were two methods of conducting an appeal—the one was to carry it to a higher court, and the other was to damn the Judge who decided the case. We are sometimes very apt to take the latter method and damn the judge. There is but one weak point in our judicial system, and that rests with you. I refer to the great trouble that we have in this city and in other cities throughout the state, in securing competent jurymen to listen to our cases. I do not suppose that there are a dozen competent jurymen to whom would not receive a slight draft (and having at the same time a slim bank account) in preference to having a subpœna served on him for jury duty. This fact reminds me of a story told of an old woman, who resided in a town in Connecticut, and who came down to the breakfast table one morning and said to her husband, "husband, I have had a very bad dream. I dreamt last night that I was dead and that I went up to Heaven. St. Peter met at the gate, and asked me where I was from. I told him I was from Windham, Conn. He said there was no city or place of that name that he had ever heard of, at least that they had no people from Windham up there, and though that I had better go down to the other place. Well, I went down to the other place, and the devil came to the door, met me, and I told him that I was from Windham, Conn. He replied to me that he had never heard of the place. Then I said, 'they won't let me into Heaven and you won't let me into hell ; what, then, am I to do?' The devil said "you will have to go back to Windham." Well, I didn't want to go back to Windham, so I just sat down on the steps of hell and cried." Well, gentlemen, that's the same dislike that you show towards jury duty. You think it is a kind of purgatory.

I am not unmindful of the time when Tweed and his infamous gang had almost entire control of the Judiciary of this city. To such extent was corruption carried that certain lawyers were "spotted" as men carrying certain judges in their pockets. But the people finally rose in their might, and threw down these unjust judges, and the memory of those that are dead and those that are living now stinks in the nostrils of every honest man. Happily that day has gone by. I do not pretend to say that the bench is an ideal one, but I do say that the bar of New York, greatly purified in the past few years by the aid of the Bar Association, has brought a higher grade of judges. The lawyer is no longer understood to be one who will injudiciously risk the property of his client held in trust, and get possession of it himself. There is a higher sense of honor in the bar and the bench of the present day. A poor barmakes a poor bench, but we have nothing to fear. I have detained you too long I am afraid. Perhaps your thoughts are reverting towards home. And speaking of home reminds me of a little anecdote which I remember happening in the first cavalry division which I belonged to in the war. A captain Hale, who was in the same division had a very comical darkey. During a certain battle things got in a very mixed state, so that the baggage trains and all the effects of the troops, including captain Hale's negro, were brought pretty near where the fighting was going on. After some difficulty, however, the troops with the train got back to their headquarters. After things had subsided somewhat, captain Hale said to the darkey, "well, Jim, how did you like it?" "Well, Massa Tom, I didn't like it at all. The fact is, massa Hale, I felt 'sif ebery hair on me head was a bugle, and they was all playing home, sweet home." With those sentiments I conclude.

PRESIDENT HINE—The next regular toast is, "Our Guests and our Customers ; always appreciative of our efforts in the front behind, whether, wives, children, and their honoring our invitation this evening, is next in order to honoring our drafts. We bid them welcome." I will call upon Mr. Simkins to respond to this toast.

REMARKS OF MR. SEMPKEN.

Mr. President and Gentlemen of the Association:

I sincerely thank you. Your guests and customers, I trust, will pardon you for calling upon me to respond to this polite call, when such gentlemen as Mr. Conover Mr. Ford, Mr. Bigelow and various others of repute are present. I confess it is somewhat embarassing for me to speak after such talent, such eloquence, such ability as we have heard here this evening. Still, I suppose I shall have to do it. The relationship between the manufacturers and their customers is simple and very clearly defined. As long as the manufacturer furnishes reliable weight or quality, whichever the case may be—and at reasonable prices—and furnish us such social occasions as this, with wines and viands for us to consume, and as long as the customer complies with his duty and appreciates the manufacturers', efforts, pays promptly and buys freely, this pleasant relationship will, it is my opinion, continue. After a longer intercourse, a slight intimacy may ensue between us and you, which may finally ripen into everlasting bonds of friendship. And I dare say that many of my colleagues will experience this happy result some day, and share it with me.

Now, Mr. President, allow me to thank you sincerely for this pleasant evening, which, I assure you, will be a very fragrant blossom in my memory.

PRESIDENT HINE—I regret that we are compelled to pass the regular toast of the Press, being disappointed in getting a gentleman, whom we expected here to-night, to respond. Owing to the lateness of the hour we shall also be obliged to pass, very reluctantly, the toast to the ladies. It was our expectation that the Rev. Dr. King would respond to this toast, to give you the last regular toast, "Our ex-Presidents; Baldwin, Hale, Appleton." and I call upon ex-President Appleton to respond.

SPEECH OF EX-PRESIDENT APPLETON.

Mr. President and Gentlemen:

This is an unexpected call. I hardly feel competent to respond, and I know that there are others who could more fitly and appropriately do so. I think some of the older gentlemen who have so well filled the office should have been first called upon. I speak in the presence of several of them—all good men—but you will join with me in doing especial honor to our senior ex-President, Mr. Baldwin, who, I am glad to see, is with us to-night. He is indeed an honor to the Association. I do not undertake to say how old he is, but I think that for more than forty-five years he has been an active member of our craft, and, although belonging to a profession which has more than ordinary temptations, no man can say that in all that long career he has ever deviated a hair's breadth from the path of commercial rectitude. An upright merchant and an honest man, long may he remain to honor us with his presence. I speak under considerable embarassment, because I see that the eye of my friend, Mr. T. G. Brown, is upon me. He says that at every banquet of the Association I always make the same speech, and that I can make no other. Many of you have often heard that "one speech" of mine, and you know what the burden of it has been, and I see you have discovered what there is in it that disturbs the bile and worries the conscience of Mr. Brown. If there was anything in the speech about the duty of making our goods of as good quality as they are represented to be, it is not I that makes the *application*. But if he has anything to say on the subject, I will sit down and let him take my place. One word before doing so, however, and that is to say the thanks that we owe to the gentlemen, our guests, who have honored us by their presence to-night, and who have so well entertained and instructed us. The flattering manner in which they have spoken of our craft reminds me of something that occurred in my youth, at a small seaport town in Massachusetts. There was an interesting trial going on in the Courts, and the illustrious relative of our no less illustrious guest, Mr. Choate, tried the case. It was an important case, but there was a very insignificant man to be a witness. It was for Mr. Choate's interest and for the interest of the case to establish a high character for the veracity and good repute of this witness. The witness was called by his neighbors, skipper Munson. Mr. Choate—it was the great Rufus Choate—called him *Captain* Munson. He spoke of Captain Munson's extended influence in the community. He said that principle and integrity guided his life, as the compass guided his ship. (The ship was in fact only a very small fishing boat). In the midst of this eulogy on his character and actions, Skipper Munson turned to me, and remarked, "He speaks beautifully, doesn't he?" So it is with this younger Choate and our other guests who spoke to us to-night. They praise us and our craft, and I think they speak beautifully.

A call was made for a speech from the respected Treasurer of the Association, T. G. Brown. This call was taken up by the members and echoed and re-echoed throughout the room. Mr. Brown finding the resistance was useless, and that all efforts to evade responding would be of no avail, finally arose and addressed the Association as follows:

REMARKS OF MR. T. G. BROWN.

Mr. President and Gentlemen of the Association:

It has been talked about, and so understood, (at any rate heretofore), that the members of this association were expected to speak on such important occasions as this. That is, they could speak quietly sitting down, provided they did'nt make too much noise, but as for talking out loud, standing up, such a thing was not to be thought of for a moment. And so, sir, being as I thought relieved from the fear of being called upon, I have rather, in a moderate way I trust, resigned myself to the pleasures of the occasion, and am hardly prepared to respond to any call, especially one that requires much mental effort. Why I am called upon *at all* is an enigma I am unable to solve. But as I am on my feet, and seem to stand pretty steady, I will take the privilege of one of the older members of the association and say a word or two.

Mr. President and gentlemen, I beg leave to offer you my hearty congratulations on this, our sixth annual dinner. After many years of business depression and hardship and dull times, such as we have never seen before, and I trust will never see again, a brighter day has at last dawned upon us. With abundant harvests all over the land, with the return of specie payments, with rapid transit a fixed fact, and the Waltham Building finished from "turret to foundation stone," I think we may safely look forward to the future, full of hope and bright with the bow of promise. And now what of this Association? I hope and trust that we are all ready to step into the ranks, and keep time to the music that is now sending forth its cheery sounds all around us, from the gloomy furnace and the forge, from the loom and the spindle, and from every humble home of industry all over the land. And as we meet here year after year in this social and pleasant way, I hope we shall be able to show some good solid work done, that we have taken some good long strides in the right direction! I should like to allude to one subject just here: The jewelers of the United States, in my judgment should have, as they do in other and elder countries, a fixed standard of gold. I mean that every article of gold jewelry made in the United States should be marked or stamped its true quality, whether eighteen, fourteen or twelve carat, and the manufacturer should be held responsible for its quality. In this way, and in this way only, can the quality of American jewelry be established and maintained, not only in our own country but in all countries where the jewelers' beautiful art is known and appreciated, and then we will find a ready market for our goods in many countries where they are now excluded in consequence of the uncertain and fluctuating quality of our gold.

I hardly dare take up any more of your time, but if you will indulge me a moment longer I would like to allude to one other subject. I mean the great and growing need we have for the establishment of schools of art and design. The great need that we have all felt in our factories is cultured and artistic taste in our workmen. We need artists as well as workmen. We need men not only with strong arms and deft fingers, but active and fertile brains as well. We need schools where our young men and boys can be early taught the use of the crayon and the pencil, and where they can learn the art of modeling and designing, and be educated in every thing that will tend to make them accomplished workmen and artists. This can only be done by making a commencement in our manufacturing towns and cities, in establishing schools of art and design. There are gentlemen here to-night who employ four or five hundred men, boys and girls. If under the auspices of the large and flourishing establishments and the smaller ones, also, something could be done in the way I have imperfectly indicated, I think it would be a good beginning and a step taken in the right direction. A short but practical lecture of an evening, not only on designing and modelling, but on the nature of and the working in the precious metals, would greatly add to the interest of the occasion and the instruction of the class, would be a source of pleasure and a substantial benefit, and moreover would bring together the employer and the employe in pleasant intercourse, and be a real bond of union between them.

PRESIDENT HINE apologized for having overlooked this regular toast of the evening, and took pleasure in presenting to the Association Mr. David C. Dodd, Jr., who would respond to "Commercial Integrity, the foundation of solid fortunes and the best legacy the possessor can leave to his sons."

SPEECH OF DAVID C. DODD, JR.

Mr. President and Gentlemen of the Association:

I am certain that I shall not detain you at this late hour by a speech upon the subject which your President has just announced. I come from New Jersey, as you know, and it is very appropriate that a Jerseyman should be called upon to respond to "Commercial Integrity," which is the best prosperity. We are noted for two things in New Jersey—hard cider and voting regularly the Democratic ticket. And there is another thing also which may be added to these two, and that is, that we make honest jewelry. My friend Mr. Brown advocates a stamp. It isn't necessary for New Jersey to establish a stamp. The word of any Jeweler is as good or better than a stamp over there It passes current throughout the State. A man has only to say that he came from Newark when he shows his jewelry to receive the unlimited endorsement of the gentlemen to whom he exhibited his goods. At this late hour, considering the condition of the gentlemen around these tables, it would be more than idle to attempt to talk upon moral subjects. I will, however, venture to say a serious word. Gentlemen, I have regularly participated in the enjoyment derived from this social gathering from year to year. I do not now happen to have the honor to be a member of the New York Jewelers' Association, but I have a friend who always invites me.

Next and after the good dinner, come the capital speeches, which are always secured to us, and I confess that while I enjoy Delmonico's best, I always like the flow of reason in preference to the mere fodder of Delmonico. The one is hard to digest, the other goes with us in pleasant memories during the year, and only leads me to hope the more that I may get an invitation to your next annual gathering. I said, I believe, that I came from New Jersey. I am the only distinguished foreigner, I suppose, here to-night. You gentlemen of New York have seemed, through your public speeches and public press, to consider New Jersey out of the Union; but the time is coming when New Jersey will claim her right to stand by her sister states as a member of the Union, and ranking too with the best of the Republican party. Now I had no idea that I could make so long a speech. I will close with this single sentence. May the Jewelers' Association live as long as Jewelers require dinners, and may its dinners be always as good as this was to-night.

THE PRESIDENT—Gentlemen, I think ought to return the thanks of the Association to our honored Treasurer for his speech, also for the addresses of the other gentlemen who have spoken this evening, and I wish especially to return the thanks to the honorable gentleman from New Jersey. I thank you all for your attendance, and wish you all a very good night.

After a short time spent in social chat the entertainment came to a close, and members and guests departed their several ways, all concurring in the sentiment that a more enjoyable and entertaining dinner the Association never provided.

The Time Work and Time Signals of the Greenwich Royal Observatory.

BY C. STUART MURRAY.

Continued from the Oct. No.

THE state of the sideral standard clock has to be ascertained; it has to be compared with the mean solar clock, and that clock has to be brought to time. To effect these the transit from the chronograph cylinder-paper is read off, certain corrections are made, and the true time of the star passing the meridian ascertained. But the transit instrument itself requires correction occasionally, notwithstanding the ingenuity with which it has been built for strength, and the foundations and piers on which it rests. Temperature acts upon it, as it acts upon the balance spring of a watch, although it seems hardly feasible that two tons of cast iron, enclosed within thick walls, and carefully tended, should sensibly feel the effects of heat and cold. But it is so, and although the errors are small, still they *are* errors, and have to be eliminated.

The standard sideral clock is one of the marvels of mechanical horology. It is fixed to the north wall of that part of the Observatory known as the magnetic basement, the temperature there varying only a few degrees throughout the year. It was made by Messrs. E. Dent & Co., in 1871, and is somewhat peculiar in its action. As far back as 1826 the present Astronomer-Royal read a paper before the Cambridge Philosophical Society "On the Disturbances of Pendulums and Balances, and on the Theory of Escapements." That of the clock under notice is of the same character. The escapement is a detached one, having an affinity to that of the chronometer. The pendulum impulse takes place at each double of vibration so that the seconds-hand moves only once every two seconds, those seconds being the even ones. The pendulum is hung from a solid large brass casting firmly attached to one of the basement walls. It has a zinc and steel compensation and a leaden bob, and the driving weight slides down a prepared "shoot," to avoid vibration did it move freely. The first zinc tube rests on the rating nut, then a steel one goes over that resting at its upper end upon the zinc, and carrying at its lower end the leaden bob; the weight of the bob is about twenty-six pounds; the rod is of steel. The compensating tubes have slots and holes cut in them better to allow the temperature to circulate. Upon the crutch axis, held by friction, are two straight brass and steel compensating bars, carrying at each end a small compensating weight, whilst along the crutch-rod is a spindle tapped and nutted at the upper end, and carrying a square weight at the lower end. This spindle is for enabling very small changes of rate to be made without stopping the pendulum. The driving weight is only about 5¾ pounds. There is a magneto-barometic arrangement to counteract barometic error, so that as the mercury in the barometer rises and falls its float produces magnetic action between it and the magnets of the pendulum. These are two bar magnets, each about six inches long, fixed vertically to the front and back of the pendulum bob. Below them is a horse-shoe magnet attached to the end of a lever, the other end of which is joined by a rod to the float on the mercury in the syphon of the barometer. The lever rests on a knife edge. It will thus be understood that as the float on the mercury rises or falls it moves the lever, the magnet of which acts correspondingly on the magnets of the pendulum either to advance or retard it. The general work of the sideral clock is to drive sideral relay, which relay closes three pairs completing as many circuits. One circuit registers the clock seconds on the chronograph previously mentioned, "another controls the half-seconds pendulum of a clock near to the hour circle of the great equatorial, driving the fifty-nine seconds clock, and working a sounder to render audible anywhere in the dome the beats of the standard clock, whilst a third closes the circuit for controlling the balance of a chronometer attached to the eye-piece of the equatorial telescope."

Mr. Criswick took us into the principal computing room and explained to us what was there. Upon the time superintendent's desk is a small electric dial, the hands of which are driven by a separate wire. Only fifty-nine seconds for each minute are sent by the sideral clock through the "relay." The stoppage of the 60th second at the end of each minute is to prove whether or not the two clocks agree. We were shown that if the seconds hand stops at what would have been one second after the minute, the dial is in correct sympathy with the parent standard sideral.

The error of the standard sideral clock having at length been found and booked, from the star observations of the previous night, and that the fifty-nine seconds clock is in sympathy with it, close beside it there is on the same desk a small mean time solar clock, only a few inches off. This has now to be compared in order to ascertain and correct is error. Previous to doing so, however, Mr. Criswick conducted us to the mean solar standard clock, which he calls "the parent of this system." Its home is across the court yard under the time-ball. The room in which it "moves, lives, and has its being," is a closet about five feet square, having one window to it. Opposite to the "mean solar" was a companion of its toils, a relic in its way. This aged "shipmate" bore the following inscription upon its dial—"Geo. Graham, No 3." It is an old mahogany case, and its rate is still so good that, like an old sentinel, it is kept there and consulted as a check upon the work or escapades of it young friend against the opposite wall. A word about that young friend.

The mean solar standard clock is entirely an electric one, with a pendulum. It was put up some thirty years ago by Messrs. Shepherd & Sons, of Leadenhall Street. A small weighted lever keeps the pendulum in motion, worked by the armature of an electro-magnet. The electrical relay from this clock controls a clock at London Bridge station, one in a front window at the works of the Messrs. De la Rue, Bunhill Row, and one in the Horological Institute, Northampton Square. This clock also gives the hourly time signals all over the country, and the public may see a sympathetic set of hands and dial worked by the same clock in the wall of the Observatory by the gate. That clock has no pendulum, the movement being kept going by the oscillation of two permanent magnets through positive and negative currents of electricity. The swing of the pallets drive forward the escape wheel, and that sends round the motion wheels of the hands. That clock has hour, minute, and second circles, the latter being below the center. The dial is figured up to 23 in the hours, the 24, or noon, being O: the minutes are ticked and dotted on a circle outside the hour figures, whilst the seconds are marked in the usual way as upon regulators

The gentleman whose business it is to ascertain the exact time, handed by means of the wires throughout together that of the standard sideral clock and the mean solar standard, nothing remains but to compare them as the method of coincidences. This can be easily effected within two or three tenths of a second, by means of an instrument called a commutator, which is on the time superintendent's desk between the small sympathetic dials already spoken of. The same principle that is used in the barometric compensation with the magnets to alter the rate of a pendulum without stopping it, is brought into play here to correct the error of the mean solar standard clock. The pendulum rod has fixed to it on the front a permanent bar magnet about six inches long; this magnet has the north pole downwards. There is a hollow coil in circuit with a galvanic battery, which is not in action in its ordinary state. Let us suppose that after the mean solar standard and the small mean time clock on the superintendent's desk have been compared together, the small one is found to be a half second too fast. The dial of the commutator has the words "retarding" and "accelerating" engraved upon it. In the present case the handle of the instrument is turned over to "retarding," which turning sends a current through the hollow coil just mentioned, making its upper end a north pole, and consequently repelling the lower end of the pendulum magnet, and "retarding" it—that is, making it go slower. The battery power is so adjusted that if the retardation is kept in action for ten minutes the pendulum will be one lost one second. When the clock is found to be slow, an accelerating turn is given to the commutator handle, and the pendulum gains to the same extent that it lost, and in the same time, which is done in this way. A wooden bracket in the clock case has a small bundle of soft iron wires fixed to it, and by friction can be made to slide to or from the south pole so as to act on the pendulum. The nearer this bundle goes to the pendulum magnet the more the clock will gain on its rate, whilst the farther it recedes, the more the clock will lose.—*Watchmaker, Jeweler and Silversmith.*

Silver Plate.

THE art of working in silver has been understood for ages, at times advancing with vigor, and then again falling into obscurity as degeneracy obtained the mastery over human intellect. These changes have been no doubt frequent, but the neglect of history on the subjects of the mechanic arts leaves us but meagre outlines from which to draw deductions that are at all satisfactory.

The Etruscans were extremely well versed in the art of war and peace, and from them the Roman derived those arts and sciences which paved the way to the empire of the world. From the Etruscans came the luxuries of the household, in common with nearly all branches of high toned art and mechanical workmanship, pre-eminent among which were the artificers' work in gold and silver. From their sepulchers we have a few examples of their skilled handiwork, since their customs led them to entomb with the affluent much of their worldly wealth. These consist in part of fine silver vases, jars, bowls, and other articles of the table, as well as spears, shields, and other implements of warfare. It is computed that the value of gold, silver and bronze ornaments, recovered from Etruscan tombs upon the estates of Lucien Bonaparte approximates to a sum nearly equal to $200,000. To the Etruscan order, as a guide in architecture, we look for all that is delicate, graceful and refined. So, also in the exquisite traceries of art in jewelry and companion luxuries ; hence the graceful forms of silver service used in our households eliciting unlimited admiration nearly all of which have their basis in the copies of Etruscan art that date back over a period of 2,500 years.

As the Roman empire increased in area and power, bringing into subjugation the rich kingdoms and principalities of Europe, Asia and Africa, the ruling classes in all the great cities, enriched by the spoils, become luxurious in their desires and seeking for every means to gratify their tastes. Feasting and revelries were of frequent occurrence ; in the indulgence of the table they sought to pass the tedious hours which idleness rendered irksome. Their houses became the temporary abodes of strangers, in the absence of inns, and to display before their guests an array of elaborately wrought gold and silver plate was the unlimited ambition of the host. At the feasts of the rich senators and patricians of Rome the entire services were of gold and silver, elaborately designed and ornamented. Their drinking cups were of gold or silver, adorned with figures, and termed *emblemato*. These figures were removable at pleasure. Within a short time a rich discovery of vases, beakers, bowls and salvers of surpassing beauty and great artistic merit, has been made by some Russian soldiers, who were making excavations near Hildesheim in North Germany. These were supposed to belong to the golden age of Augustus, or his immediate successors. They were undoubtedly the service of some luxurious old Roman, as the ornaments are all emblematic of the art and mythology of Rome in her highest glory. It is said that the exquisite workmanship displayed upon these pieces exceeds all examples of modern art and skill in that branch.

Art felt the influence of the decline of the Roman Empire, wherein political changes resulted in time in counteracting the tide of affluence and over-reaching ambition, in the display of wealth. But in the sixteenth century, when Venice, the Queen of the Adriatic, reigned in supreme splendor, art was again in the ascendency. Works of vertu designed by Paolo Veronese and Joseph Sausovino adorned the palaces of the nobility. Gold and silver ornaments for personal adornment, and in the form of household luxuries, were produced in the highest forms of delineation.

Later, when the European nations attained ascendancy and power, coupled with wealth and intellectual tastes, the production of gold and silver ornaments in the form of heavy and fine plate was a marked feature in British households.

While the fourteenth, fifteenth and sixteenth centuries were rich in plate, but comparatively few examples of the form and excellence which marked the work of silversmiths of those dates were preserved, but in fact befel the fate of nearly all the treasures of gold and silver which the reverses of fortune, alike with nations and people, have entailed. Sooner or later the golden bowl and the silver beaker were evidently destined to find their way to the crucible and melting pot. Reverses in fortune of families ; the spoils of war ; the extremities of bankrupt rulers, and the vandalism of rogues, have each in turn contributed to the reduction of the precious metals to their crude bulk, thus undoing the labors of skillful hands in the perfection of art treasures of this class.

"In four successive centuries old English plate," says the *London Quarterly*, "had as many arch enemies. In the fifteenth century the Wars of the Roses caused many a noble piece to melt ; in the sixteenth Henry VIII. and the dissolution of monasteries were even more fatal to gold and silver work ; in the seventeenth the great rebellion and the civil war again swept the side boards and plate closets of each side with equal impartiality ; and at the beginning of the eighteenth the need of bullion under which William III. labored brought to the melting pot much of the old plate which still remained after the ravages it had suffered in three preceding centuries. Taking all this into consideration the wonder is not that so little English plate exists prior to the reign of Queen Anne, but that any of it at all is left to give us some insight into the magnificence with which the halls and tables and sideboards of our ancestors were were decked on great festive occasions."

Up to the early part of the present century no effort was made in this country to compete with foreign manufacturers of silverware. Our nation was young and but just recovering from her great struggle, impoverished in means and our institutions yet undeveloped. In time, however, the demand for silverware among the first families of the nation stimulated an active determination to overcome the necessity of depending upon the skill of Europeans, and, finally in 1832 the standard of American silverware was introduced but 900, while the full British standard remained at 925-1,000.

A Solar Complication.

IT is useless to disguise the fact that our relations to the sun have recently undergone a serious change. The astronomers have maintained a studied silence in regard to the matter for the reason that they do not wish to alarm nervous people. This is creditable to their humanity, but it is certainly a mistake. There is no use in concealing from the people the fact that they are in a dangerous situation. Certain foolish persons have blamed the captain of the unfortunate *Vera Cruz* because when it was morally certain that the ship would founder he did not leave his post of duty and assure the passengers that there was no danger. It would have been more folly for him to try to conceal from his passengers the danger that they were in, and in like manner the astronomers are guilty of a want of judgment in trying to keep from the people a knowledge of the fact that the earth has suddenly increased her rate of revolution on her axis, in consequence of a contraction of her orbit around the sun.

Attention was first called to this alarming circumstance by the early and excessive heat of the summer. The last winter was an exceptionally mild one, and in the latter part of spring, instead of enjoying the etherial mildness to which we supposed ourselves entitled, we found ourselves sweltering under a temperature properly of the torrid zone. This excessive heat has occasionally been varied by cooler weather, due to the dense clouds which have from time to time veiled the sun. Vast quantities of water have been vaporized by the heat of the sun, and tornadoes have been frequent on sea and land. In short, we have had a summer of unprecedented heat and remarkable atmospheric disturbances, and it was natural that thoughtful men of a scientific turn of mind should ask what was the cause of this state of things.

It was evident that if the earth had contracted her orbit so as to bring her nearer to the sun, the increased heat, the unusual quantity of vaporized water, and the numerous tornadoes would be fully accounted for. Prof. Proctor long ago demonstrated that the earth was

slowly but inevitably nearing the sun, and we can easily assume that, owing to some unknown cause, the earth has suddenly approached the sun at a rate of speed much higher than that given by Prof. Proctor in his valuable time-tables. This assumption can be readily made by any astronomer of average strength, and its truth can be verified by the simple process of sending a few scientific expeditions to make observations in China, Kerguelinland, and other remote and interesting places. This, however, would require a good deal of time, and in the meantime we have an infallible test which we can apply to discover if the earth's orbit is really smaller than it has hitherto been. This test is the length of the day between sunrise and sunset. Any material shortening of the earth's orbit would cause the earth to revolve more rapidly on its axis, thus bringing the sunrise and sunset perceptibly closer together than they should be according to the almanac.

Now, there are certain evidences that the day is shorter than it has formerly been at this time of year. There is the Maine election, in which the Republicans failed to obtain their expected majority. Thoughtless persons have attempted to account for this by various theories, prominent among which has been the theory that the State was carried by the Fusionists because they had polled more votes than their opponents—a theory calculated to decide loathing and contempt in every earnest Republican mind. Undoubtedly, the true explanation is the fact that sunset happened at an unexpectedly early hour, so that thousands of Republicans who had intended to vote just before going for the cows found the polls closed, and so lost their votes. This theory fully accounts for the lamentable result of the election, and ought to save Mr. Blaine from any serious depression of spirits.

Of course, the history of the Maine election does not, when taken by itself, prove that the days are abnormally short, but when we note also the change in the time of firing the sunset guns at Willet's Point and Fort Schuyler, there is no longer any room for doubt in regard to the matter. A year ago sunset occurred at Fort Schuyler exactly fifteen minutes later than at Willet's Point, as was conclusively proved by the difference in time of the guns fired at sunset at those two posts. If at Willet's Point the sun set on any given day at 6:30 P. M., it did not set at Fort Schuyler, distant half a mile further west, and at the same level, until 6:45. There could be no doubt about this, for the For Schuyler gun was always fired exactly fifteen minutes after the Willet's Point gun.

What do we now find in regard to the time of the setting of the sun at the two forts in question? During the whole of the recent summer the Fort Schuyler gun has been fired only five seconds after the Willet's Point gun. The meaning of this fact is unmistakable. Whereas there was formerly a difference of fifteen minutes between the two forts, the difference is now only five seconds. In other words, the earth revolves on its axis at a speed so much greater than it formerly did that the time required for the phenomenon of sunset to travel half a mile is fourteen minutes and fifty five seconds less than was required a year ago.

From this single astronomical fact any man who is moderately skilful in the use of slate and pencil can calculate the precise increase of speed in the revolution of the earth, and from the data thus obtained, can make a long series of miscellaneous and entertaining calculations. Of the fact that the day is materially shorter than it was a year ago there can be no longer any shadow of doubt—unless, indeed, we make the wild and untenable hypothesis that the garrison of Willet's Point does not know when the sun goes down, or that the gunner at Fort Schuyler, who is understood to be an old and trustworthy person, wantonly fires his gun nearly a quarter of an hour too soon.—*N. Y. Times.*

M. DEBRAY, of the Academy des Sciences, has discovered an alloy which when heated explodes. A five-franc piece made of the metal was held over a gas flame and exploded with a loud report. It is composed of rhodium, 1 part; lead, 2 or 3 parts, melted in a crucible at a high degree.

The History of a Remarkable Gem.

BY J. H. COLLINS, F. G. S.

