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THE JEWELERS CIRCULAR.

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THE

Jewelers' Circular & Horological Review,

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

THE RECOGNIZED ORGAN OF THE TRADE.

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Volume VII.

It is with great satisfaction that we present the JEWELERS' CIRCULAR to the trade in its new shape. Doubtless there will be found in this first number sufficient imperfections to temper our joy with a reasonable quantity of anguish, but no newspaper has ever been started without such traces of original sin. Our readers will pardon them, as they regard human nature.

The manifest improvement of the first of the new over the last of the old series is not the growth of a day nor of a month. It is the result of many years' work, in winning with each change for the better that increased support from the trade which should make the next step forward possible. The trade have themselves to thank for that improvement both in taste and practical usefulness, which we trust they find in their representative, especially in the metamorphosis it has just undergone. Their hearty support and practical appreciation have authorized us to do what we have done.

But we would not have it supposed that in passing from the chrysalis into the butterfly stage, we expect to give up hard work or surrender the practical character of the paper. Representing a trade which is an art, the JEWELERS' CIRCULAR is intended to be both an art journal and a practical trade newspaper. In pursuance of the first aim, we have endeavored to make it thoroughly tasteful, and we hope to show the handsomest paper of its kind in existence. The new cover, with its emblematic designs and its vignette of "Fancy inspiring Art," was designed for us by Mr. Chas. Osborne, the designer of the Whiting M'f'g Co., whose drawing was characterized by high authorities as one of the most beautiful designs for such a purpose ever devised. We have to tender our hearty thanks, and we think we may say the thanks of our subscribers, to the Whiting Company for their courtesy in the matter, and we are especially obliged to Mr. C. Bulkley and Mr. Cowan, of that house, for the interest they have manifested in promoting the art features of the CIRCULAR. The cover design has been engraved on the wood under the superintendence of Mr. J. S. Patterson, one of the most skillful engravers in the city.

We present with this number a plate of novelties, printed in colors, such as we hope to give as often as quarterly. These designs have been prepared expressly for the CIRCULAR, in consonance with the latest styles, by A. Bonniol, and the plate has been made by G. W. Averell & Co. Several of the designs have already been spoken for by manufacturers, so that they will represent goods actually in the market. These plates, we trust, will be of great value, especially to smaller dealers who cannot afford to keep large stocks on hand. They will be virtually a considerable addition to their stocks, because they can be shown as examples to customers desiring to order, and they will also be useful as standards of the latest city styles. In addition to these plates in color printing, we hope to make illustrations in the text a feature of the new CIRCULAR. We intend to present in each number a careful and practical descriptive article on novelties in jewelry designs, which will frequently be illustrated by the designs themselves. It is our especial desire so to extend the jewelry department of the paper as to make it as indispensable to the jewelry salesman as it has been to the practical watchmaker.

The new shape of the paper will commend itself not only for the tastefulness and handiness which it gains, but for its adaptability for binding and permanent preservation. Such essays as that of "Excelsior" on the balance-spring, which, as we announce elsewhere, we hope to follow with a series of papers on the lathe, and the practical while amusing discussions of the Horological Club, which will be continued, become as much the tools of the practical workman as his buff or file, and he should have them always at hand for reference. His working library is part of his workshop, so that, in obtaining the CIRCULAR in shape for a convenient volume, he has a new advantage. This is furthered by the device of printing the advertisements in such wise as, while giving prominence to all by sandwiching them between reading-matter pages, permits most of them to be separated from the text in binding. The new shape necessitates a considerable increase of cost in producing the paper, yet we have determined to keep the price at the low rate of $1.25 per year, trusting to the increased patronage it hopes to earn, to make the difference good. We believe it is now the cheapest trade and art journal published, and it is within the reach of the poorest member of the trade. This, we trust, will lead all to become regular subscribers instead of regular borrowers.

We wish, in concluding, to recall attention to two features of the CIRCULAR in which we take much pride. We mean that in its editorial conduct it shall have a powerful commercial influence in favor of honorable and sound dealing and a useful educative influence toward true principles of art. Both as a trade and as an art, we mean that, so far as we can help to mould it, the jewelry business shall take the highest rank. We shall have neither fear nor favor in outspoken denunciation of fraud, and we feel that we shall not lack the support of the best men of the trade. That it is to the interest of every honest dealer and good workman that dishonest dealers and poor workmen shall not be ranked with them, it is scarcely necessary to point out.

And so, we present to the trade the new JEWELERS' CIRCULAR, asking hearty and practical support in such measure as we may deserve it, and frank criticism when we fall short. We trust it may be long before we fail to please the trade and to serve it.

Respectable Fences.

There is an old law maxim that "the receiver is as bad as the thief." Stolen goods are still the property of the owner, and the thief can give no title. No matter how many removes off the new purchaser or holder may be from the thief, he is just as bad, so long as he knows the goods are stolen. The difficulty is that these plain principles of right and wrong are too often obscured by certain fictions of trade, such as may sometimes be observed in the case of bankrupts. There

is no real difference between breaking into a store at night and making off with goods, and coming into it in the daytime openly and obtaining goods that the bankruptcy-speculator never means to pay for. There is a considerable difference in the eyes of the law, to be sure—for evident reasons. But in the unwritten law, which is the foundation of business, the principle of trust, there should be no distinction. The sharper is as criminal as the burglar, and not so brave.

But now we come to another step of obfuscation. What is the position of the man who helps the bankruptcy thief to conceal his goods? Well, he again is as bad as the thief, because he is out and out a receiver of stolen property. He is a respectable fence. We say respectable, for that is the way he looks at it. It is time for business men to look at it in another way. The disappearance of the assets of a bankrupt has been an unfortunately noticeable feature of recent failures. Presto, everything is nowhere! The key to it is, that by some hocus poeus the bankrupt has hid away his goods here and there "on trial," or transferred them in bulk, under due form of law, to some house that is willing to become his "fence." Now, in nine cases out of ten, these receivers must have, at any rate, a considerable suspicion of the character of the goods received. At least they know that ignorance is bliss. It remains for the trade to arouse them to wisdom by visiting such respectable fences with the obloquy they deserve. A man who will conspire to cheat another's creditors will not be backward with his own. He deserves no credit; let him have none. Turn the cold shoulder to him as a villain, and let him feel the condemnation of public opinion though he escapes the jail.

In a recent flagrant case of fraudulent bankruptcy, it was more than suspected that the goods had disappeared into the store of a "respectable" house in the same city, who could not be reached. The creditors attributed the fraud to a certain partner in the house. They have simply given this house to understand that there is no more credit for it, and if questions are asked, it is hinted that a certain partner might be better out than in. He will probably get out. This is the way to treat respectable fences.

Hocus-Pocus.

The thimble-rigger is not supposed to seek his victims from among the highly educated or the sagacious class; when it comes to commercial hocus-poeus, however, the little joker aims high. It is astonishing how many sound business men have been victimized by his pretty exhibitions of "now you see it, and now you don't."

It is not only the jewelry trade that has rich experience in this line. The book people are just now bewailing themselves over the goods they threw away upon a gift-enterprise shop in Boston, from which most of the jewelers, we are glad to say, were sharp enough to get cash. And we learn from other trade journals that they have heard of little games very similar to those we have once or twice or more called attention to. *The Carpet Trade Journal*, for instance, gives a very clear expose of the modern magician which may serve as a general picture:—

Our modern magician certainly does not lack for tricks fully equaling any performed on the stage, either for successful performance, audacity or dash.

The professional has a pet trick in which he gathers from the audience a number of valuable articles. These are placed in a canister just large enough to hold them, and having a tight fitting cover. After a parley with the audience, he places his wand over the canister and waves it to and fro, repeating certain words of an unintelligible character, and finally removes the cover, when the canister is found entirely empty. This trick our modern magician has learned to perfection, but he performs it in a more thoroughly amazing way. He disdains the plebeian manner of the professional and gives it on a grander scale.

He finds the entire wholesale trade as an audience, and selecting from their number secures merchandise of as great a value as he thinks they would care to allow in his dexterous hands. The goods are gathered together from far and near, and placed in a store. It takes longer to perform this trick by our magician than with the professional. About six months time is supposed to elapse between the acts. When the trick is to be concluded our magician calls his audience together, and shows to their wondering eyes that what was, is not, what was placed in the store is there no longer, that it was entirely a deception and the articles have so effectually disappeared that even our magician cannot recover them, and to make the audience not consider him a perfect fraud and cheat he proposes to pay a portion of the value of the goods or articles that have vanished as if with wings.

Our magician of course objects to exposing the trick. "It is for me to know and you to find out," he blandly explains. The audience pleased with his cleverness and satisfied that it would be useless to attempt a discovery of the *modus operandi*, accept the compromise offered, and the feat is completed. Some other aspirant for magical honors immediately opens the same performance, and so common has the trick become of late that merchants often receive several invitations a month, complimentary every time.

We fear there are those in the jewelry business who can "take this in." Several little exhibitions of that kind have been given recently in Chicago and St. Louis. But too much amusement, especially of this sort of dissipation, is apt to be wearing on the trade. A good many are getting tired of the conjuror's box, and are amusing themselves by putting the conjurer in a box himself. This isn't nearly so funny, and it is even said that if it is kept up it will drive all the conjurers out of business. Sad!

Over Trading.

"Money makes money," is a vulgar, but true adage. Argument would be supererogatory in proving the advantage which capital affords to its possessor. But there are two ways of using it—a right and a wrong.

The only legitimate use of capital is to be out of debt. To be out of debt under any circumstances is an inestimable blessing, but more particularly is it so in mercantile business, where pecuniary obligations are, of necessity, much larger than in private or personal affairs.

We do not envy that man who having one thousand dollars in capital, endeavors to trade upon twenty—and yet this is done every day. Assuming his speculations to be fortunate, the means are so ill adapted to the end, that a constant oscillation of feeling and anxiety are invariably created in consequence. Keep within bounds, is the best advice that can be given to any one with a moderate capital. *Over-trading* is the great bane of most young men in business. Naturally anxious "to do business," they forget that buying and selling do not necessarily imply profitable transactions; and they are too often disappointed to find, at the end of the year, or before, that they have gained their trouble for their remuneration. It is much better, in such times as these, to do a little business safely, than a great deal which is tinged with any manner of doubt.

The Duty of Employers.

There used to be a time when the merchant lived over his store, did all his own work, and kept his books into the bargain. He knew all about his business to the minutest detail. That day went by long ago, and we are now at the other extreme. There is a large class of merchants who know nothing whatever of the details of their business, and are scarcely competent even to interpret the books on which their business depends. They trust to others with a blind confidence which comes of ignorance, and in too many cases put a premium on dishonesty by offering every temptation to their clerks and giving them no safeguards with which to resist them. This is neither commercially wise nor morally right.

The most honest man has sufficient human nature in him to be somewhat open to temptation when it comes in the insidious form of a peccadillo—some lapse which deserves correction and kindly rebuke, but scarcely more. But if this is overlooked pretty soon there comes a second opportunity which takes the man one step more down, and with a moral force impaired by overwork, a small salary which puts him in painful contrast with the fast life about him, and no oversight from his employers to keep him in the straight path, the road is soon open for the most flagrant crime. Of ten embezzlements by trusted clerks this probably is the history of nine. It is the fault of the merchant himself. The least oversight on the part of the older would have helped the younger man to resist the temptation that

came to him, and have made an honest merchant instead of a self-recognized or branded criminal. Merchants should understand also that there are certain limits of temptation beyond which it is not right to go. To place fortunes in the charge of confidential clerks who have, commercially speaking, no interest in being honest, is a mistake which no wise merchant will make. It is sure to result disastrously to him and to the employee for whose welfare he is partly responsible. Every man is apt to give way when the temptation becomes out of all proportion to the safeguards aronnd him ; and especially when the employer is found to look with not too sharp an eye on dishonor or dishonesty about him, as in the present days. An insurance company for the honesty of employees would have to charge a pretty large percentage.

We put it to employers that in this matter of employees they ought to exercise common sense and christianity alike in their own interests and in the interests of their clerks. Be thoroughly acquainted with the details of your own business; know when a thing is well done and when it is ill done; see that bad work is blamed and good work is praised; let every man who is doing good work have a fair chance of doing better, and we shall hear less of losses and failnres and misfortunes of all sorts. A merchant's books in particular ought to be scarcely less a part of himself than his own memory.

A Word to Travelers.

Good work "on the road" demands the best sort of men. The work is severe, the wear and tear terrible,the temptations great, and the reward seldom over-high. It takes a sound body to stand the fatigue, a clever tongue to do the business, a clear head to pass judgment on men. The success or non-success of a house often rests with its travelers, and we see new concerns built up into stability by the shrewdness of their "drummers," and old ones ruined by their recklessness every day. Too much stress can therefore scarcely be laid on having good men "on the road," or too hearty credit awarded to the better class of travelers.

It therefore goes without saying that first-class houses should be represented by first-class travelers, men who know the trade and how to reach them, and know also, what is more important, whom not to reach. Cautiousness as well as enterprise is needed on the road, quite as much as in the home management of a house, and no small portion of losses recently sustained by the trade is to be attributed to the employment of youthful and inexperienced travelers, more anxious to sell goods than cautious to protect the interests of their employers. An example of this is found in the case of a house recently bankrupt. They were represented on the road by a young man, who is said to have been so reckless in his credits, so anxious to force sales at any hazard, that he made nearly $70,000 of bad debts during the past three years, representing about 25 per cent. of his total sales.

We may mention, by way of contrast, the case of a comparatively young house in the Lane, who have now a wholesome and paying reputation in the trade, by keeping on the road a veteran traveler, one of the oldest in the trade, and a gentleman who reflects credit on any house he undertakes to represent. He is a fine, steady old fellow —if we may speak so familiarly—who has known the trade from generation to generation, it may almost be said, knew the fathers of present members of firms, and has watched the latter grow up from boys, with a fatherly interest. Consequently, he must be treated with respect. He is not snubbed, he can obtain the ear of the buyer when other "drummers" must pass by on the other side. To be sure he does not sell as many goods as some of his younger competitors—but there his house often has the best of it. He sells only where he is sure, and it is rather a recommendation for a house when he makes sales to it. It is pardonable that his sales are less when he makes scarcely any bad debts. The result of having such a man on the road is, that his house has one of the best reputations in the country, and on its books only the safest names in the trade are to be found. Moreover, there is no house in the city that stands better with its customers.

We do not mean by this to say that the younger men are not to be employed as travelers. The life is hard, and few can stay on the road to become such veterans as the one we speak of. It is to be said, too, that many heads of houses of the present day made their position by good work on the road when they were young men. But the standard has been lowered since that day, and first-class houses employ callow men they would not have thonght of employing fifteen or twenty years ago. We are putting in a word for the employment of the best men, at fair wages, men who nnderstand their business and their customers. A good house cannot afford to economize on its travelers, who are to it what scouts are to the general in command. It is their business to guage thoroughly the responsibility of any house with which they deal, to get at the bottom facts, to keep their employers thoroughly informed as to the foundation of any rumor affecting credits. And for such purposes, experience can be replaced only by marked ability. Aside from the question of gaining an audience where less able men would be refused, the traveler's knowledge of the character and relations of his connections is to be acquired only by a considerable apprenticeship of careful attention, and the winning of wide and familiar acquaintanceship. His knowledge is then part of the capital of his house. We might touch also upon the many instances of robbery in late years, in the case of men trusted with costly samples, to show the money value and commercial importance of character in travelers.

But no article upon commercial travelers is at all fair which does not emphasize the patient hardships of their life. To get "on the road," is the chief ambition of a host of youngsters, but it means the hardest work a-going. The strain on the nervous system is terrible, and life is soon spent, too often with little thanks The traveler must work all day and travel all night, be always in trim, no matter what he may have had to stand, prove himself wise as the owl and cunning as the serpent. There is no rest for him, and too often no thanks. He has everything to lose and little to gain. All this should be recognized by employers, and the best way to recognize this is the practical economy of paying for the best men that can be got. Make it worth while, in short, for good men to take to the road.

Stock Taking.

At this time most business-men are at work on their accouut of stock. This seems to many a mere matter of routine, but it is really one of the critical periods in the business of the year, for upon the estimates then made the solvency or insolvency of the dealer often depends. It is too frequent a habit of those who hold large stocks to deceive themselves utterly, by extravagant figuring, as to their business condition, and thus to betray themselves before the year is out into an embarrassment likely to be more serious because they have felt so little apprehension. The one safe rule in taking account of stock is to mark it down on the lowest scale compatible with the cost of re, placing it, should it be destroyed by fire, keeping in mind the actual amount it would realize should there be need of putting it suddenly upon the market. Both these elements have to be regarded, or the dealer places himself at a serious disadvantage.

In estimating old styles of goods it does not do to place them much above what they are worth for the melting pot. Styles in jewelry seldom return, for the improvements from year to year are such that in every style based on old models, there is still some important and characteristic feature that make the goods different from the old. But the simple advice we have to give is that dealers, whatever the condition of their stock, should look the facts straight in the face. Whatever depreciation it has suffered, it is best to know just what that depreciation is. In these hard times men cannot afford to have their own figures lie to them and to base their business calculations on false foundations.

Pawnbrokers.

A startling statement was made in the Brooklyn *Eagle*, supported by the authorities of the police department and established by the most convincing evidence. It is that there are pawnbrokers who habitually receive articles from minors, under circumstances which leave no doubt they are stolen articles, and in a way directly to encourage the habit of stealing in the thieves they deal with. We do not know whether existing law will cure this evil, or not. If it can, it should be made to do so. If not, the law that will do it should be supplied.

Editorial Jottings.

The competition in certain lines of the silver-plated ware business became so thoroughly suicidal that the better class of dealers found themselves obliged to devise some remedy. The prices made were ruinously low, and were in no sense the effect of legitimate commercial causes. They recently, therefore, held consultations together, and in view of the unfortunate result of the past two years of business have generally adopted a scale of discounts and terms which will allow them to make a reasonable profit on staple goods. The discounts apply to spoons, forks, and other flat ware.

The leading members of the trade have determined to make an example of the parties to a recent bankrupt case, and propose to spend all of the money they recover, and more if necessary, in punishing the responsible or irresponsible parties. Accordingly the creditors of Moses Strasburger & Co. have instituted criminal proceedings against that short-lived firm, and the prospects are that the victims will make things sufficiently lively for the parties in question before they are done with them. The head of the firm is under $23,000 bail, and Rosenblatt, his worthy and interesting partner, lately jumped his bail in St. Louis and took refuge in California, whence he has been brought to New York on the governor's requisition.

The remarkable papers on balance springs by "Excelsior" which we have been giving to our readers have called forth letters from all parts of the trade teeming with praise, and his work is generally acknowledged to be the finest and most comprehensive essay ever published on the subject. We have been requested to give the name of the writer, but he wisely prefers to remain incog., so that he may be perfectly free in his judgments, and at liberty to express his opinions of men, methods, tools, etc., without fear of being talked to death either by jealous advocates of partienlar contrivances, or by those whose theories have not been treated as they think they deserve. "Excelsior," we may say, is a practical workman of long experience in the trade but this the trade has already discovered. We are glad to be able to state that this writer expects soon to take up the subject of the lathe, and will treat fully on all the details of this wide and important topic, including turning, drilling, polishing, staking, fitting new work, jeweling, and everything else connected with lathe work and finishing. We are sure this announcement will be received with gratification by our readers.

The New York reports of the commercial agencies show a considerable increase in the number of failures in 1875 over 1874. The total number of failures in 1875 was 7,740 with a total indebtedness of $201,060,352, as against $5,830 in 1874 with liabilities at $155,239,000. The figures show a continuous increase in the number of failures each year since 1870, although the average liabilities were less. The showing is not consoling to those who are trying their best to do an honest and living business, for every failure, of course, tends to throw into the market a quantity of goods which bring at bankruptcy sales prices that are in suicidal competition with those of the regular dealers. We have only to say, as we have always said, that it is the duty of responsible parties in the trade to see that bankruptcy is not made too easy a road, and failure a profitable matter. We shall see the record of failures increasing until it is thoroughly understood that failing does not pay.

We have before us a "valuable collection compendium," compiled, by E. A. Smith, of 516 Pine st. St. Louis, 346 Broadway, N. Y. It is intended for the use of business men as well as lawyers, containing: digest of the laws of every State pertaining to collections, together with the court calendars, and instructions for proving and forwarding claims for collection; a digest of the bankrupt, patent, trade-mark and copyright laws, together with the banking laws of the United States, a reliable list of banks and bankers, etc., etc. It includes also the names of lawyers in all parts of the States, with whom arrangements have been made by which claims will be collected at all points in this country and Canada, at stipulated rates of percentages for all subscribers to the compendium. The present issue is for the year ending September 1, 1876, and merchants will find it a most convenient book of reference.

The Latest Designs in Jewelry.

Even more than the usual dullness, to be looked for after the holidays, is noticeable this year in the jewelry business. The stores with a few exceptions seem deserted, and sales are few and far between; there is a great deal of activity in the trade nevertheless—new goods are coming ont, and all are looking forward hopefully to the great event of this our wonderful centennial year, that is to bring us so much good fortune. It is curious to note how the centennial fever colors everything, whatever is old in device, of a hundred years ago, in form or decoration is the fashion of the hour. This is especially marked in silverware, which is returning to all the old fashioned models.

We will give place first however to the ladies and mention the novelties in which they are personally interested. The new style of setting in platina for diamonds, *solitaire*, earrings specially, is very beautiful and very popular; it gives the gem the appearance of being without a setting, and of resting in the ear without any tangible means of support. It produces an indescribably brilliant and airy effect, and brings out the beauty of the diamond in the finest manner. Where surrounded by a swinging circle of black onyx, the effect is more striking still, though not perhaps in as good taste. The very narrowest kind of a gold band, fastening tight to the wrist, when set with diamonds, pearls, or other stones, is the favorite bracelet, and when ornamented with diamonds, the setting is in platina. They are set on the upper side with a row of nine or eleven diamonds or pearls, graduated each side to a large stone in the centre. This makes an expensive but very showy ornament. The narrow bands or "bangles" in silver which slip over the hand, still hold the affections of very young ladies, by whom they are mostly affected, though they pass enrrent under the alluring name of "*porte-bonheur*" bringing "good luck" to the wearers, we think they are oftener used to mark the number of the young flirt's conquests. She "slings" them on her wrist as the Indian chief hangs his scalps around his waist, each "angle" standing as a trophy of some poor unfortunate's discomfiture, rather than as an emblem (to him at least) of "good luck." They are worn on a slide, or more generally loosely in odd numbers of five, seven, or when the wearer belongs to the "Free Lances" and is a "slasher" the number often reaches fifteen, with unlimited expectations. When worn, as they are also made, with a number of little silver bells attached to them, the music the fair enchantress disperses at each movement can be imagined, very like "sweet bells jangled out of tune and harsh."

The "*porte-bonheur*" ring is made on the same plan, being several very narrow rings fastened together by three slides, two set in pearls and the other in turquoise; the slides are moveable and can be arranged so as to produce various effects. Many new fashions are ont in rings, all leaning towards mediæval designs. Quaint little painted figures, and tender sentiments in old French adorn them. "Motto" rings are a specialty and are very popular, their sentimental inscriptions in black enamel and old English text of "*Mizpah*," "*Dieu vous Garde*," "Remember me" etc., appealing strongly to the romantic tendencies of "sweet sixteen." The "serpent ring" is also a novelty, imitating a serpent coiled, the head upraised and set with a diamond or some other precious stone. A pretty trifle to fasten the lace so much worn by ladies around the neck, is a gold arrow, the head being in polished red gold and the plume in green gold; they can be had also in diamonds, of course becoming quite expensive "trifles." Something quite novel and destined apparently to hold the market, are the ornaments made from the conch shell, they consist of earrings, pin and hair ornaments. We can all remember the delicate rose lipped conch shells with their many pnes brought from the West Indies, which used to adorn the chimney corners of so many old fashioned houses. Nothing could be happier than the idea of thus utilizing them. They make the most delicate and charming ornaments, specially suitable in their pale pink coloring, as perfect as a rose leaf, for the lily complexion and golden hair of the blonde beauty. They are carved in Naples, in heads, flowers, figures, etc., indeed in just as various designs as are employed in coral. They are also mounted like coral, with no visible setting, and have the same durability.

Considering their beauty and desirability in many ways, and their moderate price, there is no reason why they should not become a staple article. A new "dog collar" is out, very rich and simple and combining the novelty of being a necklace and a pair of bracelets. It can be had in Etruscan gold or in silver, being adorned in both with delicate tracery. The pattern imitates a ruffle and fits round to the neck or the collar can be slid apart and worn as two bracelets.

In silverware, so-called "Centennial" silver, patterned after the fashion of Queen Anne's time, is all the rage. If we call to mind the heirlooms our great grandmothers cherished, thin handle spoons, engraved with the most delicate tracery, and having broad, egg-shaped bowls, we will have the exact counterparts of the style now in vogue. This character runs through all kinds of table articles in silver; tea sets are to be seen decorated in heavy massive, rich old English chasing; water pitchers very similar in form to the old stone jugs, though somewhat idealized, and tankards and ale flagons, just like such, no doubt, as flanked many a joint of the "roast beef of Old England" in the days "when George the Third was king."

Though the old style shape is continually aimed at, all the resources of modern art have been called into play to embellish the exteriors of these articles. In some the design and execution is really unique. The favorite Repousse chasing is shown in Italian and Japanese figures and marine designs and in intricate lines, ornamented with gold of various colors. Where the polished surface is tinted with oxide of gold, the effect is really exquisite—though the brilliancy is somewhat subdued, the beauty is enhanced.

A new and showy offering for weddings is the ice cream fork. It seems almost as ridiculous to attempt to eat soup with a fork as ice-cream, and yet the fork looks practical, and makes a most showy table ornament. The handles of silver are decorated with what appears the most perfect kind of hand engraving; it is, however, produced by a new process of moulding, which is inexpensive and places the article at as reasonable a price as plain silver. The prongs of the fork are gilded. The portion called the prongs is really a spoon of almost a circular shape with one not very deep incision in the centre of it. A set of these with a large "server" comes in a box very handsomely arranged, the box being covered with some characteristic Turkish stuff to match the Turkish design of the silver. It makes a very striking and elegant present for weddings, etc. In the matter of fancy goods such as clocks, mantel ornaments, card-receivers, ash-holders and so on, polished brass has for the moment superseded the various kinds of bronzes. A novelty in this materiel is the sconce or candelabra, an exact reproduction of those used in the sixteenth century. They are highly polished, and are in various sizes. They hang flat to the wall, and when large have a looking glass in them, making a very brilliant picture with their polished brass frames, and a heavy beveled edge on the glass, and the lighted candles in the holders which project directly in front of the glass. Others are ornamented with enameled tiles, very fine specimens of modern English and French ceramic art. As these things are not expensive, almost every one can indulge himself in the passion of the hour for mediæval interiors. Even the old fashioned brass andirons are reproduced, and what can be more beautiful and cheerful, than these old friends before a snaping wood fire, in one of the brilliant open tiled chimney places they are putting in new houses?

The Eyes and Spectacles.

An old writer, living before the days of illuminating gas and kerosene, remarks that the "first sign of the need of spectacles is a tendency to bless the man who invented snuffers." In this age we should say that the first sign is to find one scolding about the publisher of his daily newspaper, who is charged with filling his columns with type growing every day more diminutive and indistinct. When a man or woman reaches the age of fory-five or fifty, it is generally found that some aid to the natural vision is required. The discovery of this want is very liable to be made soon enough, and the eyes suffer greatly in consequence. There is also a foolish pride which prevents some people from adopting spectacles after the discovery is made. There is no truth relating to vision more important, and which, therefore, should be more clearly understood, than this; that in every case of defective eyesight, whether it proceeds from advancing age, or from congential causes or from accident, a artificial aid should be resorted to without delay. The tendeucy is in all, or nearly all, cases towards irreparable injury, when this aid is withheld. It is true, bad or ill-adapted spectacles may and do, cause injury, and so do improper medicines, or injudicious food or regimeu. If proper care is used in selecting glasses, and the right ones obtained, they strengthen vision, and the vigor of all the functions of the organs concerned in the phenomenon of sight is increased. A child discovered to be "near sighted," should be promptly furnished with appropriate glasses, and they should be selected, if possible, under the advice of a competent medical man or optician. In the case of persons who have passed middle life, as soon as it is noticed that the best artificial light is sought, or that letters grow apparently smaller or less distinct, or that the near point at which one can see distinctly is more than eight inches from the eye, the time for spectacles has arrived. In adopting them under these circumstances, we place an artificial lens outside of the eye to supplement the natural change of that within the eye, and by doing so, we add to power and normal action of the whole optical apparatus. The use of spectacles enables the eyes to work comfortably without fatigue; and they should always be strong enough to effect this object. It is difficult to give any rules for selectiug glasses, as there are many exceptions to be considered. The natural changes in vision come on gradually, and glasses need to be changed to meet this modification as age advances. At first the change is slight, and may not several years after it commences be so marked as to become positively annoying. In the early periods of decay of sight, glasses having a focal length of 60 inches will usually suffice; later in life they, must be changed for those of forty, or even ten inches.

Glasses of a focal length of 60 inches will require one to hold the object looked at a distance of 14 inches. If, at 14 inches, the letters of a book are seen most distinctly, the focal length of the glass is usually well adapted to those whose vision is slightly impaired. The distance should be quite accurately measured, as glasses of ten inch focal length require a modification of the reading distance, of only about three inches less. The first spectacles should at first only be used for reading in the evening, and when no longer sufficient they may be superceded for evening work by others, and the first pair reserved for reading by daylight, or for writing, which requires less critical vision, especially if ink be used that flows black from the pen.

Short-sightedness is a malformation of a somewhat serious nature, as short-sighted eyes are diseased ones, and they require special treatment. Never allow a child or a friend thus afflicted to fall into the hands of "travelling quacks," or those who make loud claims to optical knowledge. In all large cities there are reputable medical gentlemen who make a specialty of the treatment of eye affections, and they are the proper persons to consult. It cannot be too universally known that short sight tends to increase; and that if it increases at all rapidly, it tends also to destructive changes, and therefore it is an affection which requires prompt attention.

Perfection of eyesight is essential to our welfare and happiness, and any one who neglects these precautions, upon the observance of which its preservation depends, will find cause for deep repentance in later life. Young men and young women who suffer themselves to fall into the habit of reading by fire-light or at a window by the waning light of evening, or at a considerable distance from lamps and gas-burners, are guilty of acts for which they must suffer. Parents should promptly interfere to prevent the formation of such dangerous habits.

In the use of glasses, the tendency is toward those which are held in place by a spring pressing upon the nose. This form is convenient, and will do very well for purposes other than for reading or writing, when prolonged use is required. The nip upon the nose is often painful, and creates uneasiness; and besides the focus is liable to become disarranged. For these reasons and others, the glasses held in place by bows passing behind the ears are the best and safest for reading and study. The lenses should be of the best construction, and pure

crown-glass affords a material better than "Brazilian," or other "pebbles." Avoid purchasing of any optician who claims that his lenses are constructed of pebbles, or crystal stones. If his claims were not false, he should be distrusted. The frames of spectacles should be of blue steel, light, strong and perfectly fitted to the wearer. They should be kept perfectly clean, and this should be accomplished by the use of soft wash leather, and not by linen handkerchiefs, which are apt to scratch the lenses by the small particles of sclicious or other hard substances which they hold.

Graham and Tompion.

Graham is sometimes called "an ingenious mechanic," of whose real worth Fleet Street was hardly aware when the Cumbrian Quaker died there in 1751. Farquhar has immortalized Tompion, the watchmaker, in "The Inconstant," but Graham, who was under Tompion, and was his successor, was superior to him in scientific knowledge, though Tompion invented the cylinder escapement. If Fleet Street has forgotten him, Greenwich has not; for there the spirit of the Cumbrian works beneficially through his instruments. Graham's scientific merit, however, was soon recognized by the Royal Society :—George Graham was elected into the Royal Society on March 9, 1720, and admitted March 16, 1720. His merit early attracted the attention of that learned body, and he was elected to the Council at every alternate anniversary from the year 1722 to the year 1746. He proved himself worthy of the honors conferred upon him by contributing twenty-one papers to the "Philosophical Transactions." To open the doors of the highest guild of science in Britain to a Fleet Street clockmaker may at first sight appear no less strange than incongruous, yet further consideration will show that the Royal Society acted in an appropriate and praiseworthy manner by admitting to their council a master-workman to whom work was not simply a profession but a daily vocation. If the art practiced by Graham was only in its initiative stage, there were minds in the society fully alive to the significance of every tentative effort that would facilitate the correct measurement of time, or aid in the solution of the deep problems of astronomy. And whoever could fashion the most delicate instruments by which satisfactorily to promote these great objects affecting science, and not less the common interests of mankind, justly claimed the recognition of a true artist, on a par with the astronomer himself. Scientific observations can only be made through certain media, the arrangement of which rest with the mechanician; so that art and science are mutually dependent on each other. In offering the right hand of fellowship to Graham, the society did not look upon him as a clockmaker simply; but as a man whose skill and aptitude brought to light the best means of rendering the measurement of time and the scrutiny of the heavens worthy of confidence. The following anecdote is an illustration of the reputation achieved by Graham, as well as of his honesty :—A gentleman who had ordered a watch told Graham, when the watch was delivered to him, that he was going off to India for about seven years, and that he wanted to know how far he might rely upon the regularity of the movement. "Sir," replied Graham, "it is a watch which I have made and regulated myself; take it with you wherever you please. If after seven years you come back to see me, and can tell me there has been a difference of five minutes, I will return your money." After a lapse of more than seven years the gentleman returned, and with a serious countenance, said to Graham, "Sir, I bring you back your watch." "I remember our conditions," said Graham; "let me see the watch. Well, what do you complain of?" "Why, I have had it seven years, and there is a difference of more than five minutes." "Indeed! in that case, sir, I return your money." "What do you mean?" "I mean to fulfil my engagement." "I would not part with my watch for ten times the sum I paid for it." "And," replied Graham, "I would not break my word for any consideration. A promise is sacred. I promised, on certain conditions, to take back the watch. In consequence of that promise you have returned it to me, and no power on earth shall force me to violate my engagement." Graham was true to his word, and to his last day he used the watch as his regulator. There was no sham-and-shoddy work sent out of the shops of Tompion and Graham. Prior, in his "Essay on Learning," says that so jealous was Tompion of his reputation as a clockmaker, that he would not allow his name to appear on any of his work which was not the best of its kind. It is related that on the occasion of a person applying to him upon the subject of a watch upon which his name had fraudulently appeared, he at once broke it with a hammer, and presented another to the person, saying, "Sir, here is a watch of my making."—*Dr. Lonedale's "Worthies of Cumberland."*

Action of Sunlight Upon Precious Stones.

Dr. Schnauss has directed attention to the fact that certain minerals are quite sensible to the action of light. To many of our readers this may seem quite surprising, although some cases of this kind have been known to mineralogists. Strangely enough this property extends to the very hard minerals, and reaches its maximum in the very hardest of all minerals, the diamond. According to Dr. F. ight, under certain circumstances the colored diamond is as sensitive to light as chloride of silver. The ancients knew that certain colored precious stones gradually grew paler in the sunlight, and that this was very distinctly the case with the beautiful grass-green cryspohrase. They said that when worn for a long time set in a ring or pin, it finally lost a greater part of its beautiful color; and that this could be recovered by wrapping it in a cloth soaked in wine and keeping it in a cellar. Even the much harder, transparent, dark green emerald is also influenced by light in time, as the author found to his sorrow in the case of an emerald ring, which he had worn seven years.

The diamond, however, exhibits the most interesting phenomena under this influence. If colored diamonds are highly heated, the color disappears more or less completely, and in most cases permanently. Sometimes the color is merely changed by ignition, and the original color may be restored by the influence of the sun's light. A diamond merchant named Martin exposed a diamond to a very high temperature, in order to destroy its brownish color, but the stone became of a permanent rose red. Coster treated another diamond in the same way, and that, too, turned rose red; but the most remarkable part was that this color was only permanent in the dark, and disappeared in four or five minutes if exposed to the sun's light, the stone acquiring a weak brown color. This change also took place in a room where the light was by no means bright. Another diamond, of a dirty yellow color, was ignited in a current of hydrogen in a porcelain tube and allowed to cool thore. The color disappeared but not the lustre. If this specimen were exposed to diffused light for six minutes, its original yellow color returned. The experiment was repeated in this way, the stone being heated in chlorine gas, at as strong a heat as could be obtained by saturating the gas used by benzol vapor; it was farther heated at a lower temperature in a mercury bath, the diamond being wrapped in platinum foil. Each time the color disappeared and remained absent in the dark; but as soon as the stone was exposed for a few minutes to diffused daylight, it regained its yellow color.

These phenomena are thought by Dr. Schnauss to be related to that of phosphorsence. In addition to the cases mentioned by him, we would recall the fact, usually stated in text books on mineralogy, that a variety of topaz from Brazil, when heated, assumes a pink or red hue resembling that of the Balas ruby.

HOTEL CLERKS AS DIAMOND BROKERS.—A Chicago correspondent reveals the hotel clerks of the Northern cities in a new character—that of a diamond broker. Of the business done by them in that city he says :

"At our four great hotels—the Palmer, Grand Pacific, Tremont, and Sherman—the value of diamonds sold by clerks and their rotunda brokers exceed $100,000 annually. Aside from these palaces we have fully a dozen other hotels, each as fine as the average American hotel, and at each of these alone, the Matteson, chief clerk sold $30,000 of diamonds in 1874 to my personal knowledge.

"The Chicago hotel clerk diamond trade must amount to $200,000 annually. Most of the clerks here who have held exceptionably good positions for a term of years are rich, possessing their own establishments and fast horses. I have one in mind—John Hickey—now retired, who was night clerk for Gage Bros. & Rice for nearly twenty years in their different houses, who is to-day worth $150,000."

PHOSPHOR BRONZE.—M. Delatot, in an article upon "phosphor bronze" states that it is not an alloy but a true chemical combination of copper with phosphorus, or a phosphide of copper in definite proportions. The union of the two may be through the cold or the hot process, the cold sufficing for certain applications, being preferable indeed to combinations produced by heat. By the hot process the introduction of simple bodies other than the metals or metalloids is prevented. The copper used in the process must be commercially pure. Of the three kinds of phosphorus the operator may take his choice; the ordinary, the amorphus, and the earthy biphosphates. The amorphous is the most expensive, and is also the best. According to Delatot, the percentage of phosphorus varies from 2 to 4, between which there may be an infinity of degrees, although for industrial purposes five varieties meet all the requirements. These are formed with 2 per cent of phosphoris, 2½ per cent, 3, 3½, and 4 per cent. Above 4 phosphor bronze is useless, but between 3 and 4 per cent the material is claimed to be superior to any other metal or alloy. The price of phosphor bronze, unworked, should not exceed that of copper, plus 10 per cent.

Electro-Plating.

Gilding by the cold process requires to be done more slowly than is necessary when using the hot solutions, and the operator should watch the bath in order that he may take any article out and scratch-brush it should he find the deposit to be uneven or spotted. We find it required of us to watch also the intensity of our electrical current, which, if too great, will cause the deposit to assume a black or very dark red color; while with a properly regulated battery the color of the deposit will be yellow. Should our current be weak, only those parts directly opposite the anode will be coated with gold, showing it to be expedient for us to keep changing the position of the articles to be plated in order that they may present all sides equally to the gold anode and assure a regular deposit.

Sometimes with new baths we find surfaces once gilt lose their gold upon moving them during the gilding operation. This may arise from either of two causes; the electrical current may be too weak or the gilding solution is over saturated with cyanide of potassium and contains too little gold. When gold is deposited cold we sometimes fail to get the color desired and we are obliged to resort to one of the several methods given below to obtain the proper shade. Dip the article into concentrated sulphuric acid, and then apply heat till abundant white fumes are given off, after which throw it into a pickle of weak sulphuric acid. This is done to destroy any organic matter there might have been in the deposit, and then reduce to a metallic state the salts of gold formed. Another method is to cover the article with a paste of powdered borax and water or biphosphate of lime, of about the consistency of cream, and heat till the coating is fused. Next place the article into diluted sulphuric acid which will dissolve the borax or lime and leaves the gold with a bright color.

There is another method given which requires the article to be heated in a solution of nitrate of binoxide of mercury until it becomes white, and afterwards heating it to volatilize the mercury and then scratch-brush it. The objection to this is that we do not like to use mercury about either silver or gold any more than we are obliged to; as it is apt to do more harm than good should it through carelessness get on to the metal before the electro-depositing is begun.

Small articles that have been gilt, but whose color is bad may often be improved by plunging them into the gilding solution after they are scratch-brushed, allowing the current to pass only an instant and then placing the articles immediately into boiling water.

We have spoken of hot-gilding as being more regular, more rapid in depositing, and as possessing a deeper shade than the cold bath; and we wish to speak yet more about it, giving some of the baths and methods used by different operators and pronounced by them to be reliable.

We will give below four formulæ from a French author and used by him and others with perfect success. The following are the methods of constructing the baths.

Put into a porcelain kettle 600 grammes of crystallized phosphate of soda together with 8 litres of rain or distilled water, then place the mixture over a gentle heat and stir till the soda is all dissolved after which remove from the fire and if necessary filter and allow it to cool.

Secondly put into a glass flask 10 grammes of gold, with 15 grammes of pure nitric acid and 25 grammes of pure muriatic acid, heating the whole slowly until nll the gold is dissolved after which increase the heat in order to expel the excess of acid. There should be left in the balloon flask only a thick liquid, blackish red in color. The flask is then to be taken from the sand bath and the contents allowed to cool till a brown-red crystalline residue is formed. Now dissolve in 1 litre of water 100 grammes of bisulphite of soda and from 5 to 10 grammes of pure cyanide of potassium.

Dissolve the neutral chloride of gold in the tenth litre of water and pour it slowly into the cold solution of phosphate of soda, stirring continually with a glass rod. This mixing will give the solution a greenish-yellow color and into this pour at once the solution of bisulphito and of cyanide which will cause the liquor to become colorless, and this finishes the preparation of the bath.

It is considered best to allow the phosphate of soda solution to cool, as there would be danger of a partial reduction of the gold in the form of a metallic red or yellow powder should the soda solution be hot when the gold was introduced. This gives us a solution composed of

Phosphate of soda, crystallized	600	grammes.
Bisulphite of soda	100	"
Cyanide of Potassium, pure	10	"
Pure Gold	10	"
Rain or distilled water	10	litres.

This formula is used for baths in which to gild silver, copper or the alloys rich in copper, but for gilding iron or steel without any previous coating of copper it should be modified as follows:—

Distilled water	10	litres.
Phosphate Soda	500	grammes.
Bisulphite Soda	125	"
Cyanide Potash	5	"
Gold	10	"

When we have to gild tin, lead, antimony, zinc or their alloys it is but to give them a coating of copper first, or gild them in a hot bath nearly worn out and scratch-brush them carefully, after which the gilding may be completed in a new bath with an energetic current.

It is the enstom of some to use ordinary water, and after dissolving all the salts, except the gold, add the chloride of gold to the hot liquor. This method we do not consider to be reliable, though rapid, and it always produces turbid baths upon whose working we cannot depend.

Polishing Pinions With a Roller.

A quick plan for polishing the leaves of pinions is to use a machine constructed as follows: A cylinder of close-grained wood is placed on an arbor and turned true. It is then mounted on a frame similar to the cutter frame of an old fashioned wheel cutting engine. Then make another frame with a slide to it, and arrange it below the cylinder of wood in such a manner that it can have a steady parallel motion, nearly at right angles to the axis of the wooden cylinder, and the pinion is placed in this frame so as to revolve easily. If the cylinder, or we will now call it the polishing roller, is made to revolve, and if it rest on the pinion head when the head is exactly at right angles to the axis of the polishing roller, its weight resting on the pinion head will cause parallel grooves to be cut on the roller; but if the sides be set a little ont of square instead of parallel grooves, a screw will be formed on the roller, compelling the pinion to rotate, and for each revolution of the roller the pinion will move forward one leaf; and if the roller be charged with the necessary polishing material, the leaves of the pinion will be polished by the actiou of the roller. The exact amount of variation from a right angle the pinion should be from the axis of the roller, is equal to half the distance between two leaves of the pinion (centre to centre), in a length equal to the diameter of the roller, but no difficulty will be found in making this adjustment; the slide has only to be twisted a little to the right or to the left till the pinion rotates freely. By allowing the roller to rotate freely in the pinion, after the frame which holds the pinion has been placed in a proper relation to the line of the roller action, the screw-thread will be formed on the roller exactly the same shape of the leaves of the pinion, whereby the pinion during polishing will not only retain its original shape, but also its truth of divisions. When the operation is proceeding, the frame that holds the pinions must be moved backwards and forwards, to prevent hollows forming in the pinions When the roller has been worn out it can be turned up in the new. The larger the roller, the more rapidly it will polish the pinion with less wear to itself, and it will also be less liable to cause the polish of the pinion to be wavy, through carelessness in not moving the slide backwards and forwards. When using this method of polishing, fine emery and oil is first used to remove the cutter or file marks; and, after being thoroughly cleaned, crocus is used to produce the last finish.

Tool-Making.

Very few jewelers have any practical knowledge of tool-making. They can, perhaps, make anything they are asked to make of gold, but steel they know almost nothing about. If they want a punch, no matter how simple, some one else must make it for them, or, if they make it, it is only half made, and will not answer properly the purpose for which it was intended; still, it is well known that if a man be a sufficiently good mechanic, he can generally make a tool more in accordance with his own ideas than any second person to whom he endeavors to communicate those ideas, and the time and trouble spent in explanation is worth considering. This matter seems to be of general importance to the workman, but is especially important to the manufacturer who is unable to keep a tool-maker in his shop and has to depend on outsiders, who often disappoint him by want of punctuality—in fact he is at their mercy, which he need not be if at all ingenious and disposed to make the effort to help himself. Perhaps, his first attempt may be a signal failure, so far as the production of what he desired is concerned, but he has learned a lesson or two, and his next effort will, at least, show improvement. There are fundamental principles to be respected, and some knowledge of them is necessary, but experience is the best teacher, and opinions differ about principles. As a matter of economy the best steel should always be used, and no time wasted on old files or other rubbish which may be laying round. A punch which is to be struck with a hammer, should always be stout enough to bear the necessary blow, and considerably more, without bending longitudinally, and it is well to insure

its remaining straight by hardeniug the entire length, and drawing the upper part more than the lower end, and where the punch is of at all delicate form, great care is required in tempering so as to have it hard enough to retain its form and at the same time bear repeated blows without fracture. This can generally be accomplished in the following manner: The punch being polished to avoid oxydation, place it in an iron pan, open at the top, and cover the finished end with hamplabck. Heat the whole slowly in a charcoal fire to a bright cherry color, then throw the whole into cold water, stirring it for a moment; the punch will be found hard and the covered part unoxydized; now brighten the whole with emery, and draw to a deep purplish blue; the upper end may be drawn to quite a light blue; the second drawing seems to make it less brittle but not softer. Usually, the easiest way to draw small articles accurately, is to heat a piece of iron red and place them on till the color turns, or, with long pieces, greater accuracy may be attained by placing in a pan of sand and heating the whole gradually; and in making a tool to be used forcutting gold, the color should be yellowish brown, which is attained before the blue shade appears. One point we have omitted so far, is the preparation of raw steel for working. The process is simply to cut off the required piece, heat it to a dull red very slowly, and cover in ashes till cool, this will render it easily filed and soften the hard spots which it always contains, and makes filing hard work for the operator and very destructive to the files. Bright finished wire, such as Stub's, does not require preparation. A charcoal fire should always be used in treating steel, and a drilling and turning of a slow motion should always be given the lathe, as rapid motion dulls the tools and prevents the operation. In making tools of the more elaborate descriptions, such as cutting and stamping dies, etc., a knowledge of the elements of geometry is very useful. The operator should know how to erect a perpendicular from any given point, and should be provided with carefully tempered dividers, very stiff in the legs, for taking measures and striking circles; great accuracy being necessary to made good, useful tools, which shall fully answer the desired purpose by always making the pieces perfect and exactly alike.

For polishing out file marks, a piece of soft steel with filed surface, to which emery or powdered Arkansas stone and oil is applied, should be used, followed by diamountine for very fine finish, which on rounded surfaces or in hollows may be used on boxwood or lead.

Crucibles.