IT is only within the last century that the Cingalese have become the most astute judges upon all matters relating to gems in their uncut or natural state. That this is so is proved by the number of remarkable stones which previously found their way to England, unrecognized as being of any value; amongst them is the stone in question. How it could have been passed over and treated by the merchants as of no value is a mystery, unless its great size contradicted the probability of its being a gem. Such, however, was the case; it having been sent to England mixed with the ordinary pieces of inferior rubies and sapphires used by watchmakers. It was sold for a mere nominal sum, as a piece of quartz, or crystal, and passed into a private collection of minerals, the owner of which regarded it also as a specimen of quartz. At his decease it was sold by public auction with his minerals, by Messrs. Stevens, the natural history auctioneers, of Convent Garden. Again, remarkable to relate, not any of the mineralogists or dealers in gems recognized it, and it was purchased with other stones by a private gentleman, for the sum of £3 10s. This gentleman, Mr. Herbert Maxwell-Stuart, of Scarthingwell Hall, Yorkshire, having collected gems for many years, and being an authority on uncut gems, immediately discovered its true worth, and for many years it formed the center of attraction in his cabinet, and was shown to the gentry of the county as being the largest gem in the world. At last Mr. Stuart decided to have it cut and polished, and traveled from York to Edinburgh, to consult the lapidaries there. However, a great disappointment awaited him. He was informed, after examination, that it would be impossible to cut such a large stone (measuring about 4½ inches square) of that material, its hardness being so great. It was also stated that even if cut, it would not be pure, two or three large flaws to all appearances running nearly through the stone. London lapidaries said the same, and the gem lay for some time, until Mr. Maxwell-Stuart showed it to Mr. Bryce-Wright, of Great Russell Street, London, who upon examination, not only pronounced cutting perfectly feasible, but believed it could be accomplished without the occurrence of a single flaw. He further offered to purchase it for a large sum if he was satisfied on re-examining it with the aid of a powerful artificial light. This was allowed, and Mr. Maxwell-Stuart, perhaps doubting the feasibility of its being cut, and especially without a flaw, was tempted to part with the stone. On securing the gem, Mr. Bryce-Wright had several molds taken of it, from which were cast in gelatine eight or ten perfect models upon which to operate. The gem itself was then examined with the greatest care under a lime light, being previously dipped in a preparation of turpentine to render it more transparent, and the exact position, width and length of the flaws carefully noted. These were then measured and imitations of them made *in wood* of the precise length and width; they were then inserted in the models of gelatine in exactly the same positions as the flaws were in the original. Thus several imitations of the real gem were made, containing pieces of wood in the place of flaws. These were then cut of the gelatine in *several directions*, care being taken to cut perfectly straight, or in a manner that a lapidary's wheel could act, leaving several irregular blocks of gelatine representing the gem *without* the flaws. It was then easy to choose the form of cutting, and to determine upon which model the true gem was to be cut. The stone was then placed upon the wheel and cut precisely to the shape of the chosen model, thus effacing all the flaws. Here victory seemed complete, as the polishing was all that had to be done, when unfortunately, what is termed a feather appeared, perhaps through the strain in cutting, in the position in which it was determined to place the table. This seemed at first sight an unsurmountable difficulty, until the lapidary, Mr. William Lunan, proposed to remove the "feather" by reversing the original plan, and placing the table where it had been arranged the culet should be. The feather, which was horizontal, was thus removed in the cutting and polishing of the large plane. The gem was cut as a brilliant on

a diamond wheel, without further mishap. The polishing was the next step, the wheel for this purpose was of an unusual size, and made of bell-metal. The rapidity with which this had to be driven to polish such large facets on such a hard stone was very great, and rendered it impossible to continue the work for more than a minute or so at a time, the stone being so hot, as also the cement forming the handle to which it was attached, that it could not be held in the hand. The operations of cutting and polishing commenced on May 12, and ended June 12, having thus occupied 28 days of incessant labor.

That it is the largest cut precious stone known (exclusive of the Cairngorum, which is only quartz, and much softer) there can be no doubt. It is pure white, and possesses a brilliancy hardly, if ever, equalled in this gem. Its weight is 1,486.9 grains, or 368 carats 3.9 grains. As to its value, this is simply hypothetical, there being no standard on which to reckon the value of such an exceptionally fine stone.

Muller's Patent Chronometer Escapement.

THE following description of the new normal chronometer escapement of Mr. Muller, we take from the *British Horological Journal*. Considerable has been said relative to this new idea—if it can properly be called new—but practical men will be apt to regard it more in the light of a backward step rather than an advance movement in horological science. It will be observed that the arm of the balance is constructed of box-wood instead of metal. It is difficult to see upon what ground this can be claimed as an improvement. We give the description, however, as being of interest to watchmakers, trusting to the future to demonstrate the value of Mr. Muller's new departure.

This new normal chronometer escapement, consists of the escapement wheel, a locking mechanism, an impulsion mechanism, and a balance, with the necessary springs.

The escapement wheel is shaped like a common chronometer-escapement wheel, only the teeth stand a little more inclined. The escapement wheel in Fig. 2 differs from those at present used,

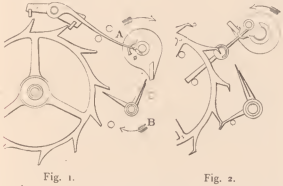


Fig. 1. Fig. 2.

owing to its teeth ending in wedge-shaped points, whose upper wedge shape surfaces are in the line of the periphery of the wheel. These wedge points of the teeth are of such size that they find room in the cavity of the half-cylinder, and do not hinder a turn of 30° of the same. The balance consists of the arbor, to which two plates are fastened, which clip a wooden arm, carrying weighted rim segments. On a roller of the arbor (A, fig. 1) is mounted an elliptic stone, which causes the releasing of detachment of the escapement wheel; and the pallet stone, upon which the impulses fall, is further inserted at the extremity of this roller. The arm of the balance is of wood, box-wood being the most suitable. The wood must be rendered constant and be impregnated. This is done in the following manner:—The roughly-finished wooden arms are laid upon wire netting, suspended in a metal box. This drying apparatus is provided with a thermometer, which shows the interior temperature; below this box burns a spirit lamp, with a flame sufficient to keep up a temperature of 160° to 180° R., but not to exceed this In this heat the wooden arms are dried for, say, twelve hours, and then thrown into copal varnish while hot. After a few hours the pores of the wood are filled with this varnish. These wooden arms, freed from the varnish adhering to the surface, are again introduced into the drying apparatus, and exposed to a heat of from 60° to 100° R. for, say, twenty-four hours. They are now constant, for they undergo no alterations of length by differences of temperature from 60° to 70° R., and are not subject to hydroscopical influences. Upon such wooden arms rest the rim segments, fastened with the screws. There are also screws to serve for regulation and to establish the equilibrium.

In a simple balance for watches and such timepieces where the regulating is done by the regulating plate on the spiral spring, the rim segments are simply fastened to the wooden arm by means of screws. These rim segments, remaining equi-distant from the axis of the under all temperature, the momentum of inertia of the balance is unchangeable.

The escapement mechanism consists of an anchor with anchor fork (fig. 1). On the roller of the balance arbor is the elliptic stone, the impulse stone, and behind the elliptic stone the arbor has a notch. The anchor moves over two teeth of the escapement wheel. The anchor teeth move in circles; therefore, when a tooth of the escapement wheel rests upon an anchor tooth, no retrograde motion of the escapement wheel it caused by the lifting of the anchor tooth, only the even sliding friction to be overcome. The anchor fork has a peculiar shape (as shown in figs. 1 and 2), and it reaches to the arbor of the balance. Two prongs do not touch the arbor; a third straight prong, standing above the forked prongs, is a little longer. When the balance turns, and with it the roller, in the direction of the arrow (fig. 1), the elliptic standing upright gets between the two forked prongs, and leads the anchor fork in the same direction until it rests against the banking pin. During this rotation of the arbor the prong gets into the notch of the same. Should, by continued rotation of the arbor, the anchor fork be inclined to go back, this is prevented by the prong touching the arbor.

The locking mechanism (fig. 2) instead of the anchor shown in fig. 1, a half-cylinder, of ruby or steel which encircles 200°, and is inserted in the arbor of the fork. The wedge points of the escapement wheel teeth move exactly though the center of this half-cylinder, which is also the center of the fork arbor. When the balance turns in the direction of the arrow (fig. 2), the elliptic stone of the roller engages the fork, and leads it to the other side of the balance arbor, through which the middle straight prong engages with the notch of the balance arbor; and, finally, the tail rests against the banking pin. At this rotation the side of the half-cylinder is raised, the tooth wedge point is liberated; a turn of the escapement wheel ensues, until this wedge point rests against the inner wall of the half-cylinder side, and the impulsion takes place; when the balance returns from its swing it also leads the fork back, until the tail rests on the other banking pin; the other side of the half-cylinder rises, the tooth wedge point is released, and a turn of the escapement wheel ensues, until the wedge point of one tooth falls upon the half cylinder side, and the winding of the impulse is accomplished. This escapement appertains to marine chronometers and all kinds of timepieces which are intended to possess a high degree of correctness. The half cylinder represents an anchor oscillating over one tooth. The difference of the resistance of friction by weak and strong pressure of the escapement wheel against the momentum of inertia of the perfectly-balanced fork, may be considered as nought; consequently, in many kinds of spring-winding timepieces, the endless screw with chain (fuzee?) might be omitted without danger to their correctness.

The impulsion mechanism consists of an arbor (B, fig. 1), on which are two arms, and underneath is fastened a spiral spring. This spring is tightened, and causes the rotation of the arbor in the direction of the arrow. One arm is straight, and has a bend on its end. When this arm is lifted by the escapement wheel the curve of this bend falls exactly upon the circumference of the escapement wheel. The other arm of the impulsion consists of two parts, namely, a short arm, upon

which, as second part, lies a spring, which is longer than it. By means of this spring the impulsion is effected, and the elasticity of this spring is proper if at the stroke it sustains a small bend. Steel springs break easily, therefore gold springs only can be used. The motion of the normal chronometer is as follows : The balance swings in the opposite direction of arrow (A, fig. 1), and is in a state of impulsion. After complete impulsion the arm rests against the pin shown, and the balance finishes its swing completely undeterred. At the return swing of the balance in direction of arrow, the impulsion stone passes the point of the spring ; the anchor fork is engaged by the elliptic stone, and led to the other side of the arbor, whereby the anchor tooth is raised, and the escapement-wheel tooth released ; consequently, the escapement wheel begins the turn, and a tooth of the same engages and lifts the other arm, till a tooth rests on the locking anchor. The least exertion of the live force of the balance is obtained when the lift of the anchor teeth is as small as possible. In the drawing it is 8°, but it may be still smaller, if either the diameter of the arbor is reduced (in this case the elliptic stone must be brought nearer to the arbor, and the angular speed is lessened in proportion), or, if instead of the anchor teeth, a half-cylinder (fig. 2) is used. In the description of the balances it is demonstrated that their momentum of inertia are unchangeable, for which reason they require no compensation ; but the spiral spring of the balance requires compensation, for its flexibility and length alter considerably under different degrees of temperature. The spiral spring of the balance is compensated with mathematical exactness by the spiral spring of the impulsion mechanism, if both springs are made of one and the same wire, and possess equal length, equal number of turns, and equal diameter. The impulse is always equally strong at equal temperatures, because the lifts of the impulsion by the escapement wheel are of equal height. In getting warm, the spiral of the balance slackens ; should the impulses now remain equally strong, as before, the spiral balance gets warm, and greater swings of the balance would result, but the elasticity of the impulsion spiral altering quite analagous to that of the balance spiral, the impulses will be exactly so much weaker, as is required to maintain perfect unirormity of the swings. Equally large swings of the balance take place in equal spaces of time. Through this invention all compensation mechanisms on balance wheels are superfluous, which, on account of their diverging effects, only allow an approximate compensation, ranging at the most between 20° and 25° R. difference of temperature ; while in this invention, by mathematically and physically correct arrangement and action of the parts of the escapement, the compensation of expansions and of the module of elasticity for temperatures on earth has been attained. There is mechanism for tightening the impulsion spiral, so that the impulses may be made stronger or weaker ; and, consequently, the swings of the balance greater or smaller, and at last that point may be found and fixed upon where the motion is reliable, that is, where the least exertion of force of the escapement wheel is still more than sufficient to lift the impulsion mechanism. Watches retain the usual regulating mechanism.

The Queen's Plate at Windsor.

THE Yeoman of the Pantry, with obliging civility points out every special piece of workmanship, though indeed to most of them a clearly written notice supplies all the information we need. A cursory glance round the larger of the two rooms shows several complete dinner services of gold plate, made at different periods for successive sovereigns. One of the most massive is that made for the coronation of George III. (1761.)

A most beautiful collection is entitled Her Majesty's Breakfast Service, and is in daily use. A stand of nearly three feet high supports a small kettle used in the sovereign's toilet. A christening font, made for the baptism of H. R. H. the Crown Princess of Prussia, and used upon all succeeding occasions of royal christenings, stands alone, and is a beautiful specimen of goldsmith's work of the present century. It is of no great dimensions, and is enriched with a border of water lilies and their foliage in bold design. The center pieces, which adorn the royal tables at state parties, are of every possible design ; the plateaux of every size, and most of them highly finished productions of art. A center piece, much to be admired, designed, we believe, by the Prince Consort, has life-like representations of Her Majesty's favorite dogs.

The only trophy from the turf is a cup won at Lincoln races by Fleur de Lys, a horse belonging to George IV. In the center of the smaller room, devoted equally to the care of gold plate, there is an enormous piece of work in silver and gold, made during the present sovereign's reign. It is entitled, "An Eau de Cologne Fountain," and stands some feet from the ground under a large glass case. It represents in the center a portion of the Alhambra, while around it are exquisitely modeled groups of figures, horses and dogs, and round the base flamingoes and other birds are reproduced in life-like perfection.

There are tankards and cups of every shape and size, and a few of these deserve a very special notice, from their historical interest. Among these, a tankard, presented to the Prince of Wales on his coming of age in 1783, was made from Spanish dollars taken at the surrender of Havannah in 1763. Another is completely covered with the coins of the realm which were current from 1605 to 1730, and are curious relics, though inferior in shape and beauty to others. In small cases are laid out sets of various articles presented at different times to members of the royal family on their birthdays. A case of pepper, mustard and salt boxes bears the inscription : "Presented by Princess Elizabeth to Prince Regent, 1818."

Of old church plate there is but little in the Royal collection ; what there is bears the mark of Queen Anne's reign, and is chiefly remarkable for its plainness and simplicity of shape. Flagon, chalice, patens, and candlesticks are of the same date, and are placed in the private chapel of the Castle when it is in use during Her Majesty's stay. Among the most beautiful designs are some exquisite tankards by Flaxman, the beauty of which is recognized at once as the great artist's work.

A covered bowl with double handles is pointed out as having belonged to Napoleon I., and was part of the service found in his carriage after the battle of Waterloo.

We scarcely realize to what extent the luxury of some of our earlier sovereigns extended, till noticing some beautiful stands of at least two feet in height, and asking their use, we are told that they are fire dogs, and bear the date of Charles II., 1669 ; and in close proximity is another article of great interest—a pair of bellows mounted in gold, which belonged to Nell Gwinne. A massive toilet service, used by Her Majesty, was made for Queen Mary II., 1688, and consists of a large mirror, exquisitely chased, boxes of various sizes and shapes, well fitted for a monarch's use. Among other articles of Queen Mary II.'s reign are another pair of fire dogs, and innumerable candlesticks, salt cellars, etc. ; but one of the most noticable is a small spice box, used by William and Mary.

Seeking the earliest dates, among the collection are a pair of tankards indisputably the work of Benvenuto Cellini, and a marvelous piece of the same masterhand in a cup formed by a large nautilus shell, the golden lid surmounted by a figure of Jupiter, and enriched with fine chased work around the shell, its stem and base.

On the same shelf stands another tankard, dated 1512, and called the Henry VIII. tankard, for on its side the figure of the monarch is seen in bold relief. A curious high flagon of Spanish workmanship was found on board the admiral's ship when taken in the Spanish Armada, and no doubt was presented to Queen Elizabeth after the defeat and victory. Some curious tankards of beautifully carved ivory set in gold are in the collection, bearing the mark of 1536.

An ancient piece of foreign workmanship has great historical interest, as it is recorded that this tankard was presented by the Queen of Sweden to Charles XI., from whom it was taken at the battle of Pultowa by Peter the Great, who presented it to his favorite physician, and, after passing through many hands, it at last became the property of Mr. Vernon (the great collector of the Vernon gallery), who presented it to King William IV.

Some enormous shields hang near these cups, representing Scripture histories, ancient Greek fables, or mythological stories. A high

cup, of peculiar workmanship, is the one presented Charles I. by the principals of the University of Oxford when the king held his parliament there in 1644, and it would appear that this cup was very closely copied at a later period, for one very similar to it dates from Charles II.'s reign.

A large rose-water dish belonged to Elizabeth, Queen of Bohemia, and was a present from her father James I. These dishes are still in use at great court feasts, when the dish, full of rose-water, is handed round to the guests to dip their fingers in.

A cup commemmorative of the victories of the Prussian Army, 1813-1814, presented by Frederick William III. to the Prince Regent, has the Iron Cross of Valor inserted in the lid.

The annointing spoons which were used at the coronation of George IV. lie in a case, and are enriched with diamonds and other precious stones on the handles.

Pinions.

IN the ordinary style of English work, the pinions are polished with a straight motion of the polisher by hand—the polisher being held in a frame that permits longitudinal and vertical movements, but not lateral. In fact this is the mode of polishing adopted in even the very best work. As a matter of course, the face work is done by the face of the polisher instead of the edge, though, if set at right angles to the line of the staff, it should face the ends of the leaves as well as polish the staff, simply by a species of slide motion in a line perpendicular to the axis of the mandril on which the polisher is swung. In this case the edge of the iron disk would do the facing, while the staff would be finished on the flat. Now, a very slight motion of the disk would change the relat ve positions in a much greater proportional degree than could be done by means of a rectilinear polisher.

It must be understood that a polisher, however well made, will leave the surface of the polished work uneven, if the relative positions are not very frequently changed. For this reason, in polishing the insides of watch cases, the polishing buff is made to revolve backward and forward as often as possible in relation to the speed of the lathe mandril. From the difficulty of obtaining this desired change of position, it is troublesome to get a good polish on the pinion leaves by means of circular polishers ; it might be done, however, if the whole frame was carried on a slide over the pinion, with just vertical motion enough to give a slight difference in the pressure. The parallelism of the leaf would not be so perfectly attained as by a straight polisher carried in a guide frame. The watchmaker may, in a general way, on steel work, make himself independent of the tool store, if he only reasons upon the various things to be done, and make occasionally a small tool, such as a little center milling tool for male centers, one for center drilling ; and even if he has nothing but the common head center lathe, he may still apply the same principles—not so handily, it is true, as on the going mandril. The best material for grinders and polishers is, for the first, soft iron, and type metal for the last. We say type metal, for it is easily obtained and wrought. The watch repairer should not be content with the faces left on Swiss or English pinions, but should finish them up, if for no other purpose than to show he is a good workman ; but there is a real practical value to a well-finished face, as it does not draw the oil off from the pivot by capillary attraction, as it would if the surface is left rough. That this would be the case, any workman may decide for himself if he will let fall a drop of oil on a plate of polished glass and another on a ground surface. The oil on the rough face will be found to spread over the surface, while the clean surface of the polished glass will retain the oil in a globular form, from the attraction of cohesion in the particles of the oil predominating over that of the faces given by such a perfect surface.

As to the proportions of pinions to the wheel teeth and the diameters, we hardly deem it within the scope designed in the article on the subject. There is no one in the trade but has at some time or other been called upon to put in a new p nion. Now, the object was to give some hints that might lessen the labor and perplexity attendant on such an operation, by giving the processes in vogue. The mathematical relations can hardly be considered of any importance, unless we went into a discussion on the theory of wheel teeth, mathematically considered. In so much as pertains to the mechanical manipulations, all has been told that is of importance to put the workman on the road to reasoning out his proceedings when he wishes to do a good workmanlike job.

Limoges and its Porcelain.

A WRITER in *Lippincott's Magazine* gives the following interesting account of these celebrated potteries : In 1772 the first porcelain factory was established at Limoges by Messrs. Massier, Fourneyra & Grellet *freres*, under the protection of the wise and liberal intendant Turgot. It is the decoration of the porcelain that gives it its value as well as its charm. Its manufacture is comparatively easy and simple. The kaolin, a dry, whitish-yellow clay, is first taken in lumps from the quarry and carried to one or another of the numerous mills lining the Vienne, where it is ground fine and reduced to a liquid paste closely resembling bread-dough In this shape it is carried in sacks to the factory, where, having been again worked over to secure fineness and pliability, it is ready for the moulder's or the turner's hands. Nothing can exceed the deftness and skill with which, under the magic touch of the experienced workman, shapeless lumps of this prepared clay are fashioned into cups, dishes, vases and every conceivable form of the most delicate pottery. It is so quickly done, too ! One handy operative can make two hundred cups a day. Once moulded into shape, the piece of pottery is dipped into liquid enamel which gives it hardness and brilliancy. It receives too the stamp of the manufacturer. It is then placed in what is called a *gazette* to be put into the oven to bake. The gazette is composed of a pair of deep earthen saucers fitting tightly together and forming a circular box, varying in dimensions according to the sizes of the objects to be baked The greater part of those in use are little larger than an ordinary soup-plate. In this gazette the piece of porcelain is herimetically sealed up, and then it goes into the oven with thousands of other gazettes, until the great circular furnace, twenty feet in diameter and two stories high, is packed full from side to side and from bottom to top. Then the doors are closed, the fires are lit, and from a period varying from thirty-four to fifty hours the baking process goes on at a temperature of thirty-two hundred degrees Fahrenheit. Even after the fires are extinguished the heat in the furnace continues intense, and twelve hours more must elapse before it subsides sufficiently to permit the workmen to enter, remove and open the gazettes, take out the porcelains, which are now hard and brilliant, and send them to the artist's for decoration. There are in all some seventy of these ovens in Limoges, with an average capacity of six thousand pieces. As most of them are kept going night and day, the reader can form some idea of the amount daily manufactured.

But thus far we have only followed the process through its homlier stages. The decorative work, yet to come, is the most delicate as it the most interesting. But not every piece of porcelain that comes out of the oven reaches the decorator's hands. Of every hundred pieces baked, an average of twenty-five are thrown out as inferior, and the remaining seventy-five are divided or sorted out into four grades, known as second choice, choice, elite and special, in the average proportion of thirty, twenty-five, fifteen and five to each class respectively. The special is employed only for very rich decorations ; elite is recommended for best selection ; the choice is for ordinary usage ; and the second choice is of such fair quality as to be pronounced less imperfect than the best porcelain sent from China and Japan, and specially recommended as the most economical pottery. The price of decoration varies according to the selection of porcelain to which it is applied. Thus, for instance, the lower grades of artists are employed upon the second-choice porcelain, while the best painters and decorators work upon the elite ; the special is only given to artists of the most exceptional merit. The various artists, painters and decorators, are paid salaries which, according to the French standard, are considered munificent, though they sound small enough to American ears. Much of the decorating, such as flowers, birds, vines, etc., is done by laying the paper designs on the porcelain and painting over them. The gilding is more laborious, and enormous quantities of pure gold leaf are used. The gold, once laid on, can only become part and parcel of the porcelain by being subjected to

an additional six hours' baking at a temperature of eight hundred degrees Reaumur.

Not less important is the decoration of faience-ware, which varies infinitely according to the desired effect. Haviland & Co., who may be taken as a standard, classify their faiences into six groups—viz: cream faiences, which are thus named from their color, and which are decorated with paintings under the enamel or with translucid enamels; enameled paintings, possessing all the tone, richness and variety of oil paintings; grand-fire fresco paintings, or exact representations of wall frescoes, and especially adapted for panels or architectural ornaments; gilt enamels, reproducing Chinese lac-paintings of vases of precious stones; Limoges enamels, very similar to the ancient enamels of Leonard Limousin; and sculptured faiences, painted either under the enamel or in grand-fire frescoes: the figures alone are never painted in these latter. Each piece of sculptured faience is the model itself, signed by the artist: not one of them is ever reproduced by moulding. In the museum connected with the Haviland works are to be seen some remarkably fine specimens of their faience-wares. The Havilands, themselves Americans, who by their enterprise and integrity reflect credit upon their country, have done much to popularize the love for ceramics in the New World, and the head of the house, Mr. Charles Haviland, was worthily decorated with the ribbon of the Legion of Honor at the close of the Paris Exposition. The firm has recently completed the manufacture of an elaborate dinner service for the White House at Washington, based upon designs by a well-known American artist. Long may that service grace the board of the first magistrate of our nation as a souvenir and symbol of the two great republics of the world—as a substantial evidence of what French resources, combined with American industry, have produced from the rough and shapeless clods of clay which so many preceding centuries have passed by unnoticed!

The Balance Spring, and its Acceleration of Motion.

AS is well known, no part of the watch is subjected to as many views, opinions, theories, fantastical and fanatical, as the balance spring. We subjoin a translation on the subject, from A. Kittel, published in the *Deutsch Uhrmacher Zeitung*. He says:

"I presume it is well known that the isochronism of the balance spring must not be sought for in its length, as was formerly believed but that it is rather dependent from motion and proportion of the size of the balance wheel. An isochronism is chiefly promoted by the judicious bendings of the ends of the spring, and it may be accepted as a rule that the larger the balance wheel the slower will be the oscillations, and *vice versa*; that by a motion where the balance wheel is large, the spring must possess an increased power to accomplish the oscillation. The bendings of a cylindrical spring are made inwardly, which furnishes an excellent means, in case it is not entirely too long, to give to the isochronism the last degree of perfection, and the spring itself receive by this a full power for its own untrammeled exertion. The round curve, however, if it requires but a scant bending, is unsuited, since it does not furnish the spring with the power to exert itself evenly, and thus occasions an injurious pressure on the balance wheel pivots. This evil may be overcome by constructing the curve after the manner as Mr. Phillips has indicated. I wish to say something about the acceleration of motion observed in new chronometers. This peculiarity seems to be inherent to rather overtempered springs, because the harder they are, the greater is their acceleration. An error should not be committed by choosing undertempered ones, because the elasticity of these will soon decrease, and they would become unfit, and although a harder spring is more subject to deviations in extreme temperature, they are preferable to softer ones on account of their greater durability. Many theories and opinions have been expressed about this peculiarity, but it should not be forgotten that it is merely due to the different tempers. I would remind the reader of the property of iron, when subjected to constant vibrations—that fibrous wrought iron is rendered as granular and vitrous as cast iron. Perhaps it may be explained by the probability that the process of hammering and fashioning iron is against its natural law, and it has the tendency, with the assistance of these constant vibrations, to reassume its natural proportion. A like appearance will be found in over-hardened balance springs. It is probable that the process of tempering causes a disturbance in its atoms which is not entirely overcome by the subsequent annealing, but it is still more probable that a forced condition arises by the bending of the curves, which will increase in due ratio with the resistance and hardness of the spring. The circumstance that sudden bendings, or those not made with pincers heated to a blue heat, are promoters of an increased acceleration, appears to affirm this idea."

Zinc and its Uses.

ZINC was unknown to the ancients, although they understood the production of alloys with copper and zinc ores. It is one of the metals which has to be produced with re-sublimation, and this mode was doubtlessly unknown to the ancient metallurgists.

The use of alloys of copper and zinc ores must have been very generally practised even in the earliest ages of antiquities; we read in the first book of Genesis, long before the time of Hiram of Tyre, "which he worked in brass—well, and understood to do all manner of work in brass." It is not more than a century ago since zinc was molten for the first time in Europe. Until then, it was brought from the East Indias, and was known by the name of "Spelter," or "Spiauter," by which appellation it is even yet known in the market. A Netherland commercial company had the monopoly to manufacture it and bring it from the East Indies, between the years 1775 and 1769; they sold over 1,000,000 lbs.

Zinc is of a bluish white color, and on being broken shows a glistening crystalline surface. It melts at 770°, but when exposed to a greater heat, it ignites and burns with a bluish white flame. The product of this combustion is a white powder, called oxide of zinc, used in the trades in place of white lead.

When molten and slowly cooled, it exhibits a fibrous crystalline texture. When heated to about 300°, it becomes malleable and capable of being drawn into wire, and it may be hammered and rolled without breaking, and it retains this property after cooling, which is made use of to produce the sheets of zinc. But when the heat is raised to 450°, it becomes granular and may be reduced to powder with the pestle.

Sulphate of zinc, also called white vitriol, zinc-vitriol, and white copperas, is made by a solution of the metal in sulphuric acid. Chloride of zinc is a product by dissolving the metal in muriatic acid. It is used by the soldering of metals, also by soft-soldering of brass, copper, and iron as "flux."

When sheet iron is immersed in molten zinc, a quantity of salts of ammonia is strewn on the surface, which quickly destroys the forming oxide of zinc, and this forms on the sheet iron what is called "galvanized iron." This coating is an excellent preserver of the iron against rust.

An alloy of zinc and lead forms an excellent metal for sockets of journals. When in right proportions, the product is very tough and malleable, and capable of being drawn into fine wire.

Zinc has been used lately for monuments, because in casting, it conforms to the molds, and is capable of giving very sharp and clear cuts, corners, &c., and being much cheaper than brass or stone.—*Techniker.*

GERMANY is about to hold a patent and model protective exposition at Frankfort-on-Main, and the proposition has met with so much favor that already after the announcement, made only eight months ago, more than one-quarter of all the inventions patented in Germany have been promised to be represented. American inventors please take notice.

Views of Correspondents.

This department of THE CIRCULAR is open for communications relating to the jewelry trade, but the editor does not hold himself responsible for the sentiments expressed by contributors. We invite correspondence, but require that it shall be free from all personalities, and the writer's integrity guaranteed by the disclosure of his true name to the editor. Anonymous communications will not be noticed.

New York, Nov. 10, 1880.

To the Editor of the Jewelers' Circular :

The issue of last month's CIRCULAR contained a very timely article on the apprentice question. Before me lies the *Revue Chronometrique*, Paris, October, 1880, filled with complaints of the slovenly manner in which apprentices are instructed at the present day, emanating from the pen of M. Saunier, whose name is "familiar as a household word" to any watchmaker of intelligence. He says :

"If we wish to retain masters of the useful branches, improve those which are more or less menaced, combat with success a debasement of sales' prices, without having recourse to a corresponding debasement of quality, we must—

1. Incessantly endeavor to perfect our working tools ;
2. Disseminate among our industrial classes the science of mechanics, the study of hand-drawing, and a taste of the decorative art. The importance of the latter in the graceful productions of chimney pieces, of clock cases, &c., can hardly be overrated ;
3. Renovate the present methods of apprenticeship and multiply the centers of practical instruction, where he may acquire without much loss of time the predicted ability of labor by hand. And only at this price will prosperous days be insured to French horology," &c.

The next is in shape of a correspondence published in the *Deutsche Uhrmacher Zeitung*, Berlin, Oct. 15, 1880, which we translate entire :

Mr. Editor : "Many glaring errors have already been uncovered and published by you, and it is time that a very great evil—the so-called apprentice-manufactories—were ventilated by you.

It is well known that a great many of our colleagues endeavor to employ as many apprentices as possible ; I know of places in small towns, where small watchmakers employ as many as four each. But what is the result ? The young men are barely instructed in repairing, and in three or four years they are sent forth into the world, where they wander from one place to the other, because of this incapacity.

Our union lately received a letter from the father of such a ready-made watchmaker, who complains that his son cannot earn money enough as journeyman to keep himself clothed, and is a constant weight on him ; during 1¼ years he was at work for only 30 weeks.

It is a pity to see five or six journeymen per week apply for work, without our ability to employ them. And even if you do, instead of their being of assistance to you, it is *vice versa*." &c.

Such, Mr. Editor, is the *status* of the trade question in Europe. America stands already second on the list of watch production, and if the employing horologer desires to raise a body of able and capable craftsmen around him, let him see to it that his apprentices be instructed in any and all the branches of the trade. We hope our great watch manufacturing centers will not remain satisfied with the production of a cheap timepiece, but will emulate, with all their wonted energy, to contest the chef d' œuvre of the French and Swiss *ateliers*. But this can only be achieved by the patient instruction of the apprentice.

To the Editor of the Jewelers' Circular :

In the November issue of your journal, in the proceedings of the Horological Club, appeared the following letter :

In the October No., 1879, of the JEWLERS' CIRCULAR, page 161, a correspondent offers to furnish glass covers for clocks. I sent him an order for one enclosing $2.00, which he wrote it would cost, but have not yet received the shade, nor any answers to letters sent him on the subject. If you should publish this, it may prevent others from being victimized by the pary in Blossburg, Pa. Would some correspondent be kind enough to give a process for drilling glass quickly ?

J. R. MURDOCK.

It is true that I announced in THE CIRCULAR that I could obtain at the factory here, *round* or *baloon shaped* shades. April 23, 1880, Mr. Murdock wrote me asking the price of a round shade one foot high. I replied that it would cost $2. He sent me the money and a paper pattern for the shade, but on looking at it, I found it was *oval* shape. I gave the pattern to the superintendent of the glass works, who informed me that he did not think they could make it, but he would find out and let me know. Some time passed and I did not hear from him. Finally I spoke to one of the blowers, whom I knew, and he informed me that they could not make ovals at the factory, as they had not the requisite tools. Thereupon I put the $2 in a letter and sent it to Mr. Murdock, explaining the matter to him. I heard nothing further of the matter until I saw his letter in THE CIRCULAR. I infer from this that he did not receive the $2 I enclosed him. This, certainly, is not my fault, for I sent it back to him precisely as he had sent it to me—simply enclosed in a letter. His order gave me a great amount of trouble, and I advised him that when a party offered to do a *certain specified* thing as an *accommodation*, not to ask them to do someting else, as such proceedings made considerable trouble and expense to both parties, occasionally.

Now, that there shall be no hard feelings on the part of Mr. M. toward myself—and I assure him I bear no malice on my part—I frankly say that "putting myself in his place," and not receiving the money in return —as I infer from his communication—and not knowing the party with whom I was dealing—taking all the circumstances, as he knew them—and not being informed different (as is also inferred from the said communication), I should have felt and done as he has. But the fact that changes the whole *status* of the case, was, *I sent back the money*. I may have been to blame for not using more caution as to the manner of sending it back, but I returned it as it came, in a letter.

Very resp'y yours,

Blossburg, Pa., Nov. 15. R. B. FREEMAN.

Diamonds in India.

IN a paper in the forthcoming number of the *Journal of the Scientific Proceedings of the Royal Dublin Society*, Mr. V. Ball, of the Geological Survey of India, gives an account of the mode of occurrence of diamonds in India and of their distribution, and adds reference to the most important authorities on the subject. There are in India three extensive tracts, widely separated from one another, in which the diamond has been sought for. The most southern of these has long borne a familiar name, which is, however, to a certain extent, a misnomer. There are no diamond mines in Golconda. This name, originally applied to a capital town, now represented by a deserted fort in the neighborhood of Hyderabad, seems to have been used for a whole kingdom ; but the town itself was many miles distant from the nearest of the diamond mines, and it was only the mart where the precious stones were bought and sold. The second great tract occupies an immense area between the Mahaunda and the Godavery Rivers ; and the third great tract is situated in Bundelcund, near the capital of which, Punnah, some of the principal mines are to be found. The work of the Geological Survey has demonstrated that the diamonds occur in the Vindhyan Rocks of Northern India. In the upper division of this formation there is a group of clay slate (Rewah), and in the lower a group of sandstone (Semri), in both of which diamond-bearing beds are met with. It is still very doubtful, however, if a diamond has yet been found in India in its original matrix. Mr. Bell gives an account of the chief mines, describing in detail, from personal observation, that of Sambalpur, which has now for some time ceased to be productive. The Punnah mines are still productive, yielding a mean annual produce of between £40,000 and £60,000 a year. Europeans have attempted diamond mining in each of these three tracts, but in no one instance have their operations been attended with success, and yet there does not appear to be the least ground for supposing that there has been any real exhaustion of the localities where mining is possible. In diamond-mining there must necessarily be a considerable amount of individual handwork. There are immense facilities for speculation. It would almost seem that to work it profitably a system of slavery must be adopted. It is, therefore, to be distinctly understood that, except by mere chance, diamond-mining will not prove a rapid road to fortune. Still, writes Mr. King, "for those content with a slowly-paying occupation and a hard life, involving close personal supervision of the workers, it would pay, provided such persons possessed capital sufficient to last them a few years."

Repairing Swiss Watches.

BY H. GANNEY.

IN attempting to write a few pages on repairing horizontal watches, now and for many years past the representative Swiss watch to such an extent that the terms horizontal and Swiss watch are considered equivalent, one cannot help wondering at the neglect of this truly useful escapement by English watchmakers, as it is the only escapement of undisputed English origin. The chronometer, duplex, and lever escapements have as many claimants in France as in England : and as I write I have before me a horizontal watch made by Graham, bearing his name, and two others of about the same make and age : one a repeater, and all of them little the worse for wear, and capable of useful service for 50 years to come. Great as has been the success of the Swiss with this watch, there is nothing that should have prevented a still greater success of the English with it, as when English, French, and Swiss were engaged in the manufacture of verge watches, prior to its invention the predominance was with the English, and the form of watch popular in England, the full plate, is better adapted to prevent dirt from accumulating in the escapement than the Swiss cock watch, which almost looks like a special arrangement for the deposition of dirt in the escapement,

There is a great difference observable in modern and the earlier make of Swiss watches in this respect, the wheel sink of fourth wheel being cut away formerly to allow the inevitable dirt to pass elsewhere, while it now travels round the fourth wheel and sink continuously, until deposited in the escapement, and retained by the oil, which, being abundant in this escapement, soon accumulates more dirt than it can perform with. To this circumstance rather than any theoretical or practical superiority enjoyed by the lever watch as commonly made, is due the rather low estimate of the horizontal watch. The latter being simpler in its parts, requires less motive power, and showing less variation in its arcs of vibration under the varying motive forces, external influence, and temperature changes, advantages which indicate it as the watch for the everyday use of the million. For such purposes it is superior to the lever, but it is incapable of being developed like the lever in its best form to an equality or superiority to the chronometer for pocket timepieces.

One of the greatest evils connected with our art is the production of complicated mechanism, which is mere imitation of the higher class of lever work ; but in sustaining this fallacy the horizontal watch bears no part, as it does not lend itself to fraud by carrying compensation balances or isochronal adjustments other than those natural to it as a frictional dead beat escapement. The correct adjustment required is shown in the simple construction of the cylinder, made to contain one tooth of the escape wheel within its diameter, and the clyinder itself passing freely within the space that divides twc teeth of the wheel. The practice of purchasing cylinders ready made always, is to be deprecated, as nothing gives such facility in repairing escapements as making them ; whilst errors in most conspicuous and most keenly avoided by those who have had constant experience of their annoyance as repairers. The most troublesome job in making a cylinder is drilling the hole in the steel, but this can generally be avoided, as most jobbers have plenty of old canon or center hollow pinions in their rubbish box, which in a few minutes can be opened to fit over the wheel tooth. An arbor put in a short distance and the pointed center of the turns sustaining the other end, 20 minutes work will produce a cylinder ready for hardening the cutting of the cylinder nearly half way for escaping, and two-thirds for banking slot with a plug of brass wire through the cylinder. It requires no special tools, the files being already on every work bench, or they can be easily made or modified by filing and rehardening ordinary square files. The polishing of the inside of the cylinder is easily done on a soft steel arbor on which the cylinder revolves ; two bows and ferrules being used, or the arbor may be moved by the fingers, whilst the cylinder is revolved by the ferrule and bow. The necessary heights and freedom will be indicated by placing wheel and cylinder in depth tool before putting in the pivots ; the other operations are obvious to every workman. In altering escapements the workman has only to remember that all drop is wasted power, and that no drop means stoppage. In order to drive the pivots out of cylinders, owing to the plugs being nearly as large as the cylinder, they must be started by resting on a chamfered or funnel shaped hole ; and the several punches used made to fit all the available space in the cylinder. A most useful tool for flattening, raising, or lowering the action of the escape wheel is a circular piece of brass or ferrule turned concave or saucer shaped both sides, and thick enough to prevent the pivot from coming through the other side when placed on the work board, and and small enough to go inside the circle of the wheel teeth, the arms resting on the brass circumference. There will be a certain amount of space between the concave surface of the brass and the arms to the center of the wheel, by giving two or three rubs up or down the arms with a piece of metal ; a screw driver we use ; they are brought in contact with the concave surface, and the arms receive some of its concavity, and are raised in proportion. Simple as this tool is, and made in a few minutes, we consider it the most useful we have in connection with Swiss jobbing, solving all the difficulties connected with raising or lowering hard steel wheels without the dangers attendant on the use of the hammer and punch.

As all Swiss watches are so arranged that the escapement depth can be easily altered, an intelligent workman can always secure from even the commonest watch a tolerable escapement.

One of the weakest points about the horizontal watch is the fourth and scape pinion depth. The necessity of placing the fourth wheel under the scape wheel makes the wheels always close to each other and their respective bars and bearings, and when to an untrue wheel and soft pinion an indifferent depth is added, special vigilance is necessary. The putting of a new wheel and pinion to common watches entailing too great an expense, doctoring the wheel becomes the prevalent remedy. The new tool for rounding-up teeth truly has been a great boon, as a wheel can be enlarged, tipped true in the turns, or depth tool and the teeth reshaped properly, and the wheel all the better for the hammering it has received ; otherwise the reshaping of the teeth by hand with a small file was all that could be done, or a piece of mainspring held against the teeth whilst revolving in the turns was depended on to round somewhat the teeth, after being enlarged and trued.

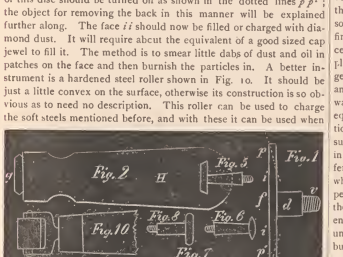
We trust a brighter era is dawning, for bad work is always unprofitable to all concerned, and that the watch repairer, in addition to being required to possess skill equal to all the producers of horological instruments for their rectification when damaged, will not be required to alter or re-arrange the parts of watches to secure original performance. The development of machine-watch making, as practiced by the Americans and lately introduced with success by Mr. Guye into Clerkenwell, will eventually prove the inutility of producing cheap and nasty hand-made watches. Another useful tool for improving teeth we have seen is based on the idea often acted on by jobbers, that bad teeth may be improved by being revolved in connection with a pinion. The tool is like an ordinary depth tool of large size, with centers made to receive the wheel pinion shoulders, and a number of short pinions of strong make ; all sizes are provided, with the arbors to fit and wheel and pinion being geared, a strong bow is applied, and the inequalities of the teeth are corrected and rubbed out by the pinion, which transfers its own true form of tooth to the wheel when revolved with power some time.—*British Watchmaker, Jeweler and Silversmith.*

IT is often desirable to cast a bridge, or other small article, which is easily effected in the following manner : Make a model of the article desired out of lead or wood, but a trifle larger than necessary, as the casting will lose somewhat in shrinking and hammering ; take two pieces of cuttlefish, and fit them smoothly together ; then insert the model between them, gently press equally on both, whereby you will receive a good imprint of the model, and to prevent a possible displacement, fasten them by three or four pins. Take them apart, carefully remove the model, make a funnel-shaped cut-in for casting, and bind them together with wire. Put brass into a crucible, strew borax over it ; and if you are skillful, you will obtan a nice casting.

Gem Engraving.

BY AN EXPERT.

IN my last article I left off just as we got ready to use our cutters. The first practice with these can be done on cheap imitation stone, or even little pieces of glass such as is used in imitation jet goods. An important tool or instrument for shaping such pieces, but which is more strictly a lapidist tool, may as well be described here, as it will be found an important auxiliary on many occasions. It should be made of copper and mounted on a bit of large brass wire turned and threaded to fit your lathe. To speak in detail, get a piece of sheet copper about a twelvth or sixteenth of an inch thick, and one and a half inches in diameter. An old fashioned Canadian or English penny is first rate for size and thickness. If sheet metal is used it should be planished or staked to harden in, as by so doing it holds the particles of diamond dust much better. Drill a hole through the center about one-tenth of an inch in diameter as shown at *f* Fig. 1. In this fig., *d* is the piece of large brass wire spoken of above, and *v* where it screws into the lathe. A pin is turned on *d* to fit *f* and the two riveted together, and to make things safe flow a little soft solder between *d* and *f*. The face *i i* should be turned off flat and true, and finally stoned with a piece of Scotch stone. The back of this disc should be turned off as shown in the dotted lines *p p*[1]; the object for removing the back in this manner will be explained further along. The face *i i* should now be filled or charged with diamond dust. It will require about the equivalent of a good sized cap jewel to fill it. The method is to smear little dabs of dust and oil in patches on the face and then burnish the particles in. A better instrument is a hardened steel roller shown in Fig. 10. It should be just a little convex on the surface, otherwise its construction is so obvious as to need no description. This roller can be used to charge the soft steels mentioned before, and with these it can be used when



they are in the lathe, revolving the spindle slowly, but for the copper disc (it is called a *lap*) it is better rolled back and forth over the face, using considerable pressure. I speak particularly of this because with the steel *steel tools oil only is used.* Two other copper laps precisely like the one described should be made; one is to be used with very fine emery and water. The use of the one with fine emery is to remove any scratches which the diamond lap might leave. The emery should be very fine; such as the diamond pointed pen makers use to grind their iradium points with will do. If such is not to be easily obtained, it is not a difficult or tedious operation to prepare it. I will give the process in detail. Take say one-fourth of a pound of common flour of emery; next procure four pint tumblers (or earthen dishes will do); nearly fill the tumbler with water and stir in the flour of emery, leaving no particles floating on the top; let it stand quiet one minute, then pour the water with the suspended particles of emery into the next tumbler; let this settle for another minute; then pour into the next tumbler and so on to the fourth, being careful each time not to disturb the particles which have settled in each. The reader will readily see that only the finest particles will be left in the last tumbler. This emery on the copper lap cuts tolerably rapid and leaves a dull look, but comes to a brilliant polish rapidly under the rotten-stone lap. The copper lap for rotten-stone is left just as the Scotch stone finishes it, and the rotten-stone is mixed up into a thin mud with water and applied with a small brush to the face of the lap; adding more water as it evaporates, and renewing the rotten-stone as it is needed. Laps of block tin (but they of course must be thicker) can be used to polish with using rotten-stone, tripoli, or putty powder; (oxide of tin) the last is best adapted for soft stones or glass imitations. The process above described will cut and polish agate (onyx) garnet, amethyst, rock crystal, quartz, or any of the ordinary stones, and will be found very convenient for many purposes, such as grinding out any little fracture which may occur from accidents in setting or in altering the shape of a stone. After these preliminaries we will proceed to cutting a letter, as this is the simplest act of gem engraving proper. A handle or holder is to be provided, shaped as shown in Fig. 2, the exact size and shape is left to the taste of the reader. The stone to be cut is attached to the end of the handle as shown at *g*; this attachment is made with some kind of cement very similar in its consistency and nature to shoemakers' wax thickened with some earthy matter; many using sifted brick dust. The following is a very good composition: pale resin, 4 oz.; tallow or sweet oil, ¼ oz.; venetian red, 1 oz. Melt the resin, add the tallow or oil and stir in the Venetian red, make into sticks for use. It should be mentioned some resin requires more tallow or oil than other samples; so if you find your cement too brittle, add more tallow or oil. A stick of the cement should be held to the lamp until softened at the end, and applied to the handle H, and enough taken off to form a bed for the gem *g*. The stone to be engraved should be heated to about 212 F. and applied to the wax and pressed down to firmly bed it into the wax. Care should be taken in heating a stone to do it gradually and equally, and neither should it go much above the temperature mentioned, for occasionally gems break by heat, without what one would suppose to be a sufficient reason. After the gem is securely bedded in the wax, the design, whether letters or other matter is to be transferred to the stone. Anything applied to the surface of the stone which dims the polish, will admit of a distinct tracing with sharpened pegwood; a little vermillion or lampblack, according to the color of the stone, mixed into a paste with glycerine, and *dabbed* on with the end of the finger, leaves a surface which can be drawn on and changed until satisfactory. This outline is not stable enough for our purpose, but it must be traced on the surface of the stone with a diamond point such as microscopists use to mark their glass slides. These outlines can be made with great care and worked up to in the cutting with great fidelity. If the design is an elaborate and expensive one it would be no loss of time to engrave metal and transfer the lines with yellow soap or camphor ice and glycerine, then, of course, fixing it with the diamond tracing point. If there should be any of the outlines left on your job after the engraving is complete, they can easily be polished off with the rotten-stone lap and water. The outline being fixed now comes the engraving proper. We will suppose it to be a Roman letter D. We select a cutter of the form shown in Fig. 6, which is shaped like a short focus double convex lens. You should have quite a variety of sizes of these cutters, for all fine lines are cut with them. They need not be charged, except on the extreme edge, with diamond dust, and should be, for straight lines half an inch in diameter, while for curves of short radius, one-tenth of an inch is quite sufficient. To resume work on our letter; the outline should be cut first as shown in Fig. 7, for it is much easier to bottom out your letters than it is to correct their farms after the heavy incisions are made. To cut the heavy bars select a square edged cutter (as described in last article) of the width between the lines, insert it in your lathe and apply the tool as shown in the dotted lines at *t* in Fig. 4. Perhaps I should have mentioned that the gem should be held below the tool, so as to bring the cutter between the eye and the work; and if using an American lathe, reverse the head block and turn the tail block to the left, so as to leave nothing below the tools to interfere with the handle which holds the gem. As a rule, the

larger diameter of cutter you can use, the better will be the result, as it avoids a wavy look. A slight zig-zag motion to the line of direction by slightly turning the tool handle, also prevents this appearance. Gutting curves as from n to r, Fig. 4, is one of the most difficult jobs in letter cutting; and if the reader will examine good specimens he will in almost all cases, find such letters as D, C, G, S, &c., imperfect at these points. Some engravers use a bevel edge cutter, Fig. 5, but this is not desirable; use the square edge cutter, as for the main bar from *n* to n[1], then a convex edge cutter, Fig. 8, or a ball cutter, Fig. 9; with a variety of these cutters a very nice finish can be made. If the letter is very large and intended for wax, a flat-nosed cutter, Fig. 11, can be used to destroy the concave appearance left by the globe cutter; but such a finish is only extreme cases. One rule must be religiously observed, and that is to never at any subsequent cutting, touch or break the truth or smoothness of the first outline, as Fig. 7, cut and manipulate all you are a mind to inside, but let the clean, sharp outline be intact. On closing this article let me give some advice; be patient; do not hurry, for of all arts this is the slowest; but with practice and patience you will be able to accomplish much.

Advice to Watchmakers' Apprentices.

BY A MAN WHO HAS SPENT TWENTY YEARS AT THE BENCH.

IT is an essential element of success to be satisfied with our calling—to feel assured that we have chosen a business in accordance with our taste and inclination—one for which we have a talent and adaptation—one which will give us a social position equal to our ambition, and one that will also produce a pecuniary reward sufficient at least, for our necessities, and likewise enable us to lay something by for accidents and old age. It is to be earnestly hoped that all these conditions have been duly considered before you make your selection, and it is to encourage and fortify you in your resolution that I have written this letter of advice. To feel satisfied, is to feel safe; and this condition of mind is only arrived at when our reason and judgment are convinced, and the strength of the conviction is just in proportion to the evidence we have; consequently, in this letter I shall endeavor to convince you beyond a doubt that your choice of a trade was not an unwise one.

I shall make no reference to your individual adaptation to the business, for if you have, or even will now properly weigh the other conditions, you can scarcely have erred in this. Now to consider the next in order of our queries as to whether it will afford you a social position which will satisfy your ambition? This is an important question, my young friend, for ambition is the mainspring, and if your hands are willing and your head clear, you may set your goal at anything reasonable and be morally certain of attaining it. Many young men are too proud to learn a trade and aspire to something in the way of a profession; now for my part I am totally unable to understand why an ignorant ass of a lawyer or doctor should be entitled to more consideration in society than an educated and skilled mechanic. It is an indisputable fact which must be apparent to every intelligent observer, that nine out of every ten of our young lawyers and doctors know comparatively nothing outside of the rudiments of their profession, and that they endeavor to make up the deficiency by cheek. Perhaps some one might suggest that in this they had a decided advantage over the young jeweler, as they could put aquafortis on his *brass*, while the jeweler could not apply this test in return. I had no idea of being witty when I commenced this letter, neither do I wish to disparage the professions. All I ask is equal justice for both trade and profession in exact proportion to their merits; and I honestly hold that the trade of watchmaker, in its full sense, requires as much knowledge of the sciences as any profession extant. How much of this knowledge you will acquire is for yourself to determine; all I can do is to point it out to you. The sciences to which I refer particularly are mathematics and chemistry. The first determines the form of the teeth of wheels and the leaves of pinions, as well as their relative sizes, also the angles of escapements, etc. These poinst involve mathematics of the highest order—*differential calculus*, and the question is by no means settled that the best form for the teeth of wheels have been eliminated yet. Chemistry is required to furnish alloys which are hard and elastic, and will not oxidize; oils which will not evaporate or gum, &c., &c. Indeed I could fill half the pages of this journal with the requirements of the trade which could be answered from these sources. They must and will be discovered and brought out by someone. No doubt some of my readers will say, Oh! I don't care about these things, I don't expect to make watches, all I care for is to learn how to clean and repair them. To such persons I beg to say, you will never be competent to touch anything but the commonest watches; for heaven's sake do not harbor such an idea of mediocrity; be equal to the machines you are called upon to care for, and put in condition to perform as their makers intended.

In order to do this you must be able to understand their work, not only the mere mechanical parts which you can see but also the adjustments. The course to pursue is to educate yourself, both in head and hand; let theory and practice move together. Whatever you learn, learn thoroughly; never let the *"good enough"* principle get into your head, it is only a botch's excuse for incompetence. To illustrate what I mean; suppose you are learning to turn; a balance staff is the most frequent job of this kind you will be called upon to do, consequently this should receive your best attention. The first requisite is a good lathe, next procure a good specimen of balance staff, say an American, practice until you can make one in every way as good, both in form and finish; after you are able to do this, get a sample of an extra fine Swiss or English staff and stick to it until you can finish one as well as this; and so along to pinions, wheels, &c &c. If you can not get the method of finish of any particular part from those immediately about you, you can enquire through the columns of this journal, and there are a score of skilled men who would gladly answer you; for there are no secrets with the truly skillful.

This method in conjunction with mathematical skill and a fair knowledge of chemistry and natural philosophy, and you will be able to compete with the best workmen of any country. The idea which some people have, that machine made watches are going to revolutionize the trade, is to a great extent a fallacy. Watchmaking is almost in its infancy yet, and if you properly fit yourself for it, you may as well be among the leaders as a follower coming in at the tail of the hunt. It would only be natural for my reader to inquire how am I to educate myself as you propose, my time is fully occupied. To these I would say, attend evening schools, hardly any town of any size but affords such opportunities; and you can just take hold of these studies with a will and I will guarantee success, at a far less expenditure of time and money than a knowledge of "pool" will cost you. Above all things be industrious and attentive to your business never let your own affairs interfere with your duties toward your employer and his business: this course is sure to win his confidence and esteem: and will establish a course of conduct—in fact habits—that will tend much to your own success in the future.

(*To be continued.*)

THE American Watch Co.'s display of watches at the Cincinnati Exposition was one of the most attractive and interesting exhibits in the building. The report of the judges (all practical workmen) is full in detail, showing that the watches were subjected to tests as follows: 1st, 24 hours in mean temperature; 2d, 24 hours in 100° Fahrenheit; 3d, 24 hours in mean temperature; 4th, 24 hours in 30° Fahrenheit. The results were not only most satisfactory, but so much better than had been anticipated, that the judges express their surprise at their excellence, and unanimously recommended that the special gold medal be awarded the American Watch Company.

Business Notes.

Rest Fenner, Smith & Co., manufacturers of gold canes, etc., offer a large assortment of these goods embracing all the most popular designs and styles.

The New Haven Clock Co. are producing many unique and attractive novelties in clocks, and their enterprise in this direction is highly commented upon by dealers everywhere.

Samuel C. Jackson, the well known manufacturer of artistic boxes for jewelery,etc., has just received direct from Japan an invoice of richly decorated boxes, the first ever imported.

A. Friedenthal, 43 Maiden Lane, offers a full line of reliable Swiss watches, and a carefully selected stock of materials and jewelry, to which the attention of buyers is invited.

H. C. Haskell, the enterprising manufacturer of artistic jewelry, has just issued his annual holiday catalogue of specialties in his line. It is a work of typographical neatness, and shows the beauty of the goods represented to the best possible advantage.

Kearney & Swartchild, of Chicago, have just completed their new watchmakers' lathe, which they now offer to the trade. It is highly spoken of by practical watchmakers, who are enthusiastic in its praise. Their advertisement will be found on another page.

The Spencer Optical Manufacturing Co. have just issued a very neat and attractive catalogue and price list, with handsome illustrations of the various styles of spectacles, eye glasses, and optical goods of their own manufacture. The work is designed exclusively for dealers and will be forwarded to any address on application.

Sinnock & Sherrill have recently introduced some elegant specimens of cameo itaglio rings, representing various poets, composers, authors, and distinguished persons of ancient and modern times. Illustrations of these rings will be found in their advertisement on another page, but it is impossible for a wood engraver to do justice to these goods, either in reproducing the likeness or the effects produced by intaglio cameo work. The goods must be seen to be appreciated.

In the advertisement of Alfred H. Smith & Co., diamond importers, the compositor made them say that they had at both their offices a large assortment of "unexceptionally fine stones and matched pairs of all sizes," etc. It should have read "exceptionally fine stones," etc., which makes a difference. The stock exhibited by the firm is one of unusual importance and embraces rare gems of "exceptional" beauty—such gems as form an exception to those usually found in the markets of this country or Europe.

In the November issue of THE CIRCULAR we announced the destruction by fire of the Ansonia Clock Company's immense factory in Brooklyn, stating that the estimated loss was $500,000. As there was little salvage on the valuable machinery in the factory, the loss actually footed up $825,000, on which there was an insurance only of $395,000. Notwithstanding the heavy loss, the Company has already made preparations for rebuilding on a much larger scale than before. The new factory will be double the size of the old one, covering an entire block of ground, and the building alone will cost $225,000. The plans for the new building have already been determined upon and the contracts given out for most of the work. This furnishes another illustration of the wonderful recuperative powers of American industries. They are so permeated with enterprise and energy that they rise from their ashes, like a modern Phœnix, and still so full of life and activity that it is hard to realize that even a feather has been scorched. It is an evidence of the pluck and energy that have characterized the career of the Ansonia Clock Company, that, immediately upon the heels of so great a disaster, they have the nerve not only to renew their works, but to double their capacity. Such enterprise is sure to be successful, and explains the wonderful success that has attended the efforts of this company. It is expected that the new works will be ready for occupation early in the new year.

Workshop Notes.