The excellence of a crucible depends on the ready expansion and contraction of the ingredients of which it is made. The best crucibles are of two kinds, with and without plumbago. The best without plumbago may be made as follows: Three parts by measure of Stourbridge crucible clay, two parts cement, consisting of old used up firebricks, and one part hard coke. These ingredients must be ground and sifted through a one-eighth inch mesh sieve; the sieve must not be finer, otherwise the pot will crack. This composition must be mixed with sufficient clean cold water, wooden with the bare foot to the consistency of stiff dough, and allowed to stand for three or four days well covered with damp cloths, to admit of its sweating and the particles of clay becoming thoroughly matured. It is then ready for use, and must be blocked by hand on a mandrine. Dr. Ure, in his "Arts and Manufactures," gives drawings and methods of working the machine. Owing to the coarseness of this composition, the pot cannot well be thrown on the potter's wheel; and in no instance can it be made by pressing. The crucible must not be burned in a kiln, but merely highly and thoroughly dried before being placed in the furnace for use. For brass and copper melting it will stand one good hard day's work; but care must be taken to replace the pot again in the furnace after the metal has been poured. If the pot be not allowed to go cold, it will last several days. It will, with the greatest safety, stand one melting of wrought iron. The cost when made on the steel manufacturer's own premises, is about 18. per pot, each pot holding from 100 lbs. to 120 lbs. of metal. Good Hessina crucibles are composed of two parts of the best German crucible clay and five parts pure fine quartz sand. This composition must be sifted through a one-eighth inch mesh sieve; It is then tempered and trodden with the bare foot as before described. When ready for use, it is pressed into different sizes of crucibles, which, when thoroughly dry, are placed in the kiln or stove and burnt hard. Or they may be made as follows: Two parts best Stourbridge crucible clay, three parts cement; sift through a one-eight inch sevie. Temper as before described and block by hand on the machine. When thoroughly dry, it is placed in the kiln and burnt hard. These crucibles are principally used for melting gold and silver, and also for dry analyses. The best and most perfect fire clay for crucible making is nearly always found in the pavement of coal. But the various compositions cannot be described, as they are as numerous as the different kinds of clays. The Birmingham soft, tough pot, or plumbago crucible, consists of the best Stourbridge crucible clay, three parts plumbago, and one part cement, consisting of old used up crucibles ground and sifted through a one-eighth inch mesh sieve. Or take four parts of the best Stourbridge crucible clay, three parts plumbago, two parts hard coke, and one part cement, consisting of old pots ground and sifted as before. Where old pots cannot be had, the above composition must be burnt hard, ground and sifted. The scales or chippings of the insides of gas retorts are far superior to the best common hard coke. But where chippings cannot be had, hard coke is the best substitute. All the ingredients of this composition must be sifted through a one-eighth inch sevie, but not finer, tempered and made as before described. When thoroughly dry, it is placed in the kiln and annealed but not burnt hard. This composition makes a pot which cannot be melted at one heat, nor can it be cracked with the most sudden heating and cooling. It is known to stand, as a rule, fourteen and sixteen meltings of iron, or even wrought iron.

Hardening and Tempering Pinions.

Hardening a single pinion for a watch is a simple operation, for being so short, it is easily heated regularly, and there is not much danger of it springing a great deal when plunged into oil or water. In long pinions the case is very different. Their length render them difficult to heat regularly, and also causes them to twist easily when cooling. The best way of heating long pinions is to place a small iron tube in a good slow-burning fire, and wrap a piece of binding wire round the pinion and place it inside the tube. When it has attained the proper degree of heat, remove it carefully, and plunge it end first into oil or water not colder than 60° Fahrenheit. Short pinions may be heated together in quantities, by placing them together in an iron box filled with powdered charcoal. The charcoal excludes the air from the surface of the pinion, and prevents blistering, if the pinions should be a little overheated. Blistering will also be prevented by covering the leaves of the pinion with ordinary soap. If a pinion is blistered or burned in the hardening, it is spoiled for good work, because, in addition to the quality of the steel being deteriorated, the leaves will be out of shape before the marks are polished, and it is usually cheapest to fling it away at once.

Before tempering a pinion it should be first tried with a file to see if it be regularly hard, and if it is not so it must be hardened over again. The tempering is an important operation. Watchmakers usually blue pinions when tempering them; but although this color indicates the proper temper for a pinion, and although the color may be easily produced on a small pinion by holding it in the flame of an alcohol lamp, yet this plan will not temper large pinions regularly. A number of pinions may be regularly tempered by a single operation by placing them in an iron or copper vessel of suitable size, along with as much tallow or cold oil as will just cover them, and hold the vessel over a free fire, and great care must be taken not to apply the heat too suddenly. It may be well to remind the young beginner that the temperature of the oil may be raised to 600° Fahrenheit, or rather more than that, and consequently any temperature below a red heat may be given to the pinions by the heated oil. Certain degrees of temperature may be estimated by the following circumstances.

When the oil begins to smoke, it indicates the same temperature as a straw color, and if measured by a thermometer it would be about 430° Fahrenheit. When the smoke becomes more abundant and of a darker color, it indicates a temperature equal to a brown, and the oil will measure about 500° Fahrenheit, by the thermometer. If the heat be continued so that the oil will yield a black smoke, and still more abundant, this will denote a purple temper, and the oil will contain about 530°. The next stage may be known by the oil taking fire if a piece of lighted paper be presented to it, but not yet so hot as to burn when the lighted paper is withdrawn. The temperature of the oil at this stage will be about 580°. The next degree of heat may be known by the oil taking fire and continuing to burn; and this is the temper best suited for pinions, and if the heat has been applied slowly, they will be of equal hardness throughout. A single pinion may be smeared over with oil or tallow, and held in the flame of a lamp in such a manner that the oil or tallow will heat slowly and regularly till once it catches fire. This produces a good and regular temper, and the pivots or other part of the pinion may be easily turned with a good graver. Although the greatest amount of care be exercised in hardening a pinion, it will often bend in the operation, but after it has tempered it can easily be straightened again by placing the arbor on a piece of soft iron, and striking the *bottom* part regularly with the rounded point of a hammer.

Plating with Nickel may be effected by placing the object to be plated, either of iron, steel, copper, bronze, zinc or lead in a boiling neutral solution of zinc chloride containing a salt of nickel and granulated zinc. If the zinc solution is acid, the coating of nickel is dull. A plating of cobalt may be made in the same manner.

Workshop Cossip.

SILVER-PLATERS' STRIPPING LIQUID.—Sulphuric acid, 8 parts; nitre, 1 part. Used to recover silver from old plated ware.

TO RE-BLACK CLOCK HANDS.—Use asphaltum varnish. One coat will make old rusty hands look as good as new, and it dries in a few minutes.

LIQUID FOIL FOR SILVERING GLASS GLOBES, ETC.—Lead, 1 part; tin, 1 part; bismuth, 1 part; melt, and, just before it sets, add mercury, 10 parts. Pour this into the globe and turn it rapidly round.

SILVERING SHELLS.—Silver leaf and gum water, a sufficient quantity; grind to a proper thickness, and cover the inside of the shells. For a *Gold Color*, grind up gold leaf with gum water, and apply to the inside of the shells.

TO CLEANSE BRUSHES.—The best method of cleansing watchmakers' and jewelers' brushes is to wash them out in a strong soda water. When the backs are wood, you must favor that part as much as possible; for being glued, the water may injure them.

TO WASH SILVERWARE.—Never use a particle of soap on your silverware, as it dulls the lustre, giving the article more the appearance of pewter than silver. When it wants cleaning, rub it with a piece of soft leather and prepared chalk, the latter made into a kind of paste with pure water, for the reason that water not pure might contain gritty particles.

TO CUT GLASS ROUND OR OVAL WITHOUT A DIAMOND.—Scratch the glass around the shape you desire with the corner of a file or gruver; then, having bent a piece of wire in the same shape, heat it red hot and lay it upon the scratch, sink the glass into cold water just deep enough for the water to come almost on a level with its upper surface. It will rarely ever fail to break perfectly true.

TO GILD STEEL.—Pour some of the etherial solution of gold into a wineglass, and dip into it the blade of a new penknife, razor, lancet, etc.; withdraw the instrument and allow the ether to evaporate. The blade will be found covered with a beautiful coat of gold. The blade may be moistened with a clean rag, or a small piece of very dry sponge dipped in the ether, and the same effect will be produced.

TO SILVER CLOCK FACES, ETC.—Old silver lace, ½ oz.; nitric acid, 1 oz. Boil them over a gentle fire for about five minutes in an earthen pot. After the silver is dissolved take the mixture off, and mix it in a pint of clean water, then pour it into another vessel free from sediment; then add a tablespoonful of common salt, and the silver will be precipitated in the form of a white powder of curd; pour off the acid and mix the curd with 2 ozs. of tartar, and 1 oz. whiting, all together, and it is ready for use. *To Use.*—Clean your brass or copper plate with rotten-stone and a piece of old hat; rub it with salt and water with your hand. Then take a little of the composition on your finger, and rub it over your plate, and it will firmly adhere and completely silver it. Wash well with water. When dry rub it with a clean rag, and varnish with this varnish for clock faces. Spirits of wine, 1 pt.; divide into three parts, mix one part with gum mastic in a bottle by itself; 1 part spirits and ½ oz. sandarac in another bottle; and 1 part spirits and 1 oz. of Venice turpentine in another bottle; mix and temper to your mind. If too thin, some mastic; if too soft some sandarac or benjamin. When you use it, warm the silver plate before the fire, and, with a flat camels'-hair pencil, stroke it over till no white streaks appear, and this will preserve the silvering for many years.

REFINING GOLD AND SILVER.—The art of assaying gold and silver is founded upon the feeble affinity which these have for oxygen in comparison with copper, tin and other cheap metals, and on the tendency which the latter metals have to oxydize rapidly in contact with lead at a high temperature, and sink with it into any porous, earthy vessel in a thin, glassy, vitrified mass. The precious metal having previously been accurately weighed and prepared, the first process is Cupellation. The muffle, with cupel properly arranged on the "muffle plate," is placed in the furnace, and the charcoal added, and lighted at the top by means of a few ignited pieces thrown on last. After the cupels have been exposed to a strong white heat for about half an hour, and have become white hot, the lead is put into them by means of tongs. As soon as this becomes bright red and "circulating," as it is called, the specimen for assay, wrapped in a small piece of paper or lead foil is added, the fire is now kept up strongly until the metal enters the lead and "circulates" well, when the heat, slightly diminished, is so regulated that the assay appears convex and more glowing than the cupel itself, whilst the "undulations" circulate in all directions, and the middle of the metal appears smooth, with a margin of litharge, which is freely absorbed by the cupel. When the metal becomes bright and shining, or, in technical language, begins to "lighten," and prismatic hues suddenly flash across the globules, and undulate and cross each other, followed by the metal becoming very brilliant and clear, and at length bright and solid (called the brightening), the separation is ended and the process complete. The cupels are then drawn to the mouth of the "muffle," and allowed to cool slowly. When quite cold, the resulting "button," if of silver, is removed by the pliers or tongs from the cupels, and, after being flattened on a small anvil of polished steel with a polished steel hammer, to detach adhering oxide of lead, and cleaned with a small, hard brush, is very accurately weighed. The weight is that of pure silver, and the difference between the weight before cupellation and that of the pure metal, represents the proportion of alloy in the sample examined. In the case of gold, the metal has next to undergo the operations of quartation. The cupelled sample is fused with 3 times its weight of pure silver (called the "witness"), by which the gold is reduced to one-fourth of the mass here, and in this state may be easily removed by parting. The alloy, after quartation, is hammered or rolled out into a thin strip or leaf, curled into a spiral form, and boiled for a quarter of an hour with about 2½ to 3 ozs. nitric acid (specific gravity 1.3); and the fluid being poured off, it is again boiled in a similar manner with 1½ to 2 ozs. more nitric acid (specific gravity 1.2); after which the gold is carefully collected, washed in pure water, and dried. When the operation of parting is skillfully conducted, the acid not too strong, the metal preserves its spiral form; or otherwise it falls into flakes or powder. The second boiling is called the "reprise." The loss of weight by partiug corresponds to the quantity of silver originally in the specimen.

ENAMELING ON GOLD OR COPPER.—The basis of all enamels is a highly transparent and fusible glass, called frit, flux or paste, which readily receives a color on the addition of the metallic oxide. *Preparation.*—Red lead, 16 parts; calcined borax, 3 parts; pounded flint glass, 12 parts; flints, 4 parts. Fuse in a Hessian crucible for 12 hours, then pour it out into water, and reduce it to powder in a biscuit-ware mortar. The following directions will serve to show how the colouring preparations are made: Black enamels are made with peroxide of manganese, or protoxide of iron, to which more depth of color is given with a little cobalt. Violet enamel of a very fine hue is made from peroxide of manganese, in small quantity, with saline or alkaline fluxes. Red enamel is made from the protoxide of copper. Boil a solution of equal parts of sugar and acetate of copper in four parts of water. The sugar takes possession of a portion of the cupreous oxide, and reduces it to the protoxide; when it may be precitated in the form of a granular powder of a brilliant red. After about two hours of moderate boiling, the liquid is set aside to settle, decanted off the precipitate, which is washed and dried. By this pure oxide any tint may be obtained from red to orange by adding a greater or smaller quantity of peroxide of iron. The oxide and purple of Cassius are likewise employed to color red enamel. The compound possesses strong fire very well. Green enamel can be produced by a mixture of yellow and blue, but it is generally obtained direct from the oxide of copper, or, better still, with the oxide of chrome, which last will resist a strong heat. Yellow.—Take one part of white oxide of antimony, with from one to three parts of white lead, one of alum and one of sal-ammoniac. Each of these substances is to be pulverized, then all are to be exactly mixed, and exposed to a heat adequate to decompose the sal-ammoniac. This operation is judged to be finished when the yellow powder well brought out. Blue.—This color is obtained from the oxide of cobalt, or some of its combinations, and it produces it with such intensity that only a very little can be used lest the shade should pass into black. A white enamel may be prepared with a calcine formed of 2 parts of tin and one of lead, calcined together; of this combined oxide, 1 part is melted with 2 parts of fine crystal and a very little manganese, all previously ground together. When the fusion is complete, the vitreous matter is to be poured into clear water, and the frit is then dried and melted anew. Prevent the pouring into water three or four times, to insure a perfect combination. Screen the crucible from smoke and flame. The smallest portions of oxide of iron or copper admitted into this enamel will destroy its value. The artist prepares his enamel colors by pounding them in an agate mortar, with an agate pestle, and grinding them on an agate slab, with oil or lavender rendered viscid by exposure to the sun, in a shallow vessel, loosely covered with gauze or glass. He should have alongside of him a stove, in which a moderate fire is kept up, for drying his work whenever the figures are finished. It is then passed through the muffle.

The partnership of the old house, last known as Carter, Howkins & Sloan, expired by limitation January 1st. The partnership is renewed under the same firm name, with the addition of three new members, younger men, who have proved their value to the house, Messrs. C. E. Hastings, Geo. R. Howe and Wm. T. Carter.

ARTIFICIAL PEARLS are made from beads of opaline glass filled with gum, the polish of the glass is reduced by the vapor of hydrofluoric acid.

Practical Hints on Watch Repairing.

By Excelsior.—No. 11.

As many readers of this number will not have the preceding volume of The Jewelers' Circular, in which Figs. 1, 2, and 3, originally appeared, and also for the convenience of old subscribers, the cuts are reinstated in this article. In Fig. 1, B C D represents a portion of the outer coil of the spring. B, 1, 2, 3, etc., to E, is the curve, as it should be formed. The dotted line indicates the modification of the curve which would be required by Prof. Phillip's rules. For the method of delineating a terminal curve, see sections (145) to (149).

(168) What is called the Breguet hairspring is a flat spiral provided with a terminal curve at its outer end, which is raised up by means of an elbow or bend, so that it can be returned toward the center *over* the other coils. As we have seen, all flat spiral springs which are desired to possess isochronism should be as long as possible and closely coiled, as the angle of inflexion of each coil will be thereby reduced, its action will be more uniform and easy, and it will have less tendency to be forced out of center and exert a side pressure against the axis of the balance. This is particularly important with the Breguet spring, which should be broad and flat, the coils very close together and more numerous than for a plain spiral of the same diameter. It is usual to give the Breguet from one-third to one-half more coils than the plain spiral would have in a similar situation. Being so close, the least injury or irregularity in the coils renders the spring worthless for fine adjustments.

(169) In fitting a Breguet spring, we proceed as directed in sections (34 to 46, 62, 63), except that we pay no attention to the position of the two *points d'attache*, for the present, till we find the correct-time point approximately; then break off into even coils, leaving at least half an inch of spring outside of that point (74, 162), and pose the balance first alone, then with the spring and collet on (75). Then form the elbow, three-quarters of a coil back from the correct-time point, which should have been previously marked (136, 180). Having restored the general shape of the outer coil, if disturbed by the preceding process, we again try in the upright holder till we get the correct-time point, and make that point the end of a *trial curve*, being careful to notice, while doing so, how much will have to be broken out at the center to bring that *point of attache* in a line with the correct-time point, and to make the proper allowance at the outside, etc., so that the total length from the collet to the end of the curve shall remain the same as before. This can be readily done by finding how much farther the correct-time point will reach around the center when *sprung* (not bent) into the general shape of a curve, than when in the full normal coil. Then sketch the proposed changes on paper, and find the proper point for the end of the curve (before forming it) by taking off in one place and adding on in another, allowing for the greater reach of the curve around the center, etc., and the point where the correct time point will come, after these changes are allowed for and measured off on the spring, is to be the end of the trial curve, one-half turn or 180° in length (147, 149.), which need not be perfect in shape, but should be approximately correct, and the end should also be at half the radius, as shown in Fig. 1.

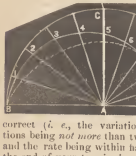


FIG. 1.

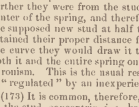
Now test for the isochronal point, shifting the spring a little in the clamps, if necessary (136, 159), and bring the correct-time and the isochronal points together, as directed for the plain spiral (137 to 140), and that point where both the rate and the isochronism are approximately correct (*i. e.*, the variation between the long and short vibrations being *not more* than two or three seconds for a six hours' trial, and the rate being within half a minute per day of correct), is to be the end of your *terminal curve*.

(170) Having formed the terminal curve in all respects as directed in section (148), determining its length according to the isochronal action of the trial curve, the isochronism is once more tested in the holder. If correct, mark the exact point which comes just outside the clamps, and this mark must come just outside of the stud (162) when pinned in it, which you will now do (44, 45, 46), put the movement together and test with the utmost accuracy for the final alterations of the curve (156, 157). If the difference between the long and the short arcs is but a few seconds for twenty-four hours, correct it by changing the terminal curve as directed in (156, 157, 158). If the error is greater than that, the spring should be moved a little in the stud (159). When the isochronism is correct, the watch is then rated or brought to exact time by the regulator or by the balance. (See article on Regulation.) But the balance should not be disturbed during the isochronal adjustment.

(171) If perfection is not sought for, this process can, of course, be greatly abridged. Probably the majority of workmen do not take even as much pains as prescribed in the preceding section (169), and would accept what I have called a trial curve as their terminal curve, for we seldom find what we may call a perfectly isochronal spring. But my object is to give the method of obtaining the very best results, and I do not hold myself responsible for those who choose to stop short of that end. In my directions I have supposed that the workman will make an upright holder (54 to 60) for the saving of time and superior work to be accomplished by it. Those who do not wish to do that, will modify their proceedings according to the necessities of the case (35), especially as regards pinning the spring to the stud at an early stage in the fitting process.

(172) I have said that the terminal curve of the Breguet spring should be made precisely the same as that of the helical spring. This is the rule when a regulator is dispensed with. The theory of the terminal curve requires its ends to be rigidly fixed, so that the angle at which it meets the stud may be as invariable as possible. But when a regulator is used in conjunction with a Breguet spring, a new element is added to the problem. Whether the regulator pins are open or close, they are injurious to the proper action of the spring. If they are open, they interfere with the normal effect of the curve, by preventing it from flexing and vibrating naturally and properly. On the other hand, even if the pins are as close as to constitute the ideal regulator and virtually become the stud, they would derange the action of the curve by changing its operative length and its place of attachment to the (supposed) new stud. For it the pins were made to conform to the position of the curve, as they were moved along it, the farther they were from the stud the farther they would be from the center of the spring, and therefore the curve would not be attached to the supposed new stud at half the radius, as required. But if the pins retained their proper distance from the center, as they moved along the curve they would draw it to their own circle, and obviously force both it and the entire spring out of concentricity, and destroy the isochronism. This is the usual result. when the ordinary Breguet spring is "regulated" by an inexperienced workman.

(173) It is common, therefore, to form a portion of the last coil, next to the stud, concentric, *i. e.*, bend it so that it will form a part of a true circle, having the center of the spring for its center and half the radius of the spring for its radius; as if, for instance, the terminal curve C A, Fig. 3 (149), joined on to a concentric, semicircular arc reaching from A to O, and the spring was pinned in the stud at O, leaving A free, where the terminal curve ends. This concentric portion is sometimes made as much as half a coil in length, as just described, and is set upon by the pins of the regulator the same as the outer coil of the ordinary flat spring.



(174) But this arrangement has also its disadvantages. At the junction of the concentric portion and the terminal curve, at A, Fig. 3, the spring is not rigidly fastened, as the theory of the curve requires, unless the regulator pins clasp it firmly, pressing it at that point, and act as a stud. But if the pins are in the least open, the yielding of the spring at and behind the pins would allow the entire terminal curve to move more or less without changing its form at all, and during the remainder of the vibration the amount and direction of its flexion, would be modified by the amount of yielding in the concentric portion of the spring behind the pins. This yielding, in turn, would depend on the position of the regulator between the point A, and the stud. The nearer it was to the stud, the greater this yielding would be, and it would require considerable difficulty that the point A, or real end of the terminal curve, would not even be fixed at half the radius, but would be at all sorts of distances from the center, sometimes farther than it should be, sometimes less—and every movement of the regulator, nearer to or further from the point A, giving it greater or less liberty and scope of motion, would change the entire position, condition, and action of the terminal curve.

(175) Theoretically, such a spring cannot possibly be isochronal. But, practically, we find that if, by making this concentric arc very short, we reduce these irregularities below a certain amount, we may overcome them. There are unavoidable irregularities of all kinds. No part or operation can be perfect, but after doing our best we shall have faults left, and these faults, of whatever kind, we must endeavor to remedy, neutralize or harmonize, by the adjustment of the spring to meet the necessities of each case. The nearer we succeed in doing this, the nearer to perfect isochronism we shall come. The reader will doubtless have noticed such expressions as "closely isochronized," "improving the isochronism," "lack of isochronism," etc., and may have

thought them rather strange. The truth is that, in practice, the term isochronism is rather indefinite. Perfect isochronism is the condition of a spring when there is absolutely no difference in time between the longest and shortest vibrations. But such a spring we seldom find. Workmen have certain standards of excellence, and when they attain their standard of performance, they call that isochronism. Others find difficulties they cannot overcome, and get the spring as closely as they can conveniently, when they pronounce it isochronized. Some make very little effort, or do not know how, and *their* idea of an isochronal spring is very low indeed. Theoretically, isochronism is a fixed term, but practically it is only a relative one, being high or low as compared with others which are better or worse. Hence, I use the term "perfectly isochronized" as the ideal which we are to strive after, but, for convenience, I speak of "improving the isochronism," and similar expressions, to indicate the change produced in the adjustment by our manipulations. So, in the present case, we are to take the imperfectious belonging to this form of spring, and make the best of them.

(176) It is an undoubted advantage to have the use of a regulator for rating a watch, and another advantage of having a concentric portion at the end of the spring is that, if necessary, it may be moved through the stud without thereby changing the distance of the end of the terminal curve from the center and so necessitating a remodeling of the shape of the curve. But the length of the concentric curve should not exceed one-eighth of a coil, or from the point A to the next radial line at R, Fig. 3 (149), which must be the place of attachment to the stud, and the regulator must only act upon the spring between these two points. Another instance is the curve in B B joining on the concentric are E D, of 45°. By confining the concentric portion within these limits we may enjoy the above advantages and yet be able to secure very fine isochronal action. But the regulator pins should be very close together. Further remarks on this form of spring will be made in connection with Figure 4 of this article.

(177) The workman can scarcely need any instructions for forming guages, or the curve itself, for this style of spring, in addition to those already given, except that he should commence his curves (both trial and terminal), *not* at the place where the correct-time and isochronal points coincide approximately (169), but the length of the concentric are inside of that place, not over 45° or one-eight of a coil from it, and half that distance would be better if the spring is likely to require any letting out (162), so that after all is done the point A, or end of the curve, shall not *exceed* 45° from the stud. Then with the point E in the stud or the clamps of the upright holder, and the point A in its false regulator, the correct-time and the isochronal points must be brought to coincide by moving the spring in the clamps for any large change required, or changing the form of the curve for slight changes, as already described. But during this operation the regulator pins must he kept at or near the point A, or junction of the curve and the concentric are, while the point R, or end of the spring, must be kept in or near the same radial line with the point pinned to the collet (137 to 140), or as may be required in order to secure isochronism.

(178) We have now to consider the elbow. It is popularly supposed that the placing of the elbow correctly is a point requiring great experience and judgment, and renders the making of a Breguet spring a very difficult and complicated job. Now, I contend that the exact position of the elbow is not an essential matter, its object being merely to raise the final or supplementary coil so that we can curve it towards the center as we find needful, without interfering with the other coils. The terminal curve need not begin at the elbow, unless we find it necessary, upon trial, to make it so long as to reach to that point. The curve may begin at any distance from the end of the spring which will secure isochronal vibrations. The position of the elbow has nothing to do with that adjustment, provided it is far enough from the end of the spring to be out of our way. It simply enables us to enjoy the same freedom in forming the terminal curve that we have in the helical spring.

(179) My meaning will be more evident by supposing that, with the exception of the outer coil being *raised up* by the elbow, no change has beeu made in its shape, the outer coil having the same size and distance from the center as before. The spring will therefore perform nearly the same as before, except so far as this elbow has made it shorter and stiffer. Accordingly, whether the elbow is a half, three-quarters or whole turn from the end makes very little difference practically, although it is considered well to make it as near the end of the spring as will give room for the terminal curve. *Then* is the real means of securing isochronism, not the elbow. The stiffness of the elbow is, of course, a disturbing influence or cause of irregular action in the spring, to a certain extent, but it is unavoidable, and we must correct or neutralize its effect in our adjustment of the terminal curve, along with other unavoidable irregularities, such as resistance of the air to the balance, unequal springing out of the sections of the rim, effects of friction in the balance jewel holes and the escapement, the oil, mechanical imperfections of all kinds, in the spring itself, as well as elsewhere—so that in spite of all of them the vibrations shall be isochronal, or as nearly so as we can make them.

(180) Nor is the *making* of the elbow difficult. Some workmen drill a hole through a piece of *hard* brass, large enough to admit a slotting file, with which they cut in one side of the hole a narrow notch, juts the width and depth of the spring, then plug up the hole so that the spring shall be firmly supported both on its sides and edges. Another way is to make a slot with straight sides and edges, just the width of the spring, and wedge the latter tightly in at one end of the slot. A good way is to take one of the double forming wires (165), one slightly convex the other similarly concave, ou their inner surfaces, cut a very shallow groove in one of them to fit the spring, then screw them tightly together upon the spring. Another similar tool is fitted with a handle, or a pair of hand tongs, opening with a spring, are bushed with iron and a shallow slot cut in one side as above described. This last tool or the tongs are for taking hold of the spring near the forming wire or piece in which the spring is fastened, and slightly bending it, first on one side then on the other. The forming wire is to be held in position, in the block or otherwise, all the tools used must be carefully heated, and by bending the spring gently after it has become thoroughly warmed up, even the hardest may be sufficiently bent with very little over - come. The novice should first practice a little on an old spring, or on the superfluous end of the one he is at work upon.

(181) The thickness of the piece in which the hole or slot is cut (180), or of the forming wire in which the spring is held, should be equal to the length of the straight portion of the elbow, between the two bends, the length of the straight portion the spring can be bent without danger of injuring or weakening it at those points. No attempt should he made to bend the spring upright at the elbow, even if it could be done. As a general rule the angle at which the elbow rises from the plane of the spring should be about 15°, or a very little more if the spring will bear it—less if it will not. This can be ascertained by experimenting upon the surplus spring not wanted at the outside. For the benefit of those who do not understand "angles," I may explain that a right angle or quarter circle is 90°, one-sixth of that is 15°. The radial lines in Fig. 1 (149), are 18° apart; the lines in Fig. 3, are 45° aud by dividing one of those spaces into three equal parts, each one will be 15°. I have seen elbows rise at an angle of 35°, but I should not advise over 20° or 22° in any case.

(182) The supplemental coil, or the coil outside of the elbow, is to be curved so that there will be room between it and the other coils, a space about twice the breadth of the spring. Some give eveu more, but that necessitates a longer elbow and increases the amouut of torsion or side twist which it produces upon the spring when vibrating. The space named gives ample clearance, which is all that is necessary. Some pocket makers give only one and a half times the width of the spring, but that is bringing the two parts rather close. The less the spring will bear to be bent, without producing the slighest injury, or the greater the clearance to be given, the longer the straight portion of the elbow, between the bends, must be made. *Of course*, where the elbow is formed, if the clearance is found too great, the bends can be made a little less abrupt by simply squeezing them between the heated tongs (180), or double forming wires, or even the corners of a pair of flat-jawed pliers, which by the help of the heat flatten the bends and so partly straighten them.

(183) The supplemental coil must be perfectly parallel to the other coils. If not, it can be made so by flattening one of the two bends. If the supplemental points upwards from the body of the spring, flattening the first bend will bring it down. If it is found too low, flattening the second bend, or the one nearest the end, will cause it to point higher and be parallel. This flattening is done by squeezing the spring flatwise, not by applying force to its edges. The supplemental may also be leveled by twisting the elbow sideways to throw the end circles or downwards, but this should only be done for very slight errors, as the edges of the elbow as well as all other parts should be truly vertical, *i. e.*, the breadth of the spring-wire should invariably be at right angles to the horizontal plane of the spring, andparallel to the balance axis.

(184) Some may think all this is a good deal of trouble to isochronize a hair-spring Well, it *is* some trouble to adjust a spring perfectly. Nothing good is to be had without trouble. But it is not so hard as it might seem at first, from the number of details given. I have endeavored to touch every point important to know, have even occasionally repeated directions in different ways, have used ungrammatical and unscientific expressions, have been diffuse and redundant in style, from a desire to make sure that my meanings should be noticed and clearly understood by all. But when once comprehended and become familiar, when the principles or models which are to be copied are fixed in the mind, the numerous details I have found it necessary to explain and dwell upon will become matter-of-course, and the practical work simple and easy, so that we may hope for an improvement

in the manner of treating springs which seems to prevail at present. Judging from their work, a good share of workmen now merely try the spring by some "quick test" (108), and let it go at that. But from what has been said, it is little better than a barefaced swindle to pass off such a spring as isochronal, for a spring may stand that test, or even a severer one, and yet not be adjusted for isochronism at all. One has no more moral right to call such a spring isochronal than he has to represent a chain as gold because it has a few grains of that metal in it, or on it.

(185) I have now given all directions necessary for selecting and fitting hairsprings in the very best manner, and making all adjustments required even in the finest watches or chronometers. It is not to be expected that the workman will observe all the niceties explained, in common watches or with low-priced ones. But if he understands fully what has been said in these articles, and uses a reasonable amount of thought and judgment in applying it in practice, he can, with little or no loss of time, do even his common jobs in a manner approximating correctness, and which will not only please his customers, but satisfy other workmen, into whose hands they may come, that he understood his business. Above all will be the satisfaction to himself of working from knowledge, instead of blind groping and guess work—and the ability to judge whether work is properly done or not. In order to get the most benefit from his knowledge—to both learn and *improve*—he should put it into practice at every opportunity, even if it involves extra trouble or doing a little more than he gets paid for. He will be amply rewarded by his improvement in information and dexterity. But without practice and knowledge will be both useless and fleeting. In my next I shall give directions for rating or regulating watches, with or without regulators, without injuring their adjustments, and even so as to improve them—together with several other matters of importance.

The Topaz.

DR. A. C. HAMLIN.

In commerce, the name topaz is bestowed upon all gems of a yellow hue and possessing a certain degree of hardness, but in mineralogy it is applied only to the mineral which has for its composition silica, alumina and fluoric acid. It will be interesting to the antiquary to trace out the etymology of the word topaz, through ancient times down to the last century, and separate and describe, if he can, the different gems to which the name was given. We will, however, only state that the rich golden stones which Pliny called topazius, were gems which we now call peridot or chrysolite, and that the ancients were unacquainted with the mineral to which the illustrious mineralogist Werner, in the last century, gave the name topaz.

To give a brief description of the true topaz, we will only say that it occurs in rhombic prisms, possessing a basal and very perfect cleavage, also exhibiting a variety of colors of a vitreous lustre. The ordinary hue is yellow, varying from a pale tint to a decided brown, but the mineral often appears white, and sometimes of a light green, or of a positive blue, or a clear vinous red. Among its curious properties are its electric powers, which it acquires easily by friction, heat, or even pressure and retains for many hours. This characteristic is very marked and forms one of the special tests in determining the identity of the mineral and its gem. Excite the stone by rubbing, and then approach it with a delicate linen thread suspended from the finger. In power of attraction it is only equaled by the tourmaline. Its optical phenomena are also interesting to the student but we have not the space to explain them here. But in alluding to them, we may with propriety state that the topaz should be regarded by the mariner as his favorite gem, because it was from experiments with this stone that Fresnel made the important discovery of double refraction with two axes, and which finally resulted in the construction of those wonderful lenses which now flash so brilliantly from our modern lighthouses.

Its specific gravity is 3.5, the same as that of the diamond, whilst its degree of hardness is 8, or two degrees below that of the diamond, and only inferior to the spinelle, chrysoberyl and sapphire.

As we have already stated, the topaz of the ancients was our peridot, and was supposed to have been obtained from the islands or the regions of the Red sea. But even at the present day we are unacquainted with the locality of the gem. We know that they come to our marts from the Levant, and that is all. Recently fine peridots have been found in the Rocky Mountains, but we have no details concerning the extent of the mine or deposits. The white topaz the ancients probably obtained from Ceylon, as the gem mines yield them at the present day, but of the yellow variety they probably knew nothing. The first specimens known in mineralogy were brought to Europe in the last century from the gem districts in Brazil, and after the nature of the mineral was established, localities were discovered in Saxony, Siberia, Scotland and other countries of Europe. Brazil, however, is the richest mine. In the district of Minas Geraes the stones are found by washing the alluvial soil, or they are procured by excavating certain soft rocks in which they occur in veins and as nests. But in the Province of Bahia, De Lacerda tells me they are knocked off the crystalline rocks like crystals of quartz. In Siberia and Saxony, they are also extracted from ledges by regular mining processes. Aberdeenshire, in Scotland, has afforded some few, but beautiful specimens of topaz, both blue and yellow. One crystal of yellow was found weighing 7.02, and also a fragment of another of still greater size. Jameson mentions a crystal of sky blue that weighed 19.02. Kamtchatka, it is said, furnishes beautiful topazes of the blue and greenish varieties, but we have no other information concerning them. Siberia yields some magnificent specimens of the crystallized varieties of the blue, green, white, light yellow and sherry wine color. The Imperial Museum, at St. Petersburg, contains a magnificent crystal of yellow topaz from Siberia, weighing over 22 lbs. avoirdupois, and measuring quite a foot in length, with a breadth of six inches. This giant of the species is not only of a symmetrical form but it is remarkably transparent and of a clear wine yellow hue. The white topaz is found in many countries, but the rounded masses, like the water worn pebbles, are found only in the true gem strata of Ceylon, Tasmania and Brazil.

In my work on the diamond, I have mentioned particularly this variety of topaz in connection with the theory of the formation of that gem, and I will refer the reader to that chapter for further information on the subject.

The white topaz may occur in large masses, as may be seen in the 12 lb. specimen in the British museum, but the brilliant gems are cut from little rounded pebbles about the size of a hazlenut. They are known in Brazil as *gouttes d'eau*, or drops of water from their sparkling clearness. When cut in the forms of the brilliant they exhibit remarkable lustre and are often taken in daytime for diamonds. At night, however, the absence of the prismatic hues betrays the true gem at once. Nevertheless, these little concentric and globular forms of the topaz, both white and yellow, display a fire which the other crystalline forms of the mineral do not, and the same peculiarity may be observed in some other gems.

During the last century, a famous haw suit was caused in Paris by the attempt to sell a lot of the little white topazes as diamonds, and mineralogists from the Academy of Sciences were summoned as witnesses to establish the identy of the material sold.

The topaz is also found in the tin mines of Saxony and in the granite quarries of Sweden, but it is generally the opaque variety called physalite. some of the crystals are of enormous size and one is preserved at Stockholm that weighs eighty pounds. In the mines near Durango, in Mexico, the transparent crystals occur, but they are said to be light colored and resemble the Saxon. In the town of Trumbull, in the State of Connecticut, the mineral is found together with fluor and dispose, but although the crystals are sometimes transparent, they are too small and too faint in line to be utilized in the arts. The mineral is not only interesting to the mineralogist by the variety of its forms, but also for its optical phenomena and peculiarities of internal structure. Sir David Brewster not only found minute crystals of several kinds in the interior of the topaz, but discovered singular cavities filled with fluids which exhibit remarkable indices of refraction.

Commerce recognizes all yellow gems as topazes, and calls the yellow quartz, Bohemian or Spanish topaz, the yellow sapphire as oriental topaz, etc. Mineralogy however recognizes but one topaz, and that is the mineral we have already alluded to. Some of the yellow gems are very rare and costly and are often confounded by the ignorant with the topaz. We refer to the yellow sapphire, chrysoberyls, zircon, tourmaline and beryl. The yellow sapphire is found in Ceylon and India, and when in perfect condition, affords a fine gem. Its velvety yellow reflections surpass in beauty and brilliancy those of the topaz, and are only inferior to the rare yellow chrysoberyl and the still rarer zircon. There are some magnificent yellow sapphires improperly called Oriental topazes, and we will mention some of them. First of all was the magnificent cut gem belonging to the Grand Mogul, and seen by the celebrated traveler, Tavernier. It weighed 157 karats and was valued at more than fifty thousand dollars. In the casket of gems belonging to the French crown may be seen a superb yellow sapphire of 78 karats, valued at 6,000 francs, also, two other beautiful stones of the same species of 13 karats weight each. In the grand mineralogical collection of the Jarden des Plantes, there is a remarkable specimen beautifully cut. The famous jeweler, Caire, possessed a splendid yellow sapphire of 29 karats weight. Its Oriental origin was proven by an Arabic inscription engraven upon it. Among the decorations of one of the saddles of Catharine of Russia, was a splendid yellow gem which cost 10,000 roubles. It was probably a yellow sapphire.

The yellow chrysoberyl is a rare stone, and, when perfect, is one of the most magnificent of gems and only surpassed by the yellow diamond. The yellow zircon is a resplendent gem when pure in color and limpidity. King declares it to be the rarest of gems, which statement, if not correct, is very flattering to us, as we happen to have in

our little collection several fine specimens. The yellow tourmaline is, in our estimation, the rarest gem of them all. They come from Ceylon, but Mt. Mica, in Maine, has furnished a few specimens. The yellow beryl is also a beautiful stone and passes from a bright jonquil yellow to the richest orange. The granite ledge at Fitchburg, Mass., has furnished some splendid crystals and gems of this description. We have one of about two karats of a deep orange tint.

The yellow quartz known as the Spanish and Bohemian topaz, or the Scottish cairngormous, is quite common and exhibits a great variey of tints, surpassing in extent even the true topaz itself. Some of its hues resemble those of the Brazilian yellow topaz perfectly so that the eye cannot distinguish them apart. The golden brown Spanish topazes, produced artificially and perhaps by boiling fragments of smoky quartz in fat or oil, are indeed magnificent gems. When these stones are well set and surrounded with diamonds the effects are very beautiful, and we must not deride them because they are nothing but quartz and common. Their want of hardness is really their only defect, therefore they do not resist the effect of time and the wear of common use as well as the true topaz.

In St. Sigmund's chapel, in Styria, there is preserved a large yellow crystal of six inches in diameter, which was presented to the shrine by Joseph, II., of Austria. History does not mention the nature of this stone but we suspect it to be one of the yellow quartz crystals from Bohemia. There is another magnificent yellow stone of a brownish hue, in the museum at Leiden, and described as a topaz from Ceylon. As the true yellow topaz is not found in Ceylon or India, we suspect this specimen to be quartz, or perhaps sapphire. In the museum of Berlin there is a yellow topaz crystal of two colors—yellow at one extremity and amythistine at the other. This effect we believe has been produced by art, and by the action of heat applied carefully to one end of the crystal. The British museum, however, boasts of having the most magnificent suite of topaz crystals in the world. They came from Siberia, and the hues of the crystals are of a sherry wine color and so sensitive to the action of light that they are kept in a dark place to preserve their hue from being bleached out. The effect of the solar light upon the gems, and, in fact of all mineral bodies, offers a perplexing study to the physcist. The beautiful amythistine quartz often loses its hue when exposed to the light. And the rose quartz is notorious for its delicacy in this respect.

Natural crystals of topaz, exhibiting a fine rose. or vinous red, have been found in Brazil, and the cause of their beautiful tints is, we think, explained by the discovery of Dumelle, of Paris, in 1750. Dumelle exposed some of the dark yellow topaz of Brazil to a low red heat in a sand bath, and found to his surprise that they became of a fine rosy pink, but that if the temperature was too prolonged, the stones became white and neither the yellow nor the rosy tints could be recalled. The low degree of heat to which we subjected the color of the mineral, leads us to believe that those natural crystals of topaz, which display a decided red tint, are altered by the effect of a tropical sun shining upon them as they lay exposed upon the sand. The heat of the noon day tropical sun is sufficiently strong in certain favorable situations to produce this metamorphose of hue. This phenomena of color is seen only in the Brazilian stones, and the darker the shade of yellow, the brighter and more distinct will be the hue of red. The yellow topazes of Saxony and Siberia all turn white when exposed to the action of heat.

One of the finest natural crystals of red topaz known, is preserved in the princely cabinet of William Vaux, of Philadelphia. It is a transparent prism of about two inches in length and exhibits a rich vinous red tint. It was obtained by Mr. Fox while British Minister at Rio Janeiro, and brought by him to Baltimore. We are the happy possessor of a beautiful cut specimen of the natural reddish topaz, which we acquired through the liberality and kindness of Messrs. Tiffany & Co. It is of a faint reddish tinge, but the reflections of its interior angles are of a rich crimson, reminding the observer of that rare and transcendent gem, the hyacinth or the red zircon.

The blue topaz, of decided hue, is one of the rarest gems, and is only found in Brazil, Kamtchatka and Siberia. It resembles the blue beryl, or aquamarine, very closely, and often can only be distinguished from them by certain tests, such as that of specific gravity, and chemical phenomena, etc. Several years ago we found a beautiful blue topaz of 34 karat weight, in the hands of a peddlar in New York, but we did not recoguize its nature until we had applied several tests, as its color perfectly resembled the blue beryl of Siberia. The finest specimens of which we have any information is the superb crystal of 1½ oz. weight, brought to Europe by Mr. Mawe on his return from Brazil. It was of an Indigo blue and said to have been the first example of the kind brought to the notice of the mineralogists.

The topaz, in former times, was estimated highly as a gem, but fashion at the present day has placed the ban of its disfavor upon it, and it now commands a mere nominal value and is but little sought for. However, as we prize its rich golden hues, and believe that fortune may some day restore the gem to its proper rank and value, we do not hesitate to invest in a specimen when it can be obtained at a moderate price. The freaks and follies of fashion do not, in our estimation, increase or impair the beauty or value of the gem. In Spain and Scotland the geu is still much worn and highly prized. The Scotch esteem it because of its resemblance to their native yellow and smoky cairngormous.

French Jewelry, Fans, &c.

There are several designs in neck ornaments that are decided favorites, hence there is no compelling furniture for the neck. Perhaps the latest novelty in this portion of a mode toilet is French jewelry; the pattern is unique and very expressive in design. It is formed of black jet in silver-gilt and connected by delicate links. It is made to wear close around the throat and fastens at the back with a clasp. The full set is very desirable; it contains belt, comb, bracelets, and shoe buckles. Those arranged in shells set upon wide black velvet ribbons are very dressy. Some are elaborately finished, while many are exceedingly plain, but never common in character. These elegant throat novelties give considerable style to a dinner toilet, producing a sort of smiling beauty to the more sombre costumes.

Appleton's Journal says: For a year or two past the only bracelets in vogue among Parisian fashionables have been the slender porte Bonheur circlets, scarce broader than a thread, at which six or seven are to be worn on one arm in oriental fashion. In a set of these slender bracelets just prepared for a young Russian countess, there were seven, each one set with a single pearl or precious stone surmounted with diamonds, comprising a black pearl, a pink one, a white one, an emerald, a sapphire, a ruby, and a diamond. A delicate arm thus adorned would be dazzling to behold.

More artistic and more really graceful was a bracelet composed of five strings of pearls of graduated lengths, the largest being quite long enough to serve for a necklace, while the shortest was just of a sufficient length to drop gracefully from the arm. To the inside of the clasp, which was of diamonds, a slight bat strong gold circlet was affixed, which, fitting the arm closely, permitted the strings of pearls to hang loose in most picturesque fashion.

But the greatest marvel of workmanship was a tazza of oxidized silver, enameled after the style of celebrated Limoges enamels. The bottom of the cup was occupied by a scene representing a knight on horseback accosted by a nude nymph with a flame upon her brow—probably Will-o'-the-wisp. The borders was wrought in delicate arabesque of flowers and vines, and was further decorated with satyrs, heads in enamel. This marvel was got up for the Vienna exhibition.

Last of all, the diadem now in preparation for the Centennial, was brought out and placed before me. It was ordered by an Austrian Princess, and is entirely composed of rubies and diamonds, each stone having been selected with peculiar care. It consists of a band of rubies and diamonds, above which rises a row of flurons, formed each of a large ruby set in diamonds, and alternating with single large pear-shaped diamonds of the finest water. Right in front the diadem rises in a fleur-de-lis-shaped ornament, which may be detached and worn as a brooch, a smaller one taking its place in that case. The centre stone of this ornament is almost unique; it is an immense ruby of a glowing fire-red hue, far purer than the ordinary bluish red of the rubies in general. Were it not for a milky stain that crosses this superb gem, it alone would be worth $10,000. The whole value of this was $40,000.

In fans, those of feathers mounted on bone, tortoise shell, ivory, or smoked pearl sticks, are by far the most fashionable ones; though the folded ivory fan, painted and carved, the silk ones on sticks of ebony and violet wood, ornamented with hand-painted flowers, and the satin and silk fans, trimmed with marabout fringe, are equally in style. Very handsome ones are seen composed of naturally-colored marabout tips, mounted on thin ivory sticks; also ostrich tips (natural color) on amber tortoise-shell. Amber and dark mottled shell are favorites for both feather and black lace fans. Lace fans, by the way, have lost none of their old favor. In white they are made of the combination lace so largely used now in all confections; one exclusive one comprised point duchesse, point d'Alencon and Valenciennes; the duchesse providing the groundwork for the medallions and other ornamentations of the two remaining laces. Painted designs represent landscapes and figures, more largely than flowers alone perhaps, and these cover the entire face of the fan instead of one corner.

The well known firm of Smith & Hedges have admitted to partnership, Messrs. James Hedges and Harrison B. Smith, younger brothers of the present firm, and the house will hereafter be known under the style of Smith, Hedges & Co. The new partners have been with the house some five or six years, and they have thoroughly earned their admittance to the firm, and we may congratulate both the house which has added business strength by the change, and the gentlemen who connect themselves more closely with so honorable a house.

Honesty in the Workshop.

BY H. C. M.

One of the greatest drawbacks in the jewelry business is, that so much care is necessary to avoid robbery. The burglar has to be guarded against, which involves expensive safes and night-watchmen. Keen perception and a watchful eye are continually required to prevent loss by the shoplifter and pretended buyer. In the workshop, the manufacturer is in danger of being robbed by his workmen and apprentices, and no iron safe protects them from their dishonesty. He has to trust them with the ever-coveted gold, and often with precious gems. Much thought has been bestowed upon the subject, and plans for keeping exact account of the stock given out, adopted by many, often embodying details of great minuteness, but all such plans are very troublesome and expensive, involving necessarily the employment of a careful person to keep account, and, after all precaution, often fail far short of the desired end. What then can the manufacturer do to protect himself? Cannot careful discrimination in the employment of help do much? Yes, do we not know the good workman is a poor thief? And is not the steady, sober, industrious man as likely to be guilty of such crime as the idle, drunken, extravagant fellow, who disgraces the shop he works in?

It may appear like accepting a low standard of morality, but really self-respect seems to guide many in the paths of honesty, and indeed there can be no doubt but an appreciation of the fact, that a man guilty of dishonesty is degraded in his own eyes, would keep most from the first act of dishonesty. A systematic arrangement, no matter how minute in detail, which will prevent robbery, or at once discover the thief in the workshop, seems impossible, but loss from dishonesty may be reduced to the minimum by the discretion and keen observation of the executive, whether he be a proprietor in the business, or a hired foreman. Where the management of a shop is left to a foreman, he should be a man whose superiority would command respect, who should be quick enough in his observation to know at all times everything which is going on around him, like the captain of one of the old "liners" between New York and Liverpool, who instantly on coming on deck, without apparently looking aloft, would call to the mate or watchman, tell him of some trifling irregularity which ought to have received his attention. He should be a man who understands the business and can explain anything so as to be easily understood, and cheerfulness, patience and diligence ought to be among his qualifications. And with such a man at the head of a carefully selected staff of fairly remunerated help, there would be little risk of loss from robbery. Such a man must be well paid, as of course, and he deserves it. He stands on his reputation, he has spent his time in studying his business and observing human nature, and, moreover, what he receives is a very small insurance on the amount entrusted to his care.

A word of encouragement or appreciation will often keep a boy, even a man, in the right path, and "come, boys, let's make hay while the sun shines," will ensure the accomplishment of much more than "hurry up there," ever will. Discipline is more necessary in the one in charge of a shop than in any one else there. His exactness engenders precision in others, whereas, if he be loose in his management and knowledge of his affairs and surroundings, looseness will pervade the whole shop, and looseness means diminution of profit through misused strength and energy, general unpunctuality, waste of time through willfulness and stupidity, and an encouraging opportunity for any one disposed to steal. In the consideration of this subject, one idea suggests itself which might be of service to manufacturers and dealers, it is this, that the names of employes guilty of stealing should be communicated to some designated centre, and then communicated to the trade generally. Such a measure might, through fear, prevent some from falling into temptation, as an employer would consult his list before engaging a new man.