Alabaster is of a soft and porous nature and can be cleaned best by means of soft water and soap, and brush ; then dry it in saw-dust.

Pencil drawings may be preserved in the following manner : Soften white wax in rectified oil of turpentine, and rub this jellyform mass gently over the drawing. The white wax will form a coating on the paper after the evaporation of the turpentine.

So-called magical napkins for polishing silver have been introduced into trade. They are pieces of red calico, prepared by steeping in an alcoholic solution of curd soap mixed with tripoli and red coraline. The color, of course, contributes nothing to the cleansing power of the cloth.

To color brass steel-gray, gray, or black, add 100 parts of water, 1 part of sub-sulphate of soda and 2 parts sulphate of copper ; carefully clean the article, immerse it in the mixture, and warm it over a flame. A larger amount of sub sulphate of soda produces a black, while a greater ratio of sulphate of copper effects a bluish gray color.

Cold has a remarkable influence on metals, and changes mercury into a malleable metal. Some genius in the frozen zone manufactured tea spoons from it, which, on being placed in the hot tea, melted, much to the consternation of his companions, and to his own great delectation. Severe frost in the climate of St. Petersburg causes tin plates to throw up blisters, like frost boils, and it was found that a crystalline metal had been produced within.

A very fine preparation for making steel very hard is composed of wheat flour, salt and water, using, say two teaspoonfuls of water, one-half teaspoonful of flour and one of salt ; heat the steel to be hardened enough to coat it with the paste by immersing it in the composition, after which heat it to a cherry red and plunge it in cold soft water. If properly done the steel will come out with a beautiful white surface. It is said that stubb files are hardened in this manner.

Silvering.—Dissolve 10 grams of silver in nitric acid, add clear rain water, and add some salt to the mixture, which causes a precipitation of the silver. When it has lost its acid taste, put it into ½ litre of rain water, in which were previously dissolved 30 grams of cyanide of potash. Articles intended to be silvered must first be well cleaned in an aqueous solution of bi-carbonate of soda, then lay it into the silvering, into which place at the same time a small zinc rod, which must touch the article under process.

The following gilding solution, to be used at a temperature of from 120° to 180° F., has been recommended by M. E. Rod in *Le Monde de la Science :* Crystalized phosphate of soda, parts by weight, 60 ; bisulphide of soda, 10 ; cyanide of potassium, 1 ; chloride of gold, 2.5 ; distilled or rain water, 1,000. To prepare this bath properly the water should be divided into three portions, viz : one of 700 parts and two of 150 parts by weight. The sodic phosphate is dissolved in the first portion, the chloride of gold in the second, and the bisulphide of soda and cyanide of potassium in the third. The two first portions are gradually mixed together, and the third is afterwards added. With this solution M. Rod uses a platinum anode—a wire or strip—adding fresh portions of the gold salt as the solution becomes exhausted.

Hard-soldering with gold.—The hard-soldering of engagement or wedding rings, and other solid articles of gold is best effected by the following alloys : For fine gold articles use 14 k. gold and for those of 14 k., 8k. gold may be used. Should, however, the articles not be entirely solid, or have been soldered previously, an alloy of two parts of gold corresponding with the fineness of the article, and 1 part of silver solder may be used to advantage. The solder for solid wedding rings is best inserted between two ends, and well covered by thick borax water, by which a nice adhesion is effected. Colored gold rings, after having been soldered, are restored to their color by being boiled in thinned sulphuric acid. For this purpose they are thrown into a powder made of two parts saltpetre, one part alum, and one part cooking salt, and then placed in a charcoal fire—or laid on a clean charcoal and the flame of a lamp directed against them, then boiled in thinned sulphuric acid, dried, and burnished with the steel. Should the color not be yellow enough, the operation may be repeated. A color produced by this recipe is far more durable than a common gilding, and the powder once prepared, a great deal easier.

Trade Gossip.

Celluloid jewelry is being revived.

Fine cameos are exceedingly scarce, consequently prices are advancing.

An extensive vein of a very fine qualtity of jet has been discovered in Utah Ter.

Diamond jewelry was never more popular than at the present time. The demand for all grades of work is unprecedented.

A large vein of well-crystallized amethysts have been discovered in the northern part of Newlin Township, Chester Co., Pa.

Painted enamels are still popular and are introduced in a variety of styles. Some of these paintings are exquisite works of art.

Many new effects in celluloid jewelry are introduced. This style of jewelry has greatly improved in both design and finish during the last few months.

It is stated on good authority that over $150,000 worth of smuggled diamonds have been siezed by the officers of the Custom House during the present year.

Over five hundred pounds of massive blue corrundum has been discovered within ten feet of the surface in Chester Co., Pa. The vein is similar to that found in North Carolina.

You may travel through the great Karroo in South Africa for three hundred miles without encountering a vestige of anything to eat. There are millions of diamonds, but a man cannot eat diamonds.

Sarah Bernhardt has been in this country one month, and yet none of our manufacturers have named a necklace or a watch movement after her. It does seem as if this country isn't as enterprising as it used to be.

We are constantly hearing complaints of diamonds and watches being smuggled into this country from Canada. We suggest that the United States government buy Canada outright and thus stop abuses of this kind.

It is reported that the firm of Wm. B. Clapp, Young & Co. has been dissolved by limit of co-partnership. Mr. Clapp having sold his interest to his former partners. The firm will hereafter be known as Otto Young & Co.

There is at the present time an almost unprecedented demand for diamonds. People have discovered that the depreciation in the value of diamonds is very much less than in the case of most other gems. They do not go out of fashion.

The jobbing trade in Chicago is reported as having been somewhat dull during the past month. It usually happens after the regular fall trade that there is a lull before the holiday trade commences, but the holiday trade will be unusually heavy, and the Chicago houses will reap their share of the harvest.

When Colonel Sellers, years ago, told Mrs. Hawkins that pork would be so precious after he had made a corner on it that she would soon be wearing hogs as jewelry, he scarcely thought of the little golden pig ornament now actually worn by fashionable ladies of Cincinnati, the pork Paris of America.

In jewelry, all colored stones are very fashionable. Ruby, garnet and turquoise are more popular then ever before. Cat's eyes, moonstones and sapphires are also in great demand. Many colored metals are made up into scarfpins and other ornaments. There is also a demand for black diamonds and pearls.

A number of the jobbing houses of Chicago have been robbed of considerable quantities of goods by boys in their employ stealing them. One boy, more enterprising than the others, has been obtaining goods on forged orders. Joliet is in too close proximity to Chicago for misdemeanors of this kind to be carried on with impunity.

Ralph D. Earl of this city has been arrested at the instance of the Morse Diamond Cutting Co., on an alleged charge of embezzlement. In May of last year Earl got a pair of diamond earrings worth $250 on the alleged representation that he had a customer for them. Since then he has neither restored the goods nor paid the money for them. The accused gave bail to answer the charge.

An adventurer, representing himself as Mr. Cady, of Cady & Olmsteads, of Kansas City, Mo., has recently been calling on various firms and asked to be shown goods. He was detected, however, before he had victimized the trade. He was last heard of in Philadelphia, but is believed to be traveling west. He is a tall, swaggering, boisterous chap, and does not at all resemble Mr. Cady. The trade should be on the lookout for him.

Prof. James C. Watson, the eminent Astronomer of the Wisconsin State University, died on the morning of the 25th ult. His remains have been taken to Ann Arbor, Mich., for interment. The deceased was one of the judges in the Horological department of the Centennial Exposition at Philadelphia, and his intelligent and comprehensive reports attracted the universal attention of scientific men.

At a recent concert given in Leadville, Colorado, Mr. Joslin, of Joslin & Parks, and Mr. Wesley Moore, with C. G. Alford & Co., of this city, contributed largely to the entertainment. Mr. Joslin has an exquisite voice, and is, consequently, popular in Leadville, while Mr. Moore has fine tenor notes—in fact, has been known to reach tenor C, without effort. A local paper enthusiastically speaks of these gentlemen as "hummers on the sing, and 24 karats fine."

Jacob Morch, a Williamsburgh Jeweler, left a package of diamonds in a Long Island railroad car two years ago. A reward of $500 for their return was offered. Miss Alice Pierson found them, took them to Mr. Morch, and claimed the reward, which he refused to pay. She then sued him and secured a verdict. He carried the case to the Court of Appeals, which decided in favor of Miss Pierson. Mr. Morch will now have to pay about $1,000 instead of $500.

On the 29th of October last seventy diamonds and five gold settings were seized on board of the steamship Labrador, from Havre, by the Custom House officers. No claimant appeared for them. The case came up recently in the United States Court, before Judge Choate. A deposition from District Attorney Woodford was read, praying that the siezed goods might be condemned as forfeited to the use of the United State. Judge Choate ordered that the goods be confiscated.

At the Winter Palace at St. Petersburg there is a room full of diamonds, pearls, and other precious stones. An Empress of Russia is allowed to borrow from this room, after giving a receipt for what she takes, and generally the Grand Duchesses are allowed to borrow from it also. The editor of London *Truth* remembers once going into this room with a French diplomatic lady. She beat a hasty retreat after one glance round, for she felt that, if she stayed, her principles would succumb to her admiration, and that she would try to steal some of the contents.

The latest visionary business scheme comes from London. It consists of a proposition to insure merchants against loss from bad debts. Its advocates claim that the guaranteed certainty of payment for all goods sold at the expiration of the term of credit would enable a merchant to extend his buying and selling operations with great confidence, and at a minimum of profit, with a resulting benefit to both producers and consumers. On the other hand, it should be apparent to the youngest student of human nature that a person cannot sublet his own responsibility. Such a scheme as the above would destroy the care now taken in granting credits, and would tend to make buyers less prompt in their payments—to say the least.

Hundreds of beautiful ornaments have within the past year been unearthed from the old tombs near Naples. The scarabei, rings, bracelets, vases, and articles of ancient household art are pronounced by connoisseurs to be of extreme rarity and richness. It is probable the collection can be purchased from the present owner, Baron Spinelli, at a moderate price, especially if it is announced to that gentleman they are intended for free exhibition and study in this country. We therefore take the occasion to suggest to the Directors of the Metropolitan Museum of Art the propriety of addressing themselves officially as the directors of that institution, not individually, to the distinguished Baron, and procure if possible his treasures for this City. In the meantime, wouldn't it be the proper thing to relieve Messrs. Cesnola and Feuardent, as well as the people of this City, by settling the question of maladministration and malformation now hanging in the atmosphere.

A persevering "notions" canvasser walked into a lawyer's office in San Francisco with a new kind of alarm clock. The man of quibbles was evidently interested and heaid him patiently to the end, When it came to his turn to get in a word, which in these cases is about once in an hour and a half, he spoke as in hereinafter connected:—"My friend, I firmly believe that this alarm will be worth seven dollars, as you state, and that you are foolish to offer it to me for two and a half ; that it will go every half hour for sixteen months without winding up and wake up an elephant at every pop. My heart tells me that this is true, and I am simply aching to give you four times the price you demand. But when I inform you that I have an infant three months old at home afflicted with perpetual colic, and a baby going on three who insists on having a drink of water at regular intervals during the night, and never sleeps after 4 o'clock in the morning, do you not think that my investment in this beautiful invention which you are retailing might, in a measure, be characterized as extravagant ?" That clock agent nodded assented, picked up his hat, put up his alarum and retired.

THE

Jewelers' Circular and Horological Review.

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THE

JEWELERS' CIRCULAR AND HOROLOGICAL REVIEW

The recognized organ of the Trade, and the official representative of the Jewelers' League.

A Monthly Journal devoted to the interests of Watchmakers, Jewelers, Silversmiths, Electro-plate Manufacturers, and those engaged in the kindred branches of art industry.

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Those of our readers whose term of subscription expires with this issue, and who have been notified by our usual circular, will confer a favor by responding as promptly as possible, as all subscriptions terminating with this volume will be discontinued if not renewed.

Our Closing Volume.

THE present issue of THE CIRCULAR completes its eleventh volume. It is with feelings of no little satisfaction that we turn the pages of the closed volumes and review the work we have accomplished. To build up a journal that should command the respect and confidence of so powerful and intelligent a class of men as those comprising the jewelry trade, was no slight undertaking. That THE CIRCULAR has achieved this is not due so much to ourselves as to those leading men in the trade, who, with their advice and encouragement, aided us in maintaining the high standard necessary to command the confidence we have enjoyed. We are also indebted to those practical and scientific members of the guild who have contributed such valuable essays to our columns that the trade could not fail to respect them. Looking over the volumes of THE CIRCULAR, we find that every branch of the jewelery trade has been fairly represented by the able corps of writers who have assisted in their preparation. Watchmaking, in its various phases, has been a prolific theme; the workers in gold and silver have been provided with technical essays on their specialties; the lapidaries have had many valuable hints given them through our columns; and the commercial men of the trade, manufacturers, travelers, workmen, apprentices, in short, everybody connected with the great jewelry interest of the country, have been able to find instructive articles in every issue of THE CIRCULAR. We do not claim special merit for this, but we do take pride in the fact that we have been able to provide an acceptable medium through which the active, thinking, progressive and ambitious minds in the trade could interchange thoughts and ideas with each other. In this respect we think we may safely claim to have been of some service to our friends in the past.

But we do not anticipate that the days of our usefulness are yet passed. The gray hairs that are rapidly appearing among our raven locks are not due to advancing years, but to our anxiety to make THE CIRCULAR the best and handsomest trade paper in this country, and worthy of the great industry it represents. We are about entering upon a new volume, and our energy and ambition is in no degree lessened. On the contrary, we are determined that improvement shall mark our footsteps as the months pass by, so that when we close our next volume we can point to it with satisfaction and pride. To this end we shall continue those features of THE CIRCULAR that have been so acceptable in the past, adding such new ones as events may demand. Our valued contributors, "Excelsior," who has done more to lighten the burdens of watchmakers than any other living man, "Expert," whose intelligent articles on gem engraving have been the most instructive ever published on this subject, and others, will continue their essays on the technicalities of the various branches of the trade, and we are pleased to announce that Prof. M. Grossman, one of the most eminent horologists, will contribute a series of papers to our columns that cannot fail to be of great value to every horologist in the land. Without putting forth an elaborate programme of promises for the future, however, we point to our past record as an indication of what may be expected of us in the year to come. And so, profoundly grateful for the confidence bestowed upon us in the past, we close the pages of the present volume, and, in the bright dawning of a prosperous season, we wish all our friends, old and new, abundant success in all their undertakings, and hopefully for them and ourselves, bend our energies to the preparation of volume twelve.

A School of Art in Jewelry.

AT the recent annual banquet of the Jewelers' Association, numerous excellent speeches were made and the trade was congratulated on its improved condition. Among the many suggestions made, none were more pertinent or valuable than those put forward by Mr. T. G. Brown, treasurer of the Association, in the course of the brief address with which he favored the company, to the effect that a necessity of the trade at present was higher cultivation in the artistic branches of the business. He favored the formation of an art school, wherein designing for the trade should be taught and encouraged and artistic workmanship cultivated. While the idea is not a new one, Mr. Brown's remarks were most opportune and forcibly put. The jewelry trade has, from time immemorial, been classed among the fine arts, and those workmen who have skillfully and elaborately worked out the artistic designs of others, have been equally honored with the artist. The workmen of America have done their full share in developing art in wrought gold and silver, but have, to a great extent, trodden in the beaten paths of their European predecessors. This was natural, for America is yet young in art work of all kinds, and had to receive her instruction from the older countries of Europe. But as America has grown in wealth and importance, the æsthetic tastes of the people have developed, and there is now a demand for originality in art. In almost everything pertaining to the

jewelry trade, America is now on a par with the old world. We have little to learn from her workmen in the reproduction of ancient or modern work in gold or silver. What we do want, however, is originality of designs. Even in this respect some of our best houses have done themselves credit, and groups and scenery of purely American origin have been fittingly and beautifully reproduced in wrought gold and silver. Enough has been done in this direction to prove that there is an art realm as yet almost unexplored, and that we have the artistic resources, if properly developed, to achieve a great triumph in the production of artistic work, "native and to the manor born." The genius of America is originality; it may be crude, but it has strength and character. What it lacks is proper culture. The jewelry trade, more than any other, needs its art school. What Peter Cooper has done with his schools of science and of applied mechanics for the rising generation of scientists and mechanics, needs to be done in the jewelry trade for the development of that latent skill and genius which its young men possess. Give them the opportunity, and the future will see a race of skilled artisans in America that will excel in originality of design and workmanship the best examples of the famous old masters in gold and silver work.

New York, Boston, Philadelphia, and Chicago have their jewelry palaces, wherein are exhibited the treasures of both the old and new worlds, and these have done much toward the education of the public and the trade. Workmen, old and young, have been inspired to compete with these examples, and, in doing so, have achieved great excellence. But schools of instruction would tend to smooth their way, and render the accomplishment of the final result—superior excellence—more easily attainable, and with less expenditure of time. In these schools should be illustrated and taught all the mysteries attending the production of artistic designs in gold and silver, and the art of designing for this especial field should be liberally encouraged. It should be projected in such a spirit of liberality that whoever sought its care and protection—whether the son of the millionaire or the workman at the bench—should be entitled to all its privileges. From such a school we might expect such development in artistic work that in future years the jewelers of America would stand without rivals in the excellence of their productions. Such a school would be no less valuable to the plated goods manufacturers than to the gold and silver workers, for art is as highly appreciated and quite as valuable to the one as the other.

How such a school should be organized it is not for us to say. We see the necessity for it, and point attention to the fact. The treasurer of the Jewelers' Association gave public utterance to the thought that has long been in the minds of many, and it would redound greatly to the credit of that organization if it would give practical shape and form to the idea advanced by him. The Association represents the wealth and culture of the trade in this city, and of the country, and a school of art in wrought gold and silver would not be an extravagant luxury for it to found and foster. We are sure that the influence of such a school would have a marked and immediate effect upon the trade, stimulating its skilled workmen at once to put forth their best efforts, while its influence would be clearly apparent in five years in the production of a class of skilled artisans, self-reliant, ambitious, original in their conceptions, and strong and vigorous in their productions. We hope Mr. Brown will not rest in his endeavors to give practical shape to the ideas to which he gave such clear and forcible utterance.

A National Bankruptcy Law a Necessity.

IMPERFECT as the old bankruptcy law was, it was, nevertheless, better than none, as has been demonstrated by events since its repeal. Without such a law, general in its application, the state laws apply, and these are so at variance with each other that creditors prefer to compromise with an insolvent debtor on his own terms to attempt to collect from his estate by means of state laws. During the past year the Boston Board of Trade has been active in ascertaining the sentiment of the country relative to a national bankruptcy law, and obtained from Judge Lowell the draft of a bill to be presented to Congress this winter. Copies of this bill were sent out very generally, and suggestions asked with a view to making it as nearly perfect as possible. In accordance with suggestions made, Judge Lowell has modified the original bill in some particulars, and it is now ready to present to Congress. It seems to cover the ground in a satisfactory manner, overcoming many objections to the old law, and should meet with the approval of the business community generally.

The bill provides for courts of bankruptcy, substantially as in the old law, but more clearly defines the duties of the register. The register is made a salaried officer, and his powers very much increased. One of the great objections to the old law was the fact that the registers were paid by fees, and it was thus made an object to them to delay and complicate the proceedings. Registers are subject to the Circuit Courts, and a supervisor, to be a salaried officer, is provided to keep watch over the bankruptcy business in each Circuit, to see that the registers transact their business promptly and economically, and to report quarterly to the Circuit Judge. Clerks are to be paid by fees, made as low as possible, and no marshals are to be employed except to serve warrants. The Supreme Court to have power to make rules and prescribe forms and modes of proceeding. The property of a bankrupt, voluntary or involuntary, may be put in the possession of a marshal when deemed necessary, and the bankrupt who is about to leave the district, may be arrested and held to answer all orders of the Court. Evidence before the register may be taken orally instead of in writing, and the register may use his discretion in recording it in full or in substance. The acts which constitute bankruptcy, and for which a creditor may force a debtor into involuntary bankruptcy, are substantially the same as in the old law; the failure to dissolve an attachment or to pay open accounts are made acts by which involuntary bankruptcy may be enforced. To avoid the danger of persecution, it is made necessary, where there are twelve or more creditors, for at least three to join in the petition to place a debtor in bankruptcy. The choice of assignee is by creditors, and every assignee is to give a bond for the faithful performance of his duties, and small creditors who are to be paid in full, shall not vote for assignee on the privileged part of their debts; and preferred creditors are not to vote unless they shall first surrender their preferences. The creditors may, if they desire, appoint a committee of three to the assignee by their advice. Greater power is given the assignee to set aside secret or fraudulent liens; if a judgment creditor has seized the property, his lien will be dissolved, and any property in the hands of the sheriff shall be turned over to the assignee. In addition to the accountability of assignees, the proposed law places them under the direction of salaried registers and supervisors, who will have no interest encouraging delay or unnecessary expense. Provable debts are substantially the same as under the old law. A preferred creditor is not to be permitted to prove any debt until he has surrendered his preferences. Privileged debts are the same as under the old law, except that one per cent. is to be paid for salaries of officers, and other expenses incident to the proceedings. The compensation of assignees to be left to the creditors, subject to revision by the register or judge. In relation to discharge, the law differs from the act of 1867 in not requiring the payment of any dividend, or the assent of creditors, if the bankrupt has been honest and fair in his dealings. It is found that, in many cases, the assent of the largest creditors, which virtually controls the action of the rest, is procured by promise of future advantage; this leads to the purchase of those creditors who are the least scrupulous, and least deserving, at the expense of the rest. This law is based upon the theory that an honest debtor, who has surrendered all his property, and faithfully assisted in the settlement of his estate, should not be subject to the caprices or enmity of any creditor. A debtor is not to have his discharge who has committed any frauds which are made criminal by this act, who has failed to obey any lawful order of the court; who, being a trader to any considerable amount, has failed to keep proper books of account, or who has given any preferences which have not

been surrendered by the preferred creditor. Composition is put upon an entirely different footing from that which it had under the old act. The purpose, however, is the same, viz : to enable a blameless debtor to arrange to the satisfaction of his creditors without the expense and delay of formal bankruptcy proceedings, and thereby to save the good will of his business, while his creditors realize as much or more than they would in complete bankruptcy proceedings. To guard the rights of creditors, it is provided that at least one-third of the composition agreed upon shall be paid in cash, and the remainder secured to the satisfaction of the creditors and the court. This done, the debtor resumes his full rights, and is entitled to his discharge. The new bill makes it a punishable offense for creditors to permit frauds upon their fellow creditors by proving false claims, or for entering into collusion to secure the appointment of assignee or the discharge of a bankrupt.

Judge Lowell has evidently given much study to the requirements of a bankrupt law that shall deal equitably between the debtor and creditor classes. He has certainly made very great improvement upon the old law, and the enactment of his bill by Congress will, unquestionably, be of great advantage to the business community. It is not expected that any bankruptcy law can be devised that will give entire satisfaction in every case, but some uniform method of dealing with delinquent or insolvent debtors is a necessity of the times. It would be well for Congress to adopt Judge Lowell's bill as an iniative bankruptcy law, to be amended and perfected in the future as its weaknesses may be developed. The author of this bill is entitled to the thanks of the entire business community for the studious care he has devoted to the consideration of the subject of bankruptcy, and for the careful manner in which he has prepared a bill that is, apparently, equitable and fair in all its provisions, protecting alike the interests of the debtor and the creditor.

That Visionary Watch Company.

HOW easily the rural editors are imposed upon. Newspaper men are generally supposed to be pretty sharp, but the gullibility of some of the country editors passeth all understanding. Our friend, Colonel Sellers has evidently been visiting Elgin, Ill., for we find in a western paper the following, which is announced as an "Elgin special :"

The most important enterprise among the many which have been inaugurated here within a decade is a new company for the manufacture of watches, which has now assumed such definite shape that its success is assured beyond a doubt. This new institution, which will be established within a year, is receiving substantial aid from outside capital upon an entirely new and original plan, and the scheme is working with entire success. In brief, this system is about as follows : The company enters into a contract with the leading and most substantial retail jewelers throughout the country to furnish its watches to those dealers for a term of twenty years, company's option, at a discount of 15 per cent. from jobbers' prices, the jewelers, for this concession, depositing $200 with the company, to be used as a working capital until the new company is firmly upon its feet. Such progress has been made that one hundred and twenty-five contracts have already been entered into, and $25,000 thus pledged by contract for the scheme.

This refers, of course, to the grand co-operative-pass-around-the-hat-watch company existing in the colossal brain of our biblical friend Shurley, and to which we have had occasion to refer before. The proposition embodied in the above is too ridiculous to be treated seriously. The idea that any retail dealer is going to be idiotic enough to pay $200 for the privilege of tying himself to the tail of a visionary kite is too absurd to comment upon. The scheme does not possess the attractions of an ordinary lottery advertisement, where 100,000 persons pay $2 each for the privilege of seeing 100 other fellows draw a few prizes. In the lottery there is really a few prizes, but General Shurley offers nothing but blanks, and these to be served out at the "company's option," whatever that may mean. It would be interesting to know who the 125 retailers are who have, as alleged, pledged friend Shurly $25,000 toward his intangible project ; if there are any such, it is high time their creditors were looking after them. If they have really given any such pledges, nothing short of close confinement in an insane asylum will prevent them from squandering their estates beyond recovery.

The Failure of C. J. Steinau.

THE recent failure of C. J. Steinau, of Cincinnati, created quite a ripple of excitement in the trade. Mr. Steinan conducted a jobbing house doing a fair business, and enjoying a moderate amount of credit. In business matters he had ingratiated himself with a certain portion of the trade, that extended to him a somewhat cautious and hesitating credit. His liabilities are placed at $59,000 and his real assets at $35,000. His affairs have been placed in the hands of an assignee for settlement Meanwhile Mr. Steinau's representative has visited New York with a view of effecting a settlement with his creditors, offering 50 cents on the dollar, half cash and half notes secured.

One cause assigned for his failure is the fact that he compromised a disputed claim for 75 cents on the dollar. This act is alleged to have given a color of insolvency to his status, and as Eastern creditors heard of it, and that he was slaughtering goods, they hastened to place their claims in the hands of Cincinnati lawyers, and thus precipitated his failure. It has been customary for some time past for the mercantile community to inquire very closely into the financial standing of a person asking credit and also into his personal habits and social surroundings. Delinquencies in the latter respect were considered quite as valid reasons for refusing accommodation as a weak financial condition. Why this very general rule should have been ignored in the case of Mr. Steinau it is impossible to conceive.

The case has been investigated by a committee of creditors, who recommend the acceptance of the offer made by Steinau, of fifty cents on the dollar. This, we presume, ends the case, but if the loss incurred shall teach the trade a lesson in the matter of giving credit that is not fully warranted by all the circumstances surrounding him who asks it, the experience will have been purchased at a moderate cost.

A Scientific Clockmaker.

AT the last meeting of the British Royal Astronomical Society, Sir George Airy, the Astronomer Royal, paid a well-deserved tribute to the memory of Graham, the clockmaker. Before his time, astronomical timepieces were very imperfect. Graham reformed astronomy by introducing clocks which would go not for a few hours only, but for many days without winding. He also introduced the dead beat escapement and the gridiron pendulum. The advantages of these two inventions were recognized quickly and adopted everywhere, and astronomy from that time became a different science, that is to say, a science of exclusively meridional observations.

" I think it is due to the memory of Graham," says Mr. Airy, " to say that he must have carefully studied the action of the pendulum and the maintaining power. He was aware that the impulse should be given at the center of the arc of vibaation, though, as far as I am aware, this fact was not drawn attention to till about forty years ago, when a paper on the subject was publised in the ' Cambridge Philosophical Transactions.' Bradley (Astronomer Royal) took advantage of these improvements, and worked in a way which excited the admiration of astronomers, but the great reformation in astronomy was due to Graham's talents. He was not only a clockmaker, but was a maker of great quadrants and instruments of that sort, such as have never been surpassed. He was the first to discover the diurnal changes of magnetism. He is the only working man, as far as I am aware, who was ever buried in Westminster Abbey. On the occasion of his funeral his coffin was followed by all the members of the Royal Society."

The Jewelers' League.

We devote this column to the interests of the League and its membership. Letters or inquiries pertinent to its business or purposes, and which might interest the trade or inquirers, will be herein answered. Address *Jewelers' League, Box 4001, P. O. New York*, or the office of THE CIRCULAR.

The following named applicants were admitted to membership in the Jewelers' League at the November and December meetings of the Executive Committee :

NOVEMBER MEETING.