MR. A. B. SPEIR, for many years the Southern traveler for MESSRS. Carter, Howkins & Sloan, has severed his connection with that house, as will be noticed by the following:

NEW YORK, January 15, 1876.

MR. A. B. SPEIR—*Dear Sir:* We regret that after having been in our employ for the past eight years, you have concluded to leave us. Your connection with us has been a pleasant one, and the conduct of the business entrusted to you by us, has at all times been managed satisfactorily. Yours, truly,

CARTER, HOWKINS & SLOAN.

MR. SPEIR is open for an engagement and can be found at the office of Post, Beach & Decker, 192 Broadway.

Correspondence.

Editor Jewelers' Circular.

It is taken for granted that every dealer is entitled to all the trade he can obtain provided, of course, that he does nothing dishonestly, and obtains the same in a legitimate way. Take a wholesale jewelry dealer for instance, it is expected that *he* will do all he can to increase his trade, but *he* must confine himself to the "jewelry trade," that is, solicit patronage from those who are in the jewelry business, or those who contemplate engaging in the same. But if he scattered his circulars, catalogues and price lists broadcast throughout the land, to every merchant and cross-roads dealer in *any kind* of goods, can he expect to keep or obtain a fair trade among the retail jewelers?

I have been prompted to speak of the above by *seeing* the illustrated catalogue and price list of "W. B. Clapp & Co., Chicago, Ill.," in some of our dry goods stores in this city, the proprietors and clerks of which are, and have been, regular customers of mine for years. I also have been favored with one of their catalogues, it being thoroughly illustrated, and prices affixed to each article. Is it supposed that one of my customers will buy from me when he can obtain the same article at the same price I pay for it? And can Messrs. Clapp & Co. expect to sell goods in quantities to me, and then sell to my customers at the same price he charges me? It is not my desire to harm any man, but if Messrs. W. B. Clapp & Co. profess to do a wholesale business, let them stop selling to the retail customers. They cannot plead ignorance of the business of the different houses of this city where they have sent in their catalogues, for they deal in nothing but dry goods, clothing, etc. I presume they have sent their catalogues to such dealers everywhere else, and if the retail jewelers wish to buy from a house that cuts right at their business, and sells to their own customers at the same price they charge them, they can do it, but I, for one, never intend to. If a wholesale dealer wishes to retail any goods at any time, no one has any objection, *provided* he will charge a *retail price.* Some of our best wholesale dealers, those who have the confidence of *every one*, either *refuse* to sell at retail, or charge even *more* at retail than the same goods can be bought for at a regular retail store.

FAIR PLAY.

Editor of Jewelers' Circular:

Will you kindly answer in your next issue of the CIRCULAR the following question: What is the best method of making 18 karat gold work easy? I find that it has a very coarse grain and gives a great deal of trouble in working it. How can the grain be made fine so as to work to better advantage? M. C. E., TORONTO.

In answer to the above we respectfully submit the following:

Editor of the Jewelers' Circular:

In melting gold of any quality that has alloy of copper, you must be careful not to oxidize the copper by making it melting hot without flux. If any of your subscribers have difficulty in getting gold tough, let them make the copper they use hot in an annealing pan and sprinkle some powdered borax over it before putting it into the gold. After pouring your gold into the ingot, roll it as much as it will possibly bear without cracking before you anneal it. By this means you give the gold a grain running lengthwise. If it is not tough then, break it, and if the grain appears close and hard, melt it with a very small piece of saltpetre (say about size of a pea to the ounce) if the grain appears open and coarse melt with a very little sal ammonite. In both cases put the saltpetre or sal ammoniac in just before pouring. After having tried the foregoing and the gold is still brittle, refine with saltpetre and take out certainly a portion of the copper; make up what you have taken out and proceed as before. It is of the utmost importance that you roll the gold a great deal before you anneal it the first time. RICH. OLIVER.

ANOTHER METHOD.

Editor of Jewelers' Circular:

In preparing the alloy to make 18 karat, take about 2 or 3 dwt. of 14 karat gold, and less of the fine copper and silver. By following this method the gold will work solid and fine. Say you have 10 dwt. of 24 karat gold; now to reduce it down to 18 karat it would require 3 dwt. of alloy for red gold; 2 of copper and 1 of silver. Instead of using 3 dwt. of the alloy, try the addition of 14 karat gold to the fine 10 dwt. of gold, which I think will work all right. Or, in the other case, by melting the gold over two or three times it will come out fine in grain. Yours, very truly, JOHN F. LUTHER.

FRICTION AS A "FACTOR."

Editor Jewelers' Circular.

Although science is useful only in proportion as it agrees with truth, the latter is not always in good taste, as for instance we would not like to be told that we cannot learn faster than our brains can grow, yet such is the truth—words or lectures can only *corroborate existing* ideas in our minds. It therefore follows that even if a man *should* happen to make new and valuable discoveries somewhere, he could only use them himself, no matter how far disposed to benefit others—he could not raise *new* ideas in them any more than he could vary the contents of a book by clever demonstrations to the cover, if he had the ability to make them. Nobody is to blame for this fact, it is nature—I have myself been many times the "swine" when "pearls" were offered.

For more than ten years I occasionnally referred to a certain discovery I made in isochronism, and among other things, I said (of course "it was only one man's opinion") that friction as a factor in time measure, is dead; that all the mischief it can henceforth do, is to alter the *extent*, and *not the duration*, of a vibration. I first ycleped it "a second isochronism," and afterwards "friction isochronism" for want of a better name; but I failed to convince a large party of adjusters and writers on the subject of isochronism, who still use the notorious eccentricity of friction, as their last resource, in the finishing adjustments, of the finest pocket chronometers.

I must therefore use a new standpoint of view, in this article, by calling to my aid the centrifugal force effect, in order to separate the two antagonistic conditions in isochronism (which I claim to have discovered), from *isochronism proper.* If the reader will accompany me to the front, I will endeavor to point out to him the beautiful head and ugly horns of the refractory beast, which the combined ability of the one-balance chronometer makers never will tame, as will hereafter appear.

If we wish to make the most of the material in our possession (and who does not, takes no interest in this paper) we must learn to cover *two* conditions of isochronism, in stationary timekeepers, and *three* conditions in portable watches. The centrifugal effect nicely proves the opposition of two of these, and so plain that a "ten year older" can see it. Explanation: We cannot indeed test the isochronism of the regulator (spring and balance combined), much less that of the spring; but we can know exactly what the watch (this time we combine the regulator with the escapement) would do in the stationary condition if the regulator *were* isochronal as per isolation from the escapement, in the chronometer escapement action, namely: 1. Lose in larger motion, when the cause is larger detent pressure, and the centrifugal effect *increases* this loss—acts in opposition to the adjuster. 2. Lose from increased resistance to the regulator, per *same* detent pressure; and our centrifugal *decreases* this loss.

Now, as the centrifugal effect is always in the same direction, it proves the antagonism claimed. 2. It proves two conditions besides "isochronism proper." 3. It clearly proves that the pendulum spring cannot serve two such opposite gods, at one and the same time, as claimed by the "large party."

I now come to "what care we for the shake," party, but will make only a few detached remarks: The "Isochronal Spring," or "ut tensio sio vis" of the English; the "Isochronal Regulator" of Berthoud, and "isochronism proper" are the same thing, and in perfection *exist by accident.* Both motor isochronism and friction isochronism are left to be provided for, and this cannot be done to the latter when the spring is thus employed. J. Muma.

Editor Jewelers' Circular.

In your "correspondence" (December number) I notice a call for a discussion of the watch oil question. Here are a few items in regard to it from my own experience of over thirty years. The best stock for oil is without doubt, fish, and the porpoise seems to be generally preferred, though this may, perhaps, be an open question. Fish oils seem to meet more of the requirements of a good watch oil than all others. There are three grades or qualities put in market by the different manufacturers, all made from the same stock. First, watch oil, which is mostly a thin and very limpid oil, standing a great degree of cold, but lacking in body and often drying up leaving the pivots to run dry in a few months. Second, chronometer oil, having more body, yet standing a good degree of cold, and, in my opinion, it is much better adapted to nearly all kinds of watch work than the so called watch oils, because sufficient body is required to prevent the pressure of the pivots in the holes from forcing the oil away, causing them soon to run dry. Third, clock oil, a thicker oil than either, containing more stearine, consequently will not stand so much cold as the others. In a large number of samples of all kinds and makes, that I have tested, I have found none entirely free from acid, some turning litmus paper red in a few moments, others requiring several hours before changing the color, but so far, those that were most free from acid, were much too thin to be very durable.

It has been my habit for many years to select the thickest watch oils that I could find, and let them stand two or three years before using, and if on trial the oil proved good, use for watches, if not, for other purposes; most new oil seeming to undergo chemical change or fermentation, sometimes requiring a year or more before completion, and on this account not reliable, for an oil that seems good now, may be utterly worthless in a few months. A good oil should be free from acid, not dry up readily on exposure to the air, nor thicken or become gummy for at least two or three years use in a watch. A number of years ago I had some old oil that seemed acid. I put into this some thin strips of clean sheet lead, and there was deposited quite an amount of sediment. When there was no further deposition, I filtered through paper, and this oil proved for some twelve years the most reliable of any I ever used, lasting on watches from two to three years in good condition. I am now trying this experiment again but the oil has not yet deposited all that I think it will, so, of course, there is no result to report.

Some to whom I explained the former test, thought the lead would cause the oil to dry readily, but this did not prove to be the case. A good way to test oil is to drill in a piece of sheet brass, say a dozen shallow holes (do not polish them) large enough to hold a drop of oil, number each, as a ready means of reference, place in each a drop of the oil to be tested, and the corresponding number on the bottle, and make a memorandum of the date and number, and of the quality, etc. of the oil. Place the brass under cover away from dust, and examine every month or two and note the color, condition, etc., of each kind of oil. This will enable you to form a tolerably correct judgment of the merits of the several oils tested.

As to the preparation of the oils, there are, I think, as many modes as there are makers. All oils contain more or less of a gelatinous or gummy substance that must be removed before a good article can be obtained, and to do this, is sometimes a very difficult matter. This gelatinous substance is, I think, the principal cause of the change or fermentation in oil, and, as before mentioned, till this has taken place, the oil cannot be relied on. As little heat as possible should be used in the first preparation, followed by thorough washing with water to remove any soluble matter. Then some makers expose to cold to partly deposit the stearine, then filter through charcoal and bottle at this stage. Some years ago I experimented with a vegetable oil in this way, and thought for a while that I had a good thing, but after a time found the oil much like clear and thick honey, and acid at that. Later investigations would lead me now to try (if I had the time to spend), first,washing with pure water, then with a strong solution of tannin in water, then with tannin in alcohol, to coagulate gelatinous or gumming matters. (If the tannin solutions show an acid reaction, neutralize with ammonia before mixing with oil) then wash again with pure water, then decant and expose to cold to deposit the larger part of the stearine, carefully pour off the clear oil, and then add clean sheet lead to neutralize whatever acid might remain, and then filter.

As good oil is indispensable where accurate time is required, I think the question of great practical importance, and have written the above hoping that some one, who has more time at his command, and is in reach of fresh made oil, will take the subject up and experiment till a reliable process for its preparation is established. L. F. Munger.

Editor of Jewelers' Circular:

In section 48 of his articles on the hair-spring, "Excelsior" gives an excellent method of taking out the stud easily and safely. As such little points becomes important because they are found useful so often, allow me to describe my method of putting the stud in again. I have a small pair of flat-jawed pliers, with one corner of the upper jaw ground off about 1.16 inch, and rounded in a little. I put the stud in its place, then take it and the arm of the balance-bridge in the pliers, in such a way that the sound corner is under the head of the stud and squeezes it to its seat, while the removed portion of the upper jaw allows the shank of the stud to come up through untouched. Any required amount of force can be applied without danger of marring the stud, slipping off, etc. I prefer this form to having a hole drilled in one of the jaws for the shank of the stud to enter, as the hole might not be placed directly over the stud, when the shank would be headed down, and the former can be used in many places where the latter cannot. C. E. Fritz.

Editor Jewelers' Circular:

There is one item that I think has been overlooked by all in the fusee and going-barrel contest. It is this, the hair-spring, however perfect, will, after a time, fail, and it is quite evident that the more a spring is strained or overworked, the shorter will be its time of perfect performance, and for this reason mainly, I prefer the fusee for the best quality of work (and for that only) where not only a close rate is desired, but one that will last. This, I think, cannot be as well secured with a going-barrel as with a fusee. All the adjustments should be as perfect in a fusee watch as in a going-barrel. L. F. Munger.

Trade Cossip.

Switzerland manufactured 1,600,000 watch cases last year.

Jewelry of oxidized metal is very popular in Paris—it is very ugly.

A splendid hairpin is made in the shape of a humming bird, of diamonds, emeralds and sapphires.

Mr. J. G. Smith, of Miller Bros., enjoy the reputation of being the most accomplished croquet player in Brooklyn.

It isn't "a failure" or an "assignment" that they call it now. "Temporarily embarrassed" is the correct thing.

Fourteen English Watch and Clock Manufacturers will exhibit specimen of their productions at the Centennial.

Mr. Grossman, of Glashütte, Saxony, announces the death of Mr. Adolf Ferd. Lange, who died in an epileptic fit Dec. 3d.

Opals are very fashionable; emeralds, sapphires, rubies, pearls and diamonds are used together to form the coveted Oriental setting.

Mr. B. C. Wells, of Austin, Texas, was awarded the first prize for the finest display of jewelry at the state fair recently held in that city.

Rosenblatt's California friends think this guileless youth an angel of innocence, as an angel he has been chiefly successful in concealing his wings.

It is now four years since a law suit about a fifty cent breastpin was first broached in Canajoharie, and the plaintiff is naturally very anxious for an 'ear-ring.

Boston stands sad-eyed and silent by the side of Winslow's vacant chair, and feels as if Faneuil Hall and Bunker Hill Monument were in some sense a failure.

Solomon Rose and Emanuel S. Rose, dealers in jewelry at No. 67 Nassau street, have gone into bankruptcy, owing $15,000; their nominal assets are $4,312.05.

The sit-down question is agitating the whole country. The St. Louis store girls insist upon reclining on lounges and reading novels while the costumers are examining goods.

One of the newest fashions among the *elite* is the use of precious stones for buttons or fastenings for elegant fur garments. No jewels are considered too costly for this purpose.

Alderman Fricker, of Americus, Geo., a gentlemen well and favorably known in this city has been chosen Mayor, Protem, during the absence of the Mayor of that enterprising city.

A tipsy fellow, who mistook a globe lamp with letters on it for the queen of night, exclaimed: "Well, I'll be (hic) blest if somebody hain't stuck an advertisement on the (hic) moon!"

Mr. Harry Bynner, the second son of our good friend and fellow townsman, T. B. Bynner, Esq., has lead to the hymeunal altar Miss Emma C. Lane, one of Brooklyn's fairest daughters.

It is expected that the compromise of fifty per cent offered by Hunting & Earle, manufacturing jewelers, will be accepted by their creditors. The liabilities are put dow n at $86,936, or against assets estimated at $41,000.

Jewelers are said to be busy preparing elegant new pins to be worn by gentlemen this season, upon which is engraved: "Engaged," "Married," "Don't want to," "No madam," or something of the kind, to be used as a protection during leap year.

Mr. Hawks, of Dennison & Co., has been compelled by ill health to give up the management of their New York house. By the advice of his physicians has gone to California to recuperate, we hope ere long to welcome his return with health thoroughly restored.

The Empress Augusta of Germany has sent Mrs. Dorrien Smith a gold and jewelled bracelet, and two ladies of Penzance brooches, in recognition of their kindness to the passengers and crew of the German steamship Schiller, which was wrecked at the Scilly Islands last year.

They say the Guikwar of Baroda had on $10,000,000 worth of jewelry when he received the Prince of Wales. An effort, it is rumored, is to be made by the police detectives of this city to induce him to visit New York, and take a walk up Baxter street at night during his stay.

The American Watch Co., of Waltham, Mass., are making extensive preparations for the centennial, by constructing the most perfect machinery ever seen on this continent, to be employed in the manufacture of watches before the astonished gaze of the multitude who will throug the centennial buildings.

Really, this is the Swindlers' Carnival. The Northampton Bank burglary, the Winslow forgeries, the New Brunswick defalcation, the Adams Express robbery, the Toledo express car fiasco, and the number of fraudulent failures in the jewelry business, all make up a category of crime which don't point to the millennium as imminent.

President Eliot, of Harvard University, says in his annual report that the late Prof. Winlock's ingenuity secured to the Observatory a permanent income from the sale of the exact time to cities, railronds, and watchmakers, and that half of this income, amounting to $1,000 a year, will be paid for five years to his widow and children.

Several meetings of the creditors of Charles Rosenbaum, manufacturer and dealer in jewelry, No. 12 John street, have been held relative to a compromise. A number of the creditors have agreed to accept twenty-five per cent, but the others are holding out for better terms, believing that the assets warrant a larger amount.

David K. Pierce, of Waterville, N. Y., who was recently arrested on a charge of having set fire to his jewelry store for the purpose of obtaining the insurance, has been convicted of arson in the first degree and sentenced to hard labor in the State Prison for life. George Woodruff, Pierce's accomplice, received a similar sentence.

There is on exhibition in the window of a Chestnut street (Philadelphia) store a very valuable French clock—the only one of its kind in America. It was patented by the French Republican Government, and made expressly for the Centennial Exposition, at a cost of 3,500 francs. The clock is for presentation to General Grant after the Exhibition.

A French machinist has discovered that by keeping his turning tools constantly wetted with petroleum he was able to cut metals and alloys with them, although when the tools were used without the oils their edges were soon turned and dulled. The hardest steel can be turned easily if the tools be thus wet with a mixture of two parts of petroleum with one part of turpentine.

The Chinese watch the pearl mussel closely, and when it opens its shell insert pieces of wood, lead or coal, or little images of their gods. These irritate the fish and cause it to cover the substance with a pearly deposit, which hardens and forms an artificial pearl. This sort of pearl making is carried on to a great extent at Ning-po, and the articles thus obtained are considered very little inferior in value to the real.

A jeweler of Lyon, a certain M. Carriat, has lately died, leaving the whole of his fortune, estimated at 500,000 francs, to the town of Bourg, where he was born. M. Carriat always lived with the utmost economy, and was indeed generally considered a miser. But it seems now that his object, far from being the mere accumulation of wealth, was to create in Bourg an establishment to be called the Institution Carriat, in which should be gratuitously taught drawing, geometry, and mathematics.

The Swiss Benevolent Society held its annual meeting on the evening of the 29th ult. at No. 864 Broadway, and elected the following officers: President, Alfred Merian; Vice Presidents, Christian Ealles, A. Nicoud, and A. Houriet; Treasurer, E. Roberts; Assistant Treasurer, J. J. Keller; French Secretary, Perrelet; German Secretary, G. Paillard; Agent, E. De Cranzat. The report of the Treasurer gave the total receipts of the year at $6,620 47, and the disbursements, $5,394 27.

The Society of Arts of Geneva, in celebration of its centenary, proposes to have an international competitive trial of pocket chronometers and fine watches, to be conducted at the Geneva Observatory under the superintendence of the Director, Professor Plataman. All timekeepers for competition must be delivered at the Observatory before noon of the 14th February, 1876, and must be accompanied by a certificate bearing the number of the watch or chronometer, the name of the maker, the name of the timer, a description of the escapement and of the balance-spring, and any other details of construction—independent seconds, chronograph, fusee, &c.—*British Horological Journal.*

A Worcester gentleman recently sent a very fine French clock to a well-known jeweler to be repaired, saying that he wished each item of repairing specified. The following is a copy of the bill rendered:

To removing alluvial deposit and oleagginous conglomerate from clock a la French	$0.50
To replacing in appropriate juxtaposition the constituent component parts of said clock	0.50
To lubricating with oleaginous solution the apex of pinions of said clock	0.50
To adjusting horologically the isochronal mechanism of said clock	0.50
To equalizing the acoustic resultant of escape wheel percussion upon the verge pallets of said clock	0.50
To adjusting the distance between the centre of gravity of the pendulum and its point of suspension, so that the vibration of the pendulum shall cause the index hand to indicate approximately the daily arrival of the sun at its meridian height	0.50
Total	$3.00

The Jewelers' Circular & Horological Review.

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THE

Jewelers' Circular & Horological Review,

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

THE RECOGNIZED ORGAN OF THE TRADE.

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D. H. HOPKINSON, 269 Pearl Street, New York.

Advertising Rates made known on application.

Removal.

The office of this journal will remove, May 1st, to No. 42 Nassau Street, corner of Liberty, where we shall be glad to see our friends.

Our New Dress.

We had hoped and, we may confess, expected that the improvements in the JEWELERS' CIRCULAR which mark the commencement of this new volume, would be pleasantly appreciated by the trade. But we must express our agreeable disappointment to find how general, hearty, and even enthusiastic has been the reception which our friends have given it. Over sixty congratulatory letters reached us the first day that we began to hear from the trade, and they have been coming in steadily since until we have more than four hundred of such cordial and welcome indorsements. These kind words and the practical appreciation associated with many of them, give us reason to push forward our work and take further steps to bring the JEWELERS' CIRCULAR up to the ideal we have formed for it.

The great value of a trade paper is as a means of communication between the several parts of the trade, and our circulation among all classes gives us the advantage of reaching each class with the opinions of every other. It is as though the whole trade were gathered together into a large hall for the purpose of talking over in orderly debate the various questions in which they are severally interested. Just as the presiding officer of such an assembly would call upon the most experienced men of the trade to give their views upon the questions most interesting to those concerned, so it is our endeavor to draw forth, either directly or by voicing them in our own editorial remarks, the wisest thought and advice that the experience of the trade can give.

Our desire is to make the paper a friendly and useful medium of communication between the manufacturer and the interior dealer, and *vice versa*. We cannot carry out these purposes without the assistance of the trade, but that assistance we have so far had, and for it we are heartily grateful. The success of the paper, let us say again, is based directly, however, upon the *practical* support which we receive, and we are encouraged by the words of cheer which have been sent to us, to hope that in this respect also the improvements in the JEWELERS' CIRCULAR will be fully justified.

The Repeal of the Bankruptcy Law.

It is too often the case that the imperfections in something essentially good lead the thoughtless to cry out for its abolition altogether. Instead of bettering the condition of things, this only makes them worse. There is no little danger of our falling into this plight in regard to the bankruptcy law. Its entire repeal would plunge us into the old chaos when every state had a bankruptcy law of its own, if it had any at all, and the merchant was forced to make his calculations according to the provisions for his protection in each state. In some there was opportunity for him to get what was honestly his own; in others, such was the looseness of their legal machinery that the bankrupt was pretty sure to evade payment altogether.

A measure to repeal the bankruptcy law has already passed the House, and is now before the Senate for action. The mercantile community has already entered protest, through the Chamber of Commerce of New York, against so sweeping an act as this, and it behooves every merchant, especially in these times when bankruptcy is so common, to exert himself to keep this law on our statute books. It is worth noting that many who at first signed a petition for its repeal, have since withdrawn from that, and asked simply its amendment.

We have many times pointed out its imperfections and the difficulties in its workings, but we have also pointed out that these are to a certain extent inherent in any bankruptcy law, and have shown how dangerous would he the experiment of conducting business without it. Let us repeat that the difficulty about bankruptcy has been after all not so much because the law was imperfect, or because the law was not fairly executed, as because merchants themselves have been so weak in asserting their rights under its provisions. No law can ever take the place of commercial common sense, and so long as our merchants are "easy" with chronic compromisers and dishonest bankrupts of all sorts, so long they will be crying out against the law and making it a scapegoat for their own weakness. This has already gone too far. We want the law amended until it becomes as perfect as it is possible for a law of this sort to be, but do not let us lose it altogether. The merchant who advocated its repeal would, in the event of his success, soon find himself "hoist by his own petard."

More About the Compromisers.

The growing reformation in the trade as regards credit and bankruptcy compromises has not prevented there being an unusual number of candidates for compromise honors during the past month, some of whom, we are sorry to say, have made disgraceful showings of knavery and rascality. These fellows are nevertheless doing good service in waking up the trade to the importance of giving fraudulent and improvident dealers the cold shoulder, and we are glad to hear that certain houses who have heretofore been very lenient in cases of compromise, have determined to take their part in purifying the trade, by making things uncomfortably warm for the vultures who are doing business on the plan that the trade owes them a living, which they are bound to get in any way they can.

A week or two since one of our leading firms had the usual notice of "wanted to compromise" from a dealer in a neighboring state who had partly succeeded in effecting a settlement with a considerable portion of his creditors. Feeling that there was no special call upon them to compromise in this case, since the would-be-bankrupt made no especial showing, they were

disinclined to accept the offered terms, and this as usual called out the offer that they might then have a little extra percentage over the other creditors. We are glad to say that this proposal to compound felony called forth the righteous indignation of the house, and they determined to prosecute him. They succeeded in getting the fellow to New York and had him locked up on a charge of false pretenses, and now his statement must be of a different sort. This is the only true way of dealing with this class of men. Dishonest bankrupts must be made to understand that dishonest bankruptcy is a criminal act, which the law punishes, and for the punishment of which the merchants mean to invoke the law. We trust that the firm who have had the backbone to assert their rights, and to vindicate the rights of the honest part of the trade, will be sustained by other houses in their good work.

But we are sorry to see that there are those whose determination to prosecute dishonesty is very soon weakened when they begin to feel that they might have made a little more out of the bargain by compromising at first, or to find that it is to cost them a little to give a man his deserts. There are certain of the creditors in the notorious Strasburger case who seem already disposed to take this view. We wish to say to them directly, on behalf of the trade, that this case is peculiarly one in which all respectable houses should stand firmly by each other. It is not now a question of how much money they will get, but how many years the man who tried to victimize them will get, and whatever money it costs to prosecute him to the bitter end they may very well enter in their books on a commercial insurance account. The punishment of this man is likely to save them no little money in the future, for it will do much to deter others like him from attempting any more such practices on the trade. They will save money by and by, by spending it now; and any compromise which should permit this man to go free, or which should mitigate his punishment for the sake of getting a few cents more on the dollar from him, will he, we say openly, a disgrace to all the houses concerned.

High Rents.

The landlords of the Lane are doing their best to kill the goose that lays the golden egg. The high rents at which they are holding all the desirable offices in Maiden Lane and John street are exerting no little influence in driving the dealers up-town, and the exodus produced by this extortion of owners will, if they don't soon change their policy, react upon them in a way which they will not very much like. No trade can afford, in this period of commercial depression, to pay the rents which have been asked in New York for the past few years; nor is the jewelry trade an exception to the rule.

The amount of business at present does not justify the extravagant rents generally charged, especially since the profits of the business seem to be growing smaller year by year. Certainly no other class of merchants can afford to pay the rents demanded by the owners downtown, and it will soon be a question with them whether they prefer to leave their stores and lofts vacant, or to reduce their prices in accordance with the temper of the times. We suspect that the trade will not much longer submit to the greed of grasping landlords, and unless the latter change their tactics soon, they may have no more chance until the birds are flown. Will they be wise in time?

We fear that these remarks will apply only too well to other centres besides New York, since the jewelry trade is generally esteemed by outsiders such a mine of wealth that nothing is too much to ask from them. We do not wish to depress the credit of our own trade, yet we may say that even in a trade where all are *millionaires*, there is a limit both to patience and to pockets.

Commercial Travelling.

We presented in our last issue some few thoughts as to the importance of the system of commercial travelling, and the necessity for the employment in it of the best class of men. We did not cite one of the most interesting features of this question,—the customs of the English trade in this particular as compared with our own. If we may judge by the experience of England, commercial travelling is still in its infancy in this country, for it is estimated that, large as is the army of "drummers" here, there is proportionately but one "on the road" here to five in England. If our business system is to follow the development of that of England, it becomes of five-fold importance that the character of commercial travellers should he high indeed, and that the system should receive the most careful directing attention. By many observers, the commercial prosperity of England in her internal trade is attributed largely to the excellence and activity of her commercial travellers. There, men are specially educated for what is almost to be called the profession of commercial travelling. A first class traveller takes with him always his sample boy, who is an apprentice in the business. He has charge of the care, packing, and so forth, of the samples which the traveller carries with him, and is expected to be alongside of the traveller, and to keep his eyes and ears wide open. In this way he learns "the road" and the individual men upon the routes which his principal covers, and by the time he gets old enough to start out for himself, he has a knowledge of his work which could not have been obtained in any other way, and which is of invaluable importance to his employers.

But there is another thing to be said as between European travellers and our own. The limited ground which the former have to cover, makes their work easier in a double sense. Their business is more compact, and the number of individuals with whom they have to deal comparatively less. Moreover, the great territory over which our missionaries of the trade must travel, requires a physical endurance far beyond that of their fellows across sea. Thus, the standard of our commercial travellers should not only he equal to that of the English, but even beyond, because they have to endure a mental and physical strain before which the European travellers would shrink. We will not reiterate here the points which we brought forward in our previous article; but we may say that the carelessness and recklessness of employing inferior men has brought upon the system in this country a taint which has gone far to condemn it in the eyes of many cautious and wise business men. Perhaps it is not the system, but the imperfections that they are really criticising; but in a future number we propose to take up their side of the question, and show both the dangers of the system and in what way these can best be counteracted by the influence of employing houses, and the travellers themselves.

An Unwise Rivalry.

An evil is beginning to manifest itself in the trade which has been so dangerous and far reaching a source of demoralization in other branches of business that it should be nipped in the bud, before it goes any further. This is the evil pointed out in our last issue by "Fair Play," whose letter has called forth many endorsements from other dealers in different parts of the country. More than one wholesale house has been sending price lists and illustrated catalogues in open envelopes through the mails addressed to private parties outside the trade, acquainting them both with the wholesale prices and the trade discount of their goods. In one case cited by a correspondent elsewhere, a firm in New York expresses a desire to appoint an agent for their goods in the locality addressed, who is not engaged in the jewelry business, and although this is, we presume, an example of a petty trick which is played upon any number of people in the same town, it is a plain illustration of the method more straight-forward manufacturers are beginning to pursue. In other words, wholesalers are making bids for an order trade, and entering into direct and cut-throat competition with their own trade custom.

This is one of the foolish attempts in which reasonably wise men often indulge, to ride two horses going different ways, at the same time. If a house is to sell goods to the trade, it must allow to its customers a reasonable chance to earn their living profit. A retail house cannot sell at the prices of a wholesale house and pay the wholesaler's bill at the rate of a hundred cents on the dollar,—at least they cannot do it until two and two make five on profit account, and only three on expense account. The firm alluded to by "Fair Play" are diffusing information which does not advertise them favorably to honest men in the trade or out of it, and dealers are already taking the remedy in their own hands by refusing to deal with such houses. Every

dry goods clerk knows from them for how much he can buy a 14 karat wedding ring marked 18 karat, and how much a pennyweight he must pay for a 9 karat chain marked 14 carat, and his first deduction is that all the goods he finds at a jewelry shop are of the same sort. Now this thing must be stopped, if there is to be any prosperity in the trade.

We are not speaking merely of those who advertise dishonest goods, but we are protesting against the manufacturer offering goods to the public at a price which the retailer cannot make to them without going into bankruptcy sooner or later. The mere circulation of the information is itself bad and unwise. It may be said that the public should be willing to pay the retailer a reasonable profit for the service he does him in bringing goods to his place and offering him a selection from which to choose; but the public has too much human nature not to be anxious to buy wherever it can buy cheapest, and without any consideration for the interests of its neighbor the local tradesman. The matter of wholesale prices and trade discounts should therefore be a trade question entirely, and the trade are making up their minds to cease buying from houses that give publicity to what should be considered private information. The retailers do not wish to obtain from the public any more than their legitimate profits, but the advertising of discounts is very sure to create public dissatisfaction which, ungrounded as it is, does the retail dealer any amount of harm. We warn the manufacturing trade that they are doing only harm to themselves by any such attempt to break down the retailers, for an attempt to break down the retailers this course certainly is.

Obituary.

VICTOR BISHOP.

We have the sorrow of recording the death of Mr. Victor Bishop, a man so honored by the trade that his death is felt as a calamity. Mr Bishop was prostrated February the 28th, and died at his residence in this city at 4 A. M., Friday, March the 10th, after torturing pain, of gall-stone, from which he had for a long while suffered severely.

Mr. Bishop was born in Paris, in 1819. He came to this country while a young man, and settled in business in this city in 1837 as an importer of precious stones and corals. He married a widowed sister of Mrs. Jas. Gordon Bennett, and a son survives to continue his business.

For nearly forty years Mr. Bishop has been a member of our trade, and throughout it there has been no man more honored, admired, and loved. Among the importing trade, he stood in the foremost rank, as a merchant of integrity, a courteous and high-minded gentleman, who had kind words for all and yet knew when honor demanded a "no." It is told of him that in his last hours, agonized into delirium, he imagined himself the chairman of a meeting of creditors and made a noble and impassioned appeal for honor and integrity in the trade. To recall him,—for to direct address his mind kept perfectly alert,—his son caught his fancy and moved that the meeting adjourn. Mr. Bishop put the motion, declared the meeting dissolved, and then sank into a sleep, from which he did not wake.

We feel that we suffer in him a personal loss, for among all the staunch and kindly friends the CIRCULAR has won we have been permitted always to count him among the first. By his words and his pen, his hearty support and his inspiring encouragement, he has done for us more than we can hope to acknowledge.

He has been buried in Greenwood. Of him above most men it may be written, he sleeps the sleep of the just. In so great a loss we almost feel it presumptuous to attempt to offer to his sorrowing family the condolences of the trade.

Pawnbrokers.

The function of the pawnbroker is an important one in every modern society, and without it the suffering among the poor would be vastly greater than it is. On the other hand it can be made by men without conscience a most terrible engine for the oppression of the poor. The solution of the difficulty has always been that the business of pawnbroking should be to a considerable extent under legislative restriction, police regulation, and to some extent, surveillance, since the chief danger of the system is that it affords to thieves an opportunity of disposing of their booty, which is a temptation to them to steal. This last difficulty becomes a serious matter when, as in too many cases, the easy virtue of the pawnbrokers leads directly to the development of a class of juvenile thieves who soon grow to be professionals.

A bill has recently been introduced into the legislature by Mr. Bradley which proposes to place new, and in many respects, desirable restrictions upon this business, and we are glad to learn that the present session is likely to bring about important modifications in the system. The proposed law raises the license fee from $30 to $250, and requires security in the sum of $2,000. It demands also a written report made to the chief of police, and open only to the police officials, of all property pawned, with a full description of it, a statement of the amount loaned upon it, the time of its being pledged, and the residence of the party pledging it. No pawnbroker may receive more than 15 per cent. interest on any loan within $50, or 7 per cent. upon any exceeding $50, under a penalty of $500 for each offense. No goods may be received from minors, and the goods can only be sold at public auction after notice, and a year after their receipt, the pawnbroker himself being prohibited from purchasing the goods offered him in pawn.

The jewelry trade have considerable interest in seeing this useful and yet dangerous business properly regulated. The material of their trade is that which offers the greatest temptation to the petty thief, and a system of pawnbroking which breeds thieves is pretty sure to have a direct effect upon their business. The law which we have summarized seems to be just and wise, although there may be question whether the restriction to 7 per cent. is not such as to impair the profits of the business over much. It should be an essential principle of law-making that no laws should interfere with the natural principles of trade, or its natural rewards; and in a business attended with considerable risk, as pawnbroking is, there must be a considerable profit to insure this risk. Doubtless, however, any such unwise restrictions will be only too easily removed from the bill in the process of amendment, and we heartily add our voice on behalf of the trade in support of the measure. Similar bills should receive the attention of legislators in other cities, although of course their most important effect is in a great metropolis like New York.

M. Grossmann.

We are glad to learn that our friend and contributor, Prof. Grossmann, Saxony, has attained to the honor of an M. P., as he informs us in a private letter of charming modesty. The liberal party of his district has just placed him as its representative in the Saxon Parliament by a handsome majority, and if he will only do as good service for his country as he has for the trade which is so much indebted to him, the electors will be well satisfied with their choice. "18 karat" men are wanted in politics, wherever it may be, and Prof. Grossmann is a worthy representative of that order.

An Important Decision.

A decision has just been rendered by Judge Blatchford in the bankruptcy case of a member of the trade which will be of interest to business men generally who have to do with bankruptcy matters. The marshal in the case of Mr. Philip Rein filed his bill of costs with the clerk of the court, amounting to $141.35, and the assignee consented to the taxing of the bill at $391.50, drawing a check for that amount. This the Register refused to countersign on the ground that he must hereafter audit the accounts of the assignee at a general meeting of creditors. The judge holds, however, that as respects the marshal and his bill, the assignee represents the bankrupt and his estate and the creditors, and it is proper that the bill should be taxed without waiting for the assignee's final accounting. It is right that the assignee should be notified of the taxation, but it is not necessary to notify the creditors.

Trade Novelties.

Owing to the lateness of the season and the continued dullness, not many novelties or new designs are at present shown, though there is a marked revival of old styles, both in costly ornaments and in the cheaper lines of ladies' fancy jewelry.

In fine goods the mixture of platina with gold is specially observable, not only in settings, but in ladies' and gentlemens' watch chains, studs and sleeve buttons. Where it is used with the most success is in diamond setting, giving a peculiar limpidity to the stone not obtained heretofore by any other style. Diamonds when set in gold, with the setting set back so as to be almost imperceptible, preserve almost the same dew-drop crystal-like appearance, although the whiteness of the platina points, as can be readily imagined, seem to add to their transparency.

A very elegant and striking design in the narrow circlets of gold now in vogue, is a band as narrow as the *porte-bonheur*, but clasping tight to the smallest part of the wrist, enameled in black half way around, and having a single diamond or pearl of special beauty and purity set in the centre in an invisible setting. Another of these thread-like bracelets has three pearls, a white oriental, a pink, and one of a pale chocolate color, set transversely in an arabesque of gold.

In rings and sleeve buttons intaglios are more in favor just now, than they have been for many years past; they have claims as works of art which recommend them to the cultured few, and keep them among the things which can never be said to be out of fashion. The new designs are chiefly heads, portraits in most cases of the old masters. Some very beautiful sleeve buttons are in amethysts, and in cornelian, somewhat larger than those which have been worn, with a different head on each button, and set in a rim of platina and gold, very nearly a quarter of an inch thick.

Gentlemen's ornaments are so limited, that it seems to test the ingenuity of manufacturers to bring out new designs in any thing worn by them; however a few novelties, in the shape of pendants for the watch chain, challenge admiration both for the beauty of their workship and for their oddity, such as a lead pencil in the shape of a screw, a circular match safe, and sporting pendants, one being a combination of stirrup and horse shoe, and another a horn, horse shoe, whip and jockey cap.

The "dog-collar" is for the moment the favorite in necklaces, but as it is an ephemeral style depending altogether on the present fashion of high ruffles, it is not made up in the expensive designs found in the staple lines of necklaces. A beautiful and effective style in the latter is a Grecian pattern in small round pendants, connected together in Grecian lines and richly decorated in *cloisonne* enamel.

The pendants worn on massive gold chains are as far as price is concerned really *objects de luxe*, as they seem to exhaust labor and ornamentation in the elaborateness of their finish. They are standard goods and are in every kind of work, raised enamel, colored crystal, *cloisonne*, and set with diamonds, pearls and every possible combination of precious stones.

The Pompeiian design is the one chiefly sought for in coral. Some beautiful sets are in the market, in the rare pink coral, carved in fruits and Bacchante heads, made where possible of only a few pieces of coral, thus rendering the ornament of so much more durability than those made in the old leaf patterns.

Clouded and clear amber, in beads, necklaces, earrings and brooches are again being worn, as are also the old fashioned shell cameos; one house in this city has had quite a demand for brooches in cameos, and has in stock quite a number set in the old style plain gold setting, with a twisted gold wire.

The oxidized silver sets which have come and gone, in fashion, for so many seasons, and which hold to the ladies' affections so tenaciously, we can scarcely tell why, for they have not heretofore been beautiful either in design or form, are again among the novelties; this time they appear mixed with gilt and are extremely well finished and in very delicate as well as rich and massive patterns. The lighter patterns are in open work of arabesque; a favorite in the heavier patterns is a dark steel-color brooch and earrings in a Grecian outline, with the lion of St. Mark upon them.

A decided novelty in shell goods is the Centennial comb, with a moderately high and elaborately carved back, representing a spread eagle surmounted by a liberty cap, with a female figure on each side adorning it with laurel leaves or some other appropriate emblem. Very rich styles of carved shell combs are in the market, not so striking and costly as the foregoing probably, but likely to be more popular.

Fans remain in the moderate sizes of the past season; the new goods combine various past devices, such as ebony, satin and marabou feathers together in equal parts, and in white, mother-of-pearl, satin and marabou feathers, or ostrich feathers in gray or any of their natural colors. Plain shell fans or ivory fans come in elegantly satin lined boxes of the same material. Quite a large business is done by Tiffany & Co. and Schuyler, Hartley & Graham in painting fans, from designs furnished by their customers; both firms also keep on hand a line of lace coverings for fans, in black thread and *point applique*.

In fancy goods the newest thing is a blue velvet odor case, encircled with a band of oxidized silver having raised figures. It is extremely elegant and tasteful.

Schuyler, Hartley & Graham have a line of travelling clocks which are among the very best of these handy little time pieces. They possess a most musical strike, the hours, halves and quarters sounding with a clear ringing peal, like a miniature cathedral chime. They can be had in all styles and consequently in all prices, from $20 to $125, a few even selling for a trifle less than $20. Of course the highest priced ones have all the improved attachments in the way of chimes, gongs, repeating, alarms, etc., or to specify they can be bought with or without the "cathedral chimes," which sounds two beautiful notes for each quarter, with or without the alarm, and with or without the repeating attachment, which upon being touched sounds the hours or quarters, a most excellent arrangement for night travelling. They are put up in a leather case with a sliding side which can be removed, exposing the face of the clock. There is a variety even in the faces, some being entirely plain, others decorated and enameled in colors. This same house has a most exquisite line of silver bronzes with gilt shadings, an entirely new article in the trade. All the regular articles, such as card receivers, mantel ornaments, etc., are made in it.

The Gorham Manufacturing Co., in response to the demand for cheaper goods to meet the exigencies of the times, has manufactured a line of bowls in sterling silver, for fruit or salad, of exceedingly graceful shapes and adorned with some of their finest borders in the mask pattern, in griffins, and in their favorite wedding border, a broad band with figures emblematical of Hymen. They are in satin finish and in plain polished silver, and are put up with or without a fruit spoon, in handsome satin lined boxes, to serve as wedding presents for people of moderate means, none of them going beyond one hundred dollars in price. This house has also something new in the way of majolica claret jugs, which they have imported and mounted them selves with very handsome silver covers.

Tiffany & Co. manufacture an assortment of polished brass goods, which may well compete with the imported articles. Their *Louis Treize* sconces, of which they have out an entirely new pattern with a porcelain plate under it, are doubly as brilliant as the imported ones and are in many new and various devices not seen before in these goods. They have a new match safe in polished brass, to hang on the wall, with a drawer under it to hold the burnt matches. Another new article is a massive inkstand of a *Louis Quatorze* pattern, and a small bedroom or study candlestick supported by a dolphin. Their sconces which we mentioned before, in polished brass with mirrors and porcelain tiles, sell from sixteen dollars upwards.

We commend to the trade as not impertinent to present questions, a recent utterance of the Rev. Adrondack Murray:—"Heaven is not populated with singing thieves, or palm-bearing bankrupts, who settle with their creditors at twenty-five cents on the dollar Wednesday, and ride to church the next Sabbath in a thousand dollar coach, with a man in livery on the box." We don't know that this consideration will restrain the "chronic compromisers," but we look to the trade to give it a mundane application.

Practical Hints on Watch Repairing.

By Excelsior.—No. 12

(186) Regulating a fine watch is an operation which but few workmen are capable of doing properly, or, indeed, without injuring it. And even with the cheaper grades of time-pieces, there is more in it than many suppose. When a watch is merely cleaned, or the repairing of it does not require any alteration of the hair-spring, the greatest care should be taken, especially with fine work, that it be put together precisely as it was before. The regulator should be at the same place, and the hair-spring should occupy the same position between the regulator pins, as before it was taken down. To insure this, a careful examination should have been made, with the balance at rest free from the motive force of the main-spring, and the position of both the regulator and hair-spring noted down—for in a fine watch both of them have probably been carefully adjusted, and changing either of them or opening or closing the regulator pins might seriously damage the adjustment. Even in cheap watches, following this rule will frequently save several days in bringing them to time.

(187) But if a watch does not perform satisfactorily on trial, or if the workman is sure from inspection that it will not do so, the defective conditions must of course be changed and corrected. I have already stated how the hair-spring should be pinned in the collet, (34, 38, 41,) and stud, (45, 46); that it should be perfectly free from constraint when fastened in the movement, (47); that the outer coil should stand perfectly free between the regulator pins as they are moved through the whole of their sweep from "slow" to "fast," not moving nearer to or against either pin at any point in the sweep; and that the regulator should stand pretty well back towards the "slow" when the watch is regulated. The pins should both be tight in their places, so that they cannot yield any when the spring presses against them. If one of them has a foot, to close the bottom of the opening between them, the spring should be entirely free from it, nor should any dirt be allowed to accumulate there and touch the spring.

(188) As a general rule, the regulator-pins should be as close together as possible and yet leave the spring free between them, (68.) But if they are found otherwise, they should not be closed without good reason, for they may have been so opened for a purpose, by some one who fully understood the effects of so doing. But wide pins may justly be regarded with suspicion. The effect of having the pins very open is not only to render the spring less susceptible to control by the regulator, but also to cause sudden and violent checks to its motion, making uniform progression of force (141, 152) difficult, if not impossible. Moreover, the spring vibrates upon the pin against which it rests, as a fulcrum or pivot, moving in one direction on one side of the pin, while back of it it yields in the opposite direction. Sometimes the spring will even slide along the pin with every vibration. In either case, an irregularity of motion results which is injurious to its proper action, and should be avoided whenever the position of the regulator-pins comes within the scope of the repairer's duty.

(189) I have also described mechanical conditions for other parts of the movement, essential to fine time-keeping, and which should be looked to (82, 85). I now call the attention of the workman to a very general fault, viz., leaving the end-stones loose in their caps or settings. If they are not set and held in the metal they must be cemented fast, for no watch can keep time with the cap or foot jewel shucking around, constantly changing its position, falling down upon the end of the pivot, or falling away when the pivot rests on it, perhaps turning up more or less edgewise and pinching the pivot against one side of the jewel-hole. It is by no means rare to see a cap jewel wobbling about with every motion of the balance, upon whose pivot it is resting. It is an invariable rule that the jewel must be fast in its cap, and the cap fast in its place.

(190) To cement the jewel in its cap or setting, take a small fragment of shellac, and melt it in the socket of the jewel, over the lamp. Then lay the jewel on, right side up, melt the wax till the jewel sinks into it, and quickly turning the cap over lay it upon the paper on your bench, and press it down with the tweezers, to bring the cap in contact with the paper. This forces the jewel into the soft wax up to its proper place where it has the support of the metal, and insures that its surface will be level with the cap. If not so, it must be heated again till it becomes so. Generally, a cap or foot jewel should be just even with the surface of its setting or cap, not lower, nor sticking out any above it. But cases occasionally occur requiring a variation from this rule.

(191) A cap or foot jewel must invariably be fixed parallel with the under surface of the cap, or the upper surface of the slip, so as to present a perfectly horizontal support for the end of the pivot. Otherwise, it will slide down the inclined surface of the jewel and be wedged in against one side of the jewel-hole. This point must be carefully attended to. In the case of a foot jewel, which is out of sight, a little wax left outside of the jewel does no harm, and considerably strengthens the jewel. But for cap jewels, where no wax must appear to the eye, after prying the cap off the paper, and scraping the superfluous shellac from the under surface, to see that the jewel is flat and true, lay it down on the bench, jewel underneath, and carefully scrape the wax from the outside of the socket, without loosening the jewel. It will do no harm to leave a very little around the edge, as by again melting carefully, (and pressing down on the bench as before), it will take a smooth, shining surface, and not be noticed. There are many workman who denounce "sticking jewels in" with shellac as botch-work. So far as hole jewels are concerned I agree with them, but with cap and foot jewels it is often a necessity, and it is certainly far better than to plug the holes around the jewels with paper, slivers of wood, etc., as we see every day. Doubtless our carping friends would sooner leave them loose than "stick them in" with wax. But then, *some* people are so *very* nice!

(192) The manner of taking observations of the sun or stars for correct time, by transits, quadrants, sextants, dipleidoscopes, and many cheaper contrivances, does not properly come in here, but I may consider it in the future. Supposing that you have a good regulator, the watch is to be set by it exactly. I will only say here that the seconds-hand should never be moved after it is properly fastened on its pivot, but when it is just at the 60 the balance should be checked by a brisk and held so as to start off when it is raised, which should be done just as the seconds-hand of the regulator strikes its 60. Then set the minute and hour hands. These must not interfere, nor touch the dial or glass, nor have too much movement up and down.

(193) If the minute hand, cannon pinion or center post, is suspected to touch the glass, place the thumb-nail on the glass and run it along just over the hand, and by getting the light right, and looking through the edge of the glass, you can see the exact distance between its under surface and the hand. Or, turn the hands and listen for any grating or squeak. Also, look for any mark on the glass over the cannon pinion. If there be the slightest evidence of touching, the end of the pinion or center post must be taken off a little, or its end-play confined, or else a higher glass substituted. Be sure to turn the minute hand once around, examining it frequently to see that it nowhere touches either glass or dial, and does not "cant up" on one side and down on the other. If it does, the centre-pinion wants uprighting. Also try if the hour hand is perfectly free of every point during this revolution of the minute hand. If not, it must be made so, for any binding will affect the time if it does not stop the watch. A black mark in the hole in the dial shows that either the hour wheel or the socket of the hand rubs there. If the hour hand trembles or bobs or jumps as it is turned, it shows something wrong about the fitting of the dial wheels. If the seconds-hand points higher on one side than on the other, bring the hour hand over it at its highest position to see if there is any possibility of their interfering. Also try if the point of the minute hand can touch it anywhere.

(194) In putting together a movement, the dial should first be fastened so that it cannot move about or become loose, then the seconds-hand should be put on and trained as closely as possible to the dial without touching at any point of its revolution. The hour-hand is next put on firmly, turned to point exactly to the I, and the minute-hand put on pointing to the dot of the XII. This position will cause the hour-hand to point correctly to all the other figures, if the dial is

correctly marked. In fitting it upon the hour wheel, the bour-hand when at its lowest end-shake must clear the seconds-hand at its highest, and the minute-hard, in turn, must clear the bour-hand at *its* highest, and, finally, the glass must clear the minute-band at *its* highest point.

(195) Hence the play of the different hands should he no greater than will give perfect freedom of motion. If the hour-hand has too much play a spring foil washer should be placed on the hour wheel to prevent end-shake, but it must still remain perfectly free to revolve. The washer is not designed to exert any pressure upon the wheel when in its correct position, but only to prevent it getting out of its proper place and having unnecessary play. These washers are sold by all material dealers, and are so cheap that there is no excuse for the use of unyielding paper plugs between tbe hour wheel and dial.

(196) Finally, bring the minute over the hour-hand at the most dangerous place, hold the movement dial downwards, and with the key turn the minute-hand back aud forth past the other while in that position, watching closely when they pass each other. Too much care cannot be given to the perfect fitting of the hands and the mechanism propelling them, for any trouble here may prevent the most perfect movement from doing even decent service, and it is useless to undertake the regulation until it is corrected. If the glass is thin and it is suspected that it may be sprung down upon the center post and interfere with the running, put a little oil on the tip of the post, shut down the glass and press it cautiously with the fingers, after pushing the post to its highest end-shake. If any contact occurs the oil will be found on the glass. Or the oil can be left on the post while the watch is worn in the pocket for a few days, and the glass then examined. When satisfied that there is no contact, absorb the oil off the post with tissue paper.

(197) If the cannon pinion or center post is loose, it may be tightened by twisting the arbor or post around between the jaws of a pair of dull cutting pliers. The sharp edges raise a couple of ridges or rings around the arbor, making it practically so much larger. If too large, twist the arbor in the flat pliers, which will flatten the ridges a little, till they just fit the cannon or center pinion snugly enough to surely carry the hands, but no tighter than that. By holding the arbor or post *straight* across the jaws of the cutting pliers and using reasonable care there is not tho least danger of either cutting or breaking the post off, or even bending it in the slightest degree. If this operation will not enlarge it enough, it is better to fit a new one than to tighten it with bristles or to flatten it with a hammer as many workmen do, for the former lasts but a little while, and both are sure to make the post and hand one-sided and probably cause "canting," besides lengthening it and disarranging the dial wheel mechanism. When the post is soft and but little enlarging is needed, it is often done by rolling it between two sharp files with a heavy pressure, thus producing a multitude of fine burrs on its surface. In a cheap watch, the cannon pinion is sometimes filed in at one side, nearly to the hore, then a punch causes the thin metal to project into the bore enough to secure a tight fit.

(198) A cannon pinion on a center post must be proof against any possible accidental turning. But if on a center-pinion arbor, it must only be tight enough to certainly carry the hands. If it has a tendency to work up and become loose by setting the hands, making a ridge near the top end of the arbor will generally cure thus. But if the arbor is very much tapering, the part of it which forms the bearing in the cannon should be made more nearly cylindrical, or smaller at the base, then properly tightened. If the cannon pinion is tight enough in some places, but on turning it a little further around becomes loose, this fault should be corrected by taking the "humps" off the arbor, then ridging it at some place where it is round.

(199) In setting the bands, if they do not turn hard and the movement is in good condition, they may be moved either forward or backward,—the way which will require the least turning. But if they move at all hard, and the lever is short, they should be turned forward only, or the balance pivots may be bent or broken, or the watch stopped. Repeaters, alarm watches, and all complicated movements had better always be turned forward, at least by the customer, and by the workman also, unless he is perfectly familiar with the requirements of the movement in hand. If the hands move very hard they should not he turned at all, as damage is almost sure to bo done, but the difficulty should he ascertained and remedied immediately. All of the foregoing and any other defective points in the movement should havo been examined while taking it apart, and all repairs made either at once or at least before cleaning. But I have mentioned them here, because they are among the pre-requisites of the timing.

(200) In regulating a watch, the workman should remember the distinetion between an error in the rate and one arising from its not being in good condition. Having set it accurately, we examine it at iutervals and compare its time with the standard. If it gains or loses an equal amount in each six bours after being wound and set, and four times as much at the end of the twenty-fours as at the end of the first six, or even if it gains or loses the same amount in the last twelve hours as iu the first twelve, the error is one of rate, aud can be corrected by the regulator. In such case, we say it "gains," or it "loses," so much per day. But if it gains in the first twelve hours and loses in the last twelve, or the reverse, then we say it "varies," and the fault is not in the rate but in the condition of the mechanism—generally a non-isochronal hair-spring, (43, 82,) and the variation in the motive-force. The only remedy for this is to remove its cause, as directed in previous articles.

(201) Such a watch can only be regulated to produce a correct *average* at the *end* of each day, (43), and the customer must be impressed with the importance of winding it at precisely the same hour every day. It does not matter much what hour that may be, only he should choose one in accordance with his habits and which he will be sure to remember. Furthermore, he must compare its time with the standard regulator at the same hour of the day, for if he compares it in the forenoon at one time, and in the afternoon or evening the next time, regulating and setting on each occasiou, bis watch will soon keep no time at all. He may even set it in the forenoon, and in the afternoon of the same day find it a minuto or two out of the way, while it may be right again the next forenoon, twenty-four hours after setting, if it is not disturbed. A workman who fully appreciates this point may make quite inferior watches give tolerable satisfaction, while if he alters the regulator for the customer whenever be happens to come in the shop, or allows him to do it himself, his reputation as a workman will soon "poter out."

(202) In regulating, there is a certain order to be followed. Workmen often find watches stopped, and after cautious examination, and perhaps much loss of time, discover that they had forgotten to wind them; or they find a watch more out of the way after regulating than before, and cannot tell whether they had set it or not, after turning the regulator; or they will wind and set, but forget to regulate it. The proper way is first to change the regulator, the hands remaining as they were, so that no mistake can be made about the correct change required. Next wind the watch, lastly set it. After winding always give the watch a little shake, or be sure that it is going, as cheap watches often stop from winding or turning the hands backwards, etc. After winding all your watches glance over them, and if every one is properly set to time, you may be sure that they are also regulated and wound. By following the above rules invariably, you will nevor havo any doubts or mistakes. In regulating fine watches, either keep a memorandum book, or attach a tag to each, and note down the error and the date, thus: "Aug. 10, 45s. fast," "Aug. 12, 52s. fast," "Reg. and Set." Or the foregoing can be abbreviated into "12, 52 s. f., R. S." In this way you will know how long a time the watch has been in making the error, and what effect your previous alterations had; also whether the rate was regular or varied. Always turn the regulator too little rather than too much, and in fine alterations use the eye-glass to observe the amount of movement it has received, especially if it has a tendency to spring back.

When the watch is running closely, do not regulate it too often. If it gains ½ minute in a day, leave it so and see if it has gained one minute, the next day. If so, it will then be safe to turn the regulator. If not, the irregular spacing of the dial may have made the difference,

or the watch may have been exposed to the sun, or to unnsual cold or heat, or kept in a different position, or had different usage. In the same way, when the watch is running closely in the customer's pocket, do not alter it for a slight error, but tell him to remember how it is and try it a little longer. Common watches will vary more or less from the sort of usage they receive, and it is better not to correct each small error, but get them so they will *average* closely, whatever the variations may be from day to day, *i. e.*, they may ow be a little fast, and then a little slow, but the mean rate will be about correct.

(202) Many watchmakers do their winding at night. This is all right for watches known to be in perfect order, and therefore needing nothiug but regulation. But for custom watches, the preference is to do it the first thing in the morning, so that if any alterations or examinations are needed they can be made at once. If a watch is fonnd still, or acting strangely, at night, it may start on before morning, and every workman knows that the best time to examine into any trouble is while that trouble is yet in operatiou and can be seen, but it may escape notice or require a long search, if allowed to pass on. Besides, tbis work is a good preparation for the more serious labors of the day. No one feels like sitting down to the bench in the morning and plnnging right into some delicate job the first thing, but after winding he is ready to take hold of anything that is waiting for bim. Use always solid-pipe, well-fitting, bench keys for winding. Careless workmen ruin more winding-posts and bend more teeth by not following this rule than their heads are worth. When winding, tnrn the key, but hold the watch still. Many persons twist the watch as much as they do the key, at the risk of overbanking, breaking off the ruby pin, stoppage, etc.

(204) When watches are hung up they shonld not rest against a hard backing, nor be allowed to swing upon their hooks. Nor shonld they be subjected to any jarring or trembling of the supports to which they are attached. Especially to be avoided is a regular or periodical jarring or thumping, whose intervals may be in unison with the vibrations of the balance, whether exactly so, or coinciding alternately, or in any similar way. They should also be protected from both cold and heat, moisture and dust, and the customers must be instructed not to lay them on marble, metal or other substance that will rapidly abstract their warmth. Watches should not be opened where the air is much warmer than they are, as the moisture of the air is condensed by contact with the cold movement, causing rust of the steel parts on which it settles. The workman must keep the watch as nearly as possible at a uniform temperature while *regulating* it. If it is to be compensated for heat and cold, that is a separate adjustment, which has nothing to do with the rating.

(205) If watches are hung up during the day, while regulating, they should retain the same position at night; and if laid down days, they should also be laid down nights. A common watch will vary in different positions, but you are not to attempt to correct that error by regulating. After it has been closely regulated for hanging, in the shop, the finishing touches should be given while it is in actual use, and subjected to the regular treatment customary with its owner, who should be instructed to follow precisely the same routine every day. If he carries it during the day, and hangs it up at night, he should hang it up *every* night. If he lays it down at night, it should invariably be laid down, horizontally, and with the same side up, and protected as directed in the preceding section. Fine watches vary less from such causes, but they are also expected to run more closely than others, so that these rules are beneficial in all cases. It is by attending to such little matters that satisfaction is given, and it cannot be done without.

(206) If the watch cases are thin, they should be carried where no undue pressure can come upon them, to force them down upon the end of the center post and stop the hands or the watch itself. Always examine the inside of the case to see if there are any marks of touching. If so, the post must be shortened or otherwise protected. Ladies' watches often run very irregularly, or, stop, from being squeezed too tightly in their belts. But it is not much better to carry them in their bosoms, as there they are kept too warm and moist. The best place is a pocket in the dress-skirt just below the belt, made of a size to fit the watch. The pocket should not be too low. As for chatelaine watches, the workman should never promise that they will keep good time, for it is impossible for them to do so—swung and flopped and jerked and knocked about the way they are. The best place, for a man, is a pocket in the pants, where the watch will rest upon the abdomen, and be less affected by pressnre and blows than if resting against the unyielding ribs.

(207) If we find that the error in the rate of our watch is so great that the regulator will not correct it, or if the regnlator is already at the limit of its sweep, our course must be guided altogether by the circumstances of the case. Certain remedies may be justifiable in cheap watches, which would not only be utterly inexcusable in fine work, but would render the workman liable to prosecntion for malpractise and payment of damages for the injury done. We will first consider the treatment of common watches, reserving the questions connected with the regnlator of the finest movements, without injuring any of their adjustments, for our next article, as there is considerable to be said on that subject.

(208) If the watch loses time, we can take np the hair-spring enough to approximately correct the error, and finish by the regulator. Before taking off the balance-bridge see if the watch is in beat. If not, notice in which direction the error is, and how much. An over-spring watch, and some others, can often be put in beat without taking out the balance or stud, (removing only the balance-bridge,) by the use of the tool named in (51). But it is safer, generally, to take the balance out. First note the distance of the stud from the nearest arm of the balance, or from some screw in the rim, or other mark, and also the distance required to place it in beat, which will show what position the stud should have when in beat. Now draw the spring through the stud the proper distance and pin again. Next loosen the stud and take out the balance, bend the spring, if necessary, to bring it into proper shape, (46, 47,) and move the collet aronnd till the stud takes the correct position as noted above. See also (49). If the watch gains, we let out the spring in the same way.

(209) But if it gains and we have no spare spring to let out, we have three remedies, besides fitting a new spring. First, we can grind the spring on its under edge, till we reduce its breadth and weaken it sufficiently. To do this, take a flat piece of soft cork, considerably larger than the spring, and half an inch thick. Make one side very flat and smooth with a knife and sharp file, then cut a hole in the center to allow the collet to be forced in with one or two central coils while the grinding is going on. Spread the spring evenly on the cork, which should first be oiled a little to secure its adhesion, then lay the cork carefully down on a clean, sharp oil stone. Before moving the cork at all, press it down hard to slightly imbed the coils in its surface and cause them to retain their position while grinding, then rub it over the stones in circles in all directions, so as to grind the spring as evenly as possible. Keep the stone well oiled, don't grind too fast, press the cork down flatly by the finger on its center, do not move the cork without pressing it down, nor lift it up till you have finished. Then take it from the cork, absorb the oil by paper and finish by soaking in alcohol, dry, replace the collet on the balance-axis, pin in the stud, put in beat and try. Should the spring be soft, or from any other reason there should unfortunately be a "feather-edge" of metal on the coils, it must be removed by dipping the spring in acid (210). I have sometimes found springs on which the workmen had left long fibres like hairs, caused by this feather-edge splitting off, and almost preventing any proper motion of the spring.

(210) To weaken a spring with acid, it shonld first be cleaned from grease, etc., so that the action of the acid will be all over alike. This may be done by soaking it in absolute alcohol, or in a warm solution of caustic soda in water—such as is used to clean articles for electroplating. If the latter method is adopted, it should afterwards be soaked in clean water, then in alcohol. When the spring is dried off put a very little oil at each end of the hole in the collet, to fill the hole and keep the acid out. The acid is made by mixing in a watch-glass ten drops of water and one drop of the strongest sulphuric or nitric acid,

or more in the same proportion. Mix well with a bit of glass and immerse the spring for a few seconds or until it becomes black. No time can be specified, as it depends on the strength of the acid, size of spring and amount of action wanted, but great care must be taken not to eat the spring too much.

(211) Rinse the spring in water, and soak it in the soda to completely neutralize the acid, then in alcohol, and finally dry it off between folds of tissue paper. If you have no caustic soda solution, lime water, or a solution of potash, common soda, or salts of tartar will do to neutralize the acid. If the effect is thought to be not sufficient, the operation can be repeated. This process, if carefully performed, is safer than grinding and more equal in its effects, but it blackens the spring, while grinding does not produce any change of appearance that is visible while running. And probably the acid will least injure the isochronism of the spring,—a result which must in some degree follow every effort to alter the strength of a hair-spring, no matter how it is done. For this reason the following process may be preferable, as the hair-spring is not disturbed at all. But whenever any change is made, it should be as nearly equal as possible throughout the whole length of the spring.

(212) The third method is to make a plain steel, gold, or brass balance heavier, by tinning it. The spring and all parts that would be injured by heat must be removed, the lower surface of the rim scraped to get a perfectly clean surface, but the edges must not be scraped lest the tin should run up on them. Then rub over the scraped surface a little soft-soldering-fluid. Now take a strip of thick sheet tin, 1½ inches broad and 3 inches long, bent into the form of a letter Z, only the middle part is nearly vertical. The heat of the lamp is to be applied to the upper part, the middle being between the flame and the balance and conducting the heat to the lower part, upon which some block tin is melted and spread all over its upper surface. Take the balance in the pliers, at the junction of an arm with the rim, and, when the tin flows freely, rub it on this lower portion of the Z till one-third of the rim is well tinned, then treat the other sections in the same way. No more heat must be used than is necessary to make the tin flow easily, as too much would color the balance. Wash off in clean, soft water, *without soap*, then soak in alcohol and dry, being sure to remove every trace of the soldering fluid, which would rust the balance and other parts of the watch if it remained. To neutralize it, the balance, after washing, could be dipped into the soda bath (210), or in water in which a little common carbonate of soda is dissolved. Then wash again, etc., as above.

(213) Take off any lumps with the scraper, level the surface of the tin, and poise properly without the spring, etc. Then fit on the spring and proceed as in section (209). Many workmen do not allow that this operation is workmanlike, but if properly performed, and the change makes the weight of the balance more suitable than before, it would be difficult to raise any valid objection to it. Most certainly no injury, but an improvement, has resulted. It must be distinctly understood that I do not justify the two first methods in any but cheap watches, and even then it is hard to see why the workman might not about as well fit a new spring, which he could afford to do for a very little more, and no one could find fault. If he has no suitable new spring, the foregoing methods may be inexcusable. But the practice of scraping springs is not excusable under any circumstances whatever. It is botch-work and butchery, out-and-out, while the methods just named, if carefully carried out, may give very fair results, and the last one, results that are entirely unobjectionable. We will next consider the methods of rating fine movements, whether with or without regulators.

Tool-Making.

We will next consider the making of cutting dies, and begin by condemning the practice of making a piece of metal of the required form, laying it on the steel plate, and scratching a line around it to show the size and form of the hole required in the cutting die or cutter as commonly so called. In the first place it is evident this mode cannot give the form accurately, because the scratch-point in forming curves and irregular shapes cannot stand at the same angle from the plate at all parts of the figure, and secondly, there is no guide to the eye beyond the figure, as necessarily the lines cannot be protracted with accuracy. For these reasons we discard this plan except in making cutters for clipping stampings, in which case we recommend to polish the face of the steel on emery cloth, color it blue over the fire, place the carefully trimmed stamping on it, and secure it in its place by running a little beeswax around it, then with a fine long point make one clear line, close as possible to the edge, which, on removing the wax, will show a white line in contrast with the blue rendering it easily seen.

There are two ways of describing the required forms on the steel plates in making cutting dies; for general purposes the greatest accuracy is retained by the use of geometrical rules in laying out the figure. We polish and blue the steel, draw a straight line from end to end as near through the center as can be seen, and make a small dot on this line in the centre of the plate, this gives a basis on which to describe the required figure, the dot being deep enough to hold the point of dividers. To enable the operator to see readily when he has filed out to the drawn lines describing the figure, it is well to draw all lines long enough to cross those they are at angles with, thus, if you are describing a square measuring half an inch, let the lines forming the sides be about an inch long, which will form four right angles resting on the angles of the square, and enable you to see accurately when the figure is properly filed out. Another mode which in fancy shapes, not easily drawn geometrically, answers as a good substitute for accurate measurement, is, to file out a piece of thin sheet steel the desired shape, harden it, draw to brownish color, stick with wax to flat jack of drop press, and with a moderate blow stamp into plate for cutting die, this gives a well defined line to file to, and the pattern can be used again in case the cutter breaks.

It is perhaps well to mention, as this is not really intended for thorough practical tool-makers, that care should always be used to have cutters sloped away from the under side at all points, for if the pieces do not fall through readily they may accumulate in the cutter, and where the bearing is unequal or deliciate points break them away.

The cutter being filed out to our satisfaction, we harden it and then draw to brownish color, and next proceed to make the plunger; where it is practicable, we make this of a piece of har steel turned to fit the press, and filed or cut down till it almost fits the cutter, we then place them in the press and force the plunger down slightly to show where it hears and wants further reduction, this we repeat until it passes through the cutter a sufficient distance. In some cases, however, it is necessary to adopt another plan, as there are shapes to which it is impossible thus to fit the plunger accurately, and in such instances a piece of steel must be filed so as to pass through the cutter, fitting it very nicely, and then soldered on to an iron stem turned to fit the press. The solder used is made of equal parts fine silver and copper, with which plenty of borax must be applied; the steel pieces must be well tied on with binding wire and may be hardened by plunging into cold water before cooling; after the solder melts and when hardened plungers are used they should be drawn to very light blue at which temper they can be upset a little when worn.

Very frequently a draw plate with holes of some peculiar shape is required, or a hole of an exact size different from anything in the shop, and to save delay and obtain exactly what is needed, the jeweler is fortunate who knows how to make it for himself. The process is very simple, and smooth holes are easily obtained by the following method: never drill the holes, but make a dot in a soft steel plate where each hole is to be, the holes ought to be made with punches, or drifts as they are sometimes termed; a punch should be made in conformity with the shape desired, but very taper, so as to make an indentation when driven in very wide at the outside; the punch must be hardened and tempered to straw color; another should be made long and gradually tapered, and also tempered and nicely polished; the steel plate being heated to redness, the first punch should be driven nearly through to the anvil at every dot, then a slight blow from the front will make the holes through, the fine drift should then be driven after the steel has cooled, first from the back and then from the front until the desired size is obtained, this avoids having a sharp edge in front which is liable to chip, and the punching process closes the grain of the steel and so improves it; all that remains, is to fill the holes with lampblack or plumbago and harden in the usual way, afterwards drawing to reddish-brown color.

The next paper on "Tool-making" will be devoted to hub cutting and diesinking.

H. G. M.

Electro-Plating.

These hot electro-gilding baths are kept in porcelain dishes for use in small quantities, but with large volumes enameled cast-iron kettles are employed; although in some instances large iron jacket kettles are used, the kettle itself forming one anode, while by the introduction of steam into the jacket the temperature of the bath may be raised to the proper degree of heat. Ordinarily the temperature is from 90° to 180° Fahrenheit, but the operator can, by a very little practice, judge best as to what heat he requires for his own work.

Small work, like bracelets and jewelry ware in general, are kept attached to the conducting wire, and are constantly plunged and agitated in the bath till the operation is completed. If a platinum wire or plate is used for an anode this must be immersed in the liquor more or less, according to the surface of the articles requiring the deposit of gold.

Articles of large size are suspended by some strong conductor and are not moved while being gilded. This method of gilding is very rapid, and but a short time is consumed before the required thickness of deposit is obtained. The color is modified, dipping the platinum anode more or less into the liquor. If only slightly immersed the gilding will be pale; but by dipping the anode more and more into the liquor the shade becomes darker and darker until it is finally red The platinum anode is to be connected with the positive pole of the battery and the work is secured to the conducting wire from negative pole.

Gilders of small jewelry nearly exhaust their baths, and as soon as they cease to give satisfactory results make a new one, using the old bath for colored golds (which we may speak of further on), or they may employ the old baths for starting articles which are then scratch-brushed after which they are finished in the new bath.

Where large electro-gilding baths are employed it is often customary to keep up the strength of the solution by successive additions of chloride of gold, or perhaps equal parts of gold ammonium and pure cyanide of potassium. Thus the bath may be made to last a long time; yet this is open to the objection that if copper or silver articles have been gilt in them they may furnish red or green gilding. It is considered best therefore to prepare new baths rather than attempt to replenish the old solutions, using the weak ones for the first coat, or for the colored gilding. Second formula is as follows:—

Phosphate of soda	400 grammes.
Bisulphite of soda	100 "
Bicarbonate of soda	50 "
Caustic Potash	50 "
Cyanide Potash	15 "
Pure Gold for chloride	15 "
Distilled or rain water	10 litres.

In making up this solution it is proper to dissolve all the substances together with the exception of the gold, and then filter the mixture, after which the chloride of gold may be added. The temperature of this bath should be from 50° to 60° C., and will be found to produce very fine gilding, but requires an extremely intense current of electricity to make it work. This solution must not be used for direct gilding on iron or steel. Third formula—

Yellow prussiate of potash	150 grammes.
Carbonate of potash pure	50 "
Hydrochlorate of ammonia	20 "
Pure gold	10 "
Water	5 litres.

Dissolve the first three salts in boiling water and then filter. Add the chloride of gold to this solution when cool, after which boil again and replace the evaporated water. The last formula to be given has at least one advantage over the others which is its simplicity of construction, and is as follows:—

Cyanide of Potassium, pure	50 grammes.
Gold for neutral chloride	10 "
Water	3 litres.

Dissolve the chloride of gold in the whole of the water, add the cyanide till all dissolves and makes the liquor colorless. We find this bath may be used without regard to temperature, still there is a serious objection to its use from the fact that it does not work uniformly, sometimes ungilding one face of an article while the other is being gilt, or it may produce red gilding at the bottom and yellow at the top.

These inconveniences may be partially overcome by giving this bath a long heating. The first formula given is the only reliable one for gilding directly on wrought iron, polished cast iron or steel, and if the other receipts are used for these metals we find the gold will not adhere well, if at all. For gilding polished steel without first coating with copper we must remember it has been suggested to diminish by half the proportion of cyanide (indicated in the first formula), leaving us 5 grammes of cyanide for 10 grammes of gold. In gilding articles of steel they should be passed through hot alkaline solution, and then rapidly through a very diluted solution of hydrochloric acid, wiped when practicable, and then put into a very hot gilding bath with an intense galvanic current at the beginning and gradually diminishing the power of the current by partly withdrawing the platinum anode. Smaller articles, like steel pens, watch hands, etc., are threaded upon a thin brass wire and separated by glass beads, or as the judgement of the operator may dictate, and after cleansing they are put into the hot bath, then rinsed and dried finally in hot and dry sawdust. We find using sawdust much better than drying by the use of a towel.

Time Signals of Harvard College Observatory.

It is now four years since the establishment of the system of signals by which a uniform standard of time is furnished by Harvard College Observatory to numerous stations in and near Boston. This system, devised by the late Professor Winlock, is distinguished from others in use for like purposes by its great simplicity. It demands no apparatus beyond that everywhere provided for the reception of ordinary telegraphic messages; except that the clock where the signals originate must have one of the various attachments which have been contrived for the purpose of breaking and restoring a telegraphic circuit at regular intervals. The clock ordinarily used as the origin of the signals at Harvard College Observatory is placed in a closed local circuit within the Observatory, and breaks this circuit for an instant at intervals of two seconds, by a small pin connected with the escapement. The breaking of the local circuit is made, by a relay, to close the main circuit which passes through the stations where the signals are received; and the sounders at these stations accordingly click whenever the local circuit is broken by the clock. The clock is made to omit one signal in each minute; the first signal heard after the pause marking the commencement of the ensuing minute. Every five minutes the pause is made longer than usual; several signals in succession, instead of one only, being omitted. In this manner, if the error of a time-piece at any one of the stations is known within five minutes, the exact difference between it and the Observatory clock may be ascertained at any time.

The clock is kept, as nearly as may be, (by placing small weights upon its pendulum, or removing them,) sixteen seconds fast of mean time at the Observatory, in order to allow for the difference of longitude between Cambridge and Boston. But as no clock can be kept absolutely free from error, a daily telegraphic message is sent along the main line to state the error of the clock to the nearest tenth of a second.

In order that the signals might manifest themselves to the eye as well as to the ear, Professor Winlock had some small dials made and placed in some points of the circuit. Each dial was provided with a hand, which moved at each signal from a vertical to a horizontal position and back again. But for most purposes, the click of an ordinary telegraphic sounder is a perfectly satisfactory signal.

The advantages of the method just described are obvious. Any failure of the apparatus is at once made known by the cessation of the signals; as long as the signals are received, they must be correct. The time-pieces at the several stations, not being in direct connection with the apparatus, are not affected by any accident to the line; and finally, the expense to be incurred is as small as it can be made.

Chrysology.

BY H. G. M.

Political economy is a science with so many ramifications that the interests of every trade and business enterprise are comprehended within the range of its thorough study, and that branch which treats of the production of wealth is certainly worth the consideration and study of all engaged in manufacturing pursuits or interested in the sale of our country's productions, whether natural or mechanical.

It is a well-established fact that properly conducted export trade is the most sure source of wealth to a country, while home trade merely changes the possession of money from one person to another.

England is rich to-day, not because of boundless natural resources, but because for many years she manufactured for the world, her policy was to make markets for her goods, and for a long time it was well followed up, but over-greedy avarice led some of her manufacturers astray and much foreign trade was lost to her thereby, and to-day English goods are not undeniably superior as they used to be. There was a time when America was supplied with watches by Liverpool manufacturers, the goods they made were never fine or substantial, but they were sold at high prices and found a ready market, so ready indeed that anything, it was thought, in the shape of a watch would sell in America, and the quality was soon deteriorated by unprincipled manufacturers in their haste to get rich. We all know the consequence, nothing is so thoroughly despised in America as an English watch, and in Liverpool there are scarcely any made.

At the present time there are countries where English watches are sold and good prices obtained and the same tricky deterioration is going on, now the country which can supply the most uniformly reliable goods in the suitable styles must eventually take the place of the makers of to-day, and why cannot such markets as the East Indian, Australian and New Zealand be turned to advantage by ourselves?

It has been demonstrated that American goods can be sold even in the manufacturing countries of Europe; our clocks stand alone. A firm in Birmingham, with large means, tried to make American clocks but had to succumb; our farming implements are unrivalled; our pianos take the premiums; our pocket pencils outsell all others in London, why then cannot a large export trade be established for watches and jewelry? True, American watches have been introduced in London, but the style is our own, now to make a market we must suit that market, and watches that will please Englishmen can be made just as cheap as those which please ourselves, so also with the East Indian and all others. The trouble is, our home necessities have been large and we have satisfied ourselves by attending to them, our country is naturally rich in resources, and we have occupied ourselves in developing them, now wo want money, hard cash, can we not get it by turning our industry and resources to account and making a market for our goods in foreign lands? Why should not the same process enrich us which has enriched other countries? And if we avoid falling into the dishonest deterioration of our goods as English manufacturers have done, after establishing a market we shall have a permanent trade increasing in extent as the reliability of our manufactures becomes known.

Many will remark, and truly, that an export trade induces a reduction in prices, but it quite compensates by giving steady employment to capital and labor, and by enriching our own people must improve some trade; in fact, the establishment of larger export trade would be obtaining the assistance of other countries to pay our debts and fill our pockets, and giving them a better return than others have for their outlay. To enable our manufacturers to compete with those of other countries, some change is needed in custom duties; all raw material should be allowed to enter duty free, and the impetus given to trade would soon more than make up the loss to the revenue. The *British Journal* of February 2nd, reports that the American Screw Co., of Providence, is about establishing a factory in Dundas, Canada, for the purpose of manufacturing screws without paying duty on raw material, thus enabling them to compete with British manufacturers. now, is it not a blind policy which forces American enterprise to go abroad? Should we not be just that much better off if the 500 hands were set to work here instead of in Dundas? A nation can never get rich by trading with itself, and no matter how great our natural resources, how extended our territory, or how industrious or enterprising our people, we need an export trade for our manufactures increasing yearly in proportion to the population, to make us a really successful people.

One particular in which English watch manufacturers have an advantage over us needs attention, namely, their cases are stamped with a mark, indicating their quality, by government authority, and this is essential in many markets, and applies also to finger rings although not so imperatively. In our dealings with England the hall mark is of little importance as the movements are sent there without cases, still cases can be made just as cheap here as there, and our watches with cases of government guaranteed quality could be sold almost to the exclusion of all others in most Oriental countries. We must also remember that by introducing one line of goods another is sure to follow and so one and all are interested, manufacturers of jewelry as well as watches, for get watches well introduced, chains and general jewelry will soon accompany them.

Of course we cannot take the world by the nose and compel the exclusive use of American goods, but we can supply goods so reliable and so well made and at such moderate prices, that they must be appreciated by people of other countries, who will soon find it worth their while to be among the consumers of our mechanical productions. At once the thought suggests itself, that the present dullness of trade affords an opportunity to expend a little time on considering the practicability of establishing an export trade which may be a lasting blessing to the country. The matter needs the united action of all interested and, in fact, anything which increases the demand for our goods must affect the whole trade, and if any well defined effort could be developed by a trade meeting or any concerted movement, no doubt some good might result.

Parisian Novelties.

Fashion has as much influence upon knicknacks as it has upon dress, and Paris is often the arbiter for both. It is curious to watch how some particular form seems to become epidemic, and is to be seen reproduced in countless materials, and for all sorts of different purposes. Some time ago wheelbarrows were the rage. They were filled with salt, they dangled at watch chains, they were used as pincushions, or employed as ornamental coal scuttles. Then came the day of gypsy pots. Not only did we have them as egg boilers and coffee retorts, but as flower glasses, inkstands, tea kettles and scent-bottles. At present manufacturers are evidently suffering from hats on the brain, and people who have more money than they know what to do with, and are amused by the small joke of buying incongruous forms for articles of every day use, may gratify themselves by becoming the happy possessors of the exact imitation of a straw hat for a butter cooler, and a "topper" for a biscuit box. The ideas suggested are no more pleasant than those felt by a fastidious person who receives burnt almonds in a pair of exquisitely made top boots. There seems to be a painful poverty of invention when we see the same form employed to collect ashes from a cigar, to hold a lady's thimble, or to make a watch stand. Yet all these can now be had in the pleasing shape of a gentleman's tall hat. Strangely enough, it is in flower vases that bad taste and artisan ingenuity run riot most wildly. Ever since some lucky manufacturer brought out the model of a hand holding a cup, there has been no cessation of designs which are ugly without being quaint and out of place without being funny. In a ladies' newspaper it was lately announced that "rabbits are taking the place of squirrels as the presiding genius over plates and dishes, as well as flower-vases, and a donkey between paniers is a really charming receptacle." People whose taste is guided by fashion and novelty may further decorate their rooms by hanging round the walls white china herrings with blue ribbons round their necks and their mouths wide open to receive monthly roses instead of marine infusoria. We hear that "one of the newest receptacles for flowers is a broken vase in delicate green

and white, with a couple of Cupids mourning over the broken portion." This is evidently intended to supply the place of the Louis Quatorze shoe with the Cupids asleep in the toe and the high heel made to hold violets. It was so successful—attracting, it is said, not only the patronage of the aristocracy, but that of royalty itself—that it could scarcely be produced fast enough. Whenever fashion comes to be stronger than art, which has now for a long time been the case, popular taste will remain uneducated and childish. A much admired and very "chaste" inspiration of inventive genius may be seen in a blue or pink china kitten lying on its back, and holding a ball for flowers between its paws. To harmonize with this table ornament, a sweet thing in candlesticks is of equally admirable design. A Cupid on his back kicks a drum with his upraised foot, the drum being supposed to form a suitable socket for the candle. A pair of windmills in ormolu, and Jack and the Beanstalk in carved wood, may be obtained for the same purpose; and if the purchaser should chance to be in search of lamps, instead of candlesticks, he may gratify his zoological, as well as his æsthetic, tastes by buying stuffed monkeys. These are to be had in all sorts of possible and impossible attitudes, grasping glass globes in their hideously human fingers. They appear dressed and undressed, and the pair representing an imaginary Irishman and his wife are never without an admiring group of people to stare at them. Those whose taste is ornithological can rejoice in the acquisition of a stuffed pheasant, not for stewing, but to hold on its back a rose-colored globe with a lace-paper shade. The proper inkstand for a table already furnished with some of these costly works of art might perhaps be the anvil with its hammer and pincers, or, in the country, a more rural conception in which the pen-rests are formed of croquet hoops, balls, and mallets. At the seaside the "dolphin" would be appropriate, with its "body and tail in a double twist," while nothing can form a more fitting paper-weight than one at present popular, which represents a swan standing on a mirror with a pin-cushion on its back, although for our part we prefer one in the form of a beehive, as it seems to teach a moral lesson. A present was once defined as a thing of value which cannot be bought. Few such presents are now even attempted. A death's head forms a fashionable breast-pin; and a brilliant sarcasm is supposed to lurk in the bowl of a spoon which contains the letter U. and fulfills the duties of a brooch.

Metal-Work among the Hindoos.

BY DR. ALEXANDER HUNTER.

The arts of working in gold, silver, copper, bronze, brass, hidryware, koofigaree, enamel, bell-metal, zinc, steel, and iron, have long been practiced in India; and in some districts of the country, where these Art-manufacturers have been encouraged, they are brought to great perfection; while in others we find them still in their primitive and almost rude simplicity, but characterized by local peculiarities and tastes, which give to some of them an artistic value somewhat akin to the bronze and metal works of Japan and China; though they far surpass most of the manufactures of these countries, and evince a thorough acquaintance with both the theory and practice of geometry, the principles and applications of design, the selection and arrangement of patterns particularly adapted for filling spaces, as well as those suited for peculiar works in metal. In addition to these important qualities, the productions in mixed metals in India evince a taste in the harmony of colors, and a knowledge of the chemistry of metals, and salts of metals, that surprise European manufacturers; and prove that different races, though apparently behind in what is called the onward march of European civilization, have still attained to various degrees of excellence, more especially to a freedom of drawing and to manipulative dexterity which have escaped detection or appreciation amongst refined or highly civilized nations. As several of the processes of manufacture are peculiar to India, and the principles of the chemistry of metals are thoroughly well understood nearly all over India, it may not be out of place to call the attention of our manufacturers to one or two points to which great importance is attached by the Hindoos. The first of these is a knowledge of free, bold, linear drawing, and the early acquisition of the power to draw clear outlines. This art is taught in most parts of southern India by the females, who commence teaching their children to draw either on sand or on a mud floor, which is washed daily; when the children are older they draw on a black wooden board, the color of which is renovated in a cheap way about once a fortnight, with lamp black and the mucilaginous juice of the fruit of the briony, *Coccinea Indica*, or *Covei codei* (Tam.), or the juice of the flowers of the shoe-plant, *Hibiscus subdariffa*. It may not be generally known that this flower, if rubbed upon white paper, produces a most useful substitute for litmus paper, a very delicate test for acidity in solutions and that the flowers of several species of *Hibiscus* give a good shining polish to boots or shoes; hence the common name of shoe-plant. Several colored flowers are employed in the same way to produce chemical test-papers, or tinted surfaces for ornamentation. The fresh flower is rubbed on white paper till the juice exudes, and thus in a few minutes a most delicate test-paper is produced, or a tinted surface of varied gradations can be made, and by combining different flowers mixed tints are the result. In this simple way a considerable knowledge of the chemistry of flowers, leaves and fruits of plants, has been acquired; and we shall have occasion to refer hereafter to the chemical uses of several plants in some of these descriptions of manufactures in metals. Another important branch of education which is entrusted to the females of Southern India are the rudiments of arithmetic and practical geometry, with the principles of color, derived from flowers, colored earths, and cheap substances, that can be applied to floor or wall decoration. Although these do not come under our consideration at present, I must make a slight allusion to them, as the patterns from which the forms of some of the most elegant manufactures in metals are taken can generally be traced to flowers, fruits, or seeds; and the punches, or steel tools, used in their ornamentation are almost invariably suggested by some parts of the same plant or flower which suggests the design.

It is not known with any certainty when works in the precious metals were first manufactured in India. Some of the ornaments in gold and silver which have been found in old tombs, accompanied by beads, necklaces of cut cornelian, agate, rock crystal, and felspar, have been enclosed in cinerary urns with calcined bones and teeth; these are believed to be upwards of two thousand years old; but there are others dating a few centuries after the Christian era which bear a striking similarity to the Etrusean and Grecian periods of Art, and are accompanied by manufactures in bronze and pottery very like those discovered in Herculaneum, Pompeii, and Etruria. During the early Buddhist periods, or from 2400 years down to the third century of the Christian era, it is supposed that the arts of Greece and Rome found their way to India; and at a subsequent period the son of one of the Roman emperors, who was banished for his licentious profligacy, visited Cambodia, and took with him skilled carvers, sculptors, and workers in precious metals. It is probable, that India could boast of efficient workmen of her own training even before these periods. Many of the oldest ornaments in gold found in the tombs, cairns, cromlechs, and kistvaens, evince a considerable amount of skill in manipulation and taste in design. The best of these were recently discovered in the Salem, Coimbatore, and Mysore territories, and on the Neilgherries.

One point that seems always to have been insisted upon by the gold and silversmiths in India, is the selection of pure, unalloyed metals. This seems to simplify and expedite the process of manufacture, and probably accounts for the delicacy of the workmanship, as pure metals are more ductile than alloys.

The finest gold filigree work of southern India is manufactured at Trichinopoly, and is remarkable for the delicacy and intricacy of its workmanship. There are four or five varieties of rose pattern, and three or four of snake-pattern chains; the latter are very delicate, fine in texture, singularly pliant, and remarkably good imitations of real snakes. The rose-patterns are more elaborate in appearance, though not actually so difficult to manufacture. The process appears very simple, and the tools employed consist of a few fine steel hammers, fine pincers, a few blow-pipes, two or three highly-polished steel anvils,

a burnisher, steel-scraper, a pair of fine compasses, and delicate scales and weights. So particular are the workmen about the purity of the metals, that they refine their gold or silver five times, by melting under a strong blast heat, before commencing to work with it. They are also very particular about the surfaces of their hammer and anvil being very highly polished and burnished. The work is commenced by beating the metal into thin plates nearly uniform, cutting these into into long strips, and drawing them into very fine wire, by passing through perforated steel plates, with a pair of strong steel pincers. The holes in these steel plates are carefully punched of graduated sizes, and are drilled of a circular form; the plate is then tempered, or case-hardened, and strongly hammered on both sides, till quite cold, the holes being frequently re-drilled and hammered. The plates are very strong and heavy, from six to eight inches long, two or three broad, and about two-thirds of an inch in thickness. They are firmly secured in a strong bench-vise, and the wire is drawn through them while the metal is kept heated by a blow-pipe. After the wire is drawn, most of the dexterity of manipulation, and the beauty of the patterns, depend upon the practical skill of the artisans, who, for the most part, work from memory, and without any pattern before them, although most of the native jewelers have books containing a variety of patterns; the beauty of these depends chiefly upon delicate workmanship, or on curious and original combinations.

The localities where the best and most tasteful work is produced are Trichinoply, Cuttack, Travancore, Vizianagram and Delhi. This manufacture is very similar to the filigree-works of Malta, Genoa, Paris, Florence and London; but it is finer in India, and cheaper. Some varieties, in which burnished, frosted, and chased metallic surfaces are combined with the filigree-work, bear a considerable resemblance to Scandinavian jewelry; but the latter is more tinselly in effect, and coarser than the best specimens from Cuttack and Trichinopoly. The Chinese and Japanese understand filigree manufacture, but their works are not so tasteful, nor do they appear to be so much appreciated as those of India.

In commencing the manufacture of inlaid works in different metals, as brass, copper, bell-metal and silver, sheets of brass or of pure copper are usually selected, and cut into pieces that will form the required shape by hammering. The metal is frequently heated to a dull red to prevent it from splitting; and if the form is complex, the vessel is made in several pieces, the edges of which are beat out thin, and the overlapping edges, after being thoroughly cleaned from oxide by scraping or by nitric acid, are heated and welded together with a hard solder of brass, to which a little borax and resin in fine powder are added. The form of the vessel is then refined by hammering, the inside being supported by a rounded metal-anvil, held in the left hand. In some cases the planishing-steel hammer and the rounded anvil fit upon each other accurately; at other times the object is finished and polished on the turning-lathe. The surface to be decorated is then slightly oxidized by being oiled, smoked, and heated; the pattern is drawn upon it with a sharp steel point, and finished with a graving-tool. Sometimes the pattern is very carefully drawn upon thin paper; this is pasted upon the polished metal, and the outline is made out with a succession of punched and dotted lines. When elaborate or complex patterns are required, punches are made of very fine steel to produce portions of these, as flowers, rosettes, or delicate curves. When patterns are to be produced by combinations of two metals, as brass upon copper, zinc upon brass, or silver upon copper, thin sheets of these metals are beaten out, and the patterns are stamped with punches. For this purpose very pure metal is generally employed, and the surfaces are both clean and bright, while the part of the vessel to which it is applied is roughened, and then moistened with a solution of borax, and the two metals are united by heating and hammering. The vessel is then cleaned with the acid pulp of tamarind, and finally polished with whitening, or chalk and water. Brass vessels are often cleaned with the pounded leaves of the tamarind, or of the *Cicer arietinum*, Bengal gram, or chick-pea, beaten into a pulp. This yields an impure tartaric acid liquor, which produces various shades of color, often of very pleasing tints, especially when applied to pure copper and gently heated. By adding a little cinnabar, or sulphuret of mercury, to this acid mixture, and then exposing the vessel to heat, after it has been coated with the mixture, an amalgam is formed which makes the silver and copper combine. The copper acquires a rich purple brown color, and the silver gets dark on the surface; but by rubbing with chalk, or fine emery powder, the silver resumes its brightness. Vessels of great elegance and purity of form are thus manufactured at Tanjore and Trichinopoly, where this branch of industry has met with encouragement, and has probably been carried on for many centuries. Fine collections of these manufactures may be seen at the India House Museum.

Bronze.

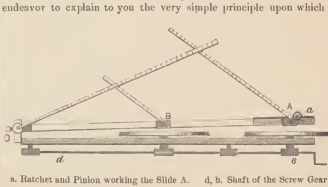
[*A Lecture delivered at Chickering Hall, New York, Thursday Evening, March 2, 1876, by* MR. FREDERIC VORS, *(in charge of Tiffany's & Co.'s Bronze Department), on "The Manufacture of Bronze, and the Different Styles of Enamel, in their connection with Ornamental Metal Work." Reported expressly for* THE JEWELERS' CIRCULAR.]

In preparing this lecture for this evening I was very much embarrassed, not to find what to say, but to find what not to say. Now the first thing I have cut out of my lecture is my preface. A great many writers spend a good deal of time on a preface, and it is very little read; and I beg the kind public will permit me to begin with chapter the first—

THE MODEL.

I wish it to be well understood that by the word "model" I mean the *object* that it is the duty of the manufacturer to reproduce in metal. Models are made of different substances. For bronze work plaster is generally used. This plaster is susceptible of a very fine finish, and when it is reproduced in metal all the work that has been done in the model is so much work saved on the metal. Of course this is so much work saved to the manufacturer; not only does he retain the original artist's work on the pattern, but he saves a great deal of time. Models are also made in wax. Wax can be moulded as well as any other substance, and Barye, who died last fall, made his models of wax. In the process of casting, his models were destroyed, but there remained the bronze pattern instead. Wood is also very often used, as it is in iron foundries; that is to say, for patterns that are to be duplicated only to a limited extent. Wax was used in the medieval times much more than it is now.

One of the great missions of bronze manufacture has been the reproduction of antiques. Shortly after the downfall of Napoleon there was in France, in Italy and in Germany, a reaction towards the fine arts, a new "Renaissance" towards the antique. At that time, bronze manufacturers in France produced an enormous quantity of copies of antiques. But these reproductions, in a great many cases, were poor copies, and even worse,—they were copies that hardly suggested the originals. It is a peculiarity of human nature that a man cannot reproduce the work of another man exactly as the first man made it. The man who copies a statue or painting, must inevitably put into it a small item of his own individuality; but when you come to so serious a thing as the shape of an antique model it is easily detected. Then science came to the help of art, and about 1830, a French inventor by the name of Achille Collas, who amongst other things invented an engraving machine, similar to that used by the United States Government for postage stamps, turned his attention to applying a well-known instrument called a pantograph, by which a drawing can be augmented from a small size to a larger one, or reduced from a large size to a smaller, to cutting out in plaster, in wood, or in metal, the different sizes of any given statue. I have here a model of the machine. It is simply a working model, and I will endeavor to explain to you the very simple principle upon which it



a. Ratchet and Pinion working the Slide A. d, b. Shaft of the Screw Gear working the Revolving Tables.

works. Let us call the working arm O, A, B,—A, B, being two movable points or slides on the arm. This revolves on the centre, O. The point B, in this case we will suppose at exactly one-half the distance between the centre and the point A. It is perfectly plain that

any motion that the point A will perform will be reproduced at the point B, with half the amplitude of A's motion. If this A describes the arc of a circle of which O, A, is the radius, O, B, will describe exactly one-half the length. It is a well-known theorem of geometry that the parallel to the base of a triangle divides the other two sides in proportional parts; so that every motion that B, moving along O, A, will make, will be exactly one-half the motion that A will make, traveling in the same direction. This machine can be set at any other scale, that is to say, this point instead of being one-half the distance between those two, might be put at one-quarter, or three-quarters. I have adopted one-half as being more easily understood.

Another part of the machine consists of two tables which revolve, and they are worked by a screw gear so that if one table revolves on a certain angle, the other table will revolve on exactly the same angle. It is now plain that any motion made at the point B will be one-half the amplitude of the motion produced in A. If in A we place a tracer, or any instrument with a dull point to it, and in B we place a cutter, or a sharp instrument, any motion that the tracer will make in following an outline, will be repeated at B at one-half the size. If we want to reduce this bust of Voltaire (pointing to the bust), I place it on the turning table in A; in B I should place a block of plaster. I show it to you finished, as it is a very long and tedious operation. The accurate reduction of a bust of this kind would require about ten or twelve days' steady work. If now I take my tracer in A (illustrating), and follow an arc of a circle, letting it go in and out, as the ball-socket joint in O will allow me to do, the cutter in B will cut in the plaster in exactly the same shape as I follow in A. A micrometric screw on the working arm of the instrument allows me to bring this tracer a trifle forward; the one in B, will make one-half the motion, and so on. When I have moved this as far as the machine will go, by turning the table I can take another section of the model and begin following again, and so forth, until I have cut out of the block of plaster the exact reproduction of the model, only at one-half the size. If I reverse the motion, that is to say, put my model and my tracer in B, then A will produce an augmentation. That is seldom done, but yet this very head of Voltaire has been augmented from life size to one-tenth larger, for a statue in Paris that was gotten up by a newspaper subscription, that of the *Siecle*.