James F. Andrews, New York City ; Henry W. Appleton, New York City ; George J. Austin, Batavia, N. Y. ; Peter J. Babcock, New York City ; Hiram F. Balsley, Marshall, Ills; John A. Beck, Portland, Oregon ; James H. Bell, Tarboro, N. C. ; Everett J. Brett, Newark, N. J. ; Jordan Broghammer, Wilkesbarre, Penn. ; Otto Caesar, New York City ; Walter G. Clark, North Attleboro, Mass. ; Henry S. Colyer, New York City ; Alfred M. Crommelin, New York City ; David M. Cubbison, Newcastle, Penn. ; Francis A. Cumberland, North Attleboro, Mass. ; Alfred E. Daniels, Mannce, Ohio; Charles W. H. Day, North Attleboro, Mass. ; Henry B. Dennison, Boston, Mass. ; Jacques Depollier, New York City, Jacob Dorst, Cincinnati, Ohio ; Jacob Dreicer and Marillo B. Dunning, New York City ; Franz J. Ehener, Chicago, Ills. ; William H. Eggert, W. Irving Fiero, New York City ; Jacob E. Frantz, Lancaster, Penn. ; Adolph Franz, George H. Gale, Simon Goldsmith, New York City ; Alexander Gordon, North Attleboro, Mass. ; Lewis W. Gordon, George II. Griffin, Rudolf C. Hahn, James Hall, Adolph Hank, Frederick C. A. Hildebrandt, Ethel C. Hine, August M. Hoeffmayr, Stephen C. Hoaard, New York City ; Cyrus H. Johnston, Harford, Penn. ; Theo. W. Kaempff, Philadelphia, Penn. ; Charles Kiefer, Charles Lar; *on*, New York City; Henry B. Lord, Sanford, Fla.; Josiah S. Luckey, Eugene City, Oregon ; Walter S. Mackintosh, Henry J. Mallet, Jr., New York City ; William W. Martin, Salem, Oregon ; Augustus W. Mead, New York City ; John B. Miller, Portland, Oregon ; John Minn Jr. New York City ; Joseph E. Mitchell, Philadelphia, Penn. ; Stephen W. Morgan, Winona, Minn. ; Charles H. Moulton, East Cambridge, Mass. ; Samuel J. Newick, New York City ; Joseph H. Oliver, Philadelphia, Penn. ; Samuel L. Park, Adolph Pfornheimer, New York City ; Charles F. Prescott, Barsia, New York ; Abraham Rahwyler, San Francisco, Cal. ; Cassius L. Ramsdell, Jules Rochat, George R. Schofield, John Scott, New York City ; Homer U. Seaman, Washington, Penn. ; William R. Sepach, New York City ? Otto Sonnenchein, Chicago; Ill. ; George Southwick, New York City ; James W. Spence, Racine, Wis. ; John H. Starbuck, Amherst: Mass. ; Montrose L. Stiles, Earnest A. Strnat, New York City ; Moses Strauss, St. Louis, Mo. ; Hiram Sweet, Atchison, Kansas ; Harry B. Thornhury, Henry Vogel, Peter T. Wagner, New York City ; Joseph Welf, Cleveland, Ohio ; William H. Wigmore, Philadelphia, Fenn ; Constant C. Willemin, New York City ; Emil A. Zadek, Mobile, Ala.

DECEMBER MEETING.

Leopold Aigeltinger, Newark, N. J. ; Joseph Alkalay, New York City ; Joseph C. Baldwin, Columbus, Ohio ; Charles E. Beals, Newtonville, Mass. ; August Becker, New York City ; Harry C. Beil, Brooklyn, N. Y. ; Wm. A. Bigler, Chicago, Ills. ; Robt. Z. Block, Brooklyn, N. Y. ; John T. Borthwick, Wilkesbarre, Penn. ; Marion D. Bradley. Brookyn, N. Y. ; Uriah T. Chamberlain, Corona, Long Island ; James A. Chency, Syracuse, N. Y. ; John W. Cotton, Brooklyn, N. Y. ; Charles E. Crane, Lake City, Minn. ; John G. Davis, Portland, Me. ; Thomas V. Dickinson, Buffalo, N. Y. ; Henry Elbe, Niagara Falls, N. Y. ; Clarence W. Fisher, North Attleboro, Mass. ; John Geiszler, New York City ; James W. Grant, East Saginaw, Mich. ; Louis A. Hoffman, Freehold, N. J. ; Charles F. Holder, New York City ; Wm. H. Keil, Orrville, Ohio ; Edwin Keller, Allentown, Penn. ; Alonzo Lambert, West Flushing, Long Island ; Alfred E. Lavigne, New York City , Henry Linn, Herman Linn, Philadelphia, Penn. ; Charles R. Nichols, Fulton, N. Y. ; Henry A. Norman, Cincinnati, Ohio ; Francis J. Patton, Cleveland, Ohio ; Henry B. Sadtler, Baltimore, Md. ; Clarence E. Settle. Brooklyn, N. Y. ; James F. Simms, Attleboro, Mass. ; James B. Story, Chicago, Ill., Oscar S. Tilyou, New York City ; Alvin S. Van Dusen, Warrensburg, N. Y. ; Wm. C. Wood, Faribault, Minn. ; Ernest Zahn, Lancaster, Penn.

The Annual Meeting will be held on the evening of Tuesday, January 18.

A FIRE in Providence partially destroyed the fourth and fifth stories of the Dyer Land Company's block in Dyer and Peck Streets, causing a loss of about $30,000. It is fully insured. Waite, Smith & Co., jewelry manufacturers, lose $15,000; Howard & Scherrible, jewelry factory, $3,000; Atwood Holwell, jewelry, $5,000; Booth, Babbitt & Co., jewelry, $3,000; John T. Mauran, jewelry, $2,500. The loss on building is about $2,000. Oily waste was probably the cause of the fire, which originated in the shop of Waite, Smith & Co.

Views of Correspondents.

ENGLISH HALL MARKING.

WE have received the following letter from a firm of silversmiths, whose artistic works are well known upon both sides of the ocean. The columns of THE CIRCULAR are always open to discussion, and it is gratifying to us to have our editorial opinions criticized. THE CIRCULAR seeks only the welfare of the trade, and is not wedded to any plan nor has it a special hobby. We recognize the fact that there are great abuses in the trade and would provide a remedy for them. The English system of Hall-marking has its advantages, and while we have said that we do not think it could be transplanted to this country as an entirety, we do think that it contains hints of a system that might be worked out among us. The silver workers are not so much subject to the abuses referred to as are the manufacturers of gold goods. Could the writer of this letter see some of the alleged gold goods sent to be assayed, and know the result of the assay, he would agree with us that the honest men in the trade and the public need some protection from the designing men who are swindling the community under the guise of jewelers. The letter is as follows, and we acknowledge our indebtedness to the writer for his clear, forcible, and corteous statements :

To the Editor of the Jewelers' Circular :

Your comments (in the Dec. No.) in defense of the English Hall-marking system, will be read by our silversmiths with more interest than satisfaction. That such sentiments should be uttered by the representative journal of our trade is a matter, to us at least, of profound astonishment. We speak, however, from the standpoints and in the interest of the silversmiths exclusively.

When you intimate that the abandonment of the system in England would result in the flooding of the country with wares unworthy the name of precious metal, we believe the opinion to be an unwarrantable assumption, theoretical rather than practicle. In our country, which is happily free from the hindrance, your theory would infer that our leading silversmiths, the honesty of whose productions are unquestioned, are suffering intolerable annoyance by reason of unscrupulous manufacturers. While we admit that the annoyance exists to a very limited extent, it is trifling in comparison with that of being obliged at such a season of the year as this to send every identical article to the Guild to be tested and stamped in their own due time and manner. And should the Guild be located at some city or town distant from the manufactory, the annoyance would indeed be unbearable, and the delay in filling orders well-nigh fatal to the business.

There is, in our opinion, no *reputable* silversmith in the United States that systematically debases the quality of the wares of his manufacture. The leading silversmiths care more for their reputation than for the trifling gain to be obtained by alloying, which is necessarily limited. We say limited for the reason that even a slight deviation from the standard, is readily detected by the workmen, and such a fact known to the employes would be fatal.

In our establishment, the additional precaution is used of employing a refiner, whose duty it is to assay the working stock at frequent intervals ; hence, we could, if necessary, safely guarantee our quality to be *above* the sterling standard, and in our long experience as manufacturing silversmiths, have never known a single piece to assay less than the standard. You doubtless have no disposition to question this statement, and with the best of intentions toward us and other silversmiths, advocate the adoption of a system which professes to be for our further and more complete protection. We claim that the English Hall-mark is not satisfactory evidence of the quality of the metal. It may be, of the identical spot which bears the stamp, but there are so many ways to overcome it, so many parts which are not and cannot be tested, that if the manufacturer is unscrupulous, he has ample facilities to accomplish his object. Within a very short time it was our privilege to have an opportunity of verifying this statement. A tureen of English manufacture came to us as old silver ; it bore the Hall-mark ; we assayed it in two parts, cutting out the mark and assaying that portion separately. The little piece bearing the mark was up to standard, but the remainder, about 99-100 of the entire article, was considerably below. Now, inasmuch as the purchaser cares more about the article as a whole, than in part, no system can be satisfactory which does not meet his wants in that respect. We also cite a single instance showing the annoyance of the system in another form which recently came to our notice.

A silver tea sent by an English silversmith to be Hall-marked. In the center of the piece was an oval section so decorated as to constitute the main feature of the piece. On its return, the Hall-mark was so carelessly placed as to disfigure the decoration, and the customer very justly refused to accept it. The Guild was as autocrattic as usual, and refused to make good the loss.

Further, the Hall-marking in England completely shuts out that market from the American manufacturer, and is an injustice imposed upon no other branch of manufacture, and in our opinion, the comments in the English press, over the signature of Mr. Warburton are not a whit too severe and condemnatory. L.

Advice to Watchmakers' Apprentices.

BY A MAN WHO HAS SPENT TWENTY YEARS AT THE BENCH.

ONE of the most frequent errors into which an apprentice falls is egotism, or as it is popularly expressed, gets "*conceity*." Now here come some nice shades of distinction, for a certain amount of pride and self-assurance is absolutely necessary ; and especially it one takes a deep interest in his craft, and lives and thinks for it, success is for the time being a regal triumph, at least to him. I remember well my own elation when I accomplished some little achievement, which to me now seems trivial, but then, to me it was all important, and filled my measure of pride to the brim. A good experiment for a young workmen is to select some extra nice specimen of his skill, and shut it up carefully in a box, and not look at it for six months or a year ; and my word for it, he will on examination, not be so well pleased with it. Still there is one consolation, and that is, that the same rule applied to other trades and professions would have a like result. In illustration, one of our best American artists was shown by a friend, some rude drawings, with the request that he would examine them and give his opinion as to the probable success of the same person who produced them, if he should adopt art as a profession. After due inspection of the specimens, he gave it as his opinion that the young aspirant could have no hopes of success as an artist, advising the selection of any profession in preference. Fancy his chagrin when informed and finally convinced that they were his own early efforts. A very good plan is to veil vanity with caution, and be sure to let the veil be thick enough so your competitors cannot see through it. If you are convinced of your superior skill, let the knowledge of it come to the surface rather by works than words. Still, on the other hand, holding back for your rivals to invite you to the front, would be simply foolishness. A consciousness of ability produces self-reliance, and the more you have of this the better, but do not let it be obtrusive.

An apprentice should, long before his time of service expires, make up his mind in regard to what he is going to do when he is free ; that is, when his apprenticeship expires. My advice is, go into business for yourself. You say you have no capital—granted ; but you can earn it, and in the majority of cases with the man of whom you learned your trade. If he is a man who thoroughly understands his trade, he is the man to stick to. If, on the other hand, you fancy there are other shops in which you would like to work, perhaps for additional instruction, or may be to judge of the way of doing business by other people, all right ; but let nothing turn you from your purpose of doing business for yourself. If the man with whom you served your time is all right and he will retain you as a journeyman —and probably he will, for if he had work for you as an apprentice, he will still have work for you as a journeyman. He knows your ways, he knows exactly what you are worth, and if he will pay you fair wages, stick to him. I have made this remark twice, but it will stand repeating. But whoever you serve, make it an inviolable rule to save a portion of your wages to lay up for *capital*. You know you are going into business for yourself, and every dollar counts. Here is a motto—a rule which I want you to abide by, and that is, no matter who you work for, draw your money as fast as you earn it ; never let it accumulate in your employer's hands. Take what is your due on Saturday night, lay out what you allow yourself to spend, and deposit the rest until you have fifty dollars ; then buy a Government bond, these are the safest--no savings bank to burst up, and you can always get your cash without any thirty, or one days' notice—very likely after you have a snug little sum in your hands, your employer will offer you a partnership. This is as desirable a condition as you could ask. You are thoroughly acquainted with the business, acquainted with the customers, and you ought surely to know your senior partner. A partnership is exceptional and in most cases the apprentice has to find a situation at the end of his service for himself. This is one of the things to be looked out for ; as your time draws to a close, come out frankly and ask your employer what he would advise, and whether he will employ you after your time is out. If he should not want you, look about ; a situation will open up for you, if you are honest, skillful and industrious. Even in your apprenticeship look out for a good place to open a shop of your own. And in forming acquaintances and associates let it be to securing patronage to your business. A few words here in regard to your associates ; avoid *fast* people; the theory that such people spend their money freely may be true, is true, we will admit it, but if you cultivate such people, associate with them, you must of a necessity imitate them ; and to lay all moral questions aside, it is not policy, for such dealings are a good deal like dipping water with a seive ; it is not what you dip up, it is what you keep which counts. If you have customers of th's class, there is no necessity of offending them, you can be frank and courteous ; this will soon convince them that you can be just without being niggardly and growling. Such people do not like to be cheated better than others. This reminds me : in dealing never deceive. Sell your goods for precisely what they are ; if they are plated say so ; if solid, insist upon it ; if they are serviceable, make it appear so ; if trashy, say the price is the only attraction. A few lines above I said we would lay a moral point by for policy sake ; I do not wish to be understood that it is my wish to inculcate this doctrine ; for I have had a good many years of experience, and can safely say that I never knew a man who was honest from policy to be very honest. Be honest because it is right ; and now we are discussing such questions, let me beg you to guard your moral character as you would the apple of your eye ; do nothing you would be ashamed to have known ; you are just commencing life, and no doubt many follies look attractive, but when you get to be more advanced in life, you will then see that a good character is even more desirable than gold.

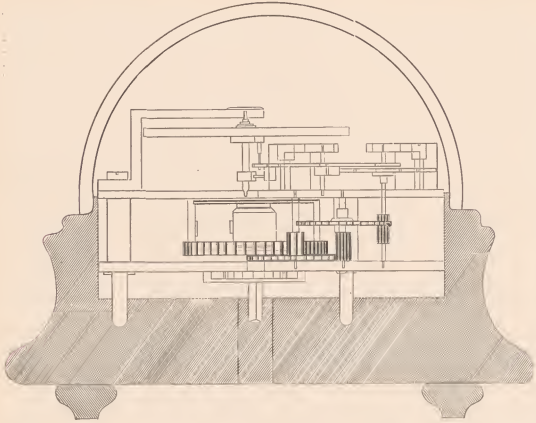
To be continued.

J. H. MORRW, a traveling salesman in the employ of Ernest Thoma, of this city, was robbed of a sample trunk containing about $7,000 worth of jewelry, while leaving the Clifton House, Chicago. He immediately telegraphed William R. Alling, president of the Jewelers' Protective Union, who placed the matter in the hands of Pinkerton's Detective Agency. As a result of the work of the detectives, aided by the chief of the Chicago police force, two persons were arrested, having in their possession the goods stolen from Mr. Morrow. One of the persons arrested was a local politician of considerable influence, and the other was a detective employed in a bank. The goods were recovered, with the exception of $600 or $800 worth, and the Grand Jury has found two indictments against the persons arrested. These individuals claim to have been acting simply as detectives, and not to know who the thieves were. Their trial will doubtless result in some interesting developments.

SOME of the Western jobbers have adopted the practice of shipping silver plated goods to their customers labeled "crackers," "candy," etc., whereby the freight charges are lessened. This is a novel method of bringing down the cost to retailers, but suppose some of those packages should be lost *en route* ; the railroad and express companies would be hard to convince that such surreptitious packages contained valuable silverware and would scarcely be willing to pay the full value of such goods when they were labeled "crackers." Eastern houses that have been asked to do the same thing have declined to take the risk, regarding the practice as neither honest nor safe.

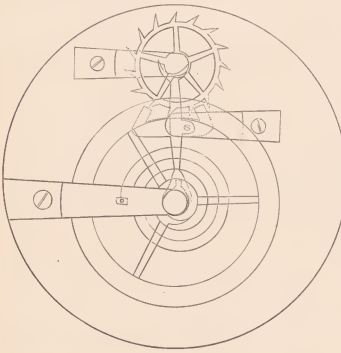
IT has been estimated that more gold has been made into jewelry in the vicinity of Maiden Lane and John Street than has been taken out of the Black Hills during the past three years. There is a good deal of wealth above Fulton Street in New York, but the value of that below that thoroughfare is vast and makes up a great portion of the general whole. The banks, the insurance companies, the sub-treasury, the Bulls and Bears, the wholesale houses, the shippers, the Custom House, et. al., crowd a great deal of wealth into a very little space.

Going Models of Escapements.



THE escapements in use for watchwork are very seldom executed in other dimensions than those prescribed by the very limited room of a watch. The inspection of a watch escapement in its quick motion is, therefore, not easily made, nor are the means of studying its principles and action or of explaining it to others very convenient. This accounts for the fact that so few people have a clear idea of the manner in which watches are made to do their work. Even among the members of the trade there are many who have not a sufficient knowledge of those escapements that are but seldom seen in their practice.

The horological escapements are, however, machanisms of such a highly interesting nature that they are now treated of in all schools pretending to offer an extended range of education. The means of thoroughly studying and explaining them, were, for these reasons, no longer to be dispensed with, and it has been a matter for congratulation in Europe that M. Grossmann of Glashütte, near Dresden, Saxony, undertook the manufacture of going models and offered them in correct execution and good arrangement at moderate prices.



These models have a measurement of 10 centimetres diameter and run 16 to 20 hours with once winding. The balance is of 6½ centimetres diameter, and the other parts of the escapement are accordingly large. The frame and train are sunk in a wooden stand on which a glass shade is adjusted. There thus remains only the escapement proper exposed to the eye, which is not disturbed by any parts of subordinate importancce. The vibration of the balance is slow, about ⅓ of a second, so that the play of the whole can be very easily followed by the eye. This mode of execution is mostly employed when the models are intended for exhibition in a show window, of which they are sure to form an attractive and cheap ornament. They are very convenient, too, for explaining the action of the escapement to apprentices or to inquisitive customers, who very often want to know the difference between a chronometer and a horizontal watch.

If the models are wanted for schools or purposes of mere demonstration, it not required to have them run for more than half an hour with once winding; then the frame is dispensed with and a simple barrel gears directly into the escape pinion.

Since these models became generally known it was found that the making up of them is a valuable method of instructing an apprentice in the beginning of his calling, at the same

time initiating him into the knowledge of the action of the escapement. Many sets of materials have been provided by the manufacturer, thus enabling the instructor to permit his pupil to begin at once with the instructive and interesting part of his work and to save the expense of time and work which is always connected with the manufacture of detached pieces, like horizontal wheels, etc. Here they are made by hundreds at a time and can therefore be offered at a moderate price. Mr. G. has also been useful to some inventors of new escapements by executing their contrivances in the form of a going model on a large scale and under the best mechanical conditions.

It appears to be desirable that some one of the importing houses of the trade should take this article in hand and make it accessible to all the watchmakers of the country. Going models of the kind described and herein illustrated should be accessible to every workman in the trade and to all apprentices. Elsewhere we suggest the organization of an art school for the benefit of the trade, and apparatus of this character is precisely what is wanted to make a beginning with.

Proceedings of the Horological Club.

A Distinguished Body of Watch and Clock Makers.

Eighticth Discussion.—Communicated by the Secretary.

(Notice.—Correspondents should write all letters intended for the Club separate from any other business matters, and header "Secretary of the Horological Club." Direct the envelope to Edward Hopkinson, Esq. *Write only on one side of the paper*, state the points briefly, mail as early as possible, as it must be received here *not later* than the eighth day of the month in order to be discussed and reported in the Circular for the next month.)

How to enamel.

Secretary of Horological Club:

Will some of your honorable body please inform me, through the Jewelers' Circular, how to use enamel, and make it flow into engraving, such as monograms on coins, &c.? Also what quality of enamel to use? What quality of enamel (black) do you use for lettering and figure marking on watch dials? Please state full process of enameling on metal and oblige, F. B. J.

In answer to the above Mr. Kolliver replied, you must pulverize the enamel in a stone mortar. After it is reduced to a fine powder put enough water or alcohol to make it into a paste, put the enamel into such parts as you wish to enamel. Dry carefully and thoroughly before putting heat to it. Enamelers have a furnace made expressly to enamel. After the article to be enameled is prepared, it is put into the furnace and the enamel melted, so that it flows into and fills all the lines, &c. Sometimes for small articles jewelers melt the enamel by means of an alcohol lamp, blowing the blaze upon the work with a blow pipe. Stone dealers usually keep enamel for sale. If you want easy-flowing enamel you must ask for that.

Back numbers of "practical hints" wanted.

Secretary of Horological Club:

I want to make my men presents of Excelsior's Practical Hints on Watch Repairing. Mr. Hopkinson tells me that the back numbers of the Circular containing them have all been taken up long ago. Can you tell me how or where I can find three complete copies? I regard them as the most valuable present I could make to my men, and I know they would be more pleased to get them than almost anything else I could give them. Please publish this, and if anyone will sell his for any reasonable price, let him reply immediately, in care of Club, to Yours truly,

Manhattan.

Mr. Isochronal said that he did not believe that any workman would part with his "Practical Hints," but the letter should be published in our Proceedings, and any offers sent us in reply would be at once handed over to "Manhattan." Mr. M. may not be aware that the "Hints" now being published in the Circular are the second series of those articles, which is not yet completed. But the first series has been published in book form by D. H. Hopkinson, Esq., the publisher of the Circular, price, $3.50. They treat on the art of rating or timing all sorts of timepieces from the finest chronometers and watches without regulators down to the common "plug" watches, how to make and fit hairsprings, the adjustment for isochronism, the adjustment of the compensation for heat and cold, and in fact all the finer manipulations, the knowledge of which makes the difference between the really good workman and the man who can merely "tinker" watches. Anyone who has ever read any of Excelsior's writings will not need to be told that those subjects, although often difficult and intricate, are brought out so clearly that any one of ordinary intelligence can understand them. The directions are full and reliable, and just what the practical workman wants to know, if he aspires to rise above the grade of "tinker." Mr. M. will probably be unable to get the second series of the "Hints," but, if his workmen have not already got the first series, the next best thing he can do is to present each of them with a copy of Excelsior's book.

How to make aluminum.

Secretary of Horological Club:

Will some of your honorable body be so kind, and give information in the Circular, how aluminum can be taken out of clay, the value of this metal and its utility? Yours &c., J. G.

Mr. Blowpipe answered that the manufacture of aluminum was unusually difficult, so that an explanation of the process, would be useless, as Mr. G. could not practice it without much preliminary study, experience and expense. It has no very general utility, and is more of a chemical curiosity than anything else. The metal is quoted by dealers at $1.75 per ounce in sheets, $2.50 in foil, and $3.50 in the form of wire.

What is your watchmaker responsible for?

Secretary of Horological Club:

What should a journeyman watchmaker be responsible for?
Yours truly, J. K.

Mr. Horologer said that the opinions differed greatly on that point. Some held him responsible for everything he had anything to do with, while others considered that he was not holden for anything except to be on hand during working hours and do what he was told to do. But the better opinion seemed to be that he is bound to do his work in a proper manner, make all proper efforts to suit customers and conserve his employer's interests, and to take as good care of his employer's and customer's property as he did of his own—more than that could hardly be required of him. When showing goods he is bound to take all reasonable precautions against having any abstracted from the trays, and in delivering work he is bound to be satisfied that he delivers it to the right person, or else refuse to deliver till the proprietor comes in, or the customer proves his identity. With regard to giving credit to customers, he is bound to strictly observe the rules and customs of the establishment, and it is still better for him to leave that discretion entirely to the proprietor or clerks. He is always held to take proper care of whatever is put in his charge, whether work or property. If he does not wish to be responsible for any particular things, he must expressly decline to assume any responsibility therefor. Mr. K's inquiry is very indefinite, but it will probably be answered by some of the instances mentioned.

Rounding-up cones—Excelsior's articles to be resumed.

Secretary of Horological Club:

I would like to enquire if Mr. Uhrmacher now has the rounding-up cones referred to in the April No. of Vol. 10, page 47, and if he has the *whole tool*, that is, the cones and the depthing tool to use them in, and if so, will he give the *lowest price* he will sell them for? I have an idea that I can use some parts of the tool for a special purpose. Also can you tell me what has become of "Excelsior?" I have missed his articles in the two last numbers of the Circular. By the closing sentence in his last article, I do not think he has got through with his present subject. I hope he will not disappoint us again, for I take great pleasure in reading his article every month. Can you tell me what is the circulation of the Circular at present? W.

Mr. Uhrmacher replied that he had the "cones," but nothing else. He would be glad to sell them for $5, to get rid of them.

As regards "Excelsior," it is understood that poor health has caused the omission of the last two articles—the first omissions for nearly six years! We are glad to inform numerous inquirers that he will resume his writing for either this month or next. The absence

of "Practical Hints" from their accustomed place has excited a great deal of comment among the readers of the CIRCULAR, all of whom prize them highly, and feel that the columns look lost without "Hints." We all hope, for our own sake as well as his, that his health may soon be fully restored, and that he may long be spared to favor the trade with his unequalled practical articles on Watch Repairing and kindred subjects.

We do not know the circulation of the CIRCULAR, but it is the organ of the trade, and includes among its subscribers all the enterprising and progressive members of the different crafts which it represents—and they must certainly make a "goodly host."

GOLD FILINGS DON'T UNITE WHEN MELTED.

Secretary of Horological Club:

We have trouble in getting our gold filings to melt. We take all the iron and steel out of them with a magnet, then put them in the crucible with borax, but cannot get all the particles to unite. We use a charcoal furnace. We have also tried gathering the dust together with mercury, but after using the mercury once or twice it will not pick up the filings. Our scraps and filings are 10 and 14 carat. Any information you can give us through your Proceedings, will be a favor to a reader. W. T.

Mr. Rolliver did not see why there should be any trouble, if the filings were really 10 k. and 14 k. gold, and the heat was sufficient. But he would advise Mr. T. to melt with saltpeter and sal ammoniac instead of borax—say equal parts of each, powdered. If the metal proved to be too hard, or brittle, use more sal ammoniac.

The Secretary then read the following letter, which he said contained some good ideas—after which the Club adjourned.

IDEAS ABOUT REPAIRING AMERICAN WATCHES.

Secretary of Horological Club:

These points have been of service to me, and may be to the reader if observed closely. When you take the movement out of your case, first examine the hands, and see if they have the proper end shake, but do not remove them until you examine the second hand and see if the stoppage is in the hands, center, or third wheel. Also, before removing the hands, with a strong glass examine the pinions and depthing very closely, so you are positive that the difficulty is not in dirt or grit in between the depthing. Then take off the hands, let down the spring, remove the balance and top plate, and now we are ready for a thorough examination. Beginning at the main wheel or barrel, remove the cover, remove the spring, and put the wheel together and put it in its proper place. If the wheel does not run true, take it out and turn the cover around, then catch the winding arbor with a pair of sliding tongs, and strike the wheel and see if you have turned the cover enough to make the wheel run true, then with a pointed countersink mark the cover and barrel so you can put it back in the same place. This may be a strange idea to the reader, but one trial will convince him of the fact.

Then examine the end shake of the barrel, and if too tight lay it on the hollow stake, and with your hammer tap the arbor until you have the desired end shake between the wheel and cover. If too loose, with a piece of boxwood drive up the bottom of the wheel until the same effect is accomplished. Next examine whether the mainspring has been rubbing on the bottom of the barrel or on the barrel cover. If so, take your mainspring gauge and put one size smaller spring in and a shade stronger. Always oil the spring when placed in the barrel, also the arbor bearings. I have found watches in which all the trouble was the arbor bearings being without oil. Next take the center wheel and try the end shake, and if too tight take the piece of boxwood and bunt the bottom plate down. Never interfere with or disturb the top plate of the watch, always operate on the bottom plate. If too loose, bunt the plate up, until the proper endshake is effected, then place the center wheel and barrel between the plates, and put in all the plate screws, and try the depthings. Before taking apart, take the canon pinion and set to its proper place, then try the depthing, and also the endshake of center pinion, by taking hold of canon pinion square with the cutting plyers, and try the shake that way, as a great many times the canon pinion is driven on so as to leave no shake to the center pinion. In that case, the center pinion shoulder does not project far enough through the plate to prevent the canon pinion from binding between the plate and the shoulder of center pinion. My remedy for that is to put the plate in the universal head, and turn out enough of the plate to allow the center pinion to project through the plate. And in trying the canon pinion with the plyers, if the canon pinion should draw off, the proper way to make it fast to the center is by laying it on your uprighting stake, with pinion leaves up, then take a three-cornered countersink, rest it on the hole in the canon pinion, and with your hammer give it one tap, which will make three burrs in it, which will bring it to the center and will make it fast to the center pinion, which I think is a decided improvement on the plan of putting in a hair, or burring the pinion with the plyers. This is a very easy remedy, and it is singular to see how many ways they try, to overcome this little difficulty. I find pinions where they have made it soft and filed it almost in two, and then pushed the thin part in, to make it fast to the center; also have found the center where the temper was drawn, and that made flat with the hammer. every way but hitting on the simple remedy of using the three-cornered countersink. The best thing to use for a countersink for this remedy is a small round file. Break off about one-third, and then grind on the oil-stone to the desired shape. Another point on the canon pinion is, in taking it off the center. When taking the watch down, if it is on very tight, never strike with the hammer, as you are liable to upset the plate, enough to interfere with the endshake, and you may overlook it, and when you put your watch up, the motion is checked, and then we are obliged to take it down and make the arbor examination. I have sat beside workmen, and have had them hand me the plates with the center pinion in, and would say, "look, how could that watch ever run?" when I *saw* them strike the pinion with the hammer, and upset the plate enough to make the center bind. In taking off the canon pinion, it is always the last thing I do, and in removing this, I take a small pair of sliding tongs, and grasp the center close up to the pinion leaves, and with my flat plyers, I take hold of the canon pinion and turn it around, just as if I was setting the watch, gradually drawing it off. In that way you do not interfere with your plate. Readers, you may think this is a good deal of trouble, but I can assure you if you want your watch to give your customer and employer satisfaction, you cannot be too careful with it. It is not the amount of work you do—it is how you do it; and by adopting a few simple things like these, you will soon become so familiar with them that it will be impossible to discard their use. In conclusion, this time, I will say, do what you can do, well; and what you can't, don't try it, but give it to some one who can, but gradually persevere, and some day, by close reading and constant practice, things will come to light. ODD TRAMP.