Now Collas invented another machine, slightly different from this but the application of which is more universal. It is a lathe on which he can reduce ornaments and has-reliefs or even reverse them. I will show you how this machine works. It is always a very difficult thing for a modeler who models in free hand a scroll, for instance, going from right to left, to reverse his work, that is, make a symmetrical ornament. If the first work is very well done, there are great chances that the second work will not be so good. Collas has brought science again to the help of art, by producing a machine by which this is obviated. In this machine he has two disks. Now if we suppose this same working arm, carrying a tracer and a cutter, which will start, one from this centre, and suppose the cutter to follow an arc of a circle from this centre, and on the end of the arm a screw which revolves at the same time as these disks, but at a much slower speed, and carries the end of the arm towards the circumference of the disk, we can easily imagine that the combined motion of the two disks turning, and the follower working down, will produce a spiral line; and if this screw works slowly enough, every single point of the surface of this disk will come in contact with it. If here we have the follower and a bas-relief, and there a flat piece of plaster about the same thickness as half that of the bas-relief, when this tool works down it will work in and out, following the bas-relief, and at the same time the cutter will have the same motion, cutting at half the scale; and by the time it gets to the circumference it will have gone over the whole surface, and every in and out of the bas-relief will be cut on the plaster. If, instead of the two tables moving in the same direction, one revolves one way and one the other, the reverse or symmetrical will be produced by the cutter. If we want a reproduction of the same size, instead of having a centre for the arm to work on, we have a system of screws making the arm work down parallel to itself, and produce the same size on both disks.

This machine has had a great many applications, one of the most interesting of which is the making of coins. An artist will model a figure on a large scale a great deal more freely than he will one of the size of a silver dollar. I will show you with the stereopticon the head of the French Republic on the 5 franc piece of 1848, made by Oudinet. He modeled his head on a disk about three feet in diameter. He sent it to Collas, who reduced it on his lathe to about a foot in diameter. Then he touched it up and finished it, and then the lathe reduced it again to the size of the coin; and that head is considered one of the finest heads on a modern coin, and is now used entirely in France on the new coins, besides being also used on the new postage stamps. (The hall was here darkened and a picture of the coin shown on the screen.)

The resumption of specie payment, which is so much talked of now, and the prospect we have of again handling silver dollars, adds interest to this production of the French 5 franc piece. By the introduction of mechanical appliances, too complicated to be explained, the cutter can be replaced by a revolving point which will cut hard substances. The lathe can also cut a die from a bas-relief.

CASTING.

Now that I have explained to you how the models are made, I will endeavor to explain how they are translated into metal. What is generally known as bronze is composed of copper, zinc, and tin. The ancients used zinc in their alloy, although zinc as a metal has only been known since the early part of this century. But they had the ore of the metal, which they put in the crucible with copper and charcoal, and so produced the metal, alloying it with copper, or brass, or with tin in the shape of bronze. The alloy generally used for bronze statues is composed of eighty or ninety per cent. of copper, the rest being half and half of tin and zinc. They generally put in a larger proportion of tin than you would actually find in statues by an assay, because tin evaporates more easily than the other two metals, and in the process of casting a proportion of the tin will disappear. What is very improperly called French bronze—because most of the real bronze comes from Paris—but what is known as French bronze among the trade, is nothing but zinc or spelter. The great difference in price between real bronze and imitation bronze, does not come so much from the price of the material, as from the difference of expense in working it. For bronze we must make a sand mould. Now, the first question is, "Why use such a substance as sand?" Because with all the science of our modern professors we have been able to find nothing else which the metal will "take." I say "take"; I can make clear to you what I mean by that, by saying that if you mix water with oil, the water will not adhere to the surface of the oil,—it will not "take." If you use a mould of anything else but sand, the molten bronze will not run freely into it, and on cooling lie quite close to the inner surfaces of the mould so as to take the impression of it. With zinc you can use iron. If you once establish your mould in cast iron, have it properly finished and put together and you can take as many pieces as you like; but for real bronze and for iron you must have a sand mould, and every time you make a piece, you have to break the mould in order to be able to take the piece out. I mentioned to you that Barye made his models in wax. He is not the first one. Most of the ancients did it; and Benvenuto Cellini, the great Italian metal worker, used that material for his model of Perseus. He first took a rough sketch of the figure in clay; he put over it a coating of wax about an inch thick—it was a large figure, ten feet high; he finished this wax perfectly; then he put more clay on the outside; made "gets" or openings for the metal to enter; made holes for the gases to escape, and then put the whole mould into an oven. The heat melted the wax out, and of course left between the inner piece that he modeled, and the outer model, a space into which the metal would run when it was poured in.

The Japanese have adopted very nearly the same method, but they

(*Continued on Page* 31.)

Workshop Gossip.

CLEAN FILES by holding them in a jet of high pressure steam.

WATCHMAKERS' OIL.—Put thin sheet lead into olive oil in a bottle, expose it to the sun for a few weeks, and pour off the clear.

PLATING WITH NICKEL may be effected by placing the object to be plated, either of iron, steel, copper, bronze, zinc or lead in a boiling neutral solution of zinc chloride containing a salt of nickel and granulated zinc. If the zinc solution is acid, the coating of nickel is dull. A plating of cobalt may be made in the same manner.

SPOT GILDING, or gilding in spots, producing a very fine appearance, is done by putting a thin coat of oil on those parts of the metal where you do not wish the gilding to appear, the gold will then be deposited in those spots only where there is no oil, and the oil is easily removed when the job is finished.

SOLUTION FOR DIPPING STEEL ARTICLES, PREVIOUSLY TO ELECTRO-PLATING.—Nitrate of silver, 1 part; nitrate of mercury, 1 part; nitric acid (sp. gr., 1.384), 4 parts; water, 120 parts. For copper articles.—Sulphuric acid, 64 parts; water, 64 parts; nitric acid, 32 parts; muriatic acid, 1 part; mix. The article, free from grease, is dipped in the pickle for a second or two.

SILVER-PLATING.—File the parts which are to receive the plate very smooth; then apply over the surface the muriate of zinc, which is made by dissolving zinc in muriatic acid; now bold this part over a dish containing hot soft solder, and with a swab apply the solder to the part to which it will adhere, brush off all superfluous solder, so as to leave the surface smooth; you will now take No. 2 fair silver plate, of the right size to cover the prepared surface, and lay the plate upon it, and rub down smooth with a cloth moistened with oil; then, with a tinned soldering iron, pass slowly over all the surface of the plate, which melts the solder underneath it, causing the plate to adhere as firmly as the solder does to the iron; then polish the surface, and finish with buck-skin.

BLACK ENAMEL ON GOLD OR SILVER.—Take ½ pennyweight of silver 2½ pennyweights of copper, 3½ pennyweights of lead, and 2½ penny weights of muriate of ammonia. Melt together, and pour into a crucible with twice as much pulverized sulphur; the crucible is then to be immediately covered that the sulphur may not take fire, and the mixture is to be calcined over a smelting fire until the superfluous sulphur is burned away. The compound is then to be coarsely pounded, and, with a solution of muriate of ammonia, to be formed into a paste which is to be placed upon the article it is designed to enamel. The article must then be held over a spirit lamp till the compound upon it melts and flows. After this it may be smoothed and polished up in safety.

ELKINGTON'S PATENT GILDING.—Fine gold, 5 oz. (troy); nitro-muriatic acid, 52 oz. (avoirdupois); dissolve by heat, and continue the heat until red or yellow vapors cease to be evolved; decant the clear liquor into a suitable vessel; add distilled water, 4 gals.; pure bi-carbonate of potassa, 20 lb.; and boil for 2 hours. N. B.—The nitro-muriatic acid is made with pure nitric acid (sp. gr., 1.45) 21 oz.; pure muriatic acid (sp. gr., 1.15), 17 oz.; and distilled water, 14 oz. The articles, after being perfectly cleaned from scale or grease, and receiving a proper face, are to be suspended on wires, dipped into the liquid boiling, and moved about therein, when, in from a few seconds to a minute, depending on the newness and strength of the liquid, the requisite coating of gold will be deposited on them. By a little practice the time to withdraw the articles is readily known; the duration of immersion required to produce any given effect gradually increases as the liquid weakens by use. When properly gilded, the articles are withdrawn from the solution of gold, washed in clean water and dried; after which they undergo the usual operation of coloring, etc. A "dead gold" appearance is produced by the application to the articles of nitrate of mercury previously to the immersion in the gilding liquor, or the deadening may be giving by applying a solution of the nitrate to the newly gilded surface, and then expelling the mercury by heat.

ARTIFICIAL PEARLS are made from beads of opaline glass filled with gum, the polish of glass being reduced by the vapor if hydrofluoric acid.

ARRANGEMENT OF LAPIDARIES CUTTING PLATES.—1, Soft iron (very thin) with diamond dust in oil. 2, Pewter, with coarse emery and water. 3, Pewter, with fine emery and water. 4, Wood with sand and water. 5, Pewter, with rotten-stone and water. 6, Leather, with putty powder slightly wet.

POLISHING DIAMONDS.—The plan in use at all the large diamond cutters is simply a cast iron disc of good metal, with a vertical spindle run through its centre, balanced, and turned, and faced true in a lathe. The disc revolves at about 1000 revolutions per minute. With a little diamond dust and oil, the stone is set in a small brass cup filled with common soft solder; it is then screwed up in the clamps and applied to the skive till the facets is formed.

SEPARATING SILVER FROM GOLD.—The *Scientific American*, in an answer to a correspondent, recommends the following as a good method: The alloy is to be melted and poured from a height into a vessel of cold water, to which a rotary motion is communicated. By this means the alloy is reduced to a finely granulated condition. The metallic substance is then treated with nitric acid and gently heated. Nitrate of silver is produced which can be reduced by any of the ordinary methods; while metallic gold remains as a black mud, which must be washed and melted.

NICKEL SOLUTIONS.—The nitrate of nickel solution may be formed by dissolving nickel in nitric acid, slightly diluted with water, and, when dissolved, diluting it with additional water; it is a solution which does not yield its metal freely. We have deposited nickel in the state of reguline white metal from a solution of the double chloride of nickel and ammonia, by making a lump of metallic nickel the anode in a strong aqueous solution of sal-ammoniac, and passing a strong current of electricity through it for several hours, until the liquid acquired a pale greenish-blue color. We have also obtained a similar deposit by treating a solution of one part of arseniate of potash and five parts water in a similar manner. It has also been deposited from a solution formed by dissolving pure nickel in nitric acid, then diluting and precipitating it by a solution of carbonate of potash, or cyanide of potassium; washing the precipitate and dissolving it nearly to saturation in a solution of cyanide of potassium, and operating upon this liquid, by the battery process, with an anode of pure metal. Its appearance, when deposited from this solution, is said to be nearly equal in whiteness to silver, and its deposition has been proposed to be applied to the production of an inferior class of plated articles.

FOR ALLOYS CONTAINING PLATINUM, which usually consist of copper, silver, platinum and gold, the method of assaying is as follows: The alloy is cupelled in the usual way, the loss of weight expresses the amount of copper, and the button made into a riband and treated with sulphuric acid, indicates by the portion dissolved that also of the silver present. By submitting the residuum to quartation, the platinum becomes soluble in nitric acid. The loss after digestion in this menstruum expresses the weight of that metal, and the weight of the portion now remaining is that of pure gold. Gold containing palladium may be assayed in the same manner. *Annealing.*—This consists in putting the pure gold into a small, porous crucible, or cupel, and heating it to redness in the muffle. Weighing must be done with the utmost accuracy. The weight in grains Troy, doubled or quadrupled, as the case may be, gives the number of karats fine of the alloy examined, without calculation. According to the old French method of assaying gold, the following quantities were taken; For the assay pound, 12 grs.; fine silver, 30 grs.; lead, 108 grs. These having been cupelled together, the perfect button is rolled into a leaf (1½x5 inches), twisted on a quill and submitted to parting with 2½ oz. and 1½ oz. of nitric acid (specific gravity 1.16, 20° Baume). The remainder of the process is similar to that above described. The usual weight of silver taken for the assay pound, when the fineness is reckoned in 1000ths, is 20 grs., every real grain of which represents 50-1000ths of fineness, and so on of smaller divisions.

(*Continued from Page 29.*)

often model directly from natural objects. For instance, they would take a basket, fill it and surround it with clay, then bake it; of course the basket is reduced to cinders. They blow all the ashes out, and there they have an exact model in the mould for the space originally occupied by the basket. With the Japanese this has gone to such an extent that it has often been thought that the baskets were made exactly like a real basket, or woven together.

That method has been applied in Europe. I have here letters patent, granted to a Mr. Fisher, of 3 Little Tower Street, London, for an improved method of casting metals and making moulds, but it is nothing more than the process I have just explained. But it was not a success; they all had to go back to the old method of modelling. I will show you the operation on this piece here, this bust of Clyte, the original of which is in the British Museum. You see it is turned upside down, for with such pieces as this, we attack it, that is to say, pour in the metal, from the top. This black substance which fills this frame of iron, which is technically called a flask, is nothing but sand; and if you want to find the origin of metal casting in sand moulds, you will have to find the baby who made the first mud pie, because he was the originator of the art. This piece has been laid on a bed of sand beaten hard, which is termed a false side. It is then completely covered with damp sand beaten hard, but applied in small sections like irregular stones in an arch, so placed that they can be removed from the model and then replaced. When this work is finished more iron frames are bolted to the first and form a box containing both the model and the piece mould; this box is filled with sand beaten hard, which keeps the small pieces round the model in place. The mould is now turned over, the false side is removed and replaced by pieces, and the moulder has now a box containing sand, in the centre of which is buried the model; but he can open this box, take out the small sections of sand, and remove the model. If he then replaces the pieces and closes his mould he will have in the centre a cavity representing exactly the space previously occupied by the model. If metal is poured in, it will fill up this space and reproduce the model exactly. This would answer very well if the bronze was to be solid, but it has to be made hollow, for in cooling, the contraction of a mass of metal of this size would cause cracks to appear on the surface.

To prepare the mould for a hollow casting, we have to prepare an inner mould or core which we suspend inside the space left by the model so that all round it there is an equal space between it and the inner surface of the mould; this space will be filled up by the metal. When the sand core is properly suspended in the mould, the metal is poured in, and when it has cooled the mould is broken and the casting taken out. This operation of moulding is long and requires great skill and care, and as for every new copy a new mould must be made, it is a very expensive method and is one of the great causes of the comparatively high price of real bronze.

MOUNTING.

When pieces are cast, they are hardly ever cast in one single piece; that is to say, if you have a group, the different parts will be cast separately, the arms and the heads in different moulds, and so on, and two methods are used in putting them together. These two methods originated in the different styles of finish that are given to bronze. If the bronze is to simply be *bronzed*, the pieces are put together by the system of cold mounting, that is, the parts are inserted into the body, having been cast with a piece projecting which acts as a bearing. It fits tight in the space reserved to receive it; a hole is drilled through and a key riveted in. If the cast is to be submitted to the subsequent action of the battery or an electric current, then the piece has to be soldered; that is to say, the two metals are brought in contact in fire, and a softer metal is put between, and the heat makes the soft metal run so that the two pieces are united. Generally for large pieces, monumental pieces, the cold mounting only is used, and often the sections are only riveted together.

(*To be Continued.*)

Miscellaneous Items.

GEM COLLECTORS, says the London *Examiner*, must be curious minded people. One can understand a man collecting pictures or jewels which are really beautiful in themselves. Old armor and old weapons are interesting, and so, to a certain extent, is any old relic. But the passion for old china and old books, and other such things, is irrational and perfectly inexplicable. The *editio princeps* of Aristotle is worth any price almost that its fortunate possessor may choose to ask for it, but it is no better for any practical purpose than the second or Basle edition of 1550, which can be bought anywhere for a few shillings. This being so, the only possible value that an *editio princeps* can have must be due to the fact that very few other collectors have got it; and the man who buys anything, whether it be a book or a teacup or a Chinese monster, simply because other people have not got it, must have more money than he well knows what to do with.

In a rich country, however, there will always be such people, and a professional dealer and collector can easily make a fortune out of them. Jewelers, it is said, do this to a very great extent, for people have already begun to put artificial prices upon precious stones with reference to their rarity and not to their intrinsic beauty. A diamond with a fly in it, if there were such a thing, would be of great interest to the chemist, as settling the question of the circumstances under which the diamond originally crystallized. But, apart from this, it would fetch literally any price as a curiosity. Fashion, too, has a good deal to do with these things.

Some few years ago the Princess of Wales took to wearing sapphires, and a demand for sapphire *parures* sprang up at once. Sapphires, of course, rose enormously in value, but they have since, we believe, fallen almost to their old price. It is said that the next stone likely to come into fashion will be the jacinth, and that, foreseeing the probability of this, the leading London jewelers are "making a corner," as Americans call it, in jacinths, by buying them up and putting them by, in the serene assurance that the money thus lying idle will ultimately earn its interest and a good deal more. When the time comes at last jacinths will be no prettier than they are at present, but their value will, for the time being, be doubled or quadrupled.

OLD MILL, the optician at New Castle, sold a sun dial to Pitman a few weeks ago, with the assurance that it was quite a reliable time keeper. About a fortnight afterwards Pitman called one day at the shop and said: "Say, Mills, that sun dial ain't worth a cent. It's no good as a time piece anyway." "Maybe you haven't got it fixed in a good place," said Mills. "Yes, I have," replied Pitman, "but I tell you it won't work. There must be something wrong about it?" "No, it's in perfect order," said Mills. "Did you ever time it by your watch?" "Certainly I did. I've stood clost to it a hundred times exactly at even hours, and the cussed thing has never struck the time once." "Merciful Moses! Why, you didn't expect it to strike the hours, did you? Thunder! why, it don't strike, of course. It has no works inside." "That's what gets me," said Pitman, "if it ain't got no insides, how's it goin' to go?" "Mr. Pitman, where have you located that sundial? In the garden?" "Garden! By gracious, no! What do I want with a timepiece in the garden? It's hung in the settin' room agin' the wall." Then Mills explained it to him, and Pitman has since traded the sundial off for a four dollar clock.

A NEW MAGNET.—The latest form of magnet appears to be that devised by M. Jamin, who has achieved so high a reputation for his wonderful researches in this line. In the improved arrangement referred to the poles are of soft iron, and are applied to the extremities of several steel leaves, which are made round in proportion to their length. Singly the plates support but very small weights; but, when combined with the iron end pieces, the latter absorb the magnetism, rendering the assemblage sufficiently powerful to carry twice or three times its own weight. A very remarkable peculiarity of this magnet, but which is not clearly explained, is that neither pole when tested separately has any very marked attractive force, but, when the armature is applied simultaneously to both poles, it is very strongly held, and yet the attraction does not seem to act over any appreciable distance.

Trade Cossip.

A Mobile jeweler is A. Poet. What a *ring* there must be to his verses?

The chimes of Antwerp Cathedral consist of nearly one hundred bells.

Who stopped the *Tribune* Tower clock? The fellow who struck Billy Patterson.

Of the 38,000 persons employed in watchmaking in Switzerland one-third are women.

Bellezza, the well known jeweler in Rome, Italy, has drawn a $40,000 prize in a lottery.

M. Shindler's jewelry store at Tarrytown was destroyed by fire on the evening of the 23d ult.

$10,000 worth of smuggled diamonds have been sold at public auction by Burdett & Dennis.

A workman in the employ of T. B. Rader, Indianola, Iowa, has made the smallest engine in the world for the Centennial.

"No, ma'am," said a jeweler to a beautiful lady, "I don't trust anybody now days. I would not even trust my feelings."

The store of S. B. Levy & Co., No. 307 Broadway, was robbed on the evening of the 18th ult. of a quantity of cheap jewelry.

THE JEWELERS' CIRCULAR, a neat publication of this city, is not, we are told, the organ of any particular *ring*.—*Commercial Advertiser.*

Prof. Silliman of Yale College, has discovered a chemical process by which German silver and britannia can be made to ring like gold and silver.

Just as we go to press we learn that Messrs. Rogers & Bro., the well-known electro-platers, have leased the building No. 690 Broadway, and will move there about May 1st.

Chas. Rumley, of Helena, Montana, has patented a novel form of blow-pipe. The idea is to afford an easy means of expelling the moisture which collects in the tube of instruments of this construction.

A watch, with the inscription, in almost invisible letters, "Presented to General Knox by De Lafayette, 1776," is in the possession of William Larue, of Wallingford, Ct. The margin of the dial is set with jewels.

Another deposit of diamonds is reported to have been discovered in the coast range of San Mateo Co., California. The story is told by one George F. Mondon, now in San Francisco organizing a Stock Company.

The Whiting Manufacturing Company are now comfortably settled in their new quarters, Broadway and Fourth street. The warerooms, silver-works and morocco case factory are under the same roof, but of this more anon.

The gold sword presented by the Legislature of this State to Capt. Samuel Chester Reid, for services rendered his country in the engagement with the British ship Plantaganet, at Fayal, is on exhibition in a jewelry window in the Bowery.

The Ithaca Calendar Clock Co. factory was destroyed by fire on the evening of the 12th of February. A large number of clocks ready for shipment and considerable material were saved. The loss is estimated at $50,000, insurance $30,000.

A monster diamond, weighing 300 carats, has been found at Old De Beer's, Cape Town. An old digger by the name of Phillips recently found a superb stone at De Toit's Pan which weighed 103 carats. He immediately sold it for £3,550.

Sharon has been giving a dinner party, the *menu* of which was engraved on tablets of silver. We expect to see Flood or O'Brien trot out at their next banquet bills of fare on gold slabs incrusted with diamonds. It will never do to stop at silver.

Samson Rosenblatt, the worthy partner of Moses Strasburger, has been released on $25,000 bail, Asher Rosenblatt, father of the prisoner, and Meyer Rosenblatt, of L. Boman & Co., St. Louis, becoming his bondsmen.

The marriage of Mr. D. W. Granbery, of Schuyler, Hartley & Graham's, to Miss Mary Peck, of Naugatuck, Conn., was solemnized at the residence of the bride's parents in that village, on the 3d ult. The bridal presents were many and of costly character.

Messrs. A. H. Smith and James Hedges, of Smith, Hedges & Co., and C. F. A. Hinrichs, Jr., son of the well-known Importer, C. F. A. Hinrichs, were among the passengers who sailed for Europe in the steamer *Russia*, March 1st. *Bon voyage*, gentlemen.

Consistency is a jewel, to be sure—but when, as in case of the Brooklyn Aldermen, that jewel comes in the form of an expensive badge ordered for each member, after cutting salaries down $30,000, we are inclined to doubt the application of the adage.

The Seth Thomas Clock Company, at Thomaston, Conn., have nearly completed a huge clock for the Centennial. It rests on a hed ten feet long, and stands seven feet high. The pendulum-rod and ball alone weigh 750 lbs., and the hammer will strike a 13,000 pound hell.

Marston & Clausson's jewelry store at 132 Chatham Street was entered on Saturday night, the 4th inst., and robbed of $30,000 worth of jewelry, among the property being a watch valued at $1,000, which had been sent there by a benevolent lodge to have a name engraved on the case.

There is a watch in a Swiss Museum only three-sixteenths of an inch in diameter, inserted in the top of a pencil case. Its little dial indicates not only hours, minutes, and seconds, but also days of the month. It is a relic of old times, when watches were inserted in saddles, snuff boxes, shirt studs, breast pins, brooches, and finger-rings.

One of the novelties of a new hotel in Jacksonville, Fla., is a crystal chandelier in the bridal chamber. By touching a button it is lighted; at the same moment out springs a little Cupid, who strikes with a hammer a chime of bells, which peal out in the sweetest melody, "Rest in this bosom," "Let me kiss him for his mother," &c.

Montana, too, has its diamond excitement, owing to the discovery of some stones at Pioneer, which having been sent to England to be cut, are pronounced by a lapidary to be genuine diamonds. One of the stones weighs four pennyweights, and, although a little off color cuts glass freely, and stands all the ordinary tests of diamonds.

So great is the excitement over the recent discoveries at Pike's Peak, and so rich all the country thereabouts, that a citizen of Colorado Springs, as a joke, reduced a stone jug in a mortar, carried the powder to an assayer, and was much surprised to find that the jug yielded at the rate of $17.82 to the ton. That assayer is evidently determined not to let the new district suffer for want of favorable reports.

A magnificent cameo, supposed to be the portrait of Octavia, the second wife of Marc Antony, and the sister of Augustus, has been brought to the notice of the Paris Academie des Inscriptions. The stone is a sardonyx, with a milky surface, the interior being of a reddish black, and the workmanship of the cameo is exquisitely delicate. The face is evidently a portrait, and the head resembles that of the Venus of Milo.

Prof. Tennant, mineralogist to Queen Victoria, has just furnished a full description of the Imperial State Crown. He summarizes the jewels as follows: One large ruby, irregularly polished, one large broad-spread sapphire, sixteen sapphires, eleven emeralds, four rubies, 1,363 brilliant diamonds, 1,273 rose diamonds, 147 table diamonds, four drop shaped pearls, and 273 pearls. The crown was made in 1838 with jewels taken from old crowns, and others furnished by command of her Majesty.

Some time ago two London thieves put in practice a plan of robbing a jeweler which had been described in a story in a popular periodical —a piece of pure invention. The jeweler was furious (he lost $40,000 so it was excusable), and wrote to the editor of the magazine, asking him if it was his mission to instruct thieves in new ways of plundering the public. "My dear sir," replied the editor, blandly, "if you had taken my periodical (which I hope in future you will do,) you would have been put upon your guard. This comes of neglecting the claims of literature."

The Jewelers' Circular & Horological Review.

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THE

Jewelers' Circular & Horological Review,

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

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Removal.

The office of this journal will remove, May 1st, to No. 42 Nassau Street, corner of Liberty, where we shall be glad to see our friends.

The Evil of the Day.

The recent disclosures at Washington have had the effect of opening the eyes of the community to the corruption which has been so widespread a curse upon this country since the war. It cannot be said that the public were ignorant of it before, but the exposure after exposure in official and in business life had not succeeded in arousing our people to the necessity of setting themselves steadfastly against this tide of dishonesty. But the fall of men so high in official position has caused the observant and the apathetic alike to start to their feet with horror, in the determination that there shall be no more of such disgrace.

We speak of this because it is not simply a political matter, but one which affects directly every business man in the land. The corruption, of which these terrible examples are symptoms, has been associated through and through with the bad methods of doing business, the easy commercial virtue, the disregard of business and of personal honor, which have been growing more and more marked since the war. Every merchant who has extended easy forgiveness to a fraudulent bankrupt has a share of the responsibility for the greater evils which he so cries out against. Every merchant, again, is affected in his daily business by the corruption which, until it is exposed, gives the younger men in life the impression that cheating somebody out of a dollar is an easier way than earning it.

The war brought about a hurry-scurry carelessness and recklessness in business dealing which has been growing upon the commercial community ever since. The sharpers who followed the army to cheat and rake in money in any way they could, amassed capital which gave them at the close of the war an unfortunate standing in the commercial community. Merchants forgot that character, after all, is the greater part of capital. At once this new class introduced into general business the tricks and frauds of their own calling, and instead of ostracising them, many in the better class of merchants were too soon meeting them on their own ground and adopting their low standard as the tone of the commercial community. The results of this are what we have been seeing for the past two or three years.

We ought not, however, to confuse corruption and its exposure. The corruption is a bad thing; its exposure is a good thing; and these final developements, the necessary outcome of wrong-doing, are the best immediate remedy to check the disease itself in the commercial community. Every man found out, every fraud exposed and punished, is a warning to the men who are forming their business characters, that dishonesty doesn't pay, after all. It is of itself an unfortunate thing that there is need to put the argument in this blunt and shocking way, but we have so generally overlooked of late years the standards of commercial morality that the arguments just now most effective must be founded rather on commercial success.

Now we put it to our merchants that pure government and honest trade are vitally connected. We may fairly look to them to set a standard of honor, morality and fair dealing which shall make men ashamed and afraid to deal otherwise than rightly with their neighbor. If they are to encourage corruption in the government by making terms with a revenue officer to "let them off easy," and corruption in business by taking what they can get on the dollar from a fraudulent bankrupt and letting him go scot free, they have no right to cry out when such causes produce their inevitable result. If they would but take this common-sense view of the matter, the only right view, and act on it, we shall have reason to thank the recent exposures for a return to the only true principles alike of public and private business.

The Decline in Silver.

The abundance of silver in the commercial world is becoming a question of great importance among Governments as well as business men. Not because there is really any just cause for such a controversy, but because many fear that the present glut in the market and the steady decline in the price of silver as compared with gold may not merely become permanent, but continue until silver becomes useless as a circulating medium, except at a great reduction in its relative value with gold.

The principal causes which have led to this result are that of the United States having ceased to use silver as a circulating medium for many years; secondly, the adoption of gold as the circulating medium in Germany and elsewhere; thirdly, the steady increase in its production which has been made for some years; fourthly, the decline in all branches of trade which has greatly decreased the demand for silver in manufacturing, and lessened the amount in the hands of the people, who, when business is prosperous, always retain in their desks and pockets large quantities for paying their daily expenses. Millions of persons are now without silver, and all others carry and keep on hand less than ever before. The current supply of silver is greatly in excess of that ever before known. At the same time the demand is greatly reduced. As business revives, the employment of silver in the fine arts and as a circulating medium will increase, when we may expect its relative value with gold, as heretofore calculated, will be resumed. Silver cannot become equal to gold as a commodity for export, because its bulk, compared with the weight of gold, is so great that its export, as specie alone, is too expensive, except to those countries where silver is the exclusive standard of value.

We need not apprehend any very depressing influence from the depreciation in the comaercial value of silver. As the price of it recedes, and business begins to revive, we can rely upon an increased demand for its use in the manufacture of many articles now made of nickle and other metals. We should also remember that, as silver declines in value, gold is made to advance in the same proportion, and thereby

increase the expense when using gold either as money or in the arts. We will thus in due time reduce the demand for gold and increase that for silver, to take the place of the gold, when their relative values will return to the old standard. Silver is too precious a metal to become really less valuable than it has been in a relative sense. Both gold and silver have been steadily depreciating in value as compared with other commodities, since their production has been augmented, but such decrease is, and will always be, apparent in the increased commercial values of other commodities, and not in the nominal value of the precious metals. These will remain so long as they are used as a circulating medium.

The continued decline in the price of other commodities, owing to the general depression in business, and the falling off in the demand for money in the old enterprises and the refusal to engage in new ones by capitalists, has greatly reduced the use of or demand for money, and thus depreciated the current value of all kinds of money, which is made apparent by the ruling rates of interest on first class securities. The many failures of business houses have led to higher rates of interest than would have prevailed, because the risk in lending is greater, which is always considered and allowed for when lending money.

When trade becomes brisk prices of goods will advance and thus increase the volume of money used in making transfers, although the amount of goods may not be enlarged. If a million of families consume a million barrels of flour costing $5 a barrel, they will put into circulation $5,000,000. If it cost $10 a barrel it will then require $10,000,000 to conduct the same exchanges.

Commercial Traveling:—The Other Side.

We have given in previous articles considerable attention to the mooted question of the wisdom or unwisdom of the system of commercial traveling, speaking chiefly from the point of view of the travelers themselves. We have now to set forth the objections which the opponents of this system bring against it. For there are those who believe that commercial traveling is the chief curse of our business system, as others believe it is its chief foundation. For our own part, as we have hinted, it seems to us that the truth, as is often the case, is between, and that the system itself is useful, though it is made dangerous by frequent and almost chronic abuse.

It is perfectly true that a large part of the evils from which business in general has been suffering for the past few years, are due to overstimulation, to the attempt to crowd upon buyers more goods than the country had the means to pay for, and the creation of a business which, though large in volume, was of the most unwise and dangerous sort. Now commercial traveling is a chief means of stimulating business beyond its natural amount. If a merchant stays at home and lets his customers come to him for his goods, he is likely to sell only those for which they have urgent need. The enterprising merchant of course seeks to increase his business by showing his customers that they can profitably buy more, because if they have more goods in stock they can legitimately make a market. If he keeps this policy within proper bounds and does not overload the middleman with more goods than he can make a market for, it is the better for all parties concerned. But the moment he succeeds in over-stocking the retail dealer, that moment he is inflicting an injury both on himself and on his customer. It is, in a word, a question of limitations.

Another point is that when the customer seeks the merchant, the merchant can make, not his own terms, because these are regulated by the general average of prices, but a reasonably safe and living profit. If he seeks the customer he has to "offer inducements," and this inducement is apt to be so large a part of his own profit as to leave him not enough to pay for the actual expenses of selling goods. The two questions therefore are, first, whether the customer is induced to buy more goods than he can pay for; secondly, whether the price which he pays is sufficient to recompense the manufacturer or jobber. Here is where the evil of commercial traveling comes in. The traveler, commonly not a partner in the house, is not restrained by the necessary caution of the partners themselves, and is therefore more likely to sell to parties whose commercial character or credit is questionable. His main point too often is to make large sales; it is the business of the house, he is apt to argue, to see that the collections are made. He knows that his expenses are large, and that to cover them on the books of the firm his sales must be proportionately large, and so he is determined to lose no chance to make a sale. If, months afterwards, the bills he has sold are not paid for, the connection is not quite so direct and may be overlooked by the firm; and in this eagerness and in his competition with rival drummers, he not only overcrowds his customers with goods and so locks up their capital as to prevent their buying more by and by, but he sells at a margin which is not sufficient sometimes even to cover his own expenses, not to speak of a decent and safe profit for his principal.

This is the strong argument which is advanced by the opponents of commercial traveling—an argument which is emphasized by the recent commercial history of this country. It has been a time of small legitimate demand for goods, but of an eager desire on the part of manufacturers to sell. Consequently the evils of the commercial traveling system have been much exagerated in recent practice.

It seems to us, as we have said, that it is not so much the system which is at fault, as its abuses. If the merchant is careful to put the right men on the road, men who have the experience and caution to sell only where sales are safe, commercial traveling is a legitimate and commendable business enterprise. If he insists on putting 'on the road' inferior men, whose object is to make the most they can in a week or a month and let the future take care of itself, the system is certain to become an abuse. A man should feel on the road that he is as much responsible for his sales as though he were a partner in the house and personally liable for its losses. To get this kind of men merchants must select the best they can find, treat them well, pay them well, and give them the hope of permanent association with the house they represent.

Apprenticeship.

It behooves every good business man to look far enough into the future to assure himself that he will have at hand the materials for his work when he needs them. This is true alike of the actual material and of the people whom he has to employ. A good merchant will always be training up a set of clerks able to carry on his complicated business in higher positions as the older ones drop off; and so a manufacturer must provide a future supply of skilled labor to continue the work of his present force as it is reduced in one or another of a hundred ways.

It has been very unfortunate that the immediate selfishness of the trades unions has led to such restrictions on apprenticeship as to seriously offset this principle of action. It has been generally the endeavor of these organizations to limit the number of apprentices, lest adult wages should be reduced by such an increase in the number of workers as they feared from an open apprenticeship system. They did not stop to think that they were thus taking the bread out of their own mouths and doing the worst for both their children and themselves by preventing the large part of the coming generation from being trained to skilled labor. Each man of family who, as a member of a trades union, helped to bring about this arrangement, prevented his children from giving him that assistance which he might otherwise have had from them; and more than that, he interfered directly with their own prospects of earning a decent livelihood and getting ahead in the world when they should grow up. The fear that there would be "too many hands" is but another phase of the same prejudice that has opposed the introduction of labor-saving machinery, which has proved in the long run the great benefactor of the workingman. So that the mechanic as well as the manufacturer is ultimately a sufferer by this limitation of apprenticeship, however wise it may seem in its temporary effects.

Unless thorough training is giving to the coming mechanic by means of a liberal apprenticeship system, the trades and arts must deteriorate instead of improving with succeeding generations. This is "turning

back the hands" in a way that no American will be willing to submit to. It behooves intelligent men and especially the manufacturers themselves to try to educate their workingmen out of such foolish notions. This is not a case where interests are diverse, and there need be no war even of words. A reasonable apprenticeship system is desirable both to employers and employed, and the one remedy for the present difficulty is to inform the working man of the full bearing of the unfortunate plan which he has been advocating.

Alleged Fraudulent Bankruptcy.

The trade is not suffered to rest in its endeavor to put an end to dishonest failures and chronic compromisers. The disgraceful failure of I. C. Levi, of New Orleans, has aroused the indignation of the entire trade. He was recently tried in New Orleans before Judge Billings, on the four counts of fraudulent bankruptcy, brought against him by New York creditors, and the judge's synopsis of the evidence in his charge bore very strongly against him, and the jury found the accused guilty of three out of four of the counts, and his motion for a new trial denied.

If the committee having this matter in charge are supported as they ought to be, they will see that it is not allowed to rest until this man gets his deserts in full. It is necessary to make such an example of him, as will deter others from pursuing the same dishonorable course. The showing here is so clear that it is no case to compromise. It is a case to prosecute to the full extent of the law, and we must say that the creditors cannot consistently listen to any terms of compromise where so much evidence against the accused has been brought out, without laying themselves open morally to the charge of compounding a felony. It is a great mistake to suppose that justice is satisfied when restitution is made or that the duties of district attorneys are consistent with such selfish principles.

In this case particularly, public decency and commercial morals, as well as the interests of creditors are directly involved, and the case cannot be measured by dollars and cents. It may seem hard upon creditors to be called upon after they have lost money, to put themselves to additional expense and trouble at the call of public duty. But this is, as we have before pointed out, a question of direct personal interest. Such expenditure should be looked at in the light of insurance premiums on commercial morality. Moreover, now that criminal proceedings have been instituted, the creditors can scarcely turn back without laying themselves open to the imputation of occasioning false imprisonment, and although a *nolle prosqui* might dispose of any direct responsibility for criminal proceedings; it would not dispose of the moral effect of such an iniquitous practice. It is bad law and bad morals to compromise a case like this, such an act would do more to encourage rascality than any one thing that can be done.

It is a question, in short, whether the trade will have its way or will let the rascals have their way. We commend to the members of our own trade a resolution adopted unanimously at the recent meeting of the Millinery and Fancy Goods Jobbers' Association, viz.:

Resolved, That as an association we look with disfavor upon any compromise with fraudulent debtors, and earnestly recommend that in case a failure is tainted in any way with dishonesty, a settlement be refused, and that the party failing be, if possible, forced into liquidation and driven from the company of honest merchants; and that we also strongly recommend that any party known to have made a dishonest failure be refused credit by all members of our association.

We should be glad to see a resolution in these terms adopted by our own trade association, but whether or no, this is the only principle on which in this emergency, honest merchants can correctly act.

The Fashion of Failing.

The list of commercial failures is increasing daily, and each week seems to bring a larger number than the last. There is no doubt that a large majority of these bankruptcies have been inevitable for a long time, and the houses that now succumb to their sad fate are acting wisely in declining longer to continue a struggle which could at last terminate in only one way—by suspension. But there is a growing impression that not all the recent failures can thus be accounted for. There is room for more than a suspicion that the expenses of a legal bankruptcy process have made creditors too willing to accept less than a fair percentage of the debts due them by suspended concerns, and this unusually favorable disposition on the part of creditors has in turn led many who might have continued to meet their obligations to take advantage of the times and scale down their debts. It is becoming common for houses that have enjoyed fair credit, and that, for all anybody has been able to ascertain, are still solvent, to permit their paper to go to protest, and call a meeting of their creditors.

So far as such bankruptcies are merely schemes to evade the payment of just obligations, which might be met if there were a proper disposition on the part of the debtor firms, they are an evidence of sad demoralization in the business community, and a sign of the times that should excite the most serious alarm on the part of those who believe that commercial integrity is quite as important a necessity of the times as financial soundness. There is but one way that we know of to prevent this fashion of failing, if we may so speak, from becoming still more general, and still more injurious to the good name of American merchants as a body. That is, by making the penalty of unnecessary bankruptcies much more severe. This remedy is of course, to be applied only by creditors themselves, for we already have a sufficiency of law on the subject.

Our Designs.

We present to the trade with this number, a second sheet of designs in color, a feature of the journal in its new form which has been received with general satisfaction. These sheets ought of themselves to be worth the subscription price of the journal, and we think we can claim for them the distinction of being the best work in colored lithography which has appeared in any trade journal.

The present plate, for whose designs we are indebted to the courtesy of Messrs. Robbins & Appleton, represents some new styles of watch backs in transparent enamel, which the American Watch Company has recently added to their line of cases. The numbers under each example are those by which the designs are known and registered in the books of the Company. The best work of this sort can scarcely do justice to the richness of these designs in real gold and enamel, but our readers will be interested in having even this necessarily imperfect representation of a new departure in watch cases, and they will be found very useful commercially, in showing to customers who may desire to select a watch.

Editorial Jottings.

JUDGING from the details of the robberies given in the daily papers, it is clear that the melancholy days of the watchmakers and jewelers have come. These burglaries, like other crimes, occur in groups, and it behooves the police to exercise more than usual vigilance until the present epidemic for plundering is stamped out.

ONE result of the present dullness in trade of all kinds will be the driving out of the credit system, and the establishment of the cash basis permanently. When we reach the point where retail merchants will only sell for cash, then the prosperity of the people will follow, for then will money be valued higher than it is at present, and its purchasing power be better understood than it has been in the later years of our national history.

THE SHREWDEST YET.—A applied to B for a loan of $100. B replied, "My dear A, nothing would please me better than to oblige you, and I'll do it. I haven't $100 by me, but you make a note and I'll indorse it, and you can get the money from the bank." Grateful A proceeded at once to write a note. "Stay," said B, "make it $200. I want $100 myself." A did so, B indorsed the paper, the bank discounted it, and the money was divided. When the note was due B was in California, and A had to meet the payment. What he is unable to cipher out is whether he borrowed $100 of A, or A borrowed $100 of him.

Practical Hints on Watch Repairing.

By Excelsior.—No. 13.

(214) We will now consider the regulation of fine watches, in which it is not expected, of course, that any great change will be necessary, as in that case a new spring would be fitted. Supposing that we have an isochronized hair-spring, it must not be let out nor taken up to change the rate, but we must alter the balance. Even if the watch has a regulator, it should be moved but very little, as by so doing we virtually change the length of the spring, and injure or destroy the isochronism. After moving a regulator to change the rate to the extent of half a minute per day, or more, the isochronism should be tested, and if it has been injured by the change, the regulator should be replaced where it was, or where the isochronism will be restored, and the rate be corrected by the balance. This is important in all cases, but particularly so in springs with terminal curves. Of course, in watches without regulators, the rate is to be corrected by the balance only, according to the directions given. But as most watches have them, the greater portion of this article is devoted to them.

(215) In genuine chronometer or compensation balances adjusted for temperatures, there are generally four mean-time screws,—two at the ends of the center-bar, and two others midway between them on the rim, being thus a quarter of a circle apart, and hence also termed "quarter-screws." The office of these timing screws is to adjust the rate of the watch, by screwing them further in, and thus by carrying their weight nearer to the center of the balance, to make it virtually smaller or lighter, and cause the watch to gain; or turning them out further from the center, to make the balance virtually heavier, and lose. Any alterations should of course be made equally on the two opposite screws, to preserve the poise of the balance. This can be done by noticing the slits in their heads and giving each one exactly the same angle of turn. If there is any doubt, the poise should be tested. Should it be found incorrect, the two screws must be made to restore it. But inasmuch as all watchmakers do not use four mean-time screws as above, it will be safer to alter only the *two* at the ends of the center bar. In any case, the other pair must never be changed more than a mere trifle, because any change of a screw upon the cut section of the rim, by moving it either in or out, must infallibly disturb the compensation for heat and cold. Even if a cut balance is not adjusted, it is not advisable to alter the screws near the ends of the sections, but only those near the center bar, where their effects upon the compensation, or the errors caused in different temperatures, will be less in amount, although the effect upon the regulation will be just as great.

(216) Not all cut balances, even when they are genuine chronometer balances, are compensated; and whether any particular balance is adjusted or not can only be certainly known by trying it in different temperatures. There are very few makers whose stamp, "adjusted," may be fully trusted without trial. A cut balance that is not adjusted may be either better or worse than an uncut balance; as it may happen to be very near correct, or, on the other hand, the position of the screws and the action of the sections of the rim may be so unsuitable to each other as to cause the balance to "act like the devil," when exposed to changes of temperature. But as the adjustment of the compensation balance for heat and cold is a special subject by itself, I shall not consider it here, but merely observe that it is important to keep our watches at a temperature as nearly uniform as possible while regulating them, in order to eliminate from our task all the irregularities which would otherwise be mixed up with the action of the hair-spring. We can regulate a watch, in one temperature, but we cannot, if we try, make the regulation cover the compensation for temperatures, and by trying we shall not only fail in that but injure our regulation besides. This rule is specially important with cheap watches. And the best are always *regulated* in one temperature and *compensated* in different temperatures.

(217) If we have an isochronal spring with a screw-balance which is not cut, we can alter any or all of the screws in the rim indifferently, so long as we do not destroy the poise. If the watch loses, we must make the balance either actually or virtually lighter. If the screws cannot be turned in, we may either file off the heads a little, taking care to do this squarely and in a workmanlike manner, or we can drill out in the center of the heads, leaving the exterior appearance unchanged. Or we can take out gold screws and substitute lighter ones of brass, or smaller gold screws. Or, if change enough is required, we can remove an opposite pair of screws entirely. On the other hand, if the watch loses, we can turn out one or two opposite pairs a little. If that is not sufficient, turn out others equally far, being careful not to draw out either of them more than the rest, and drawing out more screws rather than move a few too much. We can also substitute gold or platinum screws for those of lighter metal, or substitute larger screws, or put in an additional pair to increase the weight of the balance. These changes of weight will slightly disturb the isochronism of the spring, which must be readjusted as already directed. If the watch has a regulator, the isochronism can generally be restored by opening or closing the pins, (125.) If not, it can be done as per section (136,) or in the case of a terminal curve, by slightly altering that, (156,) after the watch is closely regulated for time. But the isochronism should never be corrected by the regulator pins with any but the plain flat spiral springs.

(218) If, instead of a screw balance, we have a plain one, whether of gold, brass, or steel, the best way to make it lighter is to hold it by the exterior of its rim in one of the step chucks of the American lathe, or any similar way, and turn out a very little with the graver, on the under side, being careful not to cut away too much. In this way, with due caution, the poise will not be disturbed. Others simply file a little from the inner edge of the under side of the rim, equally in three different places, to preserve the poise. The only way to make a plain balance heavier is to tin it (212).

(219) The effect produced upon the isochronism of a hair-spring by moving its regulator is, in general, greater in the short vibrations than in the long ones. Turning the regulator towards the "slow" makes all the vibrations slower, but the short ones proportionately more so than the long ones. And, *vice versa*, turning the regulator towards the "fast" not only makes the watch gain, but also causes the short arcs to gain on the long ones. If the spring is isochronal, and the watch gains or loses but little, the error of rate should be corrected, not by the regulator, but by altering the balance. But if the balance has no screws, such alteration would be troublesome, and we may prefer to move the regulator to correct the rate, and then restore the isochronism by opening or closing the regulator pins a little. This course is more often allowable when the required motion of the regulator is towards the stud than when away from it. But when the error of rate is considerable, we must move the spring through the stud, bearing in mind the requirements of isochronism, in the flat spiral spring (the Breguet spring will be specially noticed in section 222,) as to maintaining the relative positions of the *points d'attache*, etc. That is to say, after taking up or letting it out, we must restore their previous relative position, (if correct,) by altering the central coil, etc., as in sections (137 to 140.) If that alteration of the spring, etc., is not allowable or practicable, on account of destroying the correct proportions of the central coil, (38, 39,) or for any other reason, then we must change the weight of the balance to the required amount, as already described, or, if too much change is needed, a new spring should be fitted; for we must perform the regulation in such a way as not to destroy either the harmonious proportions of the movement or the isochronism of the spring, and to improve both if possible.

(220) But it is always a grave question for the workman to answer to his own sense of right, how far he is justified in permanently altering a watch by changing the weight of the balance, to save himself the trouble of fitting a new spring. Even in cheap watches he would require a strong excuse for removing or adding a pair of screws, or very much changing the weight of a balance by tinning or filing it; and in good watches it could only be allowed on the supposition that the weight of the balance did not bear a correct proportion to the motive force of the mainspring. If this proportion was correct, then his duty would be to conform the strength of the hair-spring to the

weight of the balance, so that the balance and hair-spring, as an entirety, would be suitable to the movement. The altering of the balance to conform to the strength of the hair-spring, in such a case, would destroy the correct proportions of the entire movement, and such a practice should only be followed within very narrow limits.

(221) In watches with regulators, the adjustment of the isochronism becomes more difficult as the distance of the pins from the stud increases. So much so, that many high authorities have claimed that a spring cannot be isochronized at all with a regulator,—probably because, in bringing the watch to time, they had got the regulator too far from the stud. There is no denying that, theoretically, the action of the pins renders a perfect progression in the increase of elastic force impossible,—since the spring cannot vibrate as it would if it ended at the regulator, nor as if its action extended to the stud uninfluenced by the regulator, but there will be a mixture of the two, varied by the effect of the pins, and further complicated by the reverse action of the portion of the spring between the pins and the stud. But, practically, if the spring has been fitted in accordance with the instructions heretofore given, and the pins are near the stud, we can so add to or take from the composite action resulting from all these different influences, as to secure a correct progression of strength, and consequently isochronal vibrations. The workman should endeavor in regulating his watches with flat spiral springs to keep the regulator as near the stud as possible, not only for the sake of the isochronal perfection of the spring's action, but because even the regulation to time is more easily and closely effected by so doing. It should also be remarked that the effect of opening or closing the pins increases as they are nearer to the stud, so that the isochronal adjustment is more easily made, or restored, when disturbed by moving the regulator.

(222) It has already been stated that, before taking down a watch with an isochronized hair-spring, the workman should examine and make a minute of the position of the regulator, the position of the spring between the pins, and the width of opening, in order to restore everything to precisely the same condition when done. This is especially important with a Breguet spring, for reasons before given. But when an error of rate requires that the *status* be changed, there are certain points to be observed in the regulation of the Breguet spring different from that of others. We first ascertain whether the terminal curve extends to the stud, or only to a concentric arc, or portion of a coil, which is pinned to the stud. This can be told by moving the regulator. So far as the spring retains the same position between the regulator pins, the coil may be considered concentric. But if the spring, from being free between the pins, soon presses against the outer pin, as the regulator is moved away from the stud, the point where this outward divergence begins may be considered the end of the terminal curve, from which point it sweeps gradually outward till it reaches the normal spiral form at the exterior coil of the spring.

(223) If the former is the case, or the terminal curve extends to the stud, the workman should conduct the regulation to time with the aim to get the regulator as near to the stud as possible. And to this end, he should make the watch go slower by moving the regulator towards the stud; but he should not move it from the stud in case the watch must be made to go faster, but, if practicable, produce that alteration by means of the balance, (215.) If he was able, without much change of the weight of the balance, or alteration of its screws, to cause the watch to gain sufficiently to allow of bringing the regulator entirely to the stud, it would certainly be wise to do so, for he would obtain the very best conditions for the perfect action of the terminal curve; simulating a spring without a regulator. The more closely to the stud he can bring it, the more nearly will the curve be free from restraint, and able to produce the legitimate effect sought for by its form. When springs whose curves reach to the stud are provided with regulators, every shifting of the regulator must be accompanied by a bending of its pins to conform properly to the spring in its new position; but the spring must never be bent to give it freedom between the pins of the regulator, as that would at once destroy the correctness of the terminal curve.

(224) On the other hand, if there is, between the end of the terminal curve and the stud, a concentric arc, (173), then his aim should be to bring the regulator to the point where the spring changes from a concentric to a divergent form. When the watch loses, he should move the regulator from the stud towards that point, and when it gains, he should not move the regulator back, but draw out the screws of the balance. When the watch keeps time with the regulator at that point, and with the pins well closed together, the position of all the parts is the one most favorable for securing isochronism that the spring, in its then shape, is capable of giving. If the isochronal action is not satisfactory, the curve should be altered as already directed, (156, 157.)

(225) But the preceding section is correct only when the concentric portion is within the limits prescribed in section (176). If its length exceeds 45°, it is evident that the supplemental coil has not been formed with proper regard to the requirements of isochronism, as there stated, and we shall obtain better results by modifying the course taken in section (224.) If the watch loses, the correction should not be made either by the regulator or the balance, but by drawing the spring through the stud; while, if it gains, the balance screws should be drawn out. If, by taking up the spring and drawing out the balance screws to a reasonable extent, we can bring the end of the terminal curve (and the regulator pins) within 45° from the stud, or less, we may hope for fine action of the spring. But if that point is more than that distance from the stud, even though we have the regulator pins at the end of the terminal curve, we cannot expect perfect isochronism. The regulator should never be moved beyond that point, and on the terminal curve, to make the watch go faster, but either take up the spring or turn in the balance screws to cause the gain in time. Nor should the spring ever be let out to produce a slower rate, if that alteration would carry the end of the curve more than 45° from the stud, but we should draw out the balance screws for that purpose.

(226) Lest this subject should seem complicated, I will recapitulate briefly. 1st. If the terminal curve of a Breguet spring reaches to the stud, the object should be to conduct the regulation or alterations so as to bring the regulator as near the stud as possible; and, rather than move it *from* the stud, the balance should be altered. 2d. If there is a concentric arc at the end of the spring, the aim is to bring the regulator to the junction of the concentric and divergent portions of the spring, and all alterations should be made to favor that purpose. 3d. But if this junction is over 45° distant from the stud, the chief object is to reduce that distance to 45°, or less, and the next is to bring the regulator to the junction; and all changes must be made so as to favor the first object, *if at all possible*, and if not, then to favor the second. Whenever any of these changes disturb the isochronal adjustment, it should of course be restored, in the most convenient way.

(227) These directions are based on the supposition that the workman is willing to take a little extra trouble for the sake of improving the isochronal action when it is not perfect. But if he cares for nothing but to bring the watch to time in the easiest way that will do no harm, or as little as possible, he should make his corrections of the rate principally by the balance. But whether he does or does not observe these rules, he will at least know how he may secure the most perfect results, if he so desires, or how to avoid injuring the timepieces in his care, when he has the choice of modes in which to make necessary alterations. If he only travels a little way in the paths recommended, or even only avoids taking wrong ones, that will be much better than working in the dark, not knowing whether he is improving or ruining his jobs.

(228) There are different degrees of excellence in Breguet springs, represented by the three preceding classes, in their order. Yet even the third and lowest degree, with a concentric arc greater than 45°, and the regulator far from the junction, is without doubt much better than a plain flat spiral not isochronized at all, because the outer coil of the former can contract and expand more evenly on all sides of the balance-axis. But we should not be contented without doing in every case the very best we are capable of doing. If we are fitting a spring, let us fit it in the manner that will give the best action; if we are only

regulating a spring already fitted, let us strive to obtain the best results which the form of the spring can yield. Only thus can we improve in our art, impress upon our memory the maxims which lead to perfection, familiarize ourselves practically with the finer manipulations, and gain the delicacy and dexterity which we should need if we were called upon to do a perfect job, but which we could not possess unless we had obtained experience by following the above course in our work, even upon cheap jobs or those in which we get no pay for our extra care.

(229) I have already alluded to a phenomenon (23) noticed in fitting new springs which have been hardened and tempered, viz., that they accelerate on their rate for the first few weeks or months, and then, having attained their highest degree of pliability and elastic force, become constant. For this reason, the watch or chronometer cannot be regulated immediately after fitting such a spring, to maintain a perfectly uniform rate for a long period. But after bringing it closely to time, the meantime screws may be drawn out to cause a loss of a few seconds per day, (two to five, generally,) by which means it will take nearly a correct rate after the accelerating process is ended. The amount is, of course, a matter of guess work, but a moderate alteration will make the final rate nearer correct than if there had been no change. Where the precise permanent rate must be known, as in marine chronometers, whose error of rate is a vital element in the calculation of longitudes, etc., it is necessary to await the completion of this acceleration before a trustworthy rate can be got. Cases occasionally occur where the spring continues to change for several years, but generally they do so only for a few months.

(230) Besides the condition of the watch itself, we have to guard against an external disturbing influence which often produces vagaries in the regulation so incomprehensible as to cause the workman to give up in despair of overcoming them. This influence is magnetism or electricity, and is more commonly felt than is supposed by the majority of workmen. It has already been said that the balance should not be magnetized. Chronometer makers fully appreciate the importance of this point, and guard against it by causing their balances to vibrate a turn and a quarter. By this means a balance is secured from any injurious effect even if it is magnetic. A magnetized balance has a constant tendency to turn to some particular position, but with the above arc of vibration this tendency is neutralized, by the retarding and accelerating influences counterbalancing each other during the course of the vibration, so that no effect is produced upon the rate. Another advantage of vibrating 1¼ turns is that the effect of a want of poise is less than if the arcs were greater or smaller. It is scarcely necessary to say that the advantages thus secured are not confined to marine chronometers, but may be obtained in the same way for all watches, by giving that vibration when their balances are wholly or partly of steel, iron or nickel. Balances of gold or brass are not affected by magnetism, but steel screws used in their rims, or elsewhere in their construction, may have a disturbing influence. In going-barrel watches, whose balances have varying arcs from the varying motive force, if we make the average between the largest and smallest vibrations to be 1¼ turns, we practically secure the advantages named as well as can be done in such cases.

(231) But the above precautions will not prevent evil effects from the application of a magnet near to a watch, and the effect is the same whether the case be open or shut. Powerful electro-magnetic batteries or machines will magnetize a watch at a distance of several feet, and persons who work around batteries, etc., should lay their watches aside during working hours. Even if the balance is of gold or brass, the magnet may attract the lever so strongly as seriously to disturb the rate. Never allow any magnet or magnetized piece, loadstone, electric machine, galvanic battery, conducting wires, etc., near a fine watch, or carried in the pocket with it. Thousands of watches have been ruined by fooling around them with magnets, etc., either knowingly or ignorantly, and when the watches are not injured by such a practice, their running is disturbed. It is often thought that a solid or uncut steel balance cannot be affected by magnetism, because it is a circle. But the arms have ends, and may be magnetized or attracted the same as plain bars, notwithstanding that they are attached to a rim. A watchmaker should take no chances in such matters, but avoid even the possibility of his adjustments being interfered with by this or any other influences known to be injurious. If the owner insists on exposing his watch to injury, it is his privilege to do so,—and to pay for it.

(232) Whenever it is suspected that a watch is magnetized, it can easily be tested by dipping the steel parts into clean, fine iron filings, having first made the pieces free from moisture, oil, etc. If magnetic, the filings will adhere to them, and most plentifully at the points where the magnetism is strongest, or "poles." Another way is to hold the suspected pieces very near to a small and well balanced compass. This is specially adapted for testing balances, springs, etc. If no part of them shows any tendency to attract one pole of the compass more than another, they may be considered free from magnetism. But if one part cause the North pole to move, and another the South pole, they are of dubious value, for in whatever position the watch is placed, they will be affected by the earth's magnetism. As far as my experience goes, there is no remedy but either to bring the pieces to a red heat, or replace them with others.

(233) In conclusion, I may mention a fact not generally known:—that if a watch which has been closely regulated is allowed to run down, its rate will almost invariably be different when again wound and set going. Whether the change of rate is due to the relaxation of the mainspring when relieved from tension, or whatever the philosophy of it may be, we may derive from the fact a useful practical lesson,—not only to guard against such a mishap while regulating our watches, but, when it does occur, to avoid moving the regulator to correct the error. Many watchmakers allow their watches to run down every Sunday, to save the trouble of winding on that day. This is a great mistake, for it generally takes them several days to fully recover their former or permanent rate, and if the regulator is changed before this takes place, it is evident that the injury is done which will have to be undone again when it has returned to its normal condition. It is well to keep customers' watches running till they are called for, unless they are left an unreasonable length of time. So, also, sale watches which have been closely regulated, and from which purchasers will expect fine performance, should be kept running. But if they have been allowed to lie still for a while, no account must be made of their rate for the first week after rewinding,—simply giving that time for them to settle down again. At the end of the week, set them, without changing the regulator, and they will generally run the same as before. If they do not, it will then be safe to move the regulator, and bring them to time in the usual way.

Electro-plating.

It may be well to repeat here what we may have said in relation to the hot gilding baths. These hot baths may be more concentrated, or the same quantity of water may be diminished without changing the proportions of the salts and of the gold, yet we have found it preferable, in practice, to use the diluted solution as they deliver the metal in smaller quantity in a given time, but with a better arrangement of its molecules. All articles suspended in the baths should be kept in constant motion as far as possible, as by so doing we prevent the stratification of the liquor, keep the specific gravity of the solution even, and the gilding produced is more uniform in color. In hot gilding we seldom use a soluble gold anode, considering a foil or platinum wire preferable as it is not dissolved, and it is handier for regulating the intensity of the current by plunging it more or less into the liquor. This anode allows us to obtain in the same bath and with the same battery the deposit of three different shades of gold—pale color by dipping the anode slightly, a yellow color when the wire is immersed deeper, and a red gold when the anode is all in the liquor. These various shades are due to different modes of arrangement of the gold molecules, and this phenomenon becomes the more striking as we operate with baths holding alloys. Thus in a bath of pink gold composed of gold, copper, and silver, we may, at will, by increasing or diminishing the length of the platinum anode in the liquor, impart to the deposit a white, yellow or red shade, since the various metals require for their reduction different degrees of intensity in the galvanic current Therefore we see that with hot electro-gilding baths, and es-

pecially with small articles, a skillful operator will keep them with his right hand constantly moving in the liquor, while the left hand is employed in changing the position of the platinum anode, so as to suit the surface of the articles and obtain the desired shade.

All hot gilding baths may have their strength maintained by successive additions of chloride of gold with a proper proportion of the other salts; but we soon ascertain that with the increasing density of the liquor, the results become inferior and that it is preferable to wear out the bath entirely and then prepare a fresh one. As the bath becomes exhausted the gilding is red if much copper has been gilt in it, and green in the case of silver articles, and it may then be used for a first coat upon objects to be finished in the new bath. Electro-gilding, either by the hot or cold process, may present many different colorations, due sometimes to different arrangements of the molecules, but oftener to the alloy of some other metal with gold. Thus green gold, and also white, result from the simultaneous deposit of gold and silver in various proportions; red gold from an alloy of copper and gold, and pink gold from the combination of gold, silver and copper. To obtain green and white golds it is sufficient to add to one of the above baths a solution of the double cyanide of silver and potassium, or a diluted solution of nitrate of silver. The tints will vary from a leek green to a very pale whitish-yellow. This kind of gilding mixed upon the same articles with red, yellow or pink gold, will produce splendid effects of contrast, especially upon chased parts where the green gold has a very velvety lustre. Red gold is obtained by mixing in suitable proportions the electro-copper bath with one of the gold baths, sometimes an old bath is used in which many copper articles have been gilt. Yellow gilding may be made to pass to red by heating it after covering it with a paste of acetate of copper, cream of tartar and common salt, after which the heated piece is plunged into a weak solution of sulphuric acid, and afterwards carefully scratch-brushed.

Pink gold or new gold is the most difficult to obtain, not only on account of the different tendency of the various metals to galvanic decomposition, but also because the jewelers disagree as to the proper shade. We should therefore expect trouble on that account, since he will have to vary the shade for each customer, some preferring a gilding slightly yellower, others redder or whiter. In our opinion pink gilding, to be perfect, should present at the same time the red, yellow and white shades in such a manner as to be distinguished by the practised eye. The effects produced by these mixed tints cannot be described, but will always be remembered by those having once seen them.

The following methods are used for obtaining the shades of pink gold: First, gild the articles yellow in hot electro-gilding bath, and then keep them in fresh running water, taking from time to time small bundles, weighing from 30 to 50 grammes each, pass these through the mercurial solution and then gild red in an old and hot bath (better in one where a great deal of copper has been gilt), or in a new bath composed of ten parts of hot electro-gilding bath and three parts of the coppering solution.—

Water	10	litres.
Acetate of Copper	200	grammes.
Carbonate of Soda	200	"
Bisulphate of Soda	200	"
Cyanide of Potash (pure)	200	"

According as the electrical current is more or less intense so is the gilding more or less red. For giving a whitish tint seen on many gilt articles and also on jewelry, controlled by law, the red gilding is passed through boiling and nearly exhausted solution of pyrophosphate, to which has been added one-tenth of its volume of a silver bath, or simply a few drops of a concentrated solution of nitrate of silver. This gilding should be scratch-brushed and burnished thereby imitating the gilding with alloyed gold. A few gilders simply pass their red gilding through a cold silver bath by dipping, but in whatever way we operate we impart a blush of silver which whitens more or less the red gilding. When we miss the proper pink gilding, it is sufficient to plunge the articles for a few seconds into a mixture of five parts of sulphuric acid to one of nitric acid, thus dissolving the copper and the silver, causing the yellow gilding to reappear upon which the operation may begin anew.

Regal Gems.

DESCRIPTION OF THE FOUR LARGEST DIAMONDS IN EUROPE.

(1) The Orloff of Amsterdam; 194½ carats; latest price, 450,000 rubles. Cut-in the old rhomboid shape. Forms the extremity of the Russian scepter. It esme from the old mines of India, and it is said to have once formed one of the eyes of the celebrated statue of Sheriigan in the temple of Brahma. At a later period it was found, with another large diamond, in the throne of the Shah Nadir of Persia. When he was murdered, it was taken by a French grenadier who had taken service there, and who fled with it to Malabar, and sold it there to a ship-captain for 14,000 thalers, and he handed it over to a Jew for 84,000 thalers. The Jew sold it at a greatly advanced price to the Armenian merchant Schafras, from whom the Empress Catharine II obtained it in 1775, at Amsterdam, for 450,000 rubles, an annuity of 2,000 rubles snd a diploma of nobility.

(2) The Regent or Pitt; 136⅜ carats; perfect diamond cut; value, 1,200,000 thalers. Among the French crown-jewels. It came from the mines of Parteal, twenty miles from Mazulipatam (Goleonda, East Indies), where it was found in 1702 by a slave, who, in order to conceal it, wounded himself in the leg and hid it under the bandage. He promised the stone to a sailor if he would procure him his liberty. The sailor, enticed him on board his ship, took the stone, drowned the slave, sold the diamond to the Governor of Fort St. George (whose name was Pitt) for 1,000 pounds sterling, squandered the money, and hanged himself. It was purchased from Pitt in 1717 by the then Regent of France, the Duke of Orleans, for Louis XV., its price being 3,375,000 francs. It weighed at that time 410 carats, and was afterward cut and polished in perfect diamond form, by which, however, it lost two-thirds of its size. This operation took almost two years and cost 27,000 thalers. As much as 9,000 thalers were expended in diamond dust, and the pieces broken off still had a value of 48,000 thalers. In 1792 it was stolen, together with all the crown diamonds, at the plundering of the Tuileries, and was lost sight of for several years, until, in an annonymous letter to the minister of police at Paris, the place of its concealment in the Champs-Elysees was accurately described. It was actually found there, together with the rest of the most valuable crown-jewels. (Probably the thief had become convinced that it was dangerous for him to attempt to sell jewels of such value.) The republic then pawned it to the merchant Trescow in Berlin. After its redemption it adorned the sword of Napoleon I.

(3) The Koh-i-nor—Mountain of Light; 106 1-16 carats; a flat oval diamond; belongs to the Queen of England; value, 800,000 thalers. Its history is lost in the darkness of Indian tradition, and can be traced with a certainty only since the beginning of the fourteenth century. It was for hundreds of years the crown jewel of the Radschas of Malwa, and was rightfully regarded as a talisman of sovereignty, because it was always the booty of the strongest conqueror. In this manner, after it had frequently changed owners, in 1813 it came into the possession of the ruler of Lahore, when it was captured by the English in 1850, at the rebellion of the Sikh troops, and was presented to Queen Victoria. It weighed at that time 186 1-16 carats; but it had been awkwardly cut—several hundred years before, by the Venetian lapidary, Hortensio Borgio—that it produced little effect. (Exhibited in London in 1851.) Queen Victoria had it newly cut by Herr Voorsanger, the most skilled workman in the celebrated diamond-cutting establishment of Herr Coster, at Amsterdam. The work was completed in 1852, in thirty-eight days.

(4) The Florentine or Tuscan; 139½ carats; value, 700,000 thalers; among the treasures of the Emperor of Austria; pure, but of a yellowish color; probably the largest of the diamonds lost by Charles the Bold in the battle of Granson in 1476. It was found by a Swiss on the public road in a casket, in which there also lay a costly pearl. At first the man scornfully threw away the diamond, but then picked it up again, and sold it for a florin to a clergyman, and he sold it for three francs to the Bernese. Here it was purchased for 5,000 florins by the wealthy merchant-prince, Bartholemew May. Then a Genoese purchased it for a little more and sold it for double the price to Ludovico Moro Sforza, the regent of Milan. On the occasion of the dispersion of the treasures of Milan, Pope Julius II procured it at auction for 20,000 ducats. It is now in the Imperial Treasury at Vienna.

Translated from the German of Dr. Schuchardt.

Proceedings of the Horological Club.

A DISTINGUISHED BODY OF WATCH AND CLOCKMAKERS.

Twenty-sixth Discussion.—Communicated by the Secretary.

ORIGIN OF THE CLUB.

Before resuming our reports of these discussions, which have been suspended for a number of months, we would seize the present opportune occasion to give the readers of the JEWELERS' CIRCULAR a brief outline of the origin and growth of this Club, and the peculiar basis on which it was constructed.

About two and a half years ago a number of ambitions gentlemen connected with the watch and clockmaking and repairing professions, consisting of Messrs. Horologer, Uhrmacher, Clerkenwell, Shafthausen, Waltham, McFuzee, O'Lever, Rubypin, Regulator, Blowpipe, Hammerhead, Chalkbrusher, Hairspringtwister, Platebumper, Jewelerscrker, Oilsmearer, Screwsqueezer, and other distinguished artisans, constituted themselves into a Club for the purpose of obtaining a free expression of ideas on subjects pertaining to the various vocations, and also with a view to the personal glorification of each of its members. A number of well known writers and practical workmen in different parts of this country, and in other countries, have from time to time been elected honorary and corresponding members.

Proper officers were elected to conduct the affairs of the Club, but no treasurer was appointed, as it was the general belief that a body of watch and clockmakers would never be likely to require the services of such an officer, and time has given ample proof, that in no other particular has the foresight of their honorable body been more astute and correct. But in human affairs it is generally fatal to any enterprise to dispense entirely with filthy lucre and the advantages to be procured thereby. The millenium has not yet attained a very alarming proximity to our era, and few are yet found who are willing to give something for nothing. Some things are indispensable, even with an organization adjusted to work so economically as this. And it is scarcely to be doubted that the now famous Horological Club would have perished in its infancy or fallen still-born from its originators' fertile brains, had it not been for the liberality of the editor of the JEWELERS' CIRCULAR in furnishing this honorable body with an elegant and spacious council chamber, and placing at their disposal the pages of his popular and valuable journal in which to inform the waiting world of the results of their incubrations—and all without money and without price, He and other public spirited gentlemen, anxious that mankind should not suffer the irreparable loss which would follow upon the demise of this honorable body, have from time to time contributed to furnish material for the production of caloric and luminiferous particles, and the necessary apparatus for extracting the same therefrom and disseminating them for the comfort and inspiration of the distinguished members of the Club, and have provided for various other needs of the inner and outer man. Thus kindly fostered, the Club has lived, flourished and grown to its present towering proportions and importance. Although without funds or facilities for instituting experiments itself, the Club has always been very liberal in encouraging others to experiment (at their own expense), and has shown unwearied patience in profiting by the results of their labors, thereby proving its possession of all the disinterested, generous and noble qualities which appertain to man in his present imperfect phase of evolution.

During the time this Club has been in existence, a number of correspondents have had the audacity to make inquiries concerning the genuineness of the organization, and even at the present day many persons incline to regard the Club as a myth. To all such doubters and unbelievers it is now once and for all positively stated that the Horological Club is a GENUINE INSTITUTION.

It is, however, peculiarly constructed, as must be apparent to all; but watchmakers themselves, when taken as a body, are "a peculiar people" and differ somewhat from the remaining portion of the human race. Why then should the Horological Club not be peculiar? It meets the requirements of a peculiar people, which it is earnestly to be hoped are "zealous after good movements" (we mean works). With this brief statement, we will proceed with our reports.

A RETROSPECTIVE VIEW.

The Chairman in opening the meeting referred to the success which had attended the Club, and the many new ideas which had been developed through the means of their controversies. The different causes which lead to the breaking of mainsprings was the first question brought before them for consideration, and the many phases of this most vexatious subject, were fully argued, and many valuable additions made to the previously existing literature on the subject. Stem-winding watches were also discussed, and the absurdity of constructing a stem-winding mechanism without a stem hand-setting arrangement was fully exposed. The principles of the compensation balance and the causes which lead to the necessity for a secondary compensation have been from time to time very fully and elaborately discussed, and several erroneous though popular ideas on the subject have been exploded. The possibility of removing magnetism from steel has also received considerable attention, and while this question has by no means been exhausted, a very considerable amount of information and diversity of opinion have been elicited. The fuzee and going barrel controversy will still be fresh in the minds of all. This debate lasted for several months, and by means of letters, was participated in by a number of the most experienced and studious practical workmen in the country. Many able, ingenious and original arguments were brought forward, both for and against the use of a fuzee in fine watches, and more general knowledge was thereby disseminated on this particular question than is joined in *all* the standard or periodical works on watchmaking that have yet been published. In addition to the discussion of the above mentioned, and many other subjects of equal or minor importance, several new and useful inventions in tools and parts of watches had been submitted for their opinion, which had given them much pleasure, both on account of the excellence of the inventions, and also on account of the confidence which appears to be reposed in the judgment of their honorable body. The development of the practical branches of the business is perhaps of more interest and of more vital importance to the masses of the trade than researches in the realms of philosophy or pure mechanics, and it was his individual opinion that while the latter should not be altogether neglected the former should receive more attention at their own hands than they had yet given it.

The communications addressed to them from "Geneva" had attracted much attention. "Secondshand" had contributed many useful ideas on the construction of new or improved tools and other subjects of a practical nature. "Isochronal" had favored them with several communications on the compensation balance which betrayed deep study and reflection, on the part of the writer. The-Adjuster-of-the-French-School had opinions and secrets which are peculiarly his own. Mr. E. D. Root had added much to the interest of their proceedings by the pertinent queries he had addressed to them on the subject of the compensation balance, while they had derived much pleasure and received much instruction from the scholarly communications received from Mr. C. E. Fritz. Other correspondents had contributed to the interest of their discussions, both by inquiries upon various subjects, and by information in answer to inquiries. He thought he expressed the minds of the members in returning the thanks of the Club to all such, and that they would in the future be pleased to hear from all who had real improvements to offer, or the results of their own experience known to be trustworthy.

Although the members of the Club were very wise in their generation, yet it was possible that there might be a few things that they did not know all about. Again, it is a well-known fact that real worth and true genius are always modest and shrink from displaying their attainments. This would doubtless account for the remarkable modesty of the members of the Club, and their reluctance to revolutionize things by telling all they knew. Or, perhaps they did not wish to monopolize all the glory themselves, but were willing to give others a chance to say something once in a while and immortalize themselves

in the columns of the CIRCULAR. For these and other reasons they would always be happy to receive communications from their friends and co-laborers in the field of horology and the kindred arts and sciences. These should be addressed to the Secretary of the Horological Club, care of the Editor of THE JEWELERS' CIRCULAR. They should always be as brief as possible, as we do not wish to trespass too much on space in the CIRCULAR, and all room for self glorification therein is already appropriated by the members of this honorable body. After very gracefully expressing his appreciation of his own high office, and promising his best endeavors to fulfill its duties acceptably, he sat down amid a storm of applause.

Mr. Screwsqueezer desired to make a few remarks. He objected "wholly, entirely, and *de toto*," to that portion of the Chairman's address in which he admitted that there might be some things that the Club did not know. There is nothing whatever about the business, sir, said he, that we don't know. I am a modest man, sir,—you seldom or never see anyone any more so than myself. But I must say in the interest of truth and justice that we *do* know all about this business. Things that ordinary men cannot understand, we can see through at a glance. What we don't know by our own experience, sir, we can evolve from our inner consciousness. There is no question that anybody can ask which we cannot answer. And I for one object to our presiding officer admitting that we do not know everything about our own business.

Considerable debate was had upon this point by the different members present, but the majority agreed with the Chairman that it was possible, although not at all likely, that some things the Club might not be perfectly conversant with, and the matter was dropped for the time. The Club then transacted considerable business of a routine nature, and also effected a complete reorganization, introducing several new features, which will appear hereafter.

DISTINGUISHING "ADJUSTED" MOVEMENTS.

The Secretary then called attention to the following letter:

Editor of the Jewelers' Circular:

Please ask the Horological Club in what way we country watchmakers can distinguish an adjusted movement from one that is not adjusted, and oblige, J. J. STRICKLER.

Mr. Uhrmacher said that their correspondent probably referred to the adjustment for heat and cold, as that was what watchmakers meant by "adjusted." The way to test a movement was to run it for a number of hours, or a day, at a high temperature, say 100° to 120° Fahr., carefully noting the exact time to a second. Then run it for the same length of time at as low a temperature as convenient. If the movement was "adjusted," it would keep the same time in both trials. If he also referred to the adjustments for positions and isochronism, he would find full directions for testing those adjustments in the articles by "Excelsior" which have recently appeared in the JEWELERS' CIRCULAR. He knew of no work published anywhere which treated of all matters connected with practical manipulations upon hair-springs so fully and reliably as those articles.

Mr. Hairspringtwister wished to free his mind about this "Excelsior." That writer had taken up page after page of the CIRCULAR with directions for putting in and adjusting hair-springs, which space might for better have been given to recording the proceedings of this Club. Then the trade would have had something practical. The way to put in a hair-spring was to pick out a spring of the right size and strength, pin it at both ends, and level it up, and the thing was done. That was all there was of it. This talk about the "isochronal adjustment" was all humbug. If the spring was put in as it should be, it would not need any adjustment. Any fool ought to know that. Yet this blamed "Excel"——

Here the irate speaker was with some difficulty choked off, and induced to resume his seat.

The Adjuster-of-the-French-School next took the floor, carefully adjusted his eye-glass upon his ruhicund nasal organ, twirled his Napoleonic mustache and hemmed thrice, after which he bowed to the Chairman and then to other members present. He could not agree with Mr. Hairspringtwister that the isochronal adjustment was a humbug. Not at all! On the contrary, his own researches into the metaphysical properties of hair-springs had convinced him that isochronism was a sublime and wonderful thing. He felt glad that "Excelsior," whom he honored and respected, had given so much attention to it in his articles. He himself had investigated the subject to the bottom-most depths, until every part of it was as familiar to him as the sun at the meridian of its diurnal revolution. He even thought that he could give "Excelsior" a hint or two, particularly about the adjustment of watches in the supra-mundane position, which was a discovery entirely his own, and which "Excelsior" seemed to know nothing about. He admitted that the subject of isochronism was incomprehensible to the common order of minds, or indeed to any but the most cultivated and expanded intellects,—which might explain the lack of appreciation shown by some, but—

Here Mr. Hairspringtwister called the speaker to order, considering his remarks as a personal reflection upon himself. A general and somewhat excited debate ensued, too desultory to be reported, but the sense of the meeting was almost unanimous that Mr. Uhrmacher's opinion of "Excelsior" and his articles was entirely correct, and that his essay was altogether the most complete and reliable treatise on the subject yet published. The wish was also generally expressed that "Excelsior" would take up the adjustment for heat and cold and treat it in the same thorough and comprehensive manner. As the identity of "Excelsior" was unknown, Mr. Uhrmacher was appointed a committee of one to wait upon the editor of the CIRCULAR and solicit his influence in favoring the above request of the Club.

DIAMOND DRILLS.

The Secretary then read the following letter:

To the Gentlemen of the Horological Club:

Will you kindly give me your experience in drilling in tempered steel with diamond splinters or diamond drills, or, in other words, can a staff and pinion be drilled with diamond splinters? Yours,

S. FITCH.

Mr. McFuzee arose and said that the only diamond drills used in watch work were those employed for piercing the holes in jewels. These make a V-shaped cut, and the jewel is thus cut from both sides, the points of the two V's meeting in the middle. The rough hole, once made, is enlarged, rounded out, and shaped up as desired by means of diamond dust on a fine wire. In the common acceptation of the term "drill," diamond splinters are therefore not drills at all, but only wedge-shaped cutters. Staffs and pinions for pivoting require to be drilled with a hole of uniform size from top to bottom, to firmly hold the steel plug driven in for forming the pivot upon. Such a hole diamond splinters or drills cannot make. The only drills suitable for that purpose are those made of hardened steel. The drill must of course be harder than the piece to be drilled, and if that is very hard, the cutting edges of the drill should be oval instead of pointed, a slow speed used, and no "chattering" should be allowed. Kerosene oil with a little gum camphor dissolved in it is said to help the cutting of hard steel considerably.

The hour being late, and several of the members having important engagements elsewhere, the Club then adjourned for one month.

TO TIN IRON WIRE.—The following is M. Heeren's process for giving iron wire the appearance of silver. This is done by a thin film of tin. The iron wire is first placed in hydrochloric acid, in which is suspended a piece of zinc. It is afterwards placed in contact with a strip of zinc in a bath of two parts tartaric acid dissolved in 100 parts of water, to which is added three parts of tin salt and three parts of soda. The wire should remain about two hours in this bath, and then he removed, and polished by drawing through a polishing iron. By this galvanic method of tinning, wire which has been wound in a spiral, or any other shape, can be made quite white. This is an advantage over most other methods, where the wire is tinned in the fire and then drawn through a drawing plate.

Workshop Gossip.

SILVER and gold may be parted by treating the alloy with very pure aquafortis. In order that this process should succeed, it is necessary that the silver should be as two or three to one of gold; also that the acid should be pure.

THE cannon pinion of a watch may be got at by hitting the end of the centre arbor a sharp blow if it stands above the pinion; otherwise a square-ended punch must be used, holding the pillar plate over as small a bed as possible while doing so. As to repairing a verge of a watch when the bottom pivot is off, it can only be done if the verge is long enough to allow another pivot so be made out of the pallet.

MANGANESE BRONZE.—The great benefit to be derived from the use of phosphor-bronze, as a substitute for both steel and iron, has led to further researches in the compounds of copper. English technical journals are loud in their praises of a new substance called manganese bronze, which can be used to great advantage. It seems to have great strength, the power of resisting shock, and to be remarkably ductile. When broken its structure is close and uniform, resembling steel. One most valuable property is the faculty with which it can be forged at a red heat, the operation apparently increasing the strength, density, and toughness of the manganese bronze.

GILDING IRON.—All efforts, as far as durability goes, to cover iron with gold have been unsuccessful. Gold, among all the known metals, stands at the head of the electro-negative ones, and, in relation to iron, is, of all others, that which most powerfully tends to promote its corosion by air and water, and by such impurities that float in the air of coal-consuming cities, both the gold and iron surfaces being freely exposed to their action are destroyed. If a total separation could be made by means of a varnish applied on the iron before the gold leaf was superposed, the disintegration of both the metals could be stopped; but no varnish yet invented will stand the effects of time. Galvanizing or coating the iron with zinc previous to gilding it, nor coating it with the electro-metallurgic methods with copper or bronze seem likely, when gold is applied, to give lasting results.

NITRATE OF SILVER.—The following method, taken from "Fresenius' Qualitative Chemical Analysis," is a good method of preparing pure nitrate of silver:—Dissolve silver alloyed with copper, a piece of standard coin for instance, in dilute nitric acid: precipitate the silver in the form of chloride, by addition of solution of chloride of sodium (common salt): wash the precipitated chloride of silver most thoroughly with distilled water, by decantation. Add to it about an equal volume of very strong solution of potash or soda, also a quantity of loaf sugar, about equal in amount to the dissolved silver; heat the mixture to boiling, keep boiling for some time, then wash the metallic silver obtained in the form of a gray powder very carefully. Dissolve the silver in pure nitric acid and crystallize. The silver you may add should be dissolved lastly, in the least possible quantity of pure acid, so as not to get an excess of acid in the solution, which acid would require evaporating.

A BEAUTIFUL ALLOY.—A beautiful alloy, resembling silver, and capable of being wrought into innumerable forms of use or ornament, has been introduced into some of the Paris establishments, and a large demand created for the articles produced. As given, the material employed in this compound are 71 per cent. of copper, 1.65 of nickel, 1.75 of cobalt, 2.5 of tin, 1.25 of iron, and 7 of zinc. The nickel is first melted with an equal amount of copper, and the zinc in the proportion of six parts of that metal to ten of copper. The iron, the rest of the copper, and the cobalt in the form of an oxide, are then fused at a high temperature in a graphite crucible, with the first alloy and charcoal under a cover of charcoal. To this the zinc, alloyed with copper, is added when the temperature has fallen to a point at which it will simply melt. The crucible is then removed from the fire, the contents stirred with a wooden rod, the tin wrapped in paper added, and the mass stirred again and poured out. Most of the zinc volatilizes in the operation.

A VERY good impression of any article of metal having a flat ornamented surface may be taken by wetting some note paper with the tongue and smoking it over a gas flame. The article is then pressed upon the smoked surface, when, if the operation be carefully conducted, a clear impression will appear. This can be made permanent by drawing the paper through milk and afterwards drying it.

RICH DISCOVERY—An important mining discovery has recently been made a few miles north of Kernville, California. For more than twelve years past prospectors have been in the habit of finding rich gold and silver-bearing float rock, on an extensive flat near an affluent of Kern river, called Bull Run, but without meeting any success in their efforts to trace up until recently. The ledge averages 15 feet in thickness, and has been traced upwards of two miles. The specimen exhibited was rich in free gold or chlorides and sulphurets of silver. Seven claims of 1,500 feet each, besides those of the discoverers have been located. It is in the same mineral belt—an upheaval of the primitive strata and igneous rocks—to which the Summer mine of Kerusville belongs, and that has been traced north and south nearly a hundred miles. The lead is called the "Albunnel." An assay of the ore, made at Kernville, shows $225.90 in gold, and $143.35 in silver, or a total of $369.25 to the ton.

SOME curious effects of lightning on the wires of an electric clock on a steeple in Balse have been described by M. Hagenbach in a recent number of *Poggendorff's Annalen*. The wire, which was sheathed in guttapercha and cotton, was torn away, and lay about in pieces of 1 decimetre to 1 metre in length. These pieces at first sight presented nothing remarkable, but they were found to have quite lost their stiffness, and further examination showed that they consisted only of the guttapercha and cotton sheath; the copper was entirely gone. The fine canal the copper had occupied was quite smooth, and the sheath was whole, except in a few places at variable intervals, where there were ruptures a few millimetres in width. These were evidently the holes at which the copper had escaped—some remains of the metal sticking in them showed it. These remains distinctly proved, too, that the copper had been driven out, for the most part, in a molten state. The intense discharge must have been limited to a very short time, for the molten copper was expelled before its heat could act upon the sheath, which was quite uninjured throughout considerable intervals. Another striking fact is, that in a portion of the wire, which was enclosed for protection in a lead pipe, the copper was quite unchanged, while the guttapercha sheath had evidently been fused in several places. M. Hagenbach thinks the lead pipe here acted by retarding the current in discharge; thus the wire had time to give up its heat to the sheath.

To spring a watch, if a watchmaker has the old spring, it will be some guide as to the strength; he must then choose a spring a little weaker than it, and see that it is the right size by placing its centre over the bottom staff-hole and see that the outside ring comes in a line with the stud-hole. Pinning on the spring, break off the centre portion—he can use a sharp graver and cut it away, resting the spring on a piece of sheet-brass while doing so, or a couple of tweezers, and break it off, till it allows the collet to come through; bend the centre end to fit in the hole of the collet, place the collet on a broach and the spring, right way on, file down a brass pin to the size of the hole and pin on; mark off deep each end of the pin with a knife, and break off with tweezers; if he has no old spring to go by he will have to go by the vibrations of the balance when the spring is pulled out. To do this, take a spring on the staff, put the roller tight over it, catch the spring at the proper length and litt the balance till it pulls the spring quite out, resting the top pivot on a piece of paper. Now move the balance with the finger till it vibrates as if when going, counting four beats to the second; and according to the accuracy of your count so your time will be after you have got the spring on. Time the watch by the seconds; if you find it losing, say four seconds per minute, take up the spring, say half a turn, only leave a margin to let out for fear of overdoing it; I have never given this subject much study, viz., how much of a spring to take up if the watch were losing, say half a second per minute, although with practice I believe you can hit upon a spring at a glance.

Bronze.

[CONTINUED FROM LAST MONTH.]

[*A Lecture delivered at Chickering Hall, New York, Thursday Evening, March 2, 1876, by* MR. FREDERIC VOSS *(in charge of Tiffany & Co.'s Bronze Department), on "The Manufacture of Bronze, and the Different Styles of Enamel, in their connection with Ornamental Metal Work." Reported expressly for* THE JEWELERS' CIRCULAR.]

CHASING.

The next question I have to speak of is that of the finish. There is a great deal of difference in the outward or surface finishing of bronzes, and if very much time and work are expended in getting a model, it is very desirable, so that the work on the bronze should reproduce it. These different styles of chasing can be made very elaborate. In reproducing the antiques, the best style is the smooth finish, reproducing the effect of the texture of the stone as nearly as possible. In works of small dimension we use different styles of finish. One is called the cross-riffled work. It is produced by taking a tool of the size of a file which is slightly curved at the point, and going over the whole surface of the bronze with it very lightly. That produces a kind of cross-work on the surface of the metal which is very similar to the cross-hatching of engraving. It is a style of finish which is very effective in certain pieces.

But the style which is the most expensive and takes the longest to work up, is what is called the skin finish. That is produced with a small tool with a flat end, which, with the use of a hammer, will give a kind of stipple grain to the surface. This is very soft, and the older the bronze, the softer it gets. For pieces of modern make, it does away with the lustre which we are apt to see on bronzes, and is only desirable to reproduce antique bronzes, the copies of which are in marble or stone.

The object of a great many bronze manufacturers is to have their modelling finished so accurately that the bronze will require very little finishing or chasing. It then retains all the original power of the artist. There is a piece in Central Park, "The Falconer," cut by Papri, in Florence, which very well illustrates that point. Other pieces, cast in Munich, are quite the reverse. For certain classical works, such as the statue of Daniel Webster, now being cast for the Park, that work is perhaps preferable; but the high finish given by the tool of the workman is never so good as the work in which the sentiment of the sculptor is preserved. For pieces of a lighter character, like "The Falconer," and other pieces of that description, work "left on the sand," that is to say, moulded so accurately as to need little or no chasing, is best.

Another style of finishing or chasing which is very little used in bronze, but is coming very much into public notice, is hammered work. If we take a flat piece of metal it is very easy to understand that by beating it up from underneath with a hammer, we can raise a part of the surface up, and after we have sketched a *bas relief*, by hammering back certain parts we can have a beautifully finished piece of *bas relief* which may be very thin. But it is a great deal more difficult to understand how with a vase which has a very small neck, say an inch in diameter, while the body of the vase is twelve or fourteen inches in diameter,—how it is possible for a man to get a hammer inside to hammer up the places which appear in *bas relief*. There is a very elaborate piece of work now being made in this city by Tiffany & Co., —the Bryant Testimonial Vase, made out of silver, and I may say, made out of one sheet of silver. It is all covered with ornaments made by hammering up from the inside of the metal. The shape was first spun up on a lathe, but the very elaborate decoration that covers it is all hammered work.

For this they use a spring hammer. The handle end of this hammer is firmly held in a vise, and the end with a head shaped according to the work to be done, is introduced into the body of the vase. It is not necessary to get the whole hammer in; a blow given on the part in the vise, will produce, by concussion, a blow in the body of the vase, and draw up the silver. So it is very easy to understand how a vase with a very small neck can be all covered with ornaments driven up from the inside. Once the ornament is sketched out in this way, the vase is filled with cement and by ordinary methods the outside surface is closed up and finished.

FINISHING AND COLORING.

The next point is the finishing and coloring of bronzes. Although we see bronzes of a good many colors, the original metal is always the same. The color produced on the surface of a bronze is simply a stain, a chemical stain, to produce in a short time the result which age would produce. The manufacturer cannot afford to let his bronzes remain out of doors for ten or fifteen years and wait for the action of the sun and rain to produce the proper color; chemistry has enabled him to produce the same effect in a few hours. This stain goes into the surface of the bronze, and cannot be worn off. One of the points in which imitation bronze is inferior to real bronze is that to color imitation bronze you have to paint it or to lacquer it. Recently the applications of electricity have enabled manufacturers of imitation bronze to cover it with a coating of copper. That does not help the value of the goods at all, because the imitation bronze itself, being cast in an iron mould, is much coarser and less sharp than the real bronze; and on this surface, which is already round, the additional thickness of coating makes it still less sharp.

Here is a specimen of green bronze. This is simply the color of bronze that is dug out of the ruins of Pompeii, etc. These bronzes are covered with verdigris, and saying "green bronze" is nothing but an artistic way of saying verdigris. This vase is intensely green; it is an original reproduction of an old piece. This raw green color has been toned down by modern art, and some parts made black and smooth. It is produced by applying to the surface of the bronze sulphuric acid and other acids which produce verdigris. This piece (indicating a piece of the color known as bronze color) is produced by darkening the surface of the metal with sulphate of ammonia. The surface is first heated and acid applied and then the piece allowed to cool. The stain may be produced with a great deal of intensity, and then it produces dark bronze; if it is made lighter, then it produces light bronze. One of the recent improvements is what is called here a *touch of gold* (showing another piece). In this piece you see the high lights are gilt. That is an imitation of the effect produced on some old pieces, and it gives richness to the tone of the bronze and seems to add to the relief of the piece. These parts being gilt, and being lighter than the back-ground, it gives to the eye an impression of being more prominent still than they really are. In a great many cases it is very useful and it is very much used in *bas relief*. Here we have a specimen of smoked bronze, or Florentine bronze (pointing to the piece). That is produced by covering the piece, when it is hot, with shellac varnish, and hanging it over a fire producing a dense smoke. When the piece cools the soot is rubbed off and the contraction of the metal secures the color to the surface of the bronze. This style was very often used by artists of the Cinque-cento period.

Another style of finish which is now coming very much into use is one where the metal cast is very fine and what they call yellow metal, that is to say, brass. In some cases it is, I may say, only dirtied or rubbed in with black grease and oil. This shows the merits of the work, and brings forth the light lines. For a great many years the workmen who made fine works in various manufactories, would always take a little of the black grease from the vise and rub it over any work they were finishing. This made the work very soft, and gave it an artistic look which the manufacturers soon turned to account by finishing pieces for the trade in this style.

The brass is also often polished, and chemistry comes to the aid of the manufacturer to stop in this case the action of nature—for brouzing, on the contrary, it accelerates it. The pieces of polished brass can be prepared in such a way that they will retain the brilliancy of the polishing and will require no rubbing up or scouring.

GILT.

There are two styles of gilt that have come very much under public notice latterly; one is called *ormoulu* and one *ormat*. They are both used very much for setting porcelain pieces, *ormoulu*. The *ormoulu* technically means burnished gold or burnished gilding. The *or mat*, on the contrary, expresses the dull dead surface we see on some parts of the metal, and which is produced by the process known as *fire gilding*.

The words fire gilt always recall the old style of gilding in the "Pendules á Colonnes" of the time of Napoleon the First, and it has become so well known and is so generally applied that most dealers call fire gilt, pieces gilt by the battery. One went so far one day as to call it fire proof gilding. The use of this word has led in England to a large unnecessary expense. The order for the bronze work for the monument of Prince Albert in Frogmore, was sent to Bartiedienne, in Paris, and in big letters on the contract appeared the words "*fire gilt*." Fire gilding had gone so much ont of fashion that a special gilding place had to be erected to gild these pieces, and it was with the utmost difficulty that workmen could be found to work on it, because the emanations of the quicksilver were very injurious to health. One of the advantages of electric gilding over fire gilding is that the workman is protected from the quicksilver. It cost the city of London or the crown an enormous price to have this fire gilding instead of the other.

Bronze is also plated with silver, nickel, and platinum, but although it may be seen decorated in numerous ways the metal is always the same.

ENAMEL.

I have still a few words to say on the decoration of metal with enamel. Enameling, which flourished in Europe in the Fourteenth, Fifteenth, and Sixteenth centuries, appears to have been completely forgotten for a certain time, that is to say, for enameling large surfaces. They would enamel jewelry, etc., but the enameling of vases was completely forgotten. The expedition of the French and English armies to China about fifteen years ago, revived this art. The armies brought back large pieces, even pieces six or eight feet high, entirely covered with enamel. The French manufacturers first, the English and German afterwards, have revived that art. It has now become very much known in the trade, and very much used in household decoration.

I beg to say a few words about the process employed in making this enamel. Enamel is simply glass. The word enamel is more particularly applied to melted glass adhering to the surface of metal. The word enamel is also used for melted glass adhering to the surface of porcelain or earthen; we hear of enameled porcelain and enameled earthen. But whether the surface is porcelain or earthen, the enamel is always the same. On this enamel on the face of the metal we can paint with enamel colors. This second enamel or paint will run into the first one when placed in the muffle, and we obtain what we call a painters' enamel, or surface enamel. Fine specimens of this are found in Chinese work. Before kaolin or porcelain earth was discovered in Europe, table utensils, such as plates, ewers, basins, cups, etc., were made in copper, in silver and in gold, and decorated in this manner. They are generally of a dark ground and styled "Limoges Enamel," from the name of the place where they were originally produced. Another class of enamels, those most used for large work, are termed "Partitioned Enamels," embracing the two distinct species of "*Champleve*" and "*Cloisonnee*."

These two species of enamel are more applied to the reproduction of diagrams and patterns than they are to figures, though the Chinese use this style sometimes for landscapes and figures. Let us suppose a sheet of metal with a drawing made upon it; if, with a tool, we cut away between the lines, just as a wood engraver does on a block from which he is to print, that leaves hollows and lines which stand ont in relief, and in these hollows we place blue, green, or yellow enamel, these enamels being glass in a very fine powder. We place the piece of metal in a muffle; the enamels will fuse, but the little walls of metal will prevent the enamel of one hollow from running into another, and keep the colors separate. Of course, the enamel in becoming vitrified by the heat, occupies a smaller space than it did as a powder, and the hollows have to be refilled and passed to the fire again, and so on until the hollows are full and the partitions and enamels flush. Then the whole surface is ground down, and we obtain the surface which we see on vases, such for instance as this, (showing one) which looks very little like glass, because the enamel is ground and has lost all its lustre. In the case where spaces in the design are cut away, the enamel is styled "*Champleve*." If we take the same sheet of metal with the drawings upon it, and instead of cutting away spaces between the lines we mount upon the surface threads of metal, we obtain exactly the same effect,—we have these threads of metal acting as partitions. That is the method which the Chinese and Japanese use, and it is used now very successfully in Europe. They take a piece of copper and spin it on a lathe into the shape they want, and on the surface of the metal they mount a very intricate work of metal lines. It has been a question of discussion between connoisseurs whether these threads were soldered or wore simply held by the enamel. In no instance have I ever seen a case where the threads were soldered. It is more than probable that the threads were held by a colorless enamel mixed with some sort of gum, which unites with enamel at the first fire.