Where are the Trojan Swords?

I also thought at first that I had found in the Treasure a fragment of a bronze sword; but, as visitors to the South Kensington Museum may see in my collection, the object referred to is no sword, but merely a very thin bronze saw. The fragment is nearly 9 in. long and 2 in. broad. If swords had been in use at all, I should probably have found some of them in this treasure, among so many other weapons; or at least I should have found them elsewhere in this third city, which was destroyed so suddenly and unexpectedly by a fearful catastrophe, that the inhabitants had not time even to save their treasures, of which ten were left for me to discover. Even with the skeletons of men, apparently warriors, I found only lances; never even so much as the trace of a sword. Neither did I find the trace of a sword even in the ruins of the two upper pre-historic cities. Moreover, had swords been in use, I should probably have found the moulds in which they were cast; but among the ninety moulds or thereabouts, which I collected, and which have forms for all the weapons I discovered, as well as for others which I did not find, there is not one for a sword.

This absence of swords is the more astonishing to me, as I found hundreds of bronze swords in the royal tombs of Mycenæ. Their non-existence at Hissarlik, even in the latest of its pre-historic cities, is the clearest proof of the very high antiquity of these ruins, and of the great distance of time which separates them from Homer, with whom swords are in common use. But if from the absence of this weapon, seemingly so indispensable, we might be forced to infer a low state of barbarism at Troy, our minds are bewildered when we look at the Trojan gold ornaments, which in artistic execution come fully up to those contained in the Mycenæn treasures; and we are still more bewildered when we consider the Trojan inscriptions, since written characters were altogether unknown at Mycenæ. I may here add that no swords have ever been found in the ancient British tumuli of the Bronze period.—*From Dr. Schliemann's New Book "Ilios."*

Novel Styles of Jewelry.

THE fashionable desire for change has introduced jewelry fashioned of Labrador feidspar and other rich stones. Its colors of azure blue and green, yellow, bronzed red or purple and it *chatoyant* reflection yield this stone a deserved popularity. It has not been known more than 100 years. Another favorite is the Oriental chrysolite, called catseye when its hues are changing and translucent. It is always cut *en cabochon*. In the East it is considered a lucky stone. Gentlemen's scarf pins are fashionably set with porphyry, fa'se topaz having the red orange hue of the jacinth, amethystine quartz, Labradorite and catseyes Moonstones are also very popular. One style of scarf pin is set with an owl's head, exquisitely carved, of a moonstone of shifting rays, with ruby eyes. A superb scarf pin is set with a crescent moon paved with diamonds, a small owl, with enameled eyes carved from a moonstone, being perched inside the crescent. Another style is a flat gold plaque decorated with a branch in relief and moonstone owl with ruby eyes ; still another gold plaque has the small moonstone carved with a Mar's face, and an attendant diamond star shining upon a glittering sea of chased platina. A scarf pin of artistic merit is set with a profile head of Indian jasper, in dull red, of an Indian, with a coronet of plumes tinted in different alloys of gold. The popular pigs, heads of elephants, dogs, owls, sprawling frogs and bats, are all seen in finest chased gold with jeweled eyes. Quaint fancies also decorate these scarf pins in the way of a crab-net of fine gold wire with a crab of platina crawling out. Another shows a coiled serpent with glittering scales ; a large diamond is set in its head and the eyes are rubies. A dainty green gold four-leaved clover has a dewdrop diamond glistening on one leaf.

The popular bugle bracelets follow the pretty quaint conceit of animals and birds. One of these of the slenderest description supports a delicate green gold oak leaf and branch on which is perched an owl with ruby eyes. Others have a decoration of leaves with tinted veins, a diamond dewdrop glittering in each. A mourning bangle enameled in black and gold is set with a black furled fan, decorated with a crescent and star of pearls. The useful and beautiful lace pin has lost none of its popularity. The Oriental taste still prevails of setting these pins with rubies, sapphires, emeralds, and diamonds ; also colored pearls. A new idea is to contrast the purest, whitest of diamonds with the golden lustre of the diamond of Africa. Some bracelets rather wider than bangles are paved with diamonds, others set with the lovely tinted pearls of pale pink, bronze, gray, and yellow separated by diamonds and in three diagonal rows upon bracelets, or three contrasting stones, such as a ruby, sapphire, and diamond set in three diagonal rows. The present caprice for a sapphire and diamond engagement ring displaces the traditional diamond or pearl sapphire. Rings still take the long Marquise shape, set with diamonds, rubies and sapphires ; some are of hammered gold set with catseyes, a crescent, or chrysolite exquisitely carved in intaglio, or aquamarine, or a serpent with jeweled eyes. The light blue water sapphire is sometimes set with the magnificent Oriental sapphire by way of contrast, and the Brazilian ruby of rose color with the costly blood-red gem.

A superb pendant is in the shape of a *fleur de lis* formed with large diamonds of the purest white ; on the upper part is set a large pink pearl, and a bronze and gray pearl is set on either side. A large ring of magnificent rubies form the center of a square Greek cross of diamonds ; an immense diamond is set in the middle. Another pendant is in the shape of a trefoil of diamonds, one large perfect pearl in the center set with three very large diamonds ; suspended beneath is a pearl of wonderful lustre and pear-shaped. An Indian style of pendant in square form is in Etruscan gold headed with fine Etruscan wire. This is set with turquoise, diamonds and pearls.

Gentlemen's sleeve buttons still remain linked and also follow the fancy for quaint ideas. A concave set of yellow gold holds an owl in relief finely engraved. A favorite style is the hammered gold set with a precious stone. One set is of pug's heads exquisitely chased in red gold with ruby eyes ; another set is composed of oval bars and owls. Some handsome sets are of mingled platina and gold. Ladies' sleeve links are similar in all respects. Among the seals worn by gentlemen is a square sard cut exquisitely in intaglio and set in platina and gold ; two colored serpents of platina and gold hold a brilliant revolving amethyst of fifteen pennyweights ; a dog, in height an inch and a half, carved beautifully from a Spanish brown shaded topaz, has diamond eyes, and a fine gold collar by which it is suspended from the watch-chain of platina and gold, simply fastened to the waistcoat by a narrow bar in the button-hole. Ladies' chatelaine chains are very short, but sufficiently long for the golden pig, grasshopper, crab, lizard, elephant's head and trunk, serpent, white enameled lamb, or any other trinket.

Repairing Swiss Watches.

BY H. GANNEY.

THERE are two things which distinguish Geneva watch repairing from English and American, and have greatly contributed to their popularity, *viz* : the facilities which the various actions exhibit for readjustment and alteration by the repairer, and the more frequent need of them. In the earlier make of a Swiss watch it is seen every depth and action can be adjusted by shifting their respective bars, and even end shake screws left to raise or lower the balance cock. Between common watches that can be altered, like the Swiss, and watches of *low* English make, that cannot be altered without much original transformation and disfigurement, there is no need for discussing which will have preference, until machine watches supersede both, and then the jobber's occupation will be gone and, with advantage to himself, exchanged for something more satisfactory. At present he has an intense experience of diseased watches, which applied to their production should make his fortune if properly developed. We propose to describe the methods usually adopted to secure performance of the lower grade of Geneva watches, success in repairing which depends on a suspicious vigilance on every part and action, both in taking down and putting up again. A watch examiner occupies a day usually on receiving a new watch, going from the finisher in examining and getting it going again, and the retail watch dealer usually lets a reliable jobber have half a day at a good watch when sold, so as to ensure satisfaction before trusting it to the customer's hands, and it is evident if these precautions are assured with good new work, thorough examination, repairing and cleaning about a dozen and a half jobs per week, which is about the average required, is out of the question. A cursory examination is all that can be given to ordinary jobs, and a day or two's trial hanging and lying must do the rest, and answers ordinary purposes. It is a great advantage to have taken in personally the work from a customer, and heard his account of the general performance ; where this is not practicable, the taker-in should note the probable cause of stoppage as a guide to the workman. All watch jobbing is a compromise between what is, and what should be, and to make that which is defective answer a purpose, appears to be its chief characteristic. Watch cleaning and replacing new pieces to good work are easy amusements to every well trained watchmaker. Every watch manufacturing center has thousands of men who can replace any part of a watch with accuracy, yet quite unable to hold a situation as repairer, unable to secure a performance from the watch as a whole. The watch jobber flourishes in their midst as an imported worker trained outside the manufactory; often unable to replace a new piece decently, and yet earning good wages because of this ability to detect causes of failure arising from defective making and alteration caused by wear, and capable of modifying them sufficiently for present purposes and small purses. Supposing nothing good or bad is known of the watch, it will be well before taking it out of the case to observe the hands, see if the seconds hand runs truly and has freedom for the pipe, and see if hands have end shake and are not touching glass at center. In opening the dome see if jet square is free of case, case springs free of movement and screws. After taking out the move-

ment, your business is to discover what has brought the watch into your hands, and what are the best and quickest means of getting it off your hands for a year or two. The first thing is to seek the cause of stoppage, and when that is settled beyond a doubt the work may be considered half done. If the watch is a good one, careful cleaning is all that is needed ; if it is a cheap one on which everyone engaged has had a race against time, a race in which you now are also entered, you need not stop to study its faults—it is all faults. You may speculate upon the limits of badness and possible performance in watch work, and if faint-hearted will return it to its owner with a recommendation to hypothecate it and get a new one ; but if you think, like a physician, your business is with the diseased, not the healthy, and if possessed of much experience and good theoretical knowledge, a good file and bluestone and a good share of patience and perseverance, you may attack it and be astonished at the reputation you can make out of such trash. This will be about the programme. Looking at the balance it will be found to be slightly rubbing the center wheel, or the stud or index pins ; push the balance in those directions with a peg and apply the file *ad. lib.* to the pieces touching. If center and balance are touching, consider it fool, and taking out balance, screw the cock on and drive it over with a blow on a boxwood peg with the hammer ; see if the required freedom is attained, and that the balance is free of stud and index in all positions. Trying the escapement will come next ; generally the wheel and cylinder are right size if the drop is not fairly equal inside and outside the cylinder ; it is either too deep or too shallow ; if too shallow, it will have little vibration, and too much drop and catch on edges of cylinder. The action of the tooth on the cylinder should be closely observed, and if foul or too close top or bottom of wheel, the wheel should be raised or lowered by the arm being pressed in the shallow concave tool mentioned last month. Alteration of the jewel and stone settings may generally be effected by raising or lowering the cylinder action slightly, or to correct end shake, as the stones are generally set low in the brass. This may be filed level with stone, or the stone replaced by a higher one. Attention to the end stones is of the first importance in common Swiss watches. The top end stone is generally loose, and cannot be fitted properly, as its steel setting is required to be screwed firmly home to hold the index. A small wedge of peg wood is the simplest method of keeping in position the end stone if the index is too loose ; the steel setting must be filed underneath to allow its upper or larger surface to come in contact with the index, or its edges must be enlarged by the hammer.

We now examine our train of wheels. If the scape depth, as often happens, is shallow, as shown by much side shake, drive the scape cock by pressure from behind if freedom allows, the seconds pivot hole being always very shallow. A pivot broach pressed by the finger underneath in opening the hole will cut away one side of the hole, into which a French bouchon or stopping being inserted and riveted we have a new depth as the result of a few minutes' work, the wheel being uprighted by driving the cock in the manner already referred to for the balance cock.

English Watch Repairing.

BY HENRY GANNEY.

ENGLISH watch repairing may be studied under several heads or branches. First, that resulting from breakage and accidental damage ; second, that resulting from wear and friction of the various actions ; and, most troublesome of all, that caused by defects in manufacturing, defects of design, bad material, or careless workmanship. It is quite possible for an English watch, if well made, to have a long and useful career, without any need of repairs, if periodically cleaned and oiled. I lately had a large full-plate lever to clean which had no signs of wear, all the pivots and holes being as bright and tight as if first finished—a very rare occurrence. Absence of wear on fuzee, center, and seconds pivot, induced me to inquire if the watch had not been carefully put away for years, it being in silver cases, no extra jewels, and extra large. I was informed that it had been in constant use by its late owner, a sergeant-major, forty years, and in the various campaigns of the British army during that period. The absence of wear from well-made lever watches, and the difficulty of rectifying the errors of ill-made ones, seems to have had a pernicious effect on the watch repairer, as his work alternates between that which requires little or no repairs, and work that requires radical alterations, that cannot be executed effectually or economically. In the old times, when the vertical watch and brass holes were the general wear, and work more of an average quality, the jobber was in constant practice ; making new holes and escapements, as a matter of course, to every watch that came to him to clean, as the usual period which necessitated the cleaning process was sufficient to wear away the effectiveness of the verge escapement ; and nothing but a thorough reorganization of the escapement, with new well-burnished holes, made with special drills and bottoming tools, new dovetail and depths, would ensure satisfaction. The modern jobber gives up the verge watch as a useless contrivance and impossible timekeeper, with which he can do nothing. This is an error, a complete mastery of vertical work being a horological education in itself, and fitting its possessor for anything else he may have the capacity to attempt ; and the trade has many of its best men, who from vertical work, have become the best makers of the duplex, lever, and chronometer escapements ; whilst those who have been trained exclusively on the more more modern escapements, confess themselves nonplussed by the verge escapement, and, when exercising great skill and desire to succeed, quite helpless and unable to secure a performance with it. As the watch jobber who does business in country towns still finds a large portion of his trade in verge watches, I propose to give at a future time some pages on vertical work, as I hold that the competent jobber should be prepared to go anywhere and do anything in the horological world. There is not the circulation of young talent between the manufacturing and repairing shops usual years ago. The greater demands of modern trade require each one engaged in new work to be a specialist ; and few watches are made in retail shops, where most of the repairing is done, and the advantageous interchange of work and ideas, common in the old times, are not the rule now ; each travels his own road, and each has tools and methods of work to which the other is a stranger. Originally, watch repairing was simply the using the tools and skill of the movement maker, finisher, and escapement maker, to replace the various parts as they become damaged or worn ; now, the jobber has a large repertoire of tools designed for his special use and wants, and used as crutches to help the watch along, and mainly to remedy defects of construction. A glance at the tool list shows us that wheel stretching tools, wheel teeth rounding tools, patent barrel contractors, wheel and barrel-hole closing tools, and punches of all sizes and shapes, are common tools of the trade of repairing. The jobber must use his own discretion as to the employment of these various tools. If working for good firms, in whom the public have confidence, and who are using watches of good quality, which they are willing to have put in perfect order, they can all be dispensed with ; but if the ordinary run of work is the rule—and owners of defective watches often think them as good as the best, and will have a performance from them without any but a small advance on the price of cleaning—then some of these tools will be useful if the workman desires to avoid the character of a slow, fault-finding, and unprofitable workman. To make that which is defective answer a purpose is not bad work, if it does not involve the alteration or injury of that which is correct, and the putting in of a new tooth or pivot in wheel or pinion are both commendable, if properly executed ; but the closing of a hole by a punch is always to be deprecated, as a hole is made much thinner, and liable to more rapid wear, both of hole and pivot. The French stoppings, or *bouchons*, give a ready and quick means of replacing small holes, and are preferable to putting a new hole in with the mandril, or upright tool, as uprights are not ordinarily to be depended on where depths are involved ; and in fuzee work, barrel and fuzee are made to stand away from each other, not quite upright, or they are liable when going to be out of upright and

foul, owing to the spring drawing them together, and all the wear being one side only of the holes—most good jobbers having a slide-rest mandril, but seldom using it. Another tool much affected by jobbers is the jacot lathe, or tool for finishing pivots. I have used them, but can see no advantage over the ordinary turns, but positive loss of time and trouble; and with pupils who have only had ordinary experience, acquired in jobbing, notice they seldom use them after purchasing. Where the jobber has had no experience in fine pivoting they may be useful, as it is impossible to reduce the pivot beyond the desired size, or to break it by pressure; but pivots are mostly broken in turning, owing to the graver not being sharp at the point, or used with sufficient skill, when squaring the shoulder, just previous to polishing. Having the work in the turns, and the hand well used to the tools, a few rubs with a cutting burnisher, or polisher, finishes the pivot without the trouble of setting up, and fitting, and studying the jacot tool, and its requirements for the job in hand. With the turns, and the pivot resting in a hole, or rather a bursted hole, in a hard steel center, the friction is so slight (if the back center is oiled), the hand can feel by the difference in the friction, if the pivot is being reduced at either end, or equally through its length, and can be reduced to any degree of fineness. Another tool which is coming into use for turning purposes is the hand or foot wheel and lathe, to replace the bow and turns. This is no novelty, as the hand-wheel has always been used by clockmakers; and I presume its want of delicacy is the reason why it has not been in use for watch work, though motion makers use it for their turning, which is very coarse. We see that lathes are used for turning the finest watch pivots, in machine watchmaking. The question is, is it worth the jobber's while, providing such a high-class lathe, which at its best can only equal, and can never surpass in quality though it surpasses in quantity, the work of the bow? The average watch jobber does not occupy an hour a week in turning—and in turning in a job one only gets about half-a-dozen turns of the ferrule before testing and trying—and it seems useless setting a lathe in motion only to stop it directly; and I am inclined to think those jobbers who advocate the lathe, and give it room, and spend time in keeping its parts in order, are, like the jacot pivoters, deficient in skill with the bow and turns. It is certainly easier to put a graver against the pivot, and keep it there, than to move it back at every stroke of the bow, and return it with exactly the same pressure; but is not this a valuable education of the hand in lightness, which is highly valuable to the watchmaker? Lightness of hand is the peculiarity of the watchmaker; all machinists would be watchmakers otherwise. Machinists seem to be getting the upper hand, though, in watchmaking; but they will have to serve a good apprenticeship before they get hold of the repairing art, to which there is on royal road—only skill and experience, their own, not other people's—as in manufacturing. I am indebted to an importer for a view of several of the new watchmaker's lathes, of German make, and other tools, of which more anon, and a pamphlet giving descriptions of several very good ones adapted to the watchmakers' wants. "Hitherto," it says, "it has been usual to polish fine pivots in a depth tool, with a revolving lap or wheel." This is the English method of snailing fuzees, but I never saw it used for polishing pivots, though lathes on this principle are in use in American factories, and by Messrs. Guye, of Clerkenwell.—*British Horological Journal.*

E. AUGUST NERESHEIMER presents in this issue of THE CIRCULAR a beautiful illustration of a new setting for diamonds and other precious gems, for which he is the owner of letters patent. The cramps designed for holding the stone in position have an outside rib of platinum projecting above and below the cramp; the upper projection laps over the cramp, thus forming a substantial seat for the stone to rest in. This method increases the strength of the setting and holds the stone more securely in its place. It also elevates the stone, thereby adding to its beauty and lustre, while the color of the metal being so near that of the diamond, rather adds to than detracts from its brilliancy. The illustrations very clearly show the advantages of this new style of setting.

Artistic Watch Cases.

WE herewith present three beautiful designs for the ornamentation of watch cases. The designs are by Mr. McGowan, of the Belfast School of Art. It is intended that in their application,

they shall be profusely studded with precious stones. Artistic engraving and ornamentation of the case adds very much to the value of the watch, for, as the taste for the beautiful is cultivated, the crude engraving to be found on too many watches becomes offensive. It

costs no more to ornament a watch case artistically and make it pleasing to the eye than it does to do the work irregularly and without form. A little more attention to this matter would be to the advantage of the trade. Some of our manufacturers have already done much in the way of artistic ornamentation of cases, but the practice is not universal. It is too much the practice to load the case with a great amount of engraving, having little regard to the beauty and harmony of the design. Such work is far from attractive. It is not the amount of engraving that lends beauty to a case, but the character of it. The accompanying illustrations give a fair idea of what may be accomplished by careful work in designing and engraving in this special field of ornamentation.

Practical Hints on Watch Repairing.

By Excelsior.—No. 68.

THE PRACTICAL EXAMINATION OF TOOTHED GEARING—CONTINUED.

(1,082). We are now prepared to examine our specimens of faulty gearings in action, as exhibited in our illustrations. The cuts are not perfect in all respects, owing to the apparent impossibility of getting them made as one wants them, but they show correctly the effects of the different faults.

In order to observe the action of each gearing, it is drawn in five different positions, beginning with the meeting or first contact, each successive position being about 12° after the preceding one, so that the five views carry us through the whole of the 60° of the driving. Of course, the next position after the fifth is the first, thus showing the whole course of the tooth and leaf. In every case the parts are supposed to move toward the right hand.

(1,083). A 6-leaf pinion is chosen, because it admits of showing all the faults of imperfect gearings, while one of 10 leaves or upward would be free from some of them. The wheel has 48 teeth, and the diameter of its pitch circle should therefore be just eight times that of the pinion, in order to have a correct pitching. The thickness of the teeth is one-half the pitch, and of the leaves one-third the pitch. When saying that a pinion is "relatively" small, (or large,) it should be understood that the real error may be that the pinion is actually smaller than it should be to gear properly into the wheel, or that the wheel is too large to suit that pinion. In either case, the pinion will be "relatively" small, *i. e.*, in proportion to the wheel. Which part is at fault, can be told by measurement.

The vertical dotted line in each figure shows the position of the line of centers, and the distances of the teeth and leaves from it show how far they have moved since the previous position. The pitch line is also marked across each tooth and leaf, which greatly assists in understanding the action. The meanings of the technical terms used, the modes of testing for the different faults or defects, and of correcting them, etc., have been fully explained in previous articles, and the reader is presumed to be familiar with them. As constant reference to the sections treating on the different points would cause endless repetition, such references are omitted. As a matter of exercise in examining gearings, the reader is recommended to study out the faults of each specimen from the figures, before reading the explanations. Even "old heads" will find this very interesting, and sometimes quite puzzling.

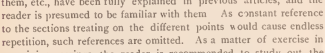


Fig. 62.

(1,084). Fig. 62 shows what appears to be a good gearing. In position 1 the engagement is perfectly safe, and the engaging tooth and leaf have just met, while the departing tooth and leaf have just barely separated. It is plain, from inspection, that there has been no pointing, or driving by the point of the tooth, but the driving has been done by the rounded surface of the addendum. That shows that the addendum is well formed, and this, together with the fact that the meeting takes place about 20° before the line of centers, (which is the proper point for an epicycloidal tooth acting on a 6-leaf pinion,) satisfies us that the addendum is of the right length and has the epicycloidal curve. We see, however, that the meeting occurred a little over 20° before the center. Consequently there is a slight error somewhere. On account of the perfect action of the tooth we conclude that the trouble is not there. The pinion shows no error in shape or proportion, and the error must be either in the pitching or the depthing. On following the action of the gearing during the entire driving of one tooth and leaf, we find that it is otherwise as free from fault as we can expect with a 6-leaf pinion. There cannot be any appreciable error in the pitching, for if there was it would be at once detected in the action. We conclude, therefore, that the trouble is in the depthing, and that the cause of the meeting occurring too soon is that the wheel and pinion are set a trifle too close together. But the error is so slight that it does not ordinarily call for correction, unless we seek to have the gearing not merely good, but perfect.

There is some engaging friction in positions 1 and 2, but that we know is unavoidable with a 6 leaf pinion, and on the whole it does not appear to be very objectionable or hurtful. In position 3 it has disappeared and we find disengaging friction, *i. e.*, the tooth and leaf are sliding off from each other. The action of the driving tooth appears to be satisfactory, throughout the driving, and we pronounce it a fairly good gearing.

In the figures, we can see the pitch line, and perceive at once that the depthing is too close—most clearly in positions 1 and 5—but in practice the teeth and leaves are not marked, and we have to judge by the action of the gearing. When we take the watch down, we can measure the geometrical diameters of the wheel and pinion, and the center distance, and determine positively where and what the error is, as fully described in previous articles. But our present object is to find out by inspection while the movement is together and running.

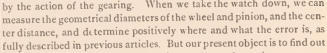


Fig. 63.

(1,085). In Fig. 63 we have a very different kind of gearing. The first contact occurs when the acting radial surface of the pinion leaf is about 40° before the line of centers, showing some very serious defect. As the driving tooth and leaf part when the engaging tooth and leaf meet, two-thirds of the driving is done before the line of centers, and only one-third after it, being just the reverse of the proper action. The cause of the excessive driving before the center may be that the addenda or points of the teeth are too short, the pinion relatively too large for the wheel, (error of pitching,) or depthing too shallow. From the way in which the addendum of the leading tooth lies alongside of the pinion leaf in position 2, we see that there has been no pointing, and would not be if they were brought into contact. We conclude that the shape of the addendum is good, and the cause of the premature contact is not there, but probably in the wheel and pinion being planted too far apart. We find an excessive amount of wedging, as it is not till position 4 that the acting surfaces reach the line of centers. We know that wedging or too much driving before the center is generally caused by addenda too short, or a scant depthing, and this confirms our opinion that the latter is the real trouble. And on watching the acting surfaces as they pass the line of centers, (position 4) we become satisfied that the depthing is considerably scant. As regards the pitching, we see nothing to indicate any error there, and although the action is by no means good, there is no fault which would not be caused by a scant depthing, and we pronounce the gearing good with the exception that the depthing is too shallow.

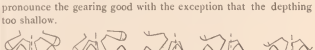


Fig. 64.

(1,086). In Fig. 64, first contact occurs about 5° before the line of centers, (one-fourth the thickness of the leaf,) which is quite too near, and may be caused either by addenda of teeth being too long, pinion relatively small, or depthing too deep. We also see that the tooth drives by its point some time before the next tooth meets its leaf, proving irregular driving. This may be caused by improperly shaped addenda on the teeth, or by error in pitching or depthing. There does not appear to be any drop, however, although it comes very near to it, as position 1 shows the point of the tooth almost off the leaf. There is

also considerable slipping between position 5 and 1. This indicates either a pinion relatively small, addenda of teeth too short, or depthing too shallow. Now what is the trouble with this gearing?

On inspection of positions 1 and 2, we conclude that the depthing is substantially correct, for the tooth and leaf meet "swell to swell," *i. e.*, their widest parts touch at the line of centers. By looking over the list of faults we have noticed, we find that every one of them *might* be caused by a pinion relatively small for the wheel, *i. e.*, either a pinion too small or a wheel too large. The fact that the point of the tooth comes so nearly off the leaf in position 1, also indicates a small pinion. The fact that it does not actually pass off, even when first contact is delayed almost to the line of centers, indicates addenda of teeth rather long, and inspection of their shape shows that to be the case. We conclude, therefore, that the depthing is correct, but the addenda of the teeth are rather long, and the pinion is smaller than it should be, relatively to the wheel. The extra length of the addenda does not require correction, as it is not excessive, and produces no injurious effect, unless it be the late contact—which is probably caused by the small pinion. And, as we have already seen, it is common to lengthen the addenda beyond the strictly theoretical length, with pinions having less than 10 leaves, in order to diminish the driving before the center. The gearing is not very bad, there is no danger of stoppage, and if it is in a cheap watch we let it go. If in a fine one, we shall fit in a larger pinion. Then, if the driving before the center is correct, we will call the gearing good.

The workman may ask, why not stretch the wheel, instead of enlarging the pinion? Because the wheel is already too large relatively to the pinion, and that would not correct the error, but only add to it. By stretching the wheel we should also have catching, as will be seen by looking at position 5—another proof that the wheel is already relatively too large. Whether the error is really a wheel too large, or a pinion too small, or both, we can ascertain by comparing their geometrical semi-diameters (measured when the movement is apart) with the center distance, as directed in article No. 66, and thus find the exact sizes required for making the gearing perfect.

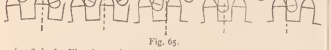


Fig. 65.

(1,087). In Fig. 65 we have a hard case. The first contact occurs about 30° before the center, so that there is only about 10° (or one-half the thickness of the leaf) of the driving done after the line of centers, and five-sixths of it is done before the center. But the worst fault is the butting of the engaging tooth and leaf, seen in position 1. Such a gearing cannot go unless the mainspring is extraordinarily stiff. If it is, it will crush through for a while, but soon wear out and stop. The teeth will soon get into the shape shown by the interior dotted line, and it is evident that no amount of force could then make it go. At present the surface of the tooth is yet a little inclined, so that there is a slight tendency to slide the leaf down it, but this surface cannot last long. This example shows very forcibly the nature and effect of wedging, or an excessive amount of driving before the center, even if it does not become an actual butting. On looking along through positions 1, 2, 3 and 4, we find the point of the leaf still jabbing into the front of the tooth, and it is not till the fifth that the parts come into good working position

Butting may result from so many different causes that we must look elsewhere to find the source of the trouble in this case. As regards the shape of the addenda of the teeth, they appear on inspection to be correct—but it is at present of very little consequence whether they are or not, for they get no chance to act in this gearing. The wedging and premature contact may be caused by a depthing too shallow or a pinion relatively too large. Inspection of position 5 shows that the depthing is good, hence the trouble is in the pitching—the pinion being too large or else the wheel too small, for that gearing. Stretching the wheel would improve the pitching, but would at the same time injure the correctness of the depthing. In a cheap watch, we may enlarge the wheel as much as it will bear without danger of catching, and thus enable it to go for a while, but it will still be a very bad gearing. The proper course is to measure the geometrical diameters and the center distance, to find what the real error is and its exact amount, and then apply such corrections as will make the gearing right.

Fig. 66.

(1,088). In Fig. 66, we have another hard case, but of a different kind. First contact occurs on the line of centers, which would be correct for a high-numbered pinion, (10 leaves or more,) but is altogether "too good" for a 6-leaf pinion. In position 1 we have the worst kind of pointing, in positions 2 and 3 we have bottoming, and in position 4 we have both pointing and catching, with much slipping between positions 5 and 1—truly a "bad lot." The bottoming is a mechanical defect which can be remedied in different ways, and will perhaps be cured by the time we have corrected the other faults. The late contact may be caused by a pinion relatively small, depthing too deep, or the addenda of the teeth being too long. As for the addenda, we see by position 4 that the shape is good, for the curve lies properly alongside the pinion leaf, and will continue to do so, without pointing, till the back of the next leaf comes up to the line of centers, which is all we expect a tooth with epicycloidal addendum to do, with a 6-leaf pinion. We therefore pronounce the addenda of the teeth correct, and cross that off our list of the possible defects of this gearing. The pointing and slipping indicate a pinion relatively small or an incorrect depthing, while the catching indicates a pinion too large or incorrect depthing. As the pinion cannot be both too large and too small, the trouble must be in the depthing, which position 1 shows is much too deep. By correcting the depthing, we shall at the same time correct all the other faults, and cause the driving to begin at 20° before the center, as it should with an epicycloidal tooth acting on a 6-leaf pinion.

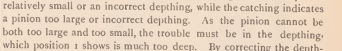
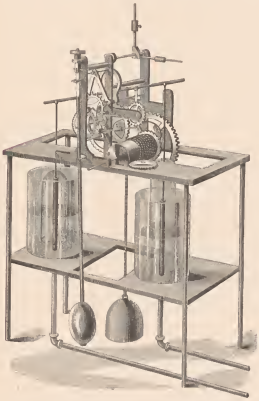


Fig. 67.

(1,089). In Fig. 67 we have a curious case. By inspecting positions 1 and 3, we find that we have apparently *two* first contacts, but the second is really a butting. In effect, however, it is practically the same as a premature contact occurring in the regular way, which may be caused by a pinion relatively large, depthing too shallow, or addenda of the teeth too short. As the addenda get no chance to do much driving, we cannot judge of their shape by their action, but to the eye they appear to be longer than the theoretical epicycloidal form would be, although no more than is usual to make them with low-numbered pinions, in order to lessen the amount of wedging and driving before the center. The bottoming in position 4 may be caused by addenda too long or depthing too deep. On inspection of positions 1, 2 and 3, we see that the depthing is a great deal too deep. But as the excessive amount of driving before the center and wedging in positions 3, 4 and 5, must be caused by a depthing too shallow or a pinion relatively too large, and we know that the depthing is not too shallow, we see that the pinion is much larger than it should be relatively to that wheel, or else the wheel is too small to suit the pinion. When the watch is apart we shall find that the pinion is too large, the depthing too deep, and the addenda of the teeth are longer than the theoretically correct length, but not too long for a good action with this pinion. To correct this gearing, therefore, we must fit in a smaller pinion, and change the center distance to get a correct depthing, and we shall then have a gearing as good as can be made with a 6-leaf pinion.

The Air Clock of Herman J. Wenzel.

WE have heretofore called attention to the air clock recently exhibited in this city by its inventor, Herman J. Wenzel, of San Francisco, and now present two illustrations representing its construction. Mr. Wenzel recently delivered a lecture before the New York Horological Society, in which he described his intention at length and the numerous experiments made by him before accomplishing the result he had in view. This object was the construction of a clock for the regulation of other clocks with perfect accuracy. Mr. Wenzel stated that his attention was called to this subject when a boy employed in his father's paper mill, where a number of clocks were used in the different rooms. It was his business to keep these in running order, and he found it impossible to make them run together. He then conceived the idea of making a single clock to regulate them all. He was apprenticed to a watchmaker, where he had opportunity to prosecute his experiments. He worked for a long time to perfect a clock to go by gas, and afterwards he spent much



time trying to make electricity do the work, but failed. Finally his experiments led to the invention of the air clock. The following is a description of its mechanism : A regulator of perfect construction and run by a weight is set up in the office. A very simple air-pump is attached, consisting of two inverted glass cups or cylinders suspended on a lever, and moving every other minute up and down into glass jars, partially filled with glycerince, which will not freeze nor evaporate. A small pipe runs through the jars, one end reaching above the liquid. The other end is conducted and branched off to the different clocks in the building. The clocks so connected contain only dial works and small air pumps. When the cylinder on the main clock is depressed into the liquid (which serves as an air-tight packing) the air is compressed, and by compression through the pipes causes the small cylinders in all the clocks to rise and start the hands a minute ahead. The next minute the cylinder on the main clock is raised out of the liquid and the pressure on the small cylinders released, and in descending will start the hands another minute ahead. By lifting the cylinder on the main clock above the liquid the air in the pipes is set free, and any expansion or contraction is neutralized, so that the pumping of the air is reduced to a simple mechanical operation, which by its positive action will move the hands on all the clocks simultaneously, and consequently they will each and all show the correct regular time and require no further attention whatever.

Mr. Wenzel's system of air clocks has been introduced in a number of establishments in San Francisco, and during the past summer was put up in the immense new hotel erected at Rockaway Beach The object sought by Mr. Wenzel—perfect uniformity in a number of clocks, controlled and regulated by a single one—has long occupied the attention of horologists. Electricity has been called into requisition for this purpose, but the batteries are liable to fluctuations from the changing conditions of the atmosphere, requiring much care and watchfulness to secure their steady and reliable operation. Whether the air clock will overcome all the difference heretofore encountered remains to be demonstrated. Mr. Wenzel's efforts in this direction are certainly ingenious and deserving of careful consideration. Four patents have been granted him for inventions in connection with this system, the latest one having been issued during the presnt year.

The Time Work and Time Signals of the Greenwich Royal Observatory.

BY C. STUART MURRAY.

Concluded from the Dec. No.

HAVING now got the mean solar standard to correct mean time, we are ready and waiting for ten o'clock in order to send the first signal of the day. This sending is managed by the clock itself through the electric wire relays. It is done by a pin on a small arm that is fixed to the arbor of the seconds wheel, and by another upon that of the minute-hand spindle Each pin has to act on a pair of very fine springs which are in contact with the sending wire. The seconds hand pair of springs closes the circuit at the O of every minute, whilst the minute pair are only closed between the 59½ and the 60½ in each hour. Let us say that the 59½ of the last minute has been reached, then the hour circuit springs are closed and will pass any current that comes along their wires up to the 60½ minute, when they will be reopened by the passing away from them of the pressure of the pin on the arbor of the minute-hand wheel. But watching the seconds hand during this time, we see that it is rising to the top with

every beat of the clock. Finally it reaches the 60th second, when its pin instantly closes its circuit, and the hour circuit being already closed, as has just been stated, away goes that 60th second up to London, and before the 61st has been reached Greenwich mean time is known all over the country! And that is how time is made at Greenwich. Is it not a triumph and a wonder? Just consider what timekeeping is to what timekeeping was. It is known both to astronomers and scientific horologists that in no astronomical observation cited by Ptolemy is the time indicated *nearer* than a quarter of an hour. We are are not satisfied with anything less than seconds, and even tenths of seconds, in our clocks.

And thus it goes on every hour of the day and every hour of the night throughout the lengthened year.

But we must not omit the great time-ball that gives its signals to the chronometers of the shipping on the Thames, and also to the surrounding neighborhood. The ball is fixed at the top of a rod that works in the groove of the mast on the east turret of the Observatory. As this ball is the first of its kind that was erected, as may be expected the mode of hoisting is in keeping with its date. We went into the turret, and saw that it was raised by a winch and chain. The deal ball, and others that have been since put up, are raised by means of rack and pinion work, a far more suitable way. The lower end of this rod terminates in a piston, resting at the bottom of an iron cylinder. There are a couple of guide rods having a collar sliding easily upon them, the latter being attached to the end of the winch chain; this collar "takes in" with another, which is fixed to the rod of the ball itself. When the ball is wound up there is a contrivance for keeping it in its place, whilst the chain is unwound and the collar that raised the ball returns to its place below. The ball is let go at the hour of 1 P. M. by the standard solar mean clock. In connection with the closing of the electric circuit by the clock which has been already described is an armature acting upon a detent or trigger, to which levers are attached. As in other cases, when the 60th second of the hour has been reached, the electric current from the clock releases the trigger, and the ball descends. The deal time-ball does so at the same instant, whilst guns fire at different places. When the deal ball falls it sends a return current to Greenwich to say that all is right. When that is not so a signal is sent by hand. The cylinder and piston at the bottom of the ball rod are to prevent violence from the fall by using the air in the cylinder as a cushion. Should not the ball act at the proper time, it is lowered to signify that fact, and again hoisted for a o'clock, when it is let down by hand. The time of hoisting it every day is five minutes to one o'clock, and it falls exactly at one. The hour signals for London pass through the signal relays of the Post Office, St. Martins-le-Grand. There is an arrangement by which public clocks can report themselves to Greenwich, and obtain an answer, but at present, "Big Ben" of Westminster is the only one that does this. The country signals go out at 10 A. M. and 1 P. M., unless under special circumstances, those being considered the two most convenient hours for the purpose.

The distributing instrument at St. Martins-le-Grand is called a chronopher, and the signals are marked off into four classes. These are Metropolitan, Provincial short, Provincial medium, and Provincial long. Contrary to some persons' apprehensions, elaborate experiment has shown that the roundabout transmission of the hours causes no delay that can have any appreciable time assigned to it. Thus the signal reaches Edinburgh just as soon as it reaches London, so far as the measurement of a high decimal of a second is concerned. Although it must absolutely reach the Post Office before it can go to Kendal, or Swansea, the difference in time is so small that it can never be marked as a factor in the second.

We will, ere we conclude, correct a very prevalent error in respect to the Westminster clock—that is, that its pendulum is controlled in some way or other from Greenwich. This is not so. It is perfectly independent in its action. It reports itself to the Observatory twice a day, and there is a galvanic needle beside it which shows an hourly signal from the standard mean time clock by deflection. Should the clock alter its rate, there are small weights which can be put on or taken off the pendulum to restore the time. It has long been admitted to be the best public clock in the world, and may be relied upon to within a second of true time. After heavy gales of wind acting upon its exposed hands, or thunderstorms, it may err by two or three seconds. The first blow on the hour ball, after the quarters have been sounded, is the time.

As we closed our note book we cordially thanked Mr. Criswick for his attentive assistance, and took our departure, full of wonder and admiration at the elaborate system of time-making and the time signals at Greenwich.

WOMEN, with few exceptions, have worn earrings in every country and at every period. In their ears they have been celebrated by poets, sculptors and painters of many times and places. Homer introduces them into the toilet of the venerable Hero, each composed of three bright mulberry colored brilliants. Praxiteles made holes for them in the ears of the celebrated Venus, and Sir David Wilkie has presented us with a charming pair about to be fixed for the first time in the ears of a little country maiden. Earrings are not confined to the "softer sex." The portrait of Shakespeare in the Chandos edition shows at least one earring ornamenting that poet. There is a tradition that Charles I. wore fine pearl earrings, and the day before his execution took one out and gave it to Juxon, in charge of his daughter, the Princess Royal. The fate of its companion is not known. At the present time, earrings are worn habitually by male gypsies and sailors. From the earliest ages earrings have been worn by male Asiatics. The Bible is not without instances of the practice, and Juvenal commemmorates the ornaments in the ears which denoted the male born by the River Euphrates. Pliny says the ear is the only immovable part of a man's body, and on none is more money spent by a woman.—*Troy Times.*

HAGSTOZ & THORPE, of Philadelphia, are now fully settled in the new building which they have recently erected. The structure has a frontage of 35 feet, is 115 feet in depth, and five stories in height. The firm has gone largely into the manufacture of gold and silver cases, and for this purpose have introduced some of the most ingenious and perfect machinery ever used. Their capacity at present is equal to the product of from 150 to 200 cases a day, but they propose to further enlarge the capacity of their works in the spring to equal the production of 600 cases a day. Their gold and silver goods are all of standard quality, and this branch of their business will be kept entirely distinct from their filled goods department. Their standard gold and silver cases will hereafter be stamped with a keystone, which symbol the firm has registered as a trade mark. Their factory at the present time presents a busy appearance, their orders being largely in excess of goods on hand.

POISON rings still exist in many antiquarian collections. They are of two kinds, one intended as an engine of destruction to its wearer, the other simply as a convenient receptacle or hiding-place for poison. Some years ago a ring of the former description was purchased at a sale of curiosities. Its device was two sharp-pointed claws holding a stone. The purchaser, slipping it on his finger, received a slight scratch from these claws, the points of which bent inward. His hand and arm very shortly became swelled and painful; a doctor was sent for, who pronounced the slight scratch poisoned. Examination of the ring showed that the claws were hollow, and that a poisonous matter had been contained in them; doubtless when first made, the ring would have caused death, instead of merely inconvenience, to its wearer. Rings intended to contain poison are frequently mentioned in ancient history; it was common to carry one as a convenient means of suicide. By such a ring Demosthenes probably destroyed himself, and some historians say Hannibal likewise. M. Crassus, the overseer of the Temple of the Capitoline Jupiter, being arrested on the charge of purloining some of the gold deposited there, broke a hollow receptacle of his ring with his teeth, and fell dead on the spot. The Emperor Heliogabalus is said to have had a collection of these poison rings among his jewels.

The Anchor Escapement.

THIS movement belongs to the class of free escapements. The balance is only during a small portion of its vibration in connection with the wheelwork, and accomplishes its motion principally without any contact with the other parts of the escapement. This is a decided advantage which this escapement possesses over that of the cylinder. While this latter permits its balance wheel to make only about ¾, that of the anchor has freedom to make 1½ vibrations, without incurring the danger of banking, and they are not so much influenced by extraneous motion. But an anchor escapement demands a great exactness in its execution, if it is intended to be a reliable timekeeper. It hardly admits of a mediocrity in this respect; while a cylinder escapement of faulty construction may render passable service, an anchor watch with like defects is of no account at all, and it is to be recommended that this kind of movement be placed only in watches, costly both in quality and construction.

The anchor escapement is composed of the following acting parts: (Fig. 1) *a* is the balance staff, with its shoulders for the balance wheel and collet. On the lower part of the staff is fastened, for intended strong friction, the steel staff roll *b*, sometimes simply called the roll or roller; this roller carries the ellipse or ruby pin *c*, placed perpendicularly to its surface, and which is generally a ruby.

Upon the anchor-staff *d* sits the anchor *A*, whose working surfaces are mostly made of jewels. Peculiar to the anchor are its pallets, *e e*, and the two reposes, *f f*. The angle which is formed by the two reposes with the lengthened radii of the anchor wheel, are called the locking angles; they serve the purpose of enabling the wheel, when it has fallen upon a repose, to retain the anchor.

Immovably connected with the anchor upon one staff, sometimes made with it of one piece, is the fork *G*. This has on one end two levers, *h h*, called horns, which are separated by the incision for the ellipse. Immediately in front of this incision, and exactly in its center, is a sharp corner *m*, called the crescent. The other piece of the fork is placed there simply for the purpose of maintaining the counterpoise of both anchor and fork.

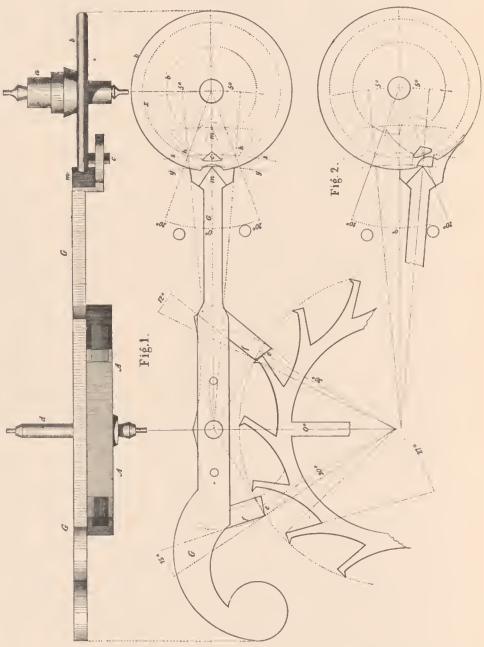


Fig. 1.

Fig. 2.

The free anchor movement has emanated from the Graham clock escapement, and has, as the reader will perceive, a great resemblance with it. That in this a part of the escapement is effected by the inclined surface of the oval teeth, makes no difference, only that the pallets of the anchor must be a great deal shorter. The wheel has, in common with the cylinder escapement, 15 teeth, making for the distance from point to point, 24°. Of this, 4° are commonly taken for the teeth surfaces, and 2° for the sloping toward either side; thus, 8° remain for the size of each anchor lever. The lever on whose pallet the tooth lies in Fig. 1, is called the escaping pallet, the other one, the entrance pallet.

When the watch is run down, that is, without motive power, both staff-roll and fork are kept in their position by the balance spring, as sketched in No. 1. By winding up the mainspring, the wheel presses against the escaping pallet, as indicated in the sketch, and the fork drives the balance with the ellipse toward the right, until the tooth falls upon the repose of the entrance pallet and retains the anchor through its locking angle of 15°. To stop the anchor and fork from going too far, the latter is forced against the wall of the incision in the watch plate, or against a pin. Wheel, anchor, and fork remain fixed, while the balance, by power of its spring, accomplishes its vibration. When the balance returns, the ellipse first drives the fork because the balance has at first to surmount the locking angle. The wheel makes a small backward movement, until the inclination of

the teeth and the slanting surface of the entrance pallet can operate together. The fork springs to the right, in proportion to the necessary play room of the pallet in the incision, and propels the ellipse and the balance to the left. As soon as the tooth falls toward the inner repose with its locking angle of 12°, the fork assumes the position, as shown in Fig. 2, by pressing against the plate, wall or pin on the other side. The balance accomplishes its motion, and has upon its return to surmount again the inner locking angle of 12°, when the lifting of the escaping pallet is renewed. The outer locking angle is larger than the inner one, because it diminishes by the movement of the lever toward the wheel; the latter increases, so that, in reality, both the return motion and the retaining power of the wheel are equal on both pallets.

The procedure by which the power of the balance surmounts the locking angle of the anchor and propels the wheel, is called the "starting" or "detent." In the anchor movement sketched in the cut, this detent on both sides takes place on levers of unequal length, the outer repose being farther from the center of the anchor than the inner one, consequently the detent demands a little more power from the balance at the entrance than at the escaping pallet of the anchor. This inconvenience is equalized by an arrangement of the escapement in which both the radii of the reposes are equal. The moving power of the wheel is also equalized by giving the pallets of the anchor different inclinations.

We sometimes find the anchor wheels with pointed teeth, mostly of gold or brass, and the pallets are constructed correspondingly broader. It is deemed a better arrangement, and is used chiefly in the finest English watches. The objection that such teeth wear out faster and are peculiarly sensitive to injury, prevents their general introduction.

The co-operation of both fork and ruby-pin demands a close attention.

The expansion of the locking angle of anchor and fork is composed of the height of the inclination of teeth measured by degrees from the center of the anchor, when the tooth stands in the tangent), the height of the anchor pallets, and the rest. In the accompanying cut, the lifting achieved by tooth and pallet has been assumed at 8½°, add to this 1½° for the repose, and we have 10° for the movement of the fork. Let us suppose that the center of motion of the balance is known, and amounts, counting from one drop of the tooth to the other, to 40°; we ascertain the acting length of fork and radius of staff-roll as follows: We connect the center of motion of the anchor and balance by a straight line, and allow, starting from the first, for the motion of the fork 5° on each side of this line. In like manner we allow for the motion of the balance, from its center, 20° on each side of this line. We then draw from the center of the balance, the circle *X* through the intersections of the thus ascertained lines (see Fig.), this gives us the distance of the ruby pin from the center, and this circle fixes the place and point of contact of the ruby pin with the fork. We then describe another circle *Z* from the center of motion of the fork through those points of intersection, and thus obtain the incision of the fork.

The walls of this incision must be exactly parallel with the center line—sharp to the outer corner; a curve or rounding toward the horns is inadmissible. Its breadth must only be enough to permit a little shake to the movements of the ruby pin, of this a very acceptable form has been given in Figs. 1 and 2. Owing to an easier construction the form of the incision of the ellipse is sometimes a flat oval—whence its name ellipse.

The point of the crescent *m* must reach as close to the ellipse as is consistent with its freedom of motion in the incision of the staff roll. This incision, or this hollow, comes so close to the ruby pin that only very little metal is left standing before it; however, the play of the point of the crescent and the bottom of the ellipse must not be too contracted, because a due regard must be had to a little side shake of the anchor and balance staff. A touching at this point would be injurious.

From the center of motion of the anchor outside of the point of the crescent, we draw the circle *y*, and where it intersects the lines indicating the motion of the fork is the point which fixes the outer line of the size of the staff roller *b*. It is clear, therefore, that the shorter the crescent, the larger must be the staff roll, and the smaller and flatter will be the circular cut of its periphery, which is included in the motion of ten degrees of the fork, and intended to prevent too early a passage of the fork and crescent. The safety in this instance, offered by the position of crescent and staff roll, lessens in ratio with the diminishing and flattening of the included part of the circumference of the staff roll—that is, with its increasing size. Or, in other words, the larger this staff roll, the smaller is its angle of passage which the crescent has to make, a greater safety only may be obtained with an increased angle of passage. The crescent, in some instances, has been placed under the incision and permitted to pass under the ruby pin, in the endeavor to obtain additional safety for the correct working of a small staff roll. This arrangement has been sought to be made comprehensible in Figs 1 and 2, by the dotted outline of the crescent *m*, and in the small staff roll, *b*¹. The object sought for in this disposition is obtained, and a greater safety is offered, because the crescent is kept from passing through too soon by an increased part of the periphery of the staff roll, without sacrificing the advantage of a long lever with which the fork operates upon the balance. The part carrying the ruby pin needs, in this instance, to be no staff roll, but may be a common lever with counterpoise on the other side, which is generally connected with the small staff roll by means of a canon. The diameter of this roll is held equal to ⅓ of the diameter of the circle which is described by the acting points of the ruby pin.

The form of the horns of the fork lying outside of the incision serves solely the purpose to hinder a possible banking of the ruby pin on the entrance corners of the incision. In the side position of the fork (Fig. 2) the rounding of the outer horn of the fork must not be parallel to the circle described by the ruby pin. Nor must this rounding of both horns be part of a common circle which has been drawn from the center of the balance, while the fork remains in repose (Fig. 1), because an accidental rubbing of the ruby pin would then almost be equal to a violent shock. The centers from which the inner form of the horns are defined, lie a little to one side from the center line of the fork, and are indicated in Figs. 1 and 2 by dotted lines. A great hollow of the staff roll increases the danger of rubbing more than a smaller one (see dotted sketch Fig. 2), and it is necessary to bestow much attention and exactness to the incision as well as to the form of the horns in the arrangement of the escapement with small staff roll. Great exactness also is necessary in the forms of the horns of the fork, because it often happens that the incision in a large staff roll is made unnecessarily wide by carelessness. Above all, be very careful to locate the point of the crescent *exactly* in the center of a straight line, which may be imaginarily drawn from the center of motion of the fork through the center of the incision.

It is plain that during the vibrations to the right and left, the crescent must not press hard against the staff roll. Those pins, called banking pins, or the side walls of the let-in which limit the motion, must be set so far back as is compatible with the safety of the escaping of the tooth, and the freedom of motion between staff roll and point of crescent. Great regard must be paid to the side shake of the pivots, so that even by an intended pressure of the balance staff toward that side, play room enough is left for the crescent to perform in. Of course, too much shake is just as hurtful, because the tooth remains unnecessarily long at repose, and the detent is consequently overburdened.

When the vibrations of a balance reach an extent of two circumferences, the ruby pin banks against the outside of the fork horns. These, as well as the banking pins, must be sufficiently strong to withstand the shock. It is well to make them of spring-tempered steel, well-hammered brass, or other hard metal, not too thick, rather elastic, in order to lessen the effect of the hard encounter, called bank-

ing. A thin elastic fork is very appropriate. It will be seen that the centers of wheel, anchor, and balance form a right angle in the escapement sketched in the Fig. This disposition is required by the length of the fork and the endeavor to make the anchor staff as high as the others. The balance should be twice as large as the escape wheel in such an arrangement and the size of the balance indicates the length of the fork. It would undoubtedly be a great improvement if by some other arrangement the fork as well as the staff roll could be diminished in size, because the smaller they are, the less is the resistance—*vis inertia*—offered. The cylinder possesses a decided advantage over an anchor escapement, because the latter has to move an additional piece, and the main endeavor of the watchmaker must be to make it as small and light as possible. The improved anchor escapement with short fork has arisen from this consideration; the anchor staff in this is so short that the balance passes over, and all three centers of motion of the escapement lie in one line. This arrangement is preferable, where the exactness of the execution is proportionate with the diminution of the parts. Owing to the smallness of the part, small staff rolls are preferred, and the ruby pin is fastened simply to a common lever.

THE BALANCE SPRING.

Commensurate with an increased expansion of the vibrations of the balance in an anchor movement, its spring must be correspondingly long; one of eight or nine coils is far too short, because its elasticity would be exerted too much, owing to the forcible motion. The limit may be overstepped, however, by choosing too long a spring, and its outer coils would almost remain inert, thus rendering the watch very difficult to regulate. Much has been written and more has been disputed, about the right length of a balance spring, but, unfortunately, without any tangible result. The length of the spring must be proportionate to the size and weight of the balance, its extent of vibration, and, generally, in due ratio with the size and proportion of the entire wheelwork.

It is evident that greater exactness in the rate of going is aimed at in an anchor than in a cylinder watch, and a great degree of attention has been paid the operation and proportion of the balance spring, it being one of the chief factors. It has been ascertained by exact observations that a very short one shortens the larger vibrations much sooner than the smaller ones, while a long spring gives the contrary results. From this follows that there must be a certain length, a certain mean by which the greater and smaller vibrations are accomplished in the same time. But this, owing to the different proportions, workmanship, difference in power of mainspring, &c., will have to be ascertained, more or less, in every individual watch.

A great improvement of the balance spring consists in the following ingenious arrangement. A satisfactory operation of the spring depends altogether upon its perfectly even coiling and uncoiling, while at work. But the inherent defect common to all flat balance springs, that when fastened in the collet, they have the tendency, while uncoiling, to be pushed to one side, takes place to a greater degree in anchor escapements. This defect is overcome by an arrangement discovered by the celebrated French watchmaker, Breguet, and which, therefore, has been named for him.* It consists in bending the outer coil upward; it is thus brought into another level and fastened nearer to the center. Such a spring uncoils with great regularity toward all sides. The greatest difficulty when replacing an old one lies in the true regulation of the new one, and can best be done by an exact counting of its vibrations for one minute. The bending upward is accomplished by laying the spring on a flat table; then, at the place where you wish the bending to take place, seize and hold the spring down by a pair of round tweezers, and by means of a second pair, draw the end left free, upward; the remaining laying into position, when the spring has assumed nearly the form desired, is best done after having been fastened in the work.

Even the best balance spring is subject to a certain change during its motion, which becomes especially noticeable in watches of exact rate, the cause for which must be sought for in the change of temperature. The expansion caused by heat, to which all bodies, especially the metals, are subjected, are not injurious to the spring; of course, according to a natural law, it becomes longer by a raised degree of heat, but at the same time, this is balanced by a corresponding increase in breadth and thickness. The great disturbing cause however, why a spring gradually loses its power, lies in the fact that hot iron is easier bent than cold; and its power and elasticity will gradually diminish by a continued heat, and the watch will go slower, especially if the very imperceptible increase of length, caused by the same agent, is added. To counteract this drawback, which, however, is of moment only in watches of very close rate, the fact that not all metals are alike expanded by heat, is made use of. Brass, for instance expands nearly twice as much as soft steel at the same degree of heat, and by connecting these two metals in the rim of the balance, and cutting it in different places, this peculiarity is overcome, by removing the center of gravity from the rim nearer to the center of motion, during heat. This arrangement is called compensation. Let the credulous not believe, however, that every balance that has been cut is compensated, although it may be engraven on the dust cap. To obtain a satisfactory compensation it is necessary, first and last, to increase the weight of that part of the balance wheel which is intended to remove its center of gravitation during heat, by large screws or other pieces of metal, such as gold, &c. And this compensation must amount to exactly the loss of elasticity of the balance by heat, which can be obtained only by careful observations and repeated trials. When this true proportion has been once established, no subsequent change, even the most trifling, can be made in either the balance or its spring.

It is easily to be seen by the above that an anchor escapement can only be put into high-priced watches, and that whatever cheap ones are sold under the high sounding title of "compensation," are simply a delusion and a snare.

THE EXAMINATION OF THE ESCAPEMENT, AND THE REPAIR OF THE MOST COMMON FAULTS.

First examine the wheel on the anchor, while in the watch, after having removed the balance. For this purpose secure the fork by gently introducing under it a piece of paper, and push it from side to side, as far as the drop of the tooth. You will observe in this way the height of the drop, the repose, and if the fork places itself at the right time against the banking pins. The drop, as is also the case in a cylinder escapement, is often unequal. Should the outer drop be too great, it indicates that the anchor is too small, and *vice versa*. Too great a drop toward both sides is caused by the pallets being too short. Pay attention to the reposes, when you notice an unequal drop, and remember that the inner one is considerably increased by too deep a lever.