A third style of enamel, used mostly for jewelry, is named "*Toille d'epargne*." In this style there is a tracery of enamel on a metal ground—it is exactly the reverse of the partitioned enamels, where the ground is enamel and the lines of ornament metal.

This brings to a conclusion the remarks I have to make this evening about this substance. There are other kinds of enamel, and other kinds of bronzing, but none I think that would be of any interest to the public. I have thanks to give to Tiffany & Company for these specimens and tools which they have allowed me to select from the showrooms and workshops to illustrate this lecture.

A Valuable Ruby.

A RUBY which was formerly in the possession of the Diamond Duke, Charles of Brunswick, has been sold to the Emperor of Brazil for 85,000 francs. This gem, which is a ruby of rare value, had an interesting history before it fell into the hands of the Duke of Brunswick. It belonged to a certain Portuguese, Duke Walicky, who appeared suddenly in St. Petersburg in 1811, and exhibited a fabulous amount of wealth, his jewels and objects of vertu alone being valued at 14,000,000 rubles. How the quasi Duke came into possession of his riches has always been a riddle. He was the son of a Lettbauer nobleman, and left his home in the government of Grodno in 1793. For eighteen years he was dead to his friends. In 1811, however, as before stated, he appeared in St. Petersburg, and astonished every one, even the court of the Czar, with his riches and costly possessions—how and where they had been gained was never fully made clear. After the death of the duke, who never married, a paper was found in his heritage, which said that his jewels and riches were taken from the tent of a Bedouin chief, whom he had killed in a combat during a journey through Middle Africa. In the tent, besides other costly articles, was a chest filled with precious stones, valued at several millions. These treasures Duke Walicky brought to Pottugal, there disposed of many of them, and, after several successful speculations, arrived in St. Petersburg. Further than this, nothing was ever known of the means by which this rare collection of jewels found their way to Europe. The one ruby, which is of great rarity and beauty, after passing through several different hands, came into possession of the Duke of Brunswick. After his death it was given, in accordance with the bequest, to the city of Geneva; was sent from there to Paris, where the court jeweler of the Emperor of Brazil purchased it. Now, perchance, it has found a permanent home, after the various vicissitudes through which it has passed.

Mr. Crooks calculated that the force exerted by the sun's light is equal to 32 grains on the square foot, or 57 tons on the square mile, or 3,000,000,000 tons on the whole earth, a repellant force which, but for the far more powerful attractive force of gravitation, would drive the earth off into space.

A Treatise on Isochronism and Elasticity of Metalic Springs.

(*From the British Horological Journal.*)

BY JAMES FERGUSON COLE.

PREFACE.

In accordance with the desire of the Council of the British Horological Institute, I write the following pages as a trauseript of a paper previously intended for publication in Volume II, of the *British Horological Journal.*

The subject of that paper is "The Isochronal Principles of the Balance-Spring, with Practical Rnles for Isochronal Adjustments." I mention these particulars only as referring to the date of that paper written by me fifteen years since; it however happens that the following pages, as the essay now written, contains also the whole of my later experience and knowledge of the snbject, np to its conclusion, June 22nd, 1876.

A further motive for prefatory remark is to express a hope that the contents of the following pages may be found useful to the inquiring reader. Isochronism bears largely on general principles; these have been duly considered as relating to mechanical influence on ultimate time-keeping, dependent on a practically right application of a sprng to the balance, and its final adjustments.

It must here be observed that, however carefully principles may be laid down, final results will, in great measure, depend on the skill, care, and judgment of the operator, as no technical writing can govern the hand or the fingers engaged in these nice manipulations. As regards timing results, the indications given by the seconds hand of a standard clock is the only test of right or wrong performance when referred to, by comparing the watch or chronometer in the manner dictated by the circumstances of trial; the results, in all cases, must be carefully noted in writing as a guide to corrections when required.

After this, as relating to isochronism, will be found a short dissertation on elasticity, an essential property of metalic springs, but more especially as regards steel, and the influence of heat and cold as the simple means of hardening and tempering that universally useful and important metal.*

In connection with the above-named paper on elasticity, will be given the essay, marked No. 1, on the following page.

1. The essay on isochronism of simple balance-springs, with their characteristic forms and modes of practical application and adjustment to watches, chronometers, and other instruments for mechanical time-keeping.
1. A brief description of the detached lever escapement, it being explained with a view to mechanical influence of a short arc of impulse on isochronism, and also as avoiding fractional measurement for the acting proportions between the pallets, lever, and rollers.
3. A comparative description of the chronometer detached escapement, together with the duplex escapement, as allied principles of action, the two being treated as serving better to illustrate the timing properties of both, as bearing on adjustments for isochronism.
4. Influence of the static property of inertin on variable extents of the vibratory arcs of watch and chronometer balances, and on the motion of pendulous bodies under various arcs of vibration, showing that less effect on rate of general going will arise from inertia, if the full arc of motion is constantly of one extent, as in astronomical clocks, where the pendulum is sometimes kept in motion by a gravity escapement.
5. Recommendation of a suggested change in the mode or habit of winding all going-barrel watches twice a day, with the view to better going.

* NOTE.—It must here be understood that the treatment adopted throughout this essay has been written in strict conformity to the long established system of time-keeping principles now in general use, and from the large majority of chronometers and watches already brought to perform with such acknowledged precision, leaves but little apparent room for improvement, though it still is desirable to lessen or remove, if practicable, the detrimental influence of pivot friction.

In this essay on isochronism the rudimentary principle of the subject is elasticity, a property belonging to metalic springs, but more especially to steel as relating to its application to purposes of mechanical time-keeping. I therefore take occasion to offer the result of some thought, in the way of suggestion, as to the source of that principle in Nature universally manifested as elasticity.

I have for many years entertained the idea that, as atmospheric air exhibits under every scientific investigation evidence of its own elastic property, and as science establishes a law which gives a constant atmospheric pressure of 14 pounds on every square inch of surface, I am led to consider matter of whatever kind is so impressed by atmospheric force, that all material bodies, by reason of their own affinity and their structural porosity, imbibe alike the elastic element known to exist in atmospheric air, as evidenced by pneumatic operations with the air-pump in the endeavor to produce a vacuum, and, on the contrary, by condensation of air, as applied to charging the reservoir of an air-gun.

In both these cases elasticity of air is manifest; but the natural intensity of what is philosophically and experimentally stated is 14 pounds of pressure to every square inch of surface.

It is also understood that malleable iron, after the process of cementation in a charcoal furnace, is, that the iron, by reason of its affinity for carbon, is thereby converted to steel.

Steel possesses the wonderful property of hardening when suddenly chilled by plunging in oil or cold water from a state of red heat; and this well-known resulting fact has always raised in my mind a feeling of astonishment that so simple a process should produce so surprising an effect.

I have searched various philosophical, metallurgical, and chemical works, but have found nothing explaining philosophically, or in any other way, the theory of this truly interesting inquiry; I am therefore led to express my own views on the elastic properties of steel so immediately belonging to considerations bearing on the subject of isochronism relating to springs under treatment in the following papers.

I now speak of carbon as a chemical element existing in steel, without which, as iron, that metal would not harden; but steel known as carbonized matter contains what chemical philosophy declares to be a constituent element of the diamond. Now, whether this be so or not, I proceed to state what I believe approaches the truth of this inquiry, as said at first, that atmospheric air is the constant active elementary principle embodied with the molecules of all matter; steel being not an exception, but a body more favorably adapted to endure heat, and also transition to cold, and these transitions many times in succession with generally like effects, as practically proved in many instances.

The preceding remarks bear especially on what follows, and which will require but few words to explain, that the theory of principles involved in this question of elasticity as under influence of extreme heat, and transition to cold, is, that h at is expansive; and therefore, if a

square bar or other form of cold steel be submitted to the action of fire until reaching the red heat, that thereby the pores of the bar are opened by extreme expansion, the molecules of steel separated by the force and escape of air, and then, by contraction of the bar when plunged into cold water, the steel molecules would be compacted together instantly and hermetically sealed at the moment of immersion, and hardening before the first contained air, or any other, had room to enter while the bar of steel remained cold. In this stage of the process the bar of steel is found so perfectly hardened that a file can make no impression, and any attempt at bending might cause the bar to break.

This hard condition of the steel is fully understood as a practical fact, in which the total absence of air is assumable, supposing molecules of carbonized steel only to be present; and notwithstanding the atmospheric air pressure of 14 pounds to the square inch is constant, no air can enter, the pores of the steel bar being sealed by contraction.

In this hard state the steel is of the utmost value for cutting purposes, though very fine cutting broaches, from their delicacy and length, allow some extent of flexure, from possibly a slight degree of tempering to prevent breaking. Glass, the most brittle and fragile of substances, has, in some few experimental instances, been employed for balance-springs. One example of a glass spring applied to a balance came into my hands broken: the use of glass for springs has, therefore, not been continued.

Now, referring to the hard condition of steel: immediately the tempering heat of a spirit-lamp is applied, so as to produce the blue color, or even a less amount of temperiug heat, such a temperature appears sufficient to relax the hard steel, and to admit the return of air to the steel molecules, and thus establish a permanent elasticity and temper.

Doubtless the air itself is molecular, and at the proper moment enters the mass of steel as a congeries of infinitely fine elastic air molecules, which, now admitted by the moderate expansive heat of tempering, gives to the steel that invaluable property of elasticity, which I am unable to understand by any other reasoning of my own, or from any scientific works I have consulted with the view of gaining information upon the nature and cause which effects the hardening and tempering of steel.

While writing these observations I am only surprised that so slender a filament of steel as the balance spring of a watch or chronometer should retain its primary molecular condition permanently, after undergoing the various processes of reduction from a mass of solid malleable iron, nearly half a ton weight, as I have seen taken direct from the puddling furnace to the steam-power rolling mills, at white heat, and the mass of iron passing through great roller-grooves, lastly at high velocity, like fiery serpents, through a building of great extent. These rods of iron of half an inch or more diameter, cut into convenient lengths, are afterwards converted to steel for further reduction, and are eventually drawn into wire of many gradations of size and strength, as prepared for the ultimate manufacture of balance-springs; the homogeneity of the steel being found, on use, entirely satisfactory for this and for other purposes.

I now add a few words relating to the elasticity of other metals—as gold, or the various alloys of gold made suitable for springs.

Gold, when hammer-hardened, rolled, or drawn into wire, is found to possess a high degree of elasticity, which in a great measure is due to these operations condensing the metalic corpuscles, or atoms of metal, to a certain extent, and also the air molecules contained in the metal; these together admit of a high degree of condensation, with consequent mechanical and molecular resistance; and this without complete expulsion of the air, which I believe impossible to effect without extreme heat; and on this point, together with the mechanical repulsion of the metalic particles of gold, the final elasticity depends. I therefore consider that as there is, in regard to gold, a total absence of carbon, that this metal acquires elasticity by condensation of air within itself to some extent, as it cannot be otherwise hardened.

This comparative examination leaves the first-mentioned carbon theory quite unimpaired as a scientific question why, under simple transition from heat to cold, steel becomes so effectually hardened.

To be Continued.

The Thompson Infernal Machine.

The general facts regarding the Bremerhaven explosion are familiar to our readers. A desperate man conceived the idea of constructing a machine that at the end of ten days would set free a hammer which in falling would ignite a charge of dynamite, the result being an instant and total destruction of the vessel in the hull of which the machine was to be placed. Passing over the detailed description of the prematnre explosion with its disastrous results, we would direct attention simply to the device itself. The accompanying drawings are authentic, and illustrate the Thompson Infernal Machine as it actually was constructed. It will be remembered that Thompson, or Thomassen, was obliged to intrust the work of construction to others; and, being thus unable to state the purpose for which it was designed, failed to correct the *one* defect that in the end thwarted his plan. It is said that he visited one Herr Rhind, a watchmaker of Vienna, and desired him to construct a model of a twelve day clock which should be noiseless, and at the end of the time fixed should give one powerful stroke. The model being completed, it was placed in the hands of an operative named Carl Gluckshall, who constructed the machine in five months. When it was completed, however, the springs that actuated the hammer were found to be too weak, and were replaced by stronger ones. When this defect was corrected, the device was so arranged within a closed box that a release of the springs at the given time caused the hammer to fall upon and ignite the explosive beneath.

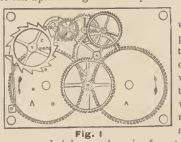

Fig. 1

The chief mechanism or clockwork was inclosed between two plates of iron, and its complication may be understood by reference to Fig. 1. A A are the wheels driven by mainsprings, the wheel at the right connects with the usual balance-wheel and regulating mechanism, while that at the left gives motion directly to a second pinion on the axis of a ratchet-wheel, C. The shaft of this rachet passes through the iron-plate, and supports on the outside a wheel, E, Fig. 2. Here also is shown the percussion mechanism. The wheel E made one complete revolution in ten days, which numbers are indicated on its face as shown. One of the spokes of this wheel was fitted with a pin, G. By the revolution of the wheel in the direction of the arrow this pin was brought in contact with the rail of the lever K F, pushing it aside, and thus releasing the lever H, which in its turn released the hammer-head I. This, being drawn down by the spiral springs on either side, came in violent contact with the percussion-cap, or dynamite.

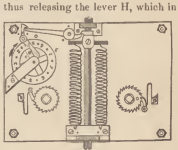

Fig. 2

The fact that these springs were released prematurely, owing to the careless handling of the box, directs attention to one fatal omission. No guard was placed to hold the lever K F in position; and, when the box was thrown down on the floor of the dock, it probably struck on the left side. The effect of this would be to throw the lever F off from the bar H, thus releasing the springs. We have called this a fatal omission, though who can tell how much more fatal would have been the result had the defect not existed! The story of this hideously-infernal device has served to direct attention to previous efforts of a like character, though none of the machines hitherto discovered equaled in ingenuity of construction that which now stands recorded as the Thompson Infernal Machine.—*Appleton's Journal.*

Miscellaneous Items.

In 1875 died Peter Roy, who was watchmaker to the King of France. He was the author for the Memoirs for the Clockmakers of Paris, entitled "Etrennes Chronometriques." Julien le Roy, a relation of this mechanician, was a famous French watchmaker, of whose reputation his brother artists in Paris were jealous, and they did what they could to imitate him. J. B. Baillon, the queen's horologer, tried to outdo him, and he made all sorts of whimsical clocks and watches, adding toys to them as the fashions of the court required change. This man died young, and probably the richest clock and watchmaker in Europe.

THE cause of the aurora borealis is explained in a novel way by Herr Groneman, of Gronigen, in Hollan3. The theory of this astronomer assumes that there is a stream of fine particles of iron constantly moving around the sun. The earth passes through portions of this stream from time to time, and the friction of the iron dust when it enters our atmosphere ignites it. causes it to become luminous, and it is then visible as the aurora. Herr Groneman attributes the form of the aurora light to the influence of the earth's magnetism npon the particles of iron, which he compares to that exerted by a magnet upon iron filings placed on a paper over it.

AT the last meeting of the Royal Society of England, Mr. Siemens exhibited his new instrument for ascertaining the depth of the sea without using a sounding line. He calls it a bathometer. It consists essentially of a vertical column of mercury contained in a steeple tube, having cup-like extensions at both extremities, so as to increase the terminal area of the mercury. The lower cup is closed by means of a corrugated diaphragm by the elastic force derived from two carefully tempered springs. The instrument is suspended a short distance above its centre of gravity on a universal joint, to cause it always to retain its vertical position at sea. It has been tested in voyages across the Atlantic in the Faraday, and found very accurate.

IN the palace of Versailles, in the Salon du Conseil, is a curious clock, that plays a chime when the hour strikes, and is set in motion by machinery, by which also sentinels are made to advance, a cock to flap his wings, Louis XIV. to come forward, and a figure of Victory or Fame to descend from the skies and crown him with a golden chaplet. The Salle des Pendules in this palace is so called from a clock in it, which shows the days of the month, the phases of the moon, the revolutions of the earth, and the motions of the planets, besides the hour, the minute, and the second of the day. We may here mention incidentally that French clock cases were formerly accounted the first in the world, and those made by Boule in the time of Louis XIV. are looked npon as curiosities of good taste and workmanship.

DR. W. C. N. Randolph, of Charlottesville, has Thomas Jefferson's silver watch. Levi Lincoln, Mr. Jefferson's attorney-general, wore it at the dispersion of the judges at the close of John Adams' administration, before Jefferson was sworn into office. Mr. Lincoln appeared in the court-room at mid-night and said that he was ordered to take possession of the office and papers. "Why, Mr. Jefferson has not yet qualified," exclaimed the astonished chief-justice. "Mr. Jefferson considers himself in the light of an executor, bound to take charge of the papers of the government until he is duly qualified," was the reply. "But it is not yet twelve o'clock," said Judge Marshall, taking out his watch. Mr. Lincoln pulled out his, and showing it to him said "This is the president's watch, and rules the hour."

EVELYN, in his "Memoirs," under date 1645, records that while he was at Venice he went through an arch into the famous Piazza of St. Marc. Over this porch stands that admirable clock. celebrated next to that of Strasburg for its many movements; amongst which, about 12 and 6, which are their hours of Ave Maria when all the towne are on their knees, come forth the 3 Kings led by a starr, and passing by ye image of Christ in his Mother's armes do their reverence, and enter into ye clock by another doore. At the top of this turret another automaton strikes ye quarters. An honest merchant told me that one day walking in the Piazza, he saw the fellow who kept the clock struck with this hammer so forcibly, as he was stooping his head neare the bell to mend something amisse at the instant of striking, that being stunn'd he reel'd over the battlements and broke his neck.

THE Paris *Journal Officiel*, cautioning amateurs against the indiscriminate purchase of relics, says that in the East, principally in Egypt and Syria, the traffic in antiquities, such as statuettes in bronze and stone of heathen divinities, arms, vases made of pottery or glass, sarcophaguses, medals, etc., has of late assumed great extension. Pottery vases, statuettes of Eyptian and Phœnician gods, monumental stones, with Hebrew, Samaritan, Arabian, Greek, and all kinds of ancient inscriptions, medals with Hebrew characters, etc., have been imitated to a wonderful exactness. An antique appearance is given them by the aid of divers processes, which enables fraudulent dealers to pass them off as objects many centuries old. The manufacturers of these sham antiques are very ingenious: by the aid of a certain liquid, used in Egypt and Syria they manage to give the bronze, pottery, and marble the most deceiving colors. They have their agents in many Eastern towns, notably at Cairo, Alexandria, Beyrout, and Jerusalem, and are in constant relations with a number of the Bedouins and fellahs scattered about in these Eastern parts.

THE Virginia City (Nevada) *Enterprise* relates the following: A day or two since Mr. Shaw, time keeper of the Consolidated Virginia mine, found a watch lying in the snow, where it had evidently been dropped by some one working in or about the mine. Mr. Shaw wrote a notice to that effect, posting it by the side of the window to which the men came to give in their names when going or on coming off their shifts. Several men called and described what was, according to their ideas, a "valuable watch," nearly all making it gold, with a fine chain of the same metal. Some set a number of beautiful pieces of gold quartz into the links of the chain. At last a little Frenchman came to the window and said: "You fiud one vatch, Mistair Shaw?"

"Yes, sir," said Shaw. "Have you lost a watch?"

"Yes, sare, me have lose me one vatch."

"Can you describe it?"

"Oh, yes, sare, me can descripe him ver' perfec'ly."

"Well, what was it like?"

"My vatch he vas a silver vateh."

"Very good. What kind of cases?"

"Vell, he have he's face wide open."

"What kind of chain?"

"One leedle brass shain."

"What kind of key was on the chain?"

"Vell, no key be on zee shain. He have no key at all. I wind him by zee tail."

The watch was a stem-winder, and the Frenchman had given a perfect description of it even down to "zee tail."

HARLAND BELL, a watchmaker living at Port Richmond, Staten Island, conceived the idea that he could build a house, and not having any business occupation, he set to work and in less than three years has finished a building which is a model in every respect. It is two stories in height, with a cupola, French windows and balcony. All the materials used in the construction have passed through his hands. The foundation is of the usual style, but the outer wall is composed of some material resembling asphalt, the composition of which is known only to the builder. The rooms are large and airy, with hard finished walls. The parlor has three large French windows, and the ceilings and walls have been frescoed by him. The mantel-piece is of highly polished wood, and in the centre is carved a dog's head, with chain suspended from the neck. The gentleman who has done all this work has had no help, doing everything himself, thus making the house a real curiosity. Connected with the house is a small frame structure, in which he follows his trade as watchmaker. His genius in this line was made known to his friends, at the age of eleven. While he was working on his father's farm one of the workmen had bought a watch but found it would not keep good time, and laid it away; but one day, on taking it up he found to his surprise that it was running and exactly right. On inquiring he found that the boy had taken it up into the garret of his father's house, dissected, cleaned and regulated it, without informing any one what he had done. This inventive genius has not confined his efforts to house building and watchmaking, but has been put to the test as a machinist, having just finished a good-sized steam-engine, of sufficient power to run a small lathe and circular saw. He has also manufactured numerous other articles.

Trade Gossip.

Shell combs are high and square.

Fans of Russia leather remain fashionable.

Little bells of gold and silver are worn for ear-rings.

Medallions and chains, in a great variety of styles, are popular.

Oxidyzed silver clasps are used for fastening shawls and sacques.

Marguerite is the new name of the aumoniere or chatelaine picket.

Linen buttons are preferable to studs for gentlemen's dress shirts.

Cameos are in unusual demand, with a preference for ancient designs.

Silver neck chains and lockets are something quite new and pretty.

Jet, relieved with gold and pearls, is fashionable for second mourning.

A blue diamond of great beauty has been found at the Cape diamond fields.

The fashionable individual butter plates are silver leaves, lined with gold.

There will be quite a number of hands on watches and jewelry at the Centennial.

Black lace fans are preferred by married ladies, and white lace ones by young ladies.

If there is no good bankrupt law, how can a merchant expect to fail and make money?

Some of the new diamond rings have the diamond deeply set in a heavy circlet of gold.

Deposits of the precious metal kuown as tellurium have been unearthed near Colorado Springs.

Pretty gift rings are golden serpents with eyes of diamonds, opals, rubies, emeralds, or some other fine stones.

Celluloid coral is growing in favor. It imitates the real to perfection, and sells for less than one-sixth the money.

According to the new law of Alabama, every commercial traveler doing business in the State must take out a $50 license.

A new gold pencil case has a monkey for a handle, which slips around the tube after the manner of the toys of the children.

Antique buttons are in demand and in some instances are very costly. The richer kinds of tortoise shell and pearl are the most sought.

The ear-rings most sought for are made with the hooks set quite low down on the drops, so that when they are in the ears the hooks are not seen.

When a man earning a salary of fifteen dollars per week can dress his wife as well as a man earning $10,000 per year, what is the use of earning $10,000 per year?

A large factory for watchmaking by machinery, similar to the American system, has been built in Birmingbnm, England, and will commence operations shortly.

It is hinted that steel jewelry and ornaments of all kinds are to be popular—ear-rings, medallions, crosses, lmir ornaments, belt-buckles, buttons, hat ornaments, etc.

The Fitch diamonds are still in the big vaults of the sub-treasury where they are held for duties, and unless they are taken away before June next they will be classified as unclaimed goods and sold by auction.

Parisian ladies who do their own needle-work have adopted thimbles with a pebble inserted as a top. The agate, cairngorm, onyx, and crystal are the most popular, as they look very pretty in their setting of silver.

The Emperor of Russia has appointed Mr. W. Benson goldsmith to the imperial court in appreciation of his artistic production of the gold casket presented to his imperial majesty by the corporation of the city of London.

Mr. Ruskin, in a recent lecture on "Precious Stones," advised the ladies to have their gems set uncut, and said that the ruby in the British crown was the most beautiful uncut precious stone in the world.

A Meriden watchmaker with a fine saw successfully removed a large gold ring from a lady's finger last week, where it had been allowed to remain till the member had grown twice its natural size, and was also mortified considerably.

A China jewel case one hundred and seventy years old, which was exhibited in Bermudn during a late industrial exhibition, had on its embellished lid this stanza: Fear God, honor the king, and kiss a pretty girl—that's no sin.

The $10,000,000 in silver bullion which Flood & O'Brien intend to exhibit at the Centennial would make a solid block ten feet long, ten feet thick, and eight and one-tenth feet high, containing 810 cubic feet, and would weigh nearly 294½ tons.

An ingenious method of protecting valuable earrings when their wearers are traveling has come into fashion. Ladies buy little balls of Roman gold, which open with clasp and hinges, and effectually enclose and conceal the precious stones.

We have received a poem of forty-six verses entitled "Blasted Hopes." There is something original in the title, but we don't want to blast the reader's happiness by publishing it, nor blast the author's hopes by rejecting it, so we have laid the blasted thing on the table for future consideration.

The mammoth telescope just erected in Paris has occupied twenty years in making and mounting. The tube is twenty-three feet four inches long and weighs 5,291 pounds, and the mirror is 49,264 inches in diameter. For strength and nicety the machinery and other appurtenances are unrivalled.

Isaiah denounced Israel in the fullness of her iniquity, saying:—"Every one loveth gifts and followeth after rewards." The ancient Jew and the modern Christian are much alike—only, if Isaiah were around now, somebody would be trying to hush him up with a free railroad pass or a post-tradership.

Some genius has iuvented an instrument to determine the distauce of armies from each other by the sound of their guns. This is a most valuable invention. By its use armies hereafter will be able to avoid all risk of accidently getting within range of each other's fire. What a blessing it would have been during the late Spanish war.

Feather fans are in fashion again. The newest among these are the pheasant feathers, arranged to curve in natural shape, with tortoise shell stick. Black or white fans prevail almost to the exclusion of colored ones. Black silk fans with a large bold cluster of flowers painted on one side, ebony sticks and black ostrich tips are exceedingly handsome.

Jacob Reese, of Pittsburg, has constructed a machine to cut hardened cold steel, by means of a saw of soft wrought iron—merely a circular disk—rotating at high velocity. With low speed this would not cut at all, but when running at 25,000 feet per minute the disk cut through steel rapidly, giving out an immense cascade of sparks in the operation. The disk is very little heated, but the steel is actually melted and drops downs.

Silver ornaments and silver trimmings are in great request. Some of the articles made in this metal are narrow bracelets with enameled mottoes in French or Latin, dog collars of pure silver, daggers for the hair, clasps for shawls, chased chatelaines for the fan, silver buckles for slippers and silver clasps and monograms for bags. Coral jewelry is shown in cameo, branch and floral sets, plain or associted with small diamonds. Silver ornaments are likewise in request; silver bangles or narrow bracelets that slip over the hand continues fashionable.

The great Hebrew philanthropist, Sir Moses Montenore, has returned from Jerusalem for the seventh time He is now in his 93d year, and has received the promises of the American and French Consuls that they will do all in their power to protect the Jews in the Holy Land against Turkish oppression. Sir Moses gives a favorable account of the skill of the Hebrew mechanics, watchmakers, lithographers, engravers, sculptors, goldsmiths, etc., in the Holy City, one of which presented him with a grain of wheat on which 10 lines were written, forming an acrostic of the philanthropist's name.

"You are not having many nice dresses this year," said one Chicago belle to another, the other evening. "No, I know I don't," was the reply. "But why don't you?" continued the inquisitive friend. 'Well, I'll tell you, Madge," was the answer. "You see, pa says that we've got to scrimp along a little for awhile, until he can make an 'assignment' or something, after which he says we can 'splurge' all we want." The friend looked surprised for a moment, and then, turning to her associate, exclaimed, in a burst of confidence: "Why, that's just what my father keeps saying—what can they mean?"

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THE

Jewelers' Circular & Horological Review,

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THE RECOGNIZED ORGAN OF THE TRADE.

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Removal.

The office of this journal has removed to No. 42 Nassau Street, corner of Liberty, where all communications should be addressed.

The Centennial Exhibition.

The Centennial Exhibition opened promptly on the 10th, and we have time only, before this number goes to press, to give our readers the briefest statement of what is to be noted in the horological and jewelry departments. The exhibition promises to be a great success and to attract multitudes from all parts of the country. In our own trade, a large share of the interior jewelers have deferred their usual visits to the centres until the big show should open, and propose to do all their buying and seeing at one time, if indeed they have any energy left for buying after they have accomplished the terrible task of looking all about the world at Philadelphia.

The Centennial Commission is entitled to great credit for the vigor with which it has pushed forward the work, and the advanced condition of the exhibits at the date of opening, which is in creditable contrast with the serious delays at Vienna and elsewhere. It is unfortunate that this general success has been tempered by several unfortunate details in administration. There has been a very general complaint of too much red tape all through the progress of the work, and in fact the arrangements for the delivery of goods have rather embarrassed than assisted both the Commission and the exhibitors. The restrictions placed upon exhibitors have also caused some prejudice among the trade, and we fear have resulted in keeping away some who might have been desirable exhibitors.

While the restrictions have been on the one hand too rigid, there has been an unfortunate laxity in another direction. There are cases in which retail dealers are exhibiting goods which are not examples of their own manufacture—a serious drawback if these goods are to count in making the awards. If this thing were to be generally allowed, the exhibits would represent nobody in particular, and it is the only safe rule to permit the display of such goods only as are manufactured by the exhibitors themselves.

The display of jewelry, bronzes, watches, etc, is perhaps not general, but it is large and most interesting. This department has the place of honor in the Main Building, the great circle at the intersection of the rear and main transept being bordered on the south-east by the fine display of silver and plated ware in the pavilion occupied by the Gorham Manufacturing Company, Tiffany & Co., and Starr & Marcus; on the north-west by the great English firm of Elkinton, the largest house of the kind in the world, whose fine display of silver, plated ware, etc., is estimated at £100,000, or over half a million of dollars, the Helicon vase alone counting $30,000; and on the north-east by the superb bronzes of L. L. Marchand, Paris.

America is especially noted for its display of watches and clocks. The American Watch Company is first with an exhibit of exquisite nickel-plated machinery, at which parts of watches are actually being made, in the Machinery Hall, a show which attracts a greater crowd than anything in that building; and a superb show-case display of watch cases and movements in the Main Building, around which so many thronged on the opening day as to break down the metal railing completely. Near the latter are the Howard, Tiffany, Elgin, Empire City and other watch people, exhibiting cases and movements. The clock manufacturers are very generally represented by the tower clocks and on the floor, the Seth Thomas, Waterbury, Welsh, New Haven, Northwestern and other companies among them. There is also a gentleman who exhibits a hundred year clock, that will not need winding till the next Centennial. The display of chandeliers and bronzes, by Archer & Pancoast Mfg. Co., Mitchell, Vance & Co., and others, are among the most noticeable features of the Main Building. Among other plated-ware people, Reed & Barton have also an attractive display, but we cannot begin to mention the names of the fifty members of our trade who are to be found on the catalogue. The New York *Tribune*, of May 13th, says:

"No visitor to the Main Building, however hypercritical he may be as to American art and manufactures, can help admitting that there is one department where our countrymen excel all foreign rivals, and that is in silverware. The English have some beautiful articles of great cost; but in the extent of their exhibit, in variety of form, and in figure-pieces showing the highest talent for designing and the finest skill in execution, they do not compare with our Philadelphia, New York, and New England exhibitors. No other nation can make a pretense of competition."

Yet the foreign exhibits are especially worth seeing, fifteen countries being represented in this department. Great Britain and France of course lead, the former having also a representation of its South Australia colony, from an Adelaide manufacturer. Germany is finely represented with a collective exhibit of gold, silver and plated ware, in which fifty manufacturers participate. Austria exhibits a good line of garnet and other jewelry. The Swiss watch manufacturers make an excellent display of watch movements and cases, under charge of Mr. Th. Grebi, a gentleman well known here, and there is some exquisite gold work from that country. There is interesting filagree from Norway; Belgium and Italy are represented; from Africa, there are objects of jewelry, not from jewelers but as ornaments, in the Egyptian and Tunisian quarters; from Asia, the Japanese bronzes are superb, and Messrs. Lien Shing and Ho a Ching, of Canton, show goods in the China section; Brazil and the Argentine Republic represent South America in this line.

We urge upon all our readers the desirability of making a journey to the exhibition; but to those who cannot, we propose to present as much of the exhibition as possible through our columns. It is our present plan to print a series of articles during the progress of the exhibition, describing and illustrating the objects of chief interest to our trade. For our next issue we have in preparation another colored plate, in connection with the exhibition series, representing the American Watch Company's fine display in the Main Building. The exhibition is a grand success; it should be a splendid education to our trade, and we shall do our best toward their making the best use of it.

A Convention of the Trade.

We believe that the world-famous Horological Club, which has its office in the same building as the JEWELERS' CIRCULAR, is the only trade association which represents all branches and interests of the watch-making and jewelry trades. We have had of late many communications from various interests, urging us to advocate a Watchmakers and Jewelers' Convention during the Centennial year. In fact these suggestions were not necessary to that end, for we have long had it in mind to present to our readers the importance of some such gathering of the general trade.

There are a score of important subjects on which an expression of the opinion of the trade at large would be of the utmost value and practical usefulness. The CIRCULAR, as we have before said, to some extent fulfils this purpose, but there is nothing like an actual gathering, face to face, of the various interests and sections of the trade, when the manufacturer can shake hands and sit down and talk with the retail dealer, and Maine and Texas—if Texas is enterprising enough—may hob-nob in friendly and effective council.

The present year affords an excellent opportunity, by the general gravitation towards Philadelphia, to gather the trade for such an interchange of views and the better promotion of trade interests. We shall be glad to have from any of our readers their views as to the best time and place for holding such a convention, and their suggestions as to what topics may usefully be brought before it.

"Practical Hints on Watch Repairing."

The series of practical hints on watch-repairing with which "Excelsior" has been informing and interesting our subscribers for many months, have called forth from his readers in all departments and sections of the trade, the highest and most hearty commendation. There has been a constant call for back numbers of the CIRCULAR containing these articles, so that our supply was long since used up, and several hundred requests to publish and subscriptions for the unannounced book have poured in upon us voluntarily. In fact, these articles have called forth an approval at home and abroad which is as exceptional as it is gratifying. The unanimous opinion has been that they contain within compact limits more practical usefulness to the watchmaker than can be found elsewhere in any shape.

We are glad to state that we have made arrangements for republishing these papers in book form. The work has been carefully gone over and revised by the author, who has corrected incidental errors and added fresh reading matter, explanations and cuts. He has inserted also the compensation for heat and cold, so that the book will include all the adjustments known to the trade for the very highest classes of time-pieces. His remarks on new tools and methods, and his full practical directions, contain very much that has never before been published, a good part of which had been kept secret by individual adjustors until the time it was set forth by our enterprising friend. The work thus forms a complete practical manual on watch-repairing, and no watchmaker who desires to learn the minutiæ of the highest and most difficult operations in his business, can afford to be without it. We shall print but a limited edition, and orders should therefore be sent in at an early date.

Hall-Marking Again.

The chronic English discussion on the hall-marking of jewelry received an important contribution in a debate called forth recently at the Society of Arts, by a paper on this subject from Mr. Alfred Lutschaunig. The paper itself handled the present system and the Goldsmiths' Company without gloves, and its criticisms seemed to receive the general indorsement of the several jewelers who took part in the succeeding discussion, although no agreement was reached as to the proper remedy. The essayist finally proceeded to propose a remedy of his own for the abuses, setting forth a new scheme for the protection alike of the trade and the public.

The points of this are, first, the entire abolition of the Goldsmiths' Company as an assaying establishment, for the reasons that it did not, would not and could not fulfil its duties under the present system, while it was too powerful for any sufferer by its action or non-action, to call it to account. Secondly, the adoption of only three standards, twenty-two, eighteen, and twelve karat articles, (with an allowance of one karat each in melting down,) with the provision that twelve karat should be the lowest standard that should bear the word "gold," under a legal definition which should exclude all jewelry that does not melt down to eleven karats. Third, the appointment of government inspectors who should have the power, as given in other trades by the FACTORY Act, to buy any article from the workshop at fixed prices, and the right to break up the whole batch should any one piece be found defective. All articles that are plated, to be marked with the word "plated," so that no cabalistic signs would obscure the public mind, the absence of the word on plated goods to be a misdemeanor. Fourth, every jeweler to give a written guaranty or invoice, and to place his mark, for identification, on all his manufacture of jewelry. Fifth, every dealer to have a license, forfeitable in case of misdemeanor. Sixth, an *ad valorem* duty on yearly sales, which at ten per cent. would produce £1,200,000 on gold and gem jewelry and watches, the importations to be as proportionate duties. The paper estimated the number of first class jewelers in the United Kingdom at 2,400 (with as many small ones), the former selling yearly an average of £5,000 gross value. The writer also proposed an *ad valorem* tax on silver at a shilling per ounce, which would pay on 3,000,000 ounces yearly £150,000.

The English trade journals seem to be decidedly conservative in their treatment of this subject. The *Watchmaker*, in quoting the paper and discussion from the *Journal of the Society of Arts*, disclaims any identification with its propositions, and the *Horological Journal*, the organ of the British Horological Institute, opposes Mr. Lutschaunig entirely and gives its opinion that the forging of the English hall-mark on imported goods is a strong argument in favor of retaining it, "as showing the high estimation in which the English hall-mark is held." The individual discussion which followed the paper was, like it, quite outspoken in its objections to the Goldsmiths' Company, and was participated in by Mr. Streeter, Mr. Watherston, and other leading English jewelers. The chairman, Major-General Cotton, "thought it would be well to abolish the karat system altogether and speak of it as a percentage." Another speaker thought "the general feeling of the trade was that no gold below eighteen karat should be marked; twelve karat gold was altogether an anomoly." Another objected chiefly to the bewildering system of hieroglyphics now made use of, and thought the difficulty could be overcome by a simple mark, or by a simple system. Another spoke of the hall-mark as a great incumbrance, especially when goods were wanted in a hurry. He had found there was little value in hall-marks in a good class of trade, and if he stated to his customers that his goods were sixteen, eighteen or twenty karats, the statement was accepted without question, and there was an end of it. In fact the debate simply renewed the perplexity into which every discussion of this subject has so hopelessly run.

One of the speakers, Mr. Watherston, who is himself a member of the "obsolete corporation," as he called the Goldsmiths' Company, proposed to solve the dilemma by taking the radical ground that "the time has come when there should be no hall-marks at all, but they should be replaced by the reputation and character of the maker." "The espionage over the trade proposed under the old or the new system are alike impossible in the present state of trade and of public feeling; he thought that any one should make chains of one karat if he liked; then those who wanted first-class goods must go to a first-class shop." We may add for our own part, that this free system has the considerable advantage of emphasizing the question of character in the trade; at the same time, if a method of protecting the public and giving honesty in the trade a better show, can be devised, the American trade, as well as the English, is certainly desirous of having it put in practice. The practical difficulty is that every plan so far proposed in that country, and still more so here, seems to have called forth more objections than commendations.

A Noble Example.

We can commend to the trade, and particularly to the Jewelers' Association, as a noble example, the treatment of a set of Chicago compromisers by the chairman of a kindred organization, the Stamped Ware Manufacturers' Association. Here is the statement from Mr. David H. James, who is entitled to admiration for his bold position and to credit for the straightforward way in which he puts the facts before his associates so that they tell their own story:

"March 10, 1876, a Chicago firm called a meeting of their creditors. March 13, two of the firm appeared in New York, with a paper showing liabilities $154,000; assets $102,000, and offering fifty cents on the dollar in one and two years without security. January 30, 1876, this firm, in answer to my direct and explicit questions as to their exact condition, stated that they were 'perfectly solvent' and 'all right in every respect,' and that there was 'no foundation for the rumors affecting their credit.' They balanced their books January 1, since which time there has been no material change in prices, nor is it apparent that they had met with losses. The conclusion is plain, that they have been insolvent for a long time; that if they did not know it on the 30th of January they are unfit to manage any business; that, if they did know it, they are dishonest; and that, in either case, they had better hand over their assets to the creditors to whom they belong. Let us examine this case. These insolvents are $52,000 worse off than nothing. They make to their creditors the modest proposition that they shall be permitted to go right on undisturbed; that these creditors shall make to them a present of $77,000 in cash, and shall loan to them $77,000 more, for one and two years, without security; thus removing, for the present, their entire liabilities, $154,000, and giving to them their entire assets, $102,000 or more, to use as capital."

So much for Mr. James in his official capacity; but he has too much backbone to let the matter rest there, and he says further, as an individual business man:

"I declare that, if this firm continues regularly on its business, they shall pay the claim of James, Aikman & Co. in full. We should be 'just before we are generous,' and I submit that when we compel our good customers to compete with rotten concerns who only pay fifty cents on the dollar where they pay one hundred, we stick the knife into the very heart of commercial honor and ability, and offer a premium to dishonesty and imbecility. It is time that the careless, and easy way of settlement into which we have fallen was stopped, and that reckless and incompetent men, who rush headlong into business and into debt, should be brought squarely to face the music, and made to march to the tune they have chosen. Let it be understood that every man who cannot pay one hundred cents on the dollar, or get others to help him do so, must close out and make room for those who can, and we shall have sound business and few failures."

As a remedy, he proposes to his associates in the trade the following agreement:

"We agree that, from this date, we will compromise no debt due us for less that one hundred cents on the dollar—to enable any debtor to continue in business—except in case of absolute misfortune which could not have been foreseen or prevented."

Here is the case in a nutshell. If the country had a few more business men like Mr. James we should have seen less failing in the past, both of dishonest tricksters and of those honest merchants who are involved in ruin by the unfair advantage given to their reckless competitors. There would also be assurances for the future to those who mean to pay one hundred cents on the dollar that they would have a chance to earn their bread and butter, and pay their bills. We say that Mr. James is entitled to admiration; and yet it is only because others have so markedly failed to do their duty, that his conduct stands out in so strong a light. He is doing nothing more than is demanded by ordinary business prudence and foresight, and that he should be thus singled out for commendation is really the strongest satire upon those who are so unwise as to foil of their plain business duties. However, we thank Mr. James on behalf of every honest merchant in the country, to whatever trade they belong, and we wish there were a hundred of him in every business in the land.

A Dangerous Move.

We are constantly receiving complaints from the retail trade through the interior against the wholesalers, actual or so-called, especially in the larger cities outside of New York, who make a bid for retail business by offering to outsiders the discounts fixed for dealers.

This question is becoming one of the most important before the trade. It is a most striking sign of business demoralization. If the trade is to hold its own, this practice must be stopped.

It would seem almost needless, yet it is very necessary to point out that a retail dealer cannot live without a reasonable profit. If he is to be denied that profit, there is only one thing for him to do, that is, shut up his shop. He keeps his shop open for the sake of supplying to individual buyers in his locality the goods which he purchases at wholesale rates of the manufacturer or jobber, out of the profits of which he must pay for his store, his clerks and his own living. This profit in the jewelry trade must be a considerable one, else the retail dealer must give up, become bankrupt, and pay what he can on the dollar.

In sending out circulars, and worse yet, postal cards, offering to individual buyers the discounts allowed to the trade, wholesale houses are taking the ground right from under the retailers' feet. The practice seems to be growing, and the trade must meet the difficulty squarely. If the members of the trade desire to do away with the thousands of retail shops all over the country and attempt to hold their enstom by these new devices, very well. We should not, however, advise them to take this course. If, on the other hand, they want to keep up the retail stores, the retail dealer must have his chance.

The evident remedy for this undercutting is to be songht in its relations to bnsiness standing and credit. We would emphasize the fact that snch means of selling goods are not often resorted to intil a wholesale house finds itself in a position in which it is obliged to realize at any sacrifice. Some of the houses who have pursued this under-cutting conrse are really but retail establishments, perhaps of no great character, which by extending their retail sales in this way, assume the right to demand a jobbing discount and undertake to run a retail business on this too small profit. Others are wholesale honses who have the impudence to send out a circular one day to private buyers, and the next day to ask retail dealers to buy of them at the same terms. In fact cases are reported, as usually happens in this cut-throat competition, where better terms have been offered to private buyers than to retail dealers. This state of things is usually sufficient indication that a honse is dishonest, on its last legs, or in some way shaky,—a house therefore to be avoided by shrewd men.

Such dealers may be reached from two sides. The retail dealer owes it to himself to cut off his patronage directly from such houses, when they compete with him, and so reduce their sales and put the choice of wholesale or retail directly before them. But we would point out also the necessity of such people hearing from the leaders of the trade. They should be given to understand that such action throws immediate suspicion on their credit, and that they will either be refused credit altogether, or be given only such limited discounts as will prevent their trying to cut their neighbors' throats and will offer some insurance on the likelihood of their failure. If buyers will refuse to buy of such houses, and sellers will look carefully into their standing before giving credit, there is some chance of this evil being nipped in the bud. In the face of so great a danger to the trade, we trust prompt and general action will be taken.

Editorial Jottings.

We present to our readers in this nnmber another colored plate of new designs in jewelery, the third full page illustration in four nnmbers. These designs have been prepared with great care, and we think will commend themselves to our subscribers. As we have pointed out, they not only serve jewelers themselves in ordering from wholesale dealers, but they are of great use in showing to customers as an illnstration of what are the latest styles in New York. But our general work has been so appreciated by our subscribers, that we have no fear that they will fail to be appreciative of such features as these.

The lucky owner of the Johnston chromo diamonds proves to be Mr. F. Austin, of Dallas, Texas, who was the holder of ticket No. 1014. This number corresponds to one of five chromos purchased by this gentleman, an old subscriber to the CIRCULAR, which has brought to him this as well as, we trust, other good luck. A number of gentlemen well known in the trade, gathered at Mr. Johnston's house on the afternoon of Thursday, the 27th ult.,—memorable day!—to determine by what method the ownership of the diamonds should be decided. A plan was hit upon of which all approved, and amid tumultuous excitement No. 1014 was declared to be the winning number. We congratnlate Mr. Austin upon his luck, and don't know of anybody—always excepting the distinguished members of the Horological Club—better entitled to such a stroke of fortune.

Proceedings of the Horological Club.

A DISTINGUISHED BODY OF WATCH AND CLOCKMAKERS.

Twenty-seventh Discussion.—Communicated by the Secretary.

The Chairman, in opening the meeting, said he was happy to hear that quite a number of correspondents had written to avail themselves of the vast stock of information and experience possessed by this honorable body, and he hoped the members would take pains to justify and encourage this confidence on the part of the trade at large, by answering their inquiries fully.

RETAINING OIL ON THE BALANCE PIVOTS.

The Secretary first read a communication from their esteemed correspondent, Mr. Ernest Sandoz, of Chicago, on the best means of preventing the oil being drawn away from the pivots of the balance, by capillary attraction. His letter, being somewhat lengthy, is printed on another page.

its jewel hole, it would be an advantage rather than an injury. He would aim to make a constantly decreasing space from the furtherest point to which the oil would go, to the top of the jewel, and thence down between the jewel hole and the sides of the pivot. The oil would then lubricate the pivot as long as any was left, by reason of always being drawn to the smallest space, *i. e.*, the space between the jewels would act as a reservoir, from which the oil would be drawn to keep full the smaller space between the pivot and the sides of its hole. It seemed to him that this would be an effectual remedy for the difficulty spoken of, but if any of the members or their correspondents could suggest anything better, he hoped they would do so.

TRUEING THE COMPENSATION BALANCE—PUTTING IN MAINSPRINGS—WORK ON ASTRONOMY.

"What is the best method of trueing the compensation balance? Describe the best tool for putting in mainsprings without touching them with the finger, and who has them for sale? Name and price of a good work on Astronomy; of whom can I get it?

JOHN H. DAVIS, Marion C. H., S. C."

MR. HAIRSPRINGTWISTER:—"JUST LET ME GET HOLD OF HIM ONCE!"

Mr. Uhrmacher said that the difficulty spoken of by Mr. Sandoz was often a serious one, but he thought he could suggest a remedy, based on the law of capillarity referred to by their correspondent. This, he conceived, was the true system:—Instead of fighting against the laws of nature, which were immutable, and their effects unavoidable, we should make them serve us, thus changing them from an obstacle to an aid, from a curse to a blessing. As it is practically impossible to count upon making an exact fit of the cap upon the hole jewel, close enough to *prevent* capillary attraction between them, it would be better, instead of trying to prevent the oil being attracted at all, to merely prevent it being carried *far away* from the pivot hole. This could be done by making the hole jewel with a considerable convexity on the top, next to the cap jewel, so that the space between the two jewels would become too great for ordinary capillary attraction before reaching any great distance from the pivot hole. By making the oil-sink, underneath, deeper than usual, to correspond to this extra convexity, this shape of jewel would not require any extra length of pivot to reach through it, notwithstanding that it would be thicker than the ordinary form. He would also make the pivot hole of nearly uniform diameter from the oil-sink to the top surface, omitting the concavity at the end next to the cap jewel, proposed by Mr. Sandoz. Should the cap and hole jewels be further apart than the sides of the pivot and of

Mr. McFuzee said there was only one way to true up a compensation balance, and that was to spring it with the fingers till it was round and true. The workman must be very cautious to *go slow*, lest he should bend it too much, or strain the rim in some screw hole. It should be continually tested in the ordinary calipers to see the effect produced. It was understood that the editor of the CIRCULAR had prevailed upon "Excelsior" to write an article on the compensation balance, which would probably appear in this number. He, Mr. McFuzee, would therefore refrain from further remarks on that subject, as no doubt "Excelsior" would tell all there was to be told about it.