Much mischief is caused by an insufficient or undue fall of the tooth upon the repose; in either case the regularity of the going must be looked into. An especially great hindrance to the balance is when it is compelled to overcome too long a repose, and its length of vibration must necessarily be decreased thereby. An unequal repose is produced by a faulty and unequal form of the pallets. A good result is often had by retouching them on the diamond disc, but great care must be taken, else the operation, instead of being beneficial, may cause much harm.

There is only one efficient method for raising or lowering the anchor—close the old holes and replace the escapement in the depthing tool. It is the only safe remedy in cases where an untrue anchor has to be replaced by a new one, and the pitching distance is incorrect. But the tool must be very exact, and the operation performed very carefully. When it has to be removed only a trifling distance, the hole in the anchor may be enlarged by means of a saw-bow and wire; replace the pins by soft, flexible ones, and countersink their holes somewhat on the inside. Care must be taken, however, while doing this not to disturb the intimate connection between anchor

and fork. Their smallest displacement is conducive to manifold errors.

An untrue wheel may also give rise to an unequal fall upon repose. This defect must be corrected by a new wheel or pinion, especially if the error is produced, as is generally the case, by an untrue shoulder, owing to having been turned carelessly.

The correct form of the fork was treated of in its place. It is of the utmost importance, especially so with regard to the incision and the position of the crescent, nevertheless, it is subject to much botch work. The sides of the incision must be well polished, to prevent a rubbing as much as possible. Too short a fork or one with rounded corners causes the banking of the ruby pin against them, thus increasing the exertion required for the unlocking and often amounting to the stopping of a watch. Place the balance into its place and continue the examination. After having loosened the fork, secure the balance with a piece of paper in the same way. It is easily seen whether the ruby pin has too much or too little play. Too much play is a great loss of power, because it is unnecessarily wasted by too strong an after-drop of the fork after the unlocking, and a part of the anchor lifting is rendered useless to the impulse, because a knock is no impulse ; this defect, however, is to be met with only in bad or botched watches, and may be remedied by bending the horns, if a new fork cannot be made. Unscrew the fork (which is fastened by a screw to the staff, and to do this, revolve the latter—the anchor has a smooth hole), seize it with tongs, and heat the fore-end to a dark-red heat. Try next, by another pair of tongs, or by heating, to close the incision somewhat. Then file the latter so that it fits truly, parallel, and in such a manner that the crescent remains exactly in the center. Hereupon replace the different parts of the escapement, and should the ruby pin not be able to pass the corners of the incision, provided the banking pins stand right, carefully straighten the horns.

The inspection of the fork and its true length is best done by stopping it with a piece of paper, and revolving the balance carefully. You will feel in this manner, in an increased measure, how great the resistance offered to a regular unlocking by an untrue form, rounded corners, or insufficient length of fork is. To remove any doubt, loosen the fork, and revolve the balance, as far as the drop of the tooth, which will at once show how much play there is between the ruby pin and the corner of the incision of the outwardly lying horn of the fork. Use the depthing tool in case of doubt, place it at the given distance from center, and put both fork and balance into it. You may thus see from the other side, the co-operation of both fork and ruby pin, and whether the fork is of right length or not, and also that the ruby pin does not rub against the bottom of the incision.

Is the fork too short in the incision, it may be lengthened by drawing out the horns.

Should the crescent be too short at the same time, lengthen the fork by hammering it in the middle, after having removed the anchor. The position of the crescent to the staff roll is of the utmost importance, and stands in connection with the accurate performance of the locking angle. To successfully examine the true joint action of these two parts, put the entire escapement together, without the balance spring, and give a few turns to the mainspring. As already mentioned, the point of the crescent must have arrived at the circumference of the staff roll, when the tooth drops, and the fork must go a little farther to the banking pin, as well for the safety of the drop as for the necessary play between the crescent and the staff roll. Turn the balance farther, and this play must be everywhere the same — enough, but not too much. Press the fork against the staff roll ; it must not be retained by this, but return to its original position, by power of its locking angles. It is a great defect if the wheel does not draw on the anchor, and it must be corrected either by grinding this on the diamond disc, or by making a new anchor. Attention is called to the fact that ignorant workmen sometimes round the fore-corners of the escape-wheel teeth, to facilitate the unlocking. If such a botched wheel is the cause of the defect, it should be thrown aside at once, and a new one substituted, before a correction of the operation of the anchor is attempted.

It may happen, even if the locking angle is all correct, that the fork, when pressed against the staff roll, will remain fixed in the position, and this is generally due to an over-amount of play. Of course, the crescent will be found too short in such a case, especially should the play on both sides be more than sufficient. If on only one side, and an inspection does not reveal that the crescent has been filed obliquely toward the incision, the position of the center of the balance to the fork, perhaps, may be untrue—in other words, the fork must, from the drop of one tooth to the other and back, move farther to one side of the pivot hole than to the other, that is, the pivot axis is not truly on the center line of the fork. This may be corrected by changing the connection of fork and anchor, and by substituting for the hardened pins well fitting soft ones, and sinking the holes inwardly. There is another and better way to remedy this evil, and is as follows :

First arrange carefully the limit of the motion of the fork, by drilling in banking pins near the anchor. It is very objectionable when the fork with its horns lays itself against the wall of the plate ; the points of contact become entirely too large, and only a small quantity of dirt is necessary to seriously infringe on the play of the crescent, or to produce a great loss of power by the glueing of the fork. It is preferable, therefore, to file the plate a little more, and after having carefully ascertained the point, secure the fork, and drill in two vertical banking pins. After having thus circumscribed its motion, unscrew it and bend it in the corresponding direction. This will be best accomplished by seizing it with two tongs, heating, and gently pressing it into the desired form. The movement of the fork may thus be easily regulated in its position to the staff-roll.

When the crescent is too short, and the fork in order, it is sometimes possible to correct this defect by filing away the corner of the crescent and placing a vertical pin in the fork, giving it sufficient projection. This may also be done on an obliquely filed crescent. A false position of the balance staff to the movement of the fork will generally indicate this condition, produced by the botch work of an ignoramus.

An anchor watch with a good mainspring should start of itself, without any other impulse. If it possesses such a defect, it may be caused by a bad polish of the wheel teeth, of the pallets, or of the incision of the fork. Too great a lifting of the balance may also prevent a watch from starting of its own accord. This lifting should not amount to more than 40°, and it is clear that by a greater lifting, the position of the fork becomes more slanting, consequently acts more unfavorable, and prevents the watch from starting itself. It may also be due to an over heavy balance, and the mainspring cannot overcome the elasticity of the balance spring. Other disturbances in the rate of going can be produced by a badly polished rim of the staff roll, or one being coverd with gluey dirt. Especially where the crescent is somewhat short, or the staff roll rather large ; when by an accidental knock the crescent is thrown on the staff roll, it may adhere. The fork, in such a state of things, will slip through, often by bending or by fracturing a pivot. Crescent and staff roll should therefore be at all times kept smooth and clean. Although it is not to be recommended to keep the oil altogether from the points of contact of fork and pallet, a very slight moistening is sufficient, and an injurious spreading of the oil upon the crescent and its surfaces of contact is prevented.

Again, all manner of rubbing of the different parts of movement must be guarded against. The anchor may touch the sides of its bed, or the escape wheel teeth may approach so near to the inner surface of the anchor, that some of the oil necessary for the pallets is deposited there and points of contact are established. Even that part serving as counterpoise to the fork should not move with too contracted a motion in its place, so that the least dust would disturb the action of the fork.

It occurs sometimes that the balance drags upon the fork—when this happens to stand somewhat high, especially so when it has an ex-

tra amount of play. It may also occasion a passage of the wheel by the pallets and reposes, and touching the steel mounting instead.

Too long a pallet may rub against the bottom of the sinking or against the small screw which secures the cover. The co-operation of both pallet and fork must be secured in such a manner that too short a pin does not permit the fork to pass below. Loose or badly fastened pallet jewels are sometimes met with, and it stands to reason that these defects make a true rate of going impossible. To well secure a pallet jewel, clean the corresponding parts thoroughly in benzine, from all oil and dirt. Shellac dissolved in alcohol serves best the purpose of fastening the jewel, but it must be thick and tough. Fill the hole with it, then insert the jewel, push it through, and heat the parts over a flame, without, however, permitting the steel to change color.

An untrue staff roll is apt to permit the crescent to have too much play in some parts, and too little in others; this defect is occasioned mostly by untrue turned pivots of balance, in case it be not due to a bent one. Too much play of the staff of the anchor and balance in their respective holes, is a great fault, which prevents a true joint action of the parts, separate or together. The fact that both anchor and fork must rest in perfect equipoise on their staff, has been mentioned already.

Little else need be mentioned It is unnecessary to add more defects to the above list, which is not by any means overcrowded, but the most glaring ones have been mentioned, and the intelligent workman will, it is hoped, be led by the above directions, to find them.

"Frauds."

THE OFFICIAL LIST OF THEM—PLANS AND PURPOSES OF THE POST OFFICE DEPARTMENT TO ERADICATE THEM.

AT intervals of a few days the telegraph makes announcement from Washington of additions to the list of "frauds" officially declared by the Post Office Department. These announcements are usually published in the daily papers for the benefit of the general public, who are thus warned against remitting money to the persons thus denounced as "frauds," but they are also intended for the information of postmasters throughout the country, who thereupon detain all letters, registered or otherwise, addressed to such persons. Of course an official formal order follows the telegraphic announcement, but usually postmasters act promptly on the latter publication, and thus save many a dollar for the dupes of the "frauds."

For several years the Department has been engaged in this work, and at the present time it has a list of 171 "frauds" to whom it denies the privilege of swindling by mail. It is adding to this list daily, and doubtless, if it had the assistance of the duped ones, it could swell the list to thousands. But it has had to depend in the past, and depends now, almost entirely on the sagacious observation and detective instincts of its postmasters and their subordinate carriers. Almost all those who are now on the list of "frauds" have been detected as such by carriers who have grown suspicious, when called upon to deliver day after day hundreds of letters to some obscure person in a dark room without visible furniture in some dilapidated building, which shows no signs of business activity. The list down to November last may be found in *The United States Official Postal Guide*, and the curious in such things will find its perusal of considerable interest.

Of course the largest number of frauds is in New York City. There are 71 of them, and many of these have each half a dozen aliases. There is not a single "fraud" in the state outside New York City except J. C. Henry & Co., alias Clarence W. Miller, at Glens Falls, and the Long Island Shirt Company, which has had the good sense since its exposure to abandon Brooklyn. Philadelphia was represented by six "frauds" until a few days ago, when one of them, Dr. John Buchanan, with five aliases in the names of medical colleges, was sent to state prison. Boston has only four, but one of them, L. A. Kendall, indulged in no less than fifteen aliases, each selected with a view to entrap the most cultured of Boston's citizens. He called himself the "Bay State Organ Company," and sold musical instruments; the "Eastern Gun Works," and dealt in arms; the "Enterprise Publishing Company," the "Parisian Photograph Company," the "People's Paper Publishing Company" and the "Welcome Guest," and hawked art and literature, and as the "Hub Watch Company" was a vender of bogus watches and doubtless other like jewelry. E. Ellsworth Slocumb, also of Boston, appears to have been prolific of aliases of a highly "cultured" character, for he figures as the "Agents' Union," "American Book Company," "Eastern Manufacturing Company," "Paris Novelty Company," "Royal Piano Company," "Solagraph Watch Company," "Star Manufacturing Company" and six other names. There was evidently affinity of soul, if no other connection, between Kendall and Slocumb, and both were clearly sly customers. There were no less than four in the small city of New Bedford, Mass., all engaged in literature and music; and there are half a score of other Massachusetts towns similarly inflicted with one or more "frauds." The class seems to have been very widely diffused, for the list locates them in such small out-of-the-way hamlets as Bristol, Tenn., Elkhart, Ind., Holston, Va., and such remote places as Cheyenne, Wyoming, Prescott, Arizona, and Rosito, Colorado. Chicago has a population of only nine "frauds"—officially speaking; but "quick and speedy divorce" lawyers are not enumerated in this class. Most of the Chicago "frauds" are agents or aliases of the Boston scamps.

The articles dealt in by these "frauds" are almost innumerable. Lotteries, of course, of which there are half a dozen, and "the greatest of these," the Louisiana State, is not mentioned at all; counterfeit money; pianos and organs; firearms of various kinds (these seem to be favorite articles of fraudulent traffic); sewing machines; bogus medical diplomas; stamping machines; literary publications of all sorts; photographs and art works; Japanese curiosities; mining stocks; stock brokerage; and shirts! There are scores of minor swindles which it is difficult to describe in which the lesser "frauds" indulged.

The laws under which the Postmaster-General acts in excluding the mails of these persons are sections 3,929 and 4,041 of the United States Revised Statutes. One prohibits the delivery to them of registered letters and the other of money orders. They read as follows; and those of the CIRCULAR readers who see this article, can greatly facilitate the work of the department by sending to the postmaster of their respective places of residence, the names of those they know or suspect to be guilty of a violation of either.

SECTION 3,929. The Postmaster General may, upon evidence satisfactory to him that any person is engaged in conducting any fraudulent lottery, gift-enterprise, or scheme for the distribution of money or of real or personal property, by lot, chance, or drawing of any kind, or in conducting any other scheme or device for obtaining money through the mails by means of false or fraudulent pretenses, representations or promises, instruct postmasters at any post offices at which registered letters arrive directed to any such person, to return all such letters to the postmasters at the post offices at which they were originally mailed, with the word "fraudulent" plainly written or stamped upon the outside of such letters; and all such letters so returned to such postmasters shall be by them returned to the writers thereof, under such regulations as the Postmaster-General may prescribe. But nothing contained in this title shall be so construed as to authorize any postmaster or other person to open any letter not addressed to himself.

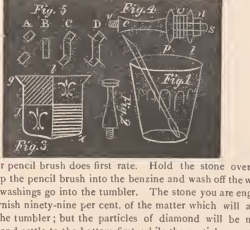
SECTION 4,041 is precisely the same as the above until the words "representations or promises" are reached, and then it adds as follows: "Forbid the payment, by any postmaster, to any such person of any postal money-order drawn to his order or in his favor, and may provide by regulations for the return to the remitter of the sums named in such money orders. But this shall not authorize any person to open any letter not addressed to himself."

The care taken in the last sentence of each to guard the sanctity of the mail in the interest of the dupe, prevents often the obtaining of evidence to prosecute the "fraud." It is believed that if the system now employed were supplemented by the aid of the duped persons, the "frauds" could be checked if not punished.—*New York Tribune.*

Gem Engraving.

BY AN EXPERT.

THE diamond dust is pretty well held by the soft steel cutters, but still some of the particles can be saved by washing the job as you go along with benzine. A little toy tumbler, Fig. 1, with a small



camel's hair pencil brush does first rate. Hold the stone over the tumbler, dip the pencil brush into the benzine and wash off the work, letting the washings go into the tumbler. The stone you are engraving will furnish ninety-nine per cent. of the matter which will accumulate in the tumbler; but the particles of diamond will be much the largest and settle to the bottom first, while the particles cut from the gem will be almost unpalpable dust and stay suspended a long time in the benzine, so that you can let it settle for fifteen minutes, then pour off the benzine carefully, and what diamond dust remains can be rewashed with fresh, clean benzine. The process is precisely like the preparation of fine emery described in a former number, except that the process is reversed, and you save the coarse particles, which are diamond dust. The few drops of benzine left in the bottom will soon evaporate, and you can leave the sediment until you do your next job, when you can fill up your tumbler with benzine, wash off your work in it, let it settle a little and pour off again. This can be repeated many times before enough diamond dust will be accumulated to be worth looking for. As soon, however, as there is some, you can use it to charge your cutters or laps, for it is just as good and sharp cutting as ever; it was only loosened from the setting you had forced it into in the soft steel. There is no doubt but there will be some of the finer particles of diamond dust thrown out with the benzine, but benzine is very fluid and a particle of any appreciable size will soon go to the bottom. Such very small particles of diamond as are lost in this way would only be useful in such cases as making watch jewels, or finishing rubies and sapphires. At any rate this point will be taken up again farther along. In gem engraving a very high speed is desirable, and if your lathe has a counter shaft so much the better, for the arbor of your lathe should make three or four times as many revolutions (when using your smallest cutters) as would be required for pivoting. This increase of speed tells in the amount of work done in a given time. When you commence cutting (I mean your first efforts) do not try to economize your diamond dust too much; let your tools cut rapidly and it will help about nervousness. As the thickened oil accumulates on your work (where the tool is cutting) it can be taken up (the tip of a quill toothpick answers well enough) and smeared on the cutter—the washing in benzine is done only when quite an accumulation is on the gem, or you wish to ascertain the precise condition of your work. Much depends on feeling, and a rapid cutting tool gives a better sense—the touch is conscious of condition and discretion better. Avoid in your first practice trying too many tools; a square edge cutter, say one thirty-second of an inch wide, and one edge cutter (of the double convex lens pattern) is about what you need to commence with. Take a Masonic keystone (most all jewelers have them in stock)—I mean one of stone of course—and try and imitate the H, T, W, &c. As a rule they are none to well engraved, but you can see how it was done. I shall not give in these articles the proportion and form of letters, as I gave them in former letters on metal engraving; but if the reader does not have these to refer to and has not the knowledge, let him get a specimen book of letters and practice until he can form a nice letter either forward or backward—for seals, lettering has to be backward or reversed, or else the wax impression would not read right.

Old English text is managed very much as Roman, although some effects can be more easily obtained, especially in the lower case. This will be understood by inspecting an *i* in old English, shown at Fig. 5. A shows the top and bottom cut with a square-edged cutter. B the perpendicular part. C, as they are combined. The dotted lines show the overlap of the cutters. D shows the letter complete and how the hair lines serve to conceal the manner of cutting. Cyphers are composed of script letters designed quite perpendicularly; the hair lines are cut with the usual edge cutters, while the broad lines are cut with a tool of an edge angle of ninety degrees. *Intaglio engraving* means cut in or sunk, and is used as a contra-distinction to *cameo* or relief —raised work. The seal engraving when applied to stones generally means such letters and figures as are cut into the gem to produce a letter &c., in wax, and was much in vogue with the ancients, and those worthy old potentates whose early education did not permit them to flourish an elegant signature. Undoubtedly the first specimens of seals made were not those elegant gems of ancient art which are now so eagerly sought after, and occasionally sold at fabulous prices. A few connoisseurs hold that some specimens of ancient gem engraving cannot be equalled in the present time, either as works of art or in point of mechanical execution. This is a great mistake. We have plenty of gem engravers who can produce work quite equal if not superior to that of any age. Seals as worn in rings and as charms, do not contain or represent a full coat of arms, as a usual thing, but more usually crests. Crests are simpler devices, and generally consist of a single figure and motto. This figure is sometimes an animal or bird, or even part of an animal, and the sentiment of the motto in keeping with that of the device. The tools are precisely like those already described, only perhaps in greater variety—convex edge cutters and globe cutters of infinite sizes are the great staples. In this work, as in all other, the great feature is the design; and is first to be made and transferred as for letters. One of the commonest jobs of seal engraving is a shield as shown at Fig 3. All the outlines are to be cut with an edge cutter or perhaps a thin square-edged cutter. The fine parallel lines shown at *y* and *x* are cut by a special tool which I will now describe. It is a double headed cutter and shown at Fig. 2. The edges *b d* should be the same distance apart as the lines to be cut are. In using it one of the edges are not charged with diamond dust. Now with a single edge cutter cut a fine line from *f* to *j*; let the smoother cutter run in this line to guide the charged cutter to cut those on each side—the gem to be turned right and left, so as to cut each way from *f f*, the guide line. A cutter of this kind can be made as shown (enlarged) at Fig. 4. This admits of its being changed to any width of line—that is, within any reasonable limit. In this figure, *c* is the spindle, *v* where it screws into the lathe, *p* the cutter fast to the spindle, *w* washers which can be changed to suit the distance apart desired; *l*, loose cutter and the one generally charged with diamond dust, *n*, setting up nut, *s* screw. In real engraving the best test for your work is an impression on wax; for many imperfections which would escape notice on the engraving itself would be noticed instantly on the wax impression. The best wax to use is the very finest red sealing wax; that known as superfine being the best. It is composed of shellac ground or broken up fine, two parts; white or pale yellow resin, one part; best vermillion, one part; melt the shellac first, then add the resin, and finally the vermillion—the parts I mean are by weight. I give the receipt as it is sometimes difficult, even in a large city, to get fine wax. In order to get a nice impression, heat the stone until it can be just comfortably born on the lip, make a nice little puddle of wax and just as it commences to set, press the seal firmly and slowly into it; let it rest for a few seconds, then remove the stone and an impression showing the most delicate line and touch will be obtained. In cutting intaglio work, the outline on the stone can only represent the extreme limit of the design; all the details must be added as the work progresses. For this reason it will be necessary to model anything like complicated design in wax; the method of doing this will be fully described in our next communication. And I want the reader to bear in mind that there is no degree of excellence in the model which he cannot realize in the engraving, if he only becomes skillful and expert enough in the use of his tools.

Trade Gossip.

Etruscan jewelry is still in great demand.

Medallions are much less worn than formerly.

Bangles are worn to excess by fashionable women.

Trinity and City Hall Clocks now are rivals in inaccuracy.

Lace pins have completely superseded other kinds of brooches.

Serpent bracelets with golden scales and ruby eyes are coming into vogue.

A. W. Luckhardt, of McKeesport, Pa., is reported to have been sold out.

Small pheasants in gold of brilliant colors are worn as earrings and cravat pins.

A happy New Year and a prosperous season is THE CIRCULAR'S greeting to the jewelry trade.

A long, narrow brooch and a slender bracelet are the fashionable pieces of gold jewelry this season.

Six bangles on each side are not considered too many by girls who adopt the extreme of that barbaric style.

The ladies are wearing little gold tuning forks for hairpins, which indicates that "there's music in the hair."

For engagement rings, sapphires replace emeralds. The most elegant among these are surrounded by diamonds.

Colored Diamonds, set side by side with perfectly white ones, are now the fashion for the costlier forms of jewelry.

A. S. Peck, for many years with Buckenham, Cole & Saunders, has entered the employ of E. August Neresheimer.

There is a great scarcity of pearls in the market, particularly of those of fine grade, and they are very difficult to be obtained.

S. A. Baldwin has severed his connection with S. M. Lewis & Co., and has entered the employ of Walter E. White, of Providence.

Louis Strasburger, who has passed several months in Europe, returned in the *Baltic*. He may now be seen in the Lane as full of life and activity as ever.

Among the pretty jewelry shown at the exhibition of the Central Union, in Paris, is a branch of hazel, the nuts in yellow diamonds, the leaves and stem in brilliants.

David Dodd, who has been in Europe for several months, returned home on the 19th ult. He is as rosy as ever, and although somewhat emaciated, full of health and vigor.

C. E. Breckenridge, manager of the Wilcox Silver Plate Co., has led to the hymenial altar Miss Ella N. Andrews, of Saratoga, and they are now sipping the sweets of their honeymoon.

Some thieves recently broke in the show window of J. H. Lehman's jewelry store, Philadelphia, and stole some 18 or more diamond rings. The theives dropped about $800 worth of goods in making their escape.

The Government of France has decided to sell the crown jewels, as they possess no historical value. It is estimated that the sale would produce 5,000,000 francs, which would be devoted to extending and improving museums.

California jewelers are disposing of large quantities of goods at auction, in consequence of the tax law, authorized by the new Constitution of that state, which is driving many of the wealthy residents out of the country.

C. G. Megrue, traveler for Aikin, Lambert & Co., had one of his sample trunks burned in a baggage car near La Grange, Ky., Dec. 11. The trunk and contents were a total loss, though fortunately fully covered by insurance.

A late French idea in jewelry is in variegated gold, whereby new and pretty effects are obtained. Various colors run through the metal, and when polished, the material becomes very attractive. This design shows best on flat surfaces.

Lockets of a rich, heavy style, in plain gold or enamel, with initials or motto engraved in pearls or diamonds, are worn, and there are brooches in lighter style for fastening on the lace or tulle bows now so fashionable in the way of cravats.

Shrimps are now the favorite ornament for the ladies, pigs having had their day. Elephants are no longer admired. Shrimps now appear in pearl and gold, coral and ruby, as brooches, bracelets, necklaces, earrings, lockets and shoe buckles.

During the holidays Cowell & Hubbard, of Cleveland, were robbed of a small quantity of jewelry. While their store was crowded some shoplifter siezed some goods and was making off, when Mr. Hubbard siezed the thief and recovered the goods.

The bachelor world of Paris is interested in the expected arrival of a Mexican nabob, Mr. Ichibiaque, this month. He was born in the Basque country, began life as a cabin boy, and has made millions in the diamond trade. He takes with him his daughters.

The animal ornaments most favored are mice, frogs with back covered with diamond chips, and flies of pink enamel, rubies and other stones. These fancy jewels must come from the best makers and be artistically made or they appear common and often very ridiculous.

Another large diamond has been discovered in Africa, weighing 125 carats. It is reported to be unusually fine in quality, and free from those blemishes that usually characterize stones of large size. The rumor that D. H. Buell, of Hartford, is negotiating for it is not true.

R. D. Kirby, traveler for the Meriden Silver Plate Company, was recently married to Miss Allie Serrill, of New Orleans. The happy couple were married in Philadelphia. The bridegroom is well known in the west, having formerly traveled with J. H. French, the eloquent auctioneer.

A new way of wearing bracelets is now adopted. They are placed over the sleeve above the elbow. This is very becoming, especially over dark-colored velvet, plush or brocade. These bracelets consist of a golden circle, with either a diamond heart or an animal of precious stones. There are sometimes flowers drawn between the arm and the bracelet.

E. August Neresheimer has just received one of the finest diamonds ever brought to this country. It is exceptional in quality, perfect in every respect, and possessing wondrous beauty. It weighs six carats. The name of the journalist's girl for whom it was imported, is maintained as a profound secret.

The Jewelers' windows were resplendent with elegant holiday goods during the past few weeks. The trade never made a better exhibit, and the designs were especially noteworthy, many of them were poems in themselves, elaborately worked out in gold, silver, and precious stones. An unusually large amount of fine goods were disposed of.

William B. Clapp, of the late firm of Clapp, Young & Co, has organized a new firm for the purpose of conducting a jobbing business. This firm will be known as W. B. Clapp & Co. They will occupy rooms in the building, No. 170 State street, Chicago. Mr. Clapp is one of the most popular men in the trade, and the CIRCULAR wishes the new firm abundance of prosperity.

A diamond crescent recently manufactured by Buckenham, Cole & Saunders, has attracted considerable attention. It is composed of graduated diamonds of exceptional beauty and quality, and are matched with the utmost skill and nicety. It makes a gem of great value and beauty, worthy of being preserved as an heirloom to be handed down through successive generations for many years to come.

M. Isenberg and B. Spier, for several years with Max Freund & Co., have formed a co-partnership under the firm name of Harris, Spier & Co., for the purpose of conducting a general jobbing and and manufacturing business. Mr. Spier is well and favorably known among the jewelers of the South, where he has traveled for several years, and Mr. Isenberg is familiar with office work. Mr. Harris was formerly in the retail business.

Manufacturers of rolled plate jewelry who make a business of following very closely the patented designs of makers of fine gold goods, are presuming upon the good nature of the trade. Recent decisions by the courts have awakened the owners of patents to an appreciation of their rights, and their imitators are likely to come to grief. Piracy is as much of a crime on land as at sea, and the law provides penalties for the one as well as the other.

An enterprising person has recently victimized several persons in the trade by obtaining goods on memorandum. His plan has been to secure the business cards of well-known firms, and then call upon them, present one of these cards, and represent that he was sent to obtain certain goods on account of the firm named. In several instances he succeeded in obtaining goods to small amounts. The practice of sending out goods on memorandum is bad at its best, but they should never be so sent except upon the written order of the firm desiring them and should always be accompanied by an invoice. This involves some trouble, but it is worth while to take a little trouble to head off the sharpers who take advantage of a system that has few advantages to recommend it.

INDEX TO VOLUME XI.

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MANUFACTURERS OF

The Finest Quality of Knives, Forks, Spoons, Casters, Cake Baskets, Butter Dishes, &c.

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Our Knives are guaranteed to wear 12 dwts. of Silver per Dozen.

All goods are put up one dozen in a box. All our Knives are put up in the latest and most attractive style, with guarantee card in every box.

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On Dessert Spoons and Forks, . . . 72 dwts. per gross.
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ALL OTHER GOODS IN PROPORTION.

All our Spoons, Forks, etc., are plated upon 18 per cent. nickel silver, The best base known for plating upon.

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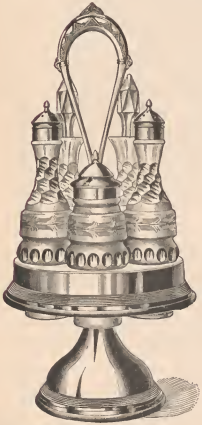
Sextuple Plate.

Our Hollow Ware is plated upon the finest white metal and is guaranteed to be plated fully

50 Per Cent. More Silver than any other brand of goods in the market.

OUR GOODS ARE PLATED 50 PER CENT. ABOVE STANDARD PLATE.

THE ABOVE GUARANTEE CARD ACCOMPANIES ALL GENUINE ROGERS PLATED WARE.



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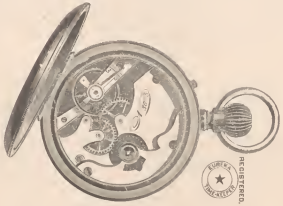

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I desire to Call your attention to my new **Ladies' and Gents' Stem-Winding Movements,** fitting **8** and **18 Size Waltham Cases.** There are four Grades of each of the above, and are all **Guaranteed** to be **Accurate Timekeepers.** Importation orders with **special** names taken for certain quantities.

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11
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