The best tool for putting in mainsprings is the ordinary mainspring winder, but that did not dispense with touching the spring with the finger, nor did he know of any tool that did. In using this tool, the spindle is first made to rotate in the right direction to bring the mainspring properly in the barrel, which is laid where it can be picked up handily by the right hand. An arbor of about the same size as the winding-arbor in the watch is fitted to the spindle, and the center of the mainspring bent to encircle it closely. The spring is then hooked on the arbor, the slide set up behind it, the thumb of the left hand in front, keeping the spring pressed against the slide, and the forefinger on top pressing the spring towards the arbor. On winding up the spring, the pressure of

the fingers compels it to coil closely, which can be assisted by pulling the end with a pair of pliers when nearly done. While held in the close coil, the barrel or main wheel is to be slipped over the spring, which was allowed to uncoil itself within it, the forefinger then pressing it in. If necessary, the spindle could be turned to cause the spring to slip around in the barrel till it hooked itself properly. These winders are sold by all material dealers.

As to the work on Astronomy, it would be necessary to know what information Mr. Davis wanted, before recommending any particular one as the best. There were a great number of works on that science, all good; but some were little more than star-catalogues, others were devoted chiefly to the theories of the subject, others to observations, descriptions and use of instruments, etc., etc. Any intelligent bookseller, after knowing Mr. D.'s object, could select the work best adapted to his use, and procure it for him.

CAUSE OF MAINSPRINGS BREAKING—NATIONAL CONVENTION OF WATCHMAKERS.

The Secretary then read the following:

To the Gentlemen of the Horological Club:

I send you a mainspring for the consideration of your honorable body. It is one I put in a watch, and it ran some time all right, but broke while hanging on the board, and upon examination I found it in fragments. Would this not be a good year for a National Convention of watchmakers? I would like to get hold of "Excelsior" some way.

R. P. S."

The spring sent by their correspondent was passed around and examined by the members. All had seen similar cases, but as to the cause no one was able to say.

Mr. Horologer remarked that there was something unaccountable about the breaking of mainsprings. They would break under all circumstances,—when wound up, when run partly down, or when run entirely down. A spring would even run for years and then finally snap off when the watch was run down and laid away. And all this when the spring was actually so soft that it could be twisted over backwards and would bend instead of breaking. Mr. C. E. Fritz, (who has since been elected a member of this honorable body, for his frequent and valuable contributions of essays on different topics,) has presented a paper to the Club, which he believed was printed in the CIRCULAR for May, 1875, which showed close observation, large experience, and careful reflection upon this subject. He would recommend all who were inclined to study into the causes of this phenomenon to read it, as they would derive many new ideas therefrom. He also hoped that others would present their views, with their reasons for the opinions advanced.

As to the suggestion about a National Convention of watchmakers, he was heartily in favor of it. A great many watchmakers would visit the Centennial Exhibition at Philadelphia, and he thought it would be an excellent plan to have a general understanding for the craft to make their visits at about the same time, so that they could, without any extra trouble or expense, meet in convention, either at Philadelphia or in this city. From conversation with many friends, he believed that the greatest rush of visitors to the great show would be in September. He therefore would suggest that watchmakers everywhere should go sooner, say in the latter part of August, when business at home would be dull, and they could afford to take all the time they needed. They would not only form new acquaintances, promote professional amity, and get much information by thus meeting each other, but they would also understand and enjoy the exhibition itself much better in company with those who had similar interests, sympathies and tastes, than alone or with those who wanted to see what they cared nothing about, or who cared nothing about just what they most desired to see.

Like their correspondent, he himself "would like to get hold of "Excelsior" some way," and shake him by the hand. It was an aggravating thought to him that he would not know "Excelsior" if he should see him. He might possibly even be already acquainted with him, and meet him regularly in the routine of business, without the opportunity of expressing his admiration and friendship. The secret bids fair to be as well kept as the identity of Junius. But he thought it too bad of "Excelsior" and the editor of the CIRCULAR to torture the whole trade in order to carry out a mere whim. He considered that there was not the least excuse for secrecy. Any man might well be proud of the authorship of those articles, and the bearer of that title should have the credit of his good work. Several other members spoke in a similar strain, and declared it as their opinion that the mask should now be thrown off.

The Chairman then referred to the mainspring question, and suggested that as Mr. Screwsqueezer had declared, at the last meeting of this honorable body, that "there was no question that anybody could ask, which we could not answer," perhaps that gentleman could answer this question.

Mr. Screwsqueezer arose and said most certainly he could. Then, after recovering from a somewhat protracted and serious attack of coughing, and hemming, and hawing, he observed that the reason the spring broke the way it did ought to be perfectly plain to any person of ordinary intelligence and average understanding. He thought it ridiculous that people who put on so many airs as some did, could not answer such a simple question as that.

Cries of "Why don't you answer it then?"

He wanted those disturbers of the order of this honorable body to understand that he could answer it, and not fret his gizzard very much about it either. In fact he could answer such questions as a regular employment, and grow fat on it. He would like to knock off working at the bench, and take a "sit" to answer such questions, at the same wages.

Cries of "O, come down! Cheese it! Question! Stick to the point! Tell the reason!" etc., filled the spacious and elegant council chamber so liberally provided for the use of the Club by the editor of the CIRCULAR.

Mr. Screwsqueezer felt constrained to come to the point. "The reason," said he, "is that the spring was too hard in spots."

Derisive laughter followed, with shouts of "Police! Get a straight jacket!" etc.

Mr. O'Lever asked how, from the way mainsprings were made, they could be too hard in spots?

Mr. Screwsqueezer replied that there were a thousand ways that it could happen. He disdained to explain such a simple thing as that. He was not accustomed to speaking to children,—and with a contemptuous smile he resumed his seat.

As soon as order was restored, the Adjuster-of-the-French-School, who had been pawing his moustache and working his eye-glasses in great excitement, arose and exclaimed: "Sir! the honorable gentleman who has just preceded me was entirely correct, sir, entirely correct. And I will explain it so clearly that even a child unborn can understand it. That gentleman truly observed that the temper of the spring was too exalted in particular localities, which caused a local liability to fracturation. Now I will explain the *modus operandi* of the production of those local weaknesses. During the manipulation of the elongated portion of metal, the exterior surface being exposed to the phosphorescent rays of our celestial luminary, in juxtaposition with the oxydating influence of the circumambient atmosphere, causes an infinitissimal layer of rubefacient gaseous particles to adhere to the polished surface of the steel. Were this layer continuous, its deteriorating effect would be uniform throughout the total latitude and longitude of the embryo spring. But owing to accidental abrasions occurring during the mechanical manipulations, this layer is obliterated in fragmentary portions, at irregular intervals. Consequently, when the metalliferous material is raised to an incandescent state, and suddenly submerged in an aqueous bath, the refrigeratory effect of the operation is much more violent in those abraded portions, on account of the contact being more instantaneous and the decaloration more complete. This causes a decomposition of the molecular attraction between the atomic particles at those points, leaving them in a strained and uncertain state. Any concatenation of unfavorable circumstances will precipitate a rupture at one or more of those perturbated localities, according to the coincidencies of the *causorum fracturandi*. There, gentlemen, you have it, in technical language befitting the importance of the subject. Let it go forth to an astonded world as the discovery of the Adjuster-of-the-French-School. Eureka!"

"That is all very well," said Mr. Waltham, rising, "but there is one little difficulty about it which troubles me. Supposing that the phantasmagory shouldn't happen to gybooherate on the diaphragm at just the right moment, what would be the effect?"

The A.-of-the-F.-S. gazed at his interrogator silently, as if pitying such density of ignorance, then waving his hand majestically he sat down on his new silk tile, fresh from Knox the hatter, which he had placed in his chair while speaking, and folded his arms in serene unconsciousness of the wreck and ruin wrought by his nether selt.

Mr. Hairspringtwister then took the floor, referred to the remarks of Mr. Horologer and others, and said that he too thought that the mask should be thrown off, or rather torn off, from "Excelsior." Any person who would hide behind a false name to make such unprincipled attacks upon his compeers as that writer had done, ought to be waloped, and if he knew who "Excelsior" was, he would be the man to do it, too. He was prevented from freeing his mind last month, but he intended now to have his say.

Mr. Isochronal inquired what occasion "Excelsior" had given the speaker for making such remarks.

"He called me a botch, sir," exclaimed Mr. H., excitedly. "Me! sir, who am far his superior in every way. A botch! Just think of that! No man can call me a botch and live, not if I know it. I too 'would like to get hold of 'Excelsior' some way.' In the words of the immortal Shakespeare, I would tear him limb from limb, and scatter him through infinite space, where Omniscience could not find him, nor Omnipotence put him together again! Just let me get hold of him once! I'll crush him to atoms!"

Here the speaker became so violent in manner that Mr. Horologer, who sat before him, was solicitous for his personal safety. Mr. Waltham vainly held up both hands in deprecation of such unseemly conduct, and several of the members were contemplating the policy of seeking safety in flight. In order to avert the catastrophe which seemed imminent, the Chairman thought proper to declare the meeting adjourned till next month. As words are entirely inadequate to express the painful sensation produced by the remarks of Mr. H., we have inserted a slight sketch of the scene at the moment he was opening and shutting his fist to show how he would crush poor "Excelsior" to atoms if he "could only get hold of him once."

Owing to the meeting being so suddenly cut short, several communications were left unattended to. Correspondents are respectfully requested to be as brief as consistent with a proper expression of their views.

It was also expected that some action would be taken on the subject of a National Convention of Watchmakers,—at least so far as to appoint a committee to confer with the dealers of the metropolis, with a view to making such arrangements as would secure the holding of the convention in this city. As this was unfortunately prevented by the premature closing of the session, it is suggested that watchmakers throughout the country who favor the proposition should notify their New York correspondents in the trade, at once, of their intention to be present, etc.; and that the New York houses should themselves appoint a committee to take such action in the premises as may be thought proper.

Horological Club Correspondence.

RETAINING OIL UPON A BALANCE PIVOT.

Secretary of Horological Club:

There is in horology a vexed question which you will probably deem of sufficient importance to be discussed in your meetings, the more so because it has hardly ever been sufficiently studied to afford and indisputable basis to our art. I now refer to the shape and construction of the balance hole and cap jewels, in relation to their qualities of retaining oil on the staff's pivots. Some are constructed seemingly with a view to furnish oil from a reservoir; in others, again, the maker seems to have had for object to close every channel by which the oil might extravase and leave the pivots dry. Most old hands at the trade have noticed the difficulty, not to say the impossibility of keeping the lower balance pivot of English watches supplied with oil when the cap jewel is a sliding one. Again in many American watches of our best makers, the oil runs between the setting of cap jewels and the sides of the bridge, and coming to the surface of the setting, shows plainly that the pivots will shortly run dry. It is not now my purpose to dwell upon the disastrous effects of dry balance pivots in an otherwise perfectly made watch; they are well understood. But by calling forth opinions from experienced artists, it is likely that a study of the present subject will prove beneficial to our manufactories and the trade at large.

The only law in physics that one can take advantage of in this regard, is capillarity. According to it, there being two channels of escape given to the lubricating oil, it will *run in the smallest*. This very simple fact seems to furnish the solution of the whole problem, and very likely would if mechanical difficulties of execution were not in the way. It is clear that the oil, after having filled the jewel hole, will remain and be attracted all around the pivot, because the space between both jewels being formed like a wedge, will act like a capillary tube and gather the oil at the point where the surfaces meet. In theory the shape of such jewels and reservoirs is correct, and would likely act very well were it not for other attractions, which are often more powerful than the capillary channel thus formed between the jewels. The first one is found wherever the cap jewel is not of sufficient size, as the metal in which the cap jewel is set generally presents shallow indentures made by the file or the stone in flushing the jewel in its setting; these indentures act as so many small capillary tubes, and gradually draw the oil from the larger one, according to the law of capillarity. Another defect comes from the setting of the cap jewel itself when it is not of sufficient size, the setting being fitted close to the walls of the bridge, acts as a most powerful suction tube, and just as soon as the watchmaker has seen the oil previously put in the hole jewel disappear, and ad1 (for safety) a little more, the oil extravases along the walls of the setting, and in a few weeks is found on top of the setting, only waiting for a good chance to withdraw entirely from the pivots.

This statement is especially intended for an answer to a correspondent in one of the last numbers of the CIRCULAR, who stated that the balance holes should be oiled several minutes previous to setting the watch up definitively, so as to have a chance to add some oil when the first has disappeared,—as I contend that such suction denotes a wrong arrangement of the reservoirs, and should be attended to whenever practicable. A cap jewel that does not lay flat on the hole jewel will also dry the pivots, as the surfaces come nearer together on one side than on the other, act again like a capillary wedge, and draw the oil around the sides of the jewel setting and cap jewel.

It may be that some members of the Horological Club will be able to present a suggestion to construct an effective oil reservoir, and in that case would deserve highly from the craft, as oil is certainly a most fruitful cause of irregular running in adjusted watches.

ERNEST SANDOZ, 170 State street, Chicago.

[A sketch sent by Mr. Sandoz represents a sectional view of the jewels as ordinarily arranged in the American watch—a cap jewel in its setting resting on the hole jewel underneath. The latter, however, in addition to the usual oil-sink, has another concavity at the upper end of the hole, next to the cap jewel, similar to the oil-sink but of smaller diameter.—*Secretary Horological Club.*]

THE power of light to produce motion is demonstrated by an ingenious instrument called the Radiometer, invented by Professor William Crookes, F. R. S. The instrument is only manufactured in London by James J. Hicks, F. M. S. The principle of motion and construction of the instrument is the light impinging upon four metallic discs, which has on one side a white, and on the other a black surface These discs are so connected by a fine wire as to be perfectly balanced, and while revolving around a common centre on a pivot in a perfect vacuum chamber, the amount of light is regulating the velocity of the rotating discs. Thus, if a constant ray of light, no matter from what source, be brought to bear upon the instrument, it will constitute a sure perpetual motion. It will also measure the force, intensity, and weight of light, and its application is slumbering like the forces of electricity when first discovered. The instrument is intended for the Centennial Exhibition, and was brought to this country by Mr. Hicks, from London.

Practical Hints on Watch Repairing.

By Excelsior.—No. 14.

(234) *Adjustment to Temperatures.*—The compensation for heat and cold completes the list of adjustments which are found in the modern fine portable time-piece. It may be accurately adjusted to positions and isochronism, and yet be utterly untrustworthy for time. Every change in the weather, or other circumstance, however trivial or unavoidable, which warms or cools the movement, will produce an error in the rate, which may vary from a few seconds to as many minutes in a single day. Change of temperature affects the time given by a watch or chronometer in three ways:—1st. Heat expands the balance, making it, for the time being, of larger diameter, and causing it to vibrate more slowly. 2d. It expands the hairspring, making it longer, and causing a loss of time. 3d. It diminishes the elastic force of the hairspring, causing a still greater loss,—the effect produced upon the hairspring being much more than that upon the balance itself. The opposite of the effects above noted takes place in cold.

(235) The first attempts to remedy these errors were by contrivances acting upon the hair-spring—an example of which is the "parachute regulator," often seen in old escapement or anker watches, which opens or closes the pins of the regulator by means of a compensating quadrant, as the temperature changes. It would be interesting to examine the various methods of compensating for the effects of heat and cold which have been proposed at different times, and trace the progress of invention from the first crude ideas through successive discoveries and improvements, but the practical character of these articles forbids. At the present day the means almost universally employed for that purpose are embodied in what is generally known as the chronometer balance, more correctly termed the compensation balance of ordinary construction. Of the other forms proposed, only three seem to have any great practical value, viz:—Dent's Hartnup's and Kullberg's. Fritz's balance, with adjustable radial compensating segments, lately described in the Horological Journals, is certainly very promising, and based upon the correct principle, but as yet has not the standing given by long practical trial, like the others named. Should it prove stable and permanent in its action, as claimed by its inventor, and which there seems to be no reason to doubt, it will give its competitors a hard pull in the race for precedence.

(236) *The compensation balance of ordinary construction* consists of a steel center-bar, carrying a circular compound rim, which is cut into two or four sections, each having one free end and the other end attached to the center-bar. This rim is composed of two metals, which are unequally affected by heat and cold, usually steel and brass. The brass expands and contracts much more than the steel, and it is by means of this difference that the rim "compensates." When the balance is exposed to heat it expands and the watch would consequently run slower. But this is counteracted by the action of the rim, which, from the brass being outside and expanding more than the steel, curves the free end of the rim inward, and carries the weight or screws upon it towards the center of the balance. In cold the whole balance contracts, and, from being smaller, would vibrate more rapidly, but the brass exterior contracting more than the steel, tends to straighten the rim and carry its screws outward, thus neutralizing the effects of the cold. The first balances of this kind were made by fastening the steel and brass strips together by rivets at frequent intervals, and afterwards they were soft-soldered together. At present they are united either by hard-solder or melting the brass upon the steel.

(237) *Making a Balance.*—In making this balance, a piece of the best cast steel is selected, a hole of proper size drilled through the center, it is then mounted on an arbor and turned perfectly flat on both sides and on the edges, which should be parallel to the sides of the center-hole and at right angles to the flat sides. We then have a round piece of steel, of the thickness of the rim of the proposed balance, and of the exact diameter to be given to the steel part of the rim. The brass is then either melted on the outside, or a piece of brass is stamped out, of the right size, and soldered on. Some prefer one method, some the other. But there is probably but little difference between the products of each, where equally well made.

(238) *Uniting the Metals by Fusion.*—When the brass is to be melted on, the hole in the center of the circular steel plate is first filled up with plumbago, pipe clay, or even fine chalk pressed in wet and allowed to dry. Some turn out a plug of slate pencil to fit the hole perfectly, and many other means are employed to prevent the melted brass from entering the hole during the process. It is indispensible that this hole remain unaltered, as upon it depends the truth of all the parts and the equal action of the segments when finished. The outer edge of the plate must be perfectly clean, to secure a perfect union and adhesion of the metals throughout the whole rim, and thereby insure equal and uniform action in all its parts. Some makers even gild the steel to prevent any danger of oxidation of the metal. The surface is then coated with powdered borax and water in the usual way, which is allowed to dry, the steel plate is then placed in a crucible, or in a heated mold of fire clay or soapstone. In the former case, enough of the best brass is put into the crucible to surround and cover the steel plate when melted, and the whole is exposed to the fire in a suitable stove or furnace, till the brass melts and flows freely, then the whole is immediately removed and allowed to cool gradually. In the latter case, the brass is melted separately. As soon as it becomes thoroughly liquid, and the characteristic greenish flame appears, it should be poured into the red hot mold. Old English watch movements are found to furnish brass which is generally very satisfactory. The melting should be done by a charcoal or coke fire. The fumes from coal are very objectionable, especially from soft or bituminous coal, and ordinary wood is not much better, unless thoroughly seasoned and dry. When the brass is to be soldered on, a thin film of silver solder is interposed between the steel plate and brass ring when the latter is driven on, plenty of borax applied, and the whole is carefully exposed to heat till the solder flows satisfactorily.

(239) *Finishing the Balance.*—When cold, the center-hole is cleaned out, the superfluous brass filed off the sides, and also on the edges till it is about three times the thickness it is to be when done, then the rim is carefully hammered to harden the brass without denting it or breaking the grain. This hammering should bring the rim to about the diameter it is to remain, so that as little as possible of the metal will have to be turned off, as that would remove more or less of the hardened surface and impair its value. The edges and outside of the rim are turned perfectly flat and true, and the inside of the steel plate is turned out in such a way as to leave the metal at the bottom of the cavity, of the thickness the center-bar is desired to be, and the steel part of the rim about one-half the thickness of the brass portion outside.

(240) The bottom is next pierced and filed out, leaving the center-bar of exactly the same size and shape on each side of the center, and the rim of the same thickness from edge to edge, without filing or scratching the portion of it which was cut out in the lathe. It is then drilled and tapped for the screws, the number of which varies. American watches generally have thirteen holes on each half of the rim. Some makers locate the holes at a progressively decreasing distance apart as they approach the free ends of the segments,—others make them an equal distance apart throughout. This is not material, but it is absolutely indispensible that each opposite pair of screws be exactly in a diametrical line passing through the precise center of the balance. Instead of screws, chronometer makers often use sliding weights, which may be moved along the rims and fastened at any desired point by a set-screw. But the use of screws for compensating is becoming the rule. The balance is then set up in the lathe again, and the rim polished. It is now cut, generally near the center-bar, so as to form two long sections or segments, but sometimes midway between the ends of the center-bar, thus forming four shorter segments. The drilling and cutting are best done by the help of a dividing engine, to insure exactness, and so that the two segments should be of precisely the same length, and shape of cut. It is necessary that all the opposite parts of the balance be of exactly the same thickness, shape and weight, as otherwise, even if the balance was in poise at the mean or middle

temperature, it would not be so when the segments had changed their positions under the influence of heat or cold, for their unequal motions would carry the compensating screws to different distances from the center, and render the rate utterly unreliable in different positions, or in carrying. It must also be staked or riveted concentrically upon the staff, as any fault here would vitiate all previous painstaking.

(241) *Cutting the Rim.*—Where the rim shall be cut is determined largely by the construction of the balance itself. Every maker tries to have a definite system, which he rigidly adheres to, and by this means he produces balances comparatively uniform, or at least having a certain character. The balances of some makers are more sensitive than those of others. The former do not need so long segments to produce the same effect. And each maker will by careful observation and experience find the length of segment which is suitable to his balances. Very long segments are apt to be irregular in extreme temperatures, while short ones may not have action enough to effect a compensation. If the rim is sufficiently sensitive, it may with advantage be cut into four equal segments. But, in any case, when there are but two compensating segments, the cut should be far enough from the center-har to afford a good hold upon the balance while handling it, without the fingers pressing on the free ends of the segments.

(242) *Truing up a Balance.*—When the rim is cut apart, the segments fly "out of round," and require to be trued up. This is always done by hand, by very gradual and gentle curves, and is a somewhat tedious operation. In trueing a balance, whether new or one that has been bent, use no pliers or other tools to bend it into shape, but spring it very carefully with the fingers. If a rather sharp bend is wanted at any particular point, place the thumb or finger nails at that point as a support, and spring the segment on each side, against the nail The novice must use the utmost care, or he will bend it too much, or in some screw hole, and will he very likely to crack it, when it will he ruined, beyond the power of the cleverest workman to remedy. At first he had hetter practice only on abandoned balances, till he has acquired a little skill and experience. To find the change required place the halance in the calipers, or even in the "turns," with sufficient pressure on the pivots of the staff, (or the arbor, if it has not been staked upon the staff,) to hold it in any position it may he placed in. Then set the rest of the lathe, or slip-piece of the calipers, to harely touch the upper edgo of the rim with its sharp corner.

(243) *Eccentric Balance.*—First test if the balance is staked upon the staff concentrically. If so, the outside of the rim, at the end of the center-bar, will be equally distant from the center, or will touch the rest alike. If not, perfect action cannot he expected, for it is evident that the two segments have different centers of motion from which to act in either direction under change of temperature. But if this error is not too great the balance may do for ordinary watches. The quickest and hest way to remedy this (without bending the staff or pivots,) is, probably, to drive the balance off the staff, turn or stone it down a little smaller so that the halance will go on somewhat loosely, then hy riveting it a little harder on one side than the other throw the halance a little further out on that side, and make the rim concentric. If the balance hole was already too large for the staff, and that was the cause of the eccentricity, re-staking properly will bring it concentric with the pivots. Or if the arhor of the staff was not concentric with the pivots, it should be made so in the lathe, and the balance then riveted concentrically upon it. Never attempt to bend the arms of the center-bar, except to straighten or level them after some botch has hent them out of shape; such a halance is of little value for accurate performance.

(244) *Rounding the Balance.*—The rim being concentric at the ends of the center-bar, turn the balance slowly with a piece of pcg-wood, and note where the rim hegins to go in or out from the true circle indicated by the sharp corner of the slip-piece or rest. Have ready a little whiting and oil, mixed, and mark the rim with a speck of this, on the outside where it begins to go out, on the inside where it begins to go inward. So go around the whole rim, marking every such place, and you will have a clear idea of the condition of the balance. In trueing, take one segment at a time, begin at the center-har and work from there to the end of the segment, testing it after every alteration hefore making another, till it is true to the end. Then true the other segment in the same way. All this should be done at the middle temperature for which the balance is to be adjusted. If the extremes are to be 30° and 120°, the mean will be 75°, at which temperature the balance should be caused to be round or concentric. If the extremes are 35° and 95°, the mean will be 65°. The temperature of the adjustment-room should be kept at that degree, and if the heat of the sun, steve, lamp, fingers or breath, should warm the halance shove that, it should be cooled in a dish of alcohol hefore testing the roundness in the calipers. Should there be jewels on the staff which are fastened in with shellac, the alcohol would loosen them, and water should he used instead. See that the rim is true in "the flat," as well as in "the round," which should always be tried with the halance in the vertical position, or edge upwards, so that the segments may assume their natural position as regards flatness.

(245) *Poising the Balance.*—Then poise it accurately (71) with the screws (except the timing or quarter-screws,) turned clear in, but not tight. If they were screwed in tightly, the pressure of their heads against the rim would affect its curvature while the hrass part of it was expanded under the influence of heat, and might even cause a change of shape in the rim, which, from the method of its production, is comparatively soft. The shove directions apply only to new balances. We often find halances in use having their screws all considerahly turned out to make the rate slower. In that case we must let them remain so, if the rate is correct and the opposite screws are at equal distances from the center, as turning them in would necessitate the fitting of a new hairspring. But if we have orders to make everything right, as it should he, we ought to turn the screws home, to hanclite as shove, then fit a hairspring which will give correct time,—provided the halance is of the right size and weight for the movement. If not, it shonld he entirely discarded, and a new one put in. Also now test the halance for magnetism (232), if it has not been done hefore.

(246) *Irregular Action.*—Whenever a balance shows any irregularity in time, it should be tested as to its *poise in extreme temperatures*, say 35° and 120° Fahrenheit. And it is well to test the balances of all fine movements hefore beginning the compensation. Sometimes the brass and steel are not firmly united, and will separate more or less under change of temperature. This defect may not be so great as to he discoverable by prying the metals apart, and yet cause the two segments to operate very irregularly and differently. Sometimes the rim is "out of round," or not truly circular, when the segments will spring in or out differently, from their different shape or curvature. Sometimes one segment has been hent accidentally and trued up again, or for some other reason one segment has been bent hack and forth more than the other, and as this bending impairs the elasticity and changes the condition of the metals, its action will he different from that of the other segment. It is of the highest importance to handle a compensation halance with the utmost care, to avoid the slightest springing or straining of the segments. Flaws or defects in the metal or workmanship of the halance will also cause a diffcrence of action in the segments. If one side has been bruised or dented in the hammering process, that side will show the effects ever after. Care should also he taken not to expose a balance to a heat exceeding 130° to 140° in waxing it on the lathe, or for any other purpose, and not for any great length of time to that temperature, as it is liable to cause the segments to "set" more or less differently from their former shape.

(247) *Poising in extremes* may he done by placing the balance properly in the notches of the poising tool (73), and then exposing it to heat and cold in the manner hereafter described. If its position is found changed when the oven or cold-box is opened, the segment found down in cold, or up in heat, has acted more strongly than the other, and hoth should he closely examined. If its position has remained unchanged it may be inferred that the error is very small, if any exists, provided the poising tool is in good condition. But if the halance is very small and light, a considerahle error might fail to

be detected, owing to the mass or weight moved being too slight to overcome its inertia and the friction of the pivots. In such cases, a wire can be passed through the wall of the adjusting oven or cold-box at any convenient place, bent into a ring on the outside for convenience of turning, and split inside to hold a bristle. The balance should be placed where the bristle can touch its rim, and after the desired temperature is reached give the wire a twist, which will cause the bristle to strike the balance inside and whirl it around. In the oven the balance can be observed from the outside, and several trials made before opening it. But in the cold-box it will be necessary to open it and see the position of the balance at each trial. If it stops in all positions indifferently, it may be considered to remain in poise at all temperatures. But if one side is repeatedly found down, in heat or in cold, the error must be traced out and corrected before proceeding further.

(248) *What is Compensation?*—Having our balance in the watch and running, let us consider what it should do. We have already seen that in heat the greater expansion of the brass exterior of the rim will curl the segments inwards and carry the screws or weights towards the center. In cold the greater contraction of the brass carries the weight outwards, and thus compensates for the contraction of the entire balance, which would otherwise cause a gain in time. Obviously, the weight should he carried inward in heat, and outward in cold just enough to make up for the expansion or contraction of the balance, the effects of heat or cold on the hairspring, and all other changes resulting from the change of temperature. Whether it does so or not can only he told by actually trying it in heat and cold. Even when marked "adjusted," they seldom can be safely guaranteed to he closely compensated, till they have been tested and their actual performance ascertained. As a general rule, any movement costing less than $50 may he considered doubtful. The custom with movements of that class is to test them, and those which perform with tolerable accuracy are marked "adjusted," while the rest are sold as unadjusted. It will he seen that even the former are really not *adjusted* at all, but only found to he close. Watchmakers who have many customers for fine watches can frequently make it profitable to buy these unadjusted movements, and adjust them themselves, thereby raising them to the value of the adjusted movements of the same class. The process is somewhat tedious and troublesome, but this is largely compensated by the number which may be under way at the same time, with hut little more trouble and expense than one would he.

(249) *Over-Compensation.*—Instead of the weights or screws on the rim being moved inward and outward just enough to compensate for heat and cold, they may be moved too far, or not far enough. In the former case, the watch is said to be "over-compensated." It will gain in heat, because the weights are carried too near the center, thus making the balance virtually smaller; in cold the weights will he carried too far outwards, and cause a loss of time. The segments act too strongly, but as we cannot change their action we must find some means to lessen its effects. It would not do lessen the weights, as that would cause a gain in time by making the balance lighter. But we can move the weight or screws back from the cut ends of the segments towards the center-har. The motion of the segments inward and outward being greatest at their free ends, the further back we place the screws, the less they will be moved. So that we can regulate the effect produced, to almost any degree. For it is evident that if the weights were placed just at the ends of the center-bar, there would be no compensation at all, except that produced hy the weight of the segments themselves. And we have the entire length of the segments as a range for the weights, according to the effect we desire. Sometimes the action of the segments is so strong that they compensate too much, even when the screws are all moved back as far as they can he. In In such case we must substitute lighter screws in place of those nearest to the ends of the segments, and correspondingly increase the weight of those next to the center-bar.

(250) *Under-Compensation.*—Ou the other hand, if the watch loses in heat and gains in cold, the weights are not carried far enough to produce the required effect, and it is said to be "under-compensated." The remedy for this is the opposite of that for over-compensation, viz: to move the weights or screws nearer to the ends of the segments, and increase the effect produced hy their motion. In making these changes, the screws must of course he moved in pairs, to prevent destroying the poise of the halance. Take out one of the screws, and change to another hole, nearer the end, if we wish to strengthen the compensation, or further from the end if we desire to weaken it. Then move the screw which was exactly opposite to it in the same way. We frequently need to move several pairs, and not merely one hole, hut perhaps change their position by several holes, according to the indications of the trials. If the compensating action is so weak that even massing the screws at the ends of the segments does not produce sufficient effect, we can substitute heavier screws for those nearest the ends, and lighter ones for those furtherest back,—as, for instance, screws of gold or platinum for those of hrass or aluminum; and the reverse may he done for over-compensation. But in making these changes the total weight of the halance must he kept the same, otherwise the rate will he altered.

(251) *Range of the Adjustment.*—The range of temperature for which the halance is adjusted varies with the ideas of the manufacturers, or the climate in which the chrouometer is expected to be used. For temperate climates, a range from 50° to 90° is thought to be sufficient. Many makers adjust only for 50° to 70°. For hot climates, 60° to 90° is considered ample to include all ordinary vicissitudes of temperature. 50° to 85° will generally cover the temperatures to which ship chronometers are exposed on hoard. And instruments have been carried with expeditions to the polar regions without experiencing any greater range than that, owing to the care taken of them. But pocket watches should he adjusted for a range from 35° to 95°, in order to cover the temperatures to which they will he frequently exposed. During the day they are kept warm by contact with the person, while at night they are often exposed to the temperature of freezing, zero, or even lower. Some American watch companies adjust from about zero to about 120°. This, however, is rather more than is heneficial, as the residuary error spoken of in a subsequent section becomes very considerable in so extended a range. We should adjust for a range that will include the reasonable exposures to be expected, and then divide up the error between the mean and the two extremes, so that it shall nowhere be very large.

(252) *Length of Trials.*—The length of time the trials should last also varies according to the circumstances of the case. In the first trials six hours will generally he sufficient to show the error clearly. But as each correction diminishes the error the length of the trial must he increased to twelve, and finally to twenty-four hours. Where great accuracy is required, chronometers are often kept for a week in heat and cold alternately. In all cases the same period must he taken for heat, cold and mean temperature, so that the results can he safely compared. If the trial in one temperature is for six hours, the others must also he for six hours. The longer trials not only give time for the errors of compensation to accumulate to an appreciable quantity, but they have the further advantage of averaging errors due to other causes, as lack of isochronism, mechanical defects, etc.

(253) *Requisites of Compensation.*—It is always desirable, and is supposed to he the case, that before the trials for compensation commence, the movement shall he in perfect order,—the escapement particularly being as closely adapted as possible, adjusted to positions, the hairspring closely isochronized, regulated to meantime, and observations made hy a regulator whose rate may implicitly depended upon as correct and uniform. If there is any doubt on any of these points, the trials should he repeated, to ascertain if the results coincide. If not, it is evident that the errors arise from some other source than the compensation,—unless the halance is defective as noted in sections (243, 246). If the adjustment to positions has not been made, the movement must be placed in exactly the same position during each trial. And at the final trials, in order that the adjustment may be relied upon as perfect, the chronometer is kept a week in cold, then a week in heat, and lastly a week in cold again. This gives time to develope the actual performance of the instrument. Then finally test

for a week at the mean temperatnre, and get the rate as correct as possible if it has been disturbed by any of the changes made during the adjustment, or by the tests, for when a chronometer has been going for some time at a very bigh or low temperature, the rims frequently "set" a little, causing a change of rate at mean temperature.

(254) When a balance is properly compensated, the adjustment is not altered by changing the bairspring, or changing its length in bringing it to time, although it may be considerably longer or shorter than before, or than the old one was. The explanation of this lies in the fact that the heat or cold affects the spring in the same proportion, or percentage, whatever its length may be. For instance, if we suppose that the heat is sufficient to expand a spring one-fiftieth in length, it does not matter what the real length may be. One spring may be twice as long as another; then the increase of length in the former will be twice the amonnt of that in the latter,—but both will be *increased by one-fiftieth*. So if the cold increases the effective strength of a spring ten per cent., the precise strength of the spring is immaterial. We are now only concerned with the proportion or ratio by which its strength is changed, and having compensated our balance to cover that progressive increase or decrease of strength found at the temperatures for which it is adjnsted, the compensation will be correct for any other bairspring having that progression, *i. e.*, having about the same form, nature and temper. But if a soft spring be substituted for one hardened and tempered, or the reverse, or its temper considerably changed, then the progression will be altered, and the compensation would require a readjustment to suit the changed conditions. For it must be remembered that the rate depends upon the absolute quantity of effective force in the spring, but the compensation is affected only by the ratio of its increase or decrease under the influence of different temperatures.

(255) *Distinguishing "Adjusted" Balances.* No one can tell by mere inspection when a balance is adjusted, for there is absolutely no difference in appearance between one adjusted and one not adjusted. One may be as near perfect as the highest skill and many efforts can get it, while the other may be "wild," but no one can distinguish them by their looks. So of the balances sold by material dealers,—they may be from an excellent maker, made with every care, and all apparently equally good in every respect. Yet a trial will show that no two will act just alike. While some will be good, others may be worthless for accurate performance. The only way to ascertain is to test their running in beat and cold. It may be said, however, that the thinner and higher the rim the stronger the compensating action will be. These remarks of course refer only to balances completed and cut as already described. Very many watches are provided with balances having rims of steel and brass, with screws inserted, the same as before stated, except that the rims are not cut, or are cut only partly through, which amounts to the same thing. These are in effect chronometer balances, but the *laminae* or compensating segments cannot compensate, because they are not allowed to act. Any balance the rim of which is not cut entirely through, is certainly not "adjusted," although it may be called a compensation balance. It is no better than the common balances of one metal, with screws in their rims, which are only imitations of chronometer balances. Such balances, however, are better than plain ones in that they may be timed by these screws, either turning them in or out, or putting in lighter or heavier screws, to suit the strength of the hairspring, as in section (217). They are also safer from injury while being handled by bungling workmen, and add something to the appearance of the movement, which is all that many people judge by. They are good enough for customers who do not comprehend the value of a real compensation balance, and are unwilling to pay the additional price,—and consequently they cannot expect anything better than an imitation balance.

(256) *Performance when Adjusted.*—If a watch keeps the same time in heat, cold and mean temperature it is accurately compensated. But this is very seldom the case with the ordinary compensation balance, except by accident, when the limits within which it is tried are circumscribed. And it may be valuable to the novice to know what performance may be considered good, average, or poor. Marine chronometers come nearest to perfection, and the very best made and most accurately adjusted instruments will gain daily, on an average, from five to six-tenths of a second more at the mean temperature than at the extremes,—supposing the former to be, say 70°, and the latter 55° and 85°. What may be called superior instruments, but not *the best*, will lose from one-tenth to one-fifth of a second for each degree of change of temperature either way from the mean, in twenty-four hours. When exposed to temperatures 10° to 20° beyond these extremes, they will lose from one-quarter to three-quarters of a second, daily, more than at the extremes. So regular are these variations, that when the connection between certain temperatures and the daily rate of a chronometer has been ascertained, the error of rate may be computed from observations of the thermometer. It will be sufficient for all practical purposes to determine the rate in the three temperatures for which it is adjusted, or the mean and the two extremes, and also say 15° outside of each extreme. In good instruments this connection will remain constant for a long time. The rate at the middle temperature is generally the standard or starting point, from which variations are noted. But cases sometimes occur when it is desirable to regulate to meantime at one of the extremes. As, if a chronometer is exposed habitually to a temperature of 95°, it can be regulated to meantime at that temperature, and the rate at the mean, or say 60°, will then be said to be so much slower or faster than the mean rate. Sometimes instruments are even adjusted with three rates,—as if, for instance, the rate was made correct with meantime at 95°, but there was an error at the other extreme, or 55°, and still another rate at the mean, or 60°. The owner being furnished with a schedule of the rates corresponding to certain temperatures, could very easily compute the approximate error of his instrument by noticing the degrees on the thermometer, as already stated.

(257) *Ordinary Rates.*—But the above named results are shown only by the finest instruments. Ordinary chronometers will vary from one or two, up to five or six seconds daily when the temperature changes from the extremes for which they are adjusted, to the extent of 10° to 20° beyond. Pocket watches may be made to come nearly as close as marine chronometers, but they seldom do so. Watches marked "adjusted" will frequently vary from three to ten seconds in twenty-four hours, at the temperatures of 55° or 95°. A closely adjusted movement of the first quality ought not, however, to vary more than one to three seconds in twenty-four hours, when the temperature is changed from the mean of 75°, to 55° or 95°. At the first trials, an unadjusted balance may vary from thirty seconds to two minutes in twenty-four hours heat or cold. And a variation, of only fifteen or twenty seconds per day may be considered good for the first trials. All the foregoing rates apply only to the true compensation balance. Unient balances, and the ordinary ones of one metal, will vary from three to six minutes when the temperature is changed from 35° to 95°.

(258) *Marine Chronometers.*—It must not be supposed that all ship chronometers are good timepieces, and reliably compensated for heat and cold, for they are not. The majority of those in use are hired by the month, and in order to save a few shillings per month in the rent, shipmasters will deliberately choose instruments which are inferior in performance to a decent watch. So well is this understood by chronometer makers, that they are in great measure deterred from experimenting for the sake of improving the compensation, or from availing themselves of the discoveries of others, well knowing that they can scarcely hope to make good their outlay. A large share of their customers will pass by a really good instrument at a fair price, and take a "thing" offered by some competitor at a dollar less per month. It is only for some special uses that the most accurate performance is insisted upon, such as instruments for observatories, expeditions, watchmakers' time, and a few first class vessels. As a matter of ordinary business, a perfect compensation is not profitable, and consequently not sought for. Of course, instruments designed for competition are made and adjusted regardless of time, trouble and expense, if only they may take the first or at least a leading place in the list of competitors. And for this purpose almost innumerable devices have been employed to reduce or remove the error which always remains after adjusting the ordinary compensation balance, and which will be further considered in a subsequent section.

A Treatise on Isochronism and Elasticity of Metalic Springs.

(From the British Horological Journal.)

BY JAMES FERGUSON COLE.

ESSAY ON ISOCHRONISM.

Isochronism is a term ordinarily used to signify eqnal duration of time in the alternating motions of moving bodies; but simply as a term applied to science in relation to the oscillatory motion of a pendulum, as that of a clock, or the recurrent motions of a vibratory balance, as in a watch or chronometer, it admits of no illustration other than mechanical. To say isochronism is a term derived from the Greek or Latin languages implies nothing in connection with a mechanical application to science, and therefore can have no other than an operative mechanical definition, as will be shown hereafter. The pendulum, governed by gravitating force, is effectnal for measurement of time; while, for the same purpose, the balance is governed hy the principle of elasticity—a property existing in a metallic spring, one end of which, as a fine length of tempered steel wire, formed into several elastic coils as a spring, is attached to the central axis of the balance, while the other end is attached to the frame of the machine, as in balance time-keepers of the usual construction. Balance-springs are made of various forms, of which there are but two of original ch racter; these two are the flat spiral spring, and the helical, or cylindrical spring. Both these springs were used by Dr. Hooke for different purposes, as published in the volume of his Cutlerian Lectures, 1660. The first spring mentioned was a helical coil of wire, suspended from a fixed point, and carrying a weight at its lower end for the specific purpose of testing the gradations of resistance in the elastic coil. The second was a flat spiral, or volute-formed spring, fixed at the center of a vibratory balance, and applied by him afterwards to a watch. The effect of this spiral spring he calls *Isochrone*, and was adapted for the inventor, Dr. Hooke, by the celebrated Thomas Tompion, an eminent watchmaker of that day.

From these two forms of simple spring several modifications have arisen; some of these will he noticed further on. The helical spring was not at first applied to a watch or balance by Dr. Hooke; but many years afterwards the helical spring was adopted hy the late John Arnold, under the altered name of cyliadrical spring, and this form of cylindrical spring is now, with few exceptions, universally made use of for marine, and also for pocket, chronometers; and, as the name implies, all the convolutions of this spring are of uniform diameter, forming a cylinder through its whole length, excepting the upper and lower coils, which are curved inwards towards the center for convenience of attachment to the collet and stud, for setting the body of the spring true, and also for final adjustment.

In investigating the various principles of the halance time-keeper, with the view of arriving at right conclusions in regard to causes of isochronal error, it will be admitted that all circumstances relating to the mechanical condition of the spring, in its connection with the watch and balance, must be taken into account in order to establish proper ground for the inquiry; this is imperative, as the omission of any circumstance or fact of the case would lead only to wrong conclusions, and invalidate the result of any calculation founded upon an imperfect basis. This argument also applies to the pendulum.

Whether the simple spring of a chronometer balance possesses an inherent property of isochronism or not will in no way affect the questions under consideration, as the properties of the spring will only admit of being examined in the complex condition of its application, as connected with other principles in the machine taken as a whole; and which, under varied circumstances, may operate in favor of, or, on the other hand, against the isochronous result sought.

Under these statements, all the forces and resistances relating to this inquiry will have to be carefully estimated.

REFERENCE NO. 1.

In regard to force, it will be clearly understood that force is not the primary property of any spring, as some extraneous power must have been applied to overcome, firstly, its inertia, and, secondly, its elastic resistance, before any action of the spring could take place. This remark relates alike to springs of every kind, whether a halance-spring, a locking-spring, or main-spring of a watch or chronometer.

The main-spring is usually called the motive power; this, however, is a misapplication of the term power, the spring itself being only a reservoir of the force applied by action of the hand in winding the spring up, and, therefore, elasticity, under whatever circumstances, while in repose can only he considered as a constant principle of resistance tending only to obstruct motion or to remain inert, unless acted on, as first stated, by some extraneous force applied; after this, reaction will take plac̈ from the spring.

Power, therefore, as a prime moving principle, is a subject of high philosophical interest far too wide for investigation here, as relates to its extensive application and general influence; though on the limited scale of effectiveness as bearing on horological machines, and their ultimate time-keeping properties, the effects of power will have to be duly considered, and treated accordingly.

The aforesaid remarks, as leading to higher inquiries on the primary source of power, have induced more extended reasoning, and as a note at some later moment may eventually serve as a dissertation on that important question.

Leaving these few comments, I proceed to consider the subject of isochronism in metalic springs of the simple sonorous character.

SONOROUS METALIC SPRINGS.—REFERENCE NO. 2.

Here it must be observed that the collateral forces and resistances which operate against the natural isochronism of a simple spring, as applied to a halance, if it exists at all in a spring of convolute form as attached at both ends; fixed in this way, it cannot be so perfectly free, and in itself so naturally isochronous, as the sonorous spring fixed at only one end or root, the other end being perfectly free to vibrate, and so considered, a simple tongue of tempered steel, like that of a musical box, is a perfectly free agent, having no interference whatever with any secondary principle. I therefore speak with confidence, not altogether theoretically, but practically, in reference to the principle of action, and also the effective properties of such sonorous springs.

Isochronism, therefore, is only very briefly definable by the sonorous effect produced, and which lasts but a few seconds of time; consequently, by sound, its isochronism could only he exhibited, if at all, by the agency of some secondary mechanism for sustaining the vibratory motion which would at once destroy the effectiveness of the primary principle.

The current of air necessary to prolonging vibration in a metalic reed, as in the harmonium, produces an average of uniform tone; but as the current of air producing the tone will be of variable effect if the force of air by pressure is not equal, the final effect will, to some extent, depend on the force applied, and not entirely on the reed itself. This principle of sound is, however, for its purpose, a truly satisfactory comhiuation.

The foregoing facts show that no inherent property of isochronism in springs of this or any other kind can be proved to exist without detrimental influence from the needful mechanism, or means employed for perpetuating motion, as in the acting condition of the vibrating spring of a chronometer balance, or in any simple spring, for an arc of vibration beyond the sonorous extent; and, thereiore, that the supposed natural property of any spring, as that usually applied to the balance time-keeper, will ever remain obscure, if judged of hy no other facts than those existing in springs generally; such facts themselves invisible, heing altogether beyond philosophical reasoning, or mathematical treatment, there heing no data other than mechanical.

The term isochronism from sonorous effect, or by any other mode of simple vihratory action, can therefore only be understood as undefinable, and, consequently, under like conditions, can indicate nothing of any value in practical application to time-keeping.

Having in the above view said what I believe to be altogether beyond objection, if fairly considered, I proceed to offer a rational conclusion therefrom—that however strongly the idea of a natural

isochronous property in springs heretofore used for time-keeping purposes may be entertained, that all the practically good results arrived at under any unbiased view of the question have in every instance of success been dependent—first, on the right condition of all the acting principles involved in the general mechanism; and, secondly, on the judgment and manipulatory skill of the operator in acting upon the written results of comparative trials, and upon careful corrections, if needful.

I now proceed to submit a practical, simple rule for what I conceive to be the principle of effective correction for loss of time in short arcs. The proposition just named embraces largely the consideration of principles relating to the influence of motive power transmitted to the escapement mechanism, and thence for giving impulse-motion to the balance—uniformity of power being of great importance to uniform time-keeping. A few remarks, therefore, may be applicable in this place. I formerly considered high numbers in the train wheels and pinions to be of advantage for equal transmission of power, using 12 leaved pinions for the thirds and fourths in pocket chronometers, and for the same in marine chronometers, pinions of 16 leaves; but eventually I preferred using the ordinary lower numbers, which allowed the use of smaller and lighter wheels, as being less under influence of inertia.

Any little difference on those points in well-made movements, properly finished, is not seriously detrimental, as the train-wheel motion is so frequently averaged under well-applied motive power.

Consideration of acting principles in the two most approved escapements for chronometers and pocket watches I conceive to be of much higher importance to notice, as the mechanical effects of these on timing and adjustments allow no room for mechanical faults; all must be right, and nothing wrong, in any department, if an ultimate satisfactory performance he the final object desired.

In the outset of treating on the various subjects of these papers it soon appeared evident that nearly the whole range of principles would be laid open under the comprehensive title, "Isochronism," which includes the general principles of mechanical time-keeping. It therefore must be supposed that every care has been bestowed upon the general impelling mechanism of the movement for transmitting power to the escapement; that the balance is of right weight for its diameter, and which can only be determined by experience and practical results—momentum of the balance being only the mean effect of the matter in motion at the center of gyration. This center, as relates to the variously disposed matter contained in a chronometer balance, involves many abstruse calculations not easily determinable, even by mathematical process.

What may now be said regarding the influence of escapements will at first relate to the detached lever principle. This will require but a few observations just now, supposing this escapement well understood; and, therefore, for the present, I need only say that a short arc of lever impulse on the roller and balance, not exceeding 27 degrees, tends to accelerate the short arcs of vibration; it, therefore, requires but little argument to show that the whole sum of force, from a short impulse arc of escapement, if expended within this limit, is given out in less time, with a proportionately greater intensity, than it would be with a larger arc, and would impel the balance through short arcs with greater determination. This I consider to be a result best calculated to assist in overruling a frictional defect of isochronism, provided the main-spring is equal to producing a full turn-and-half vibration.

In making these remarks, I have given no rule yet in regard to proportions of this escapement, considering it sufficient to say what I believe will be the good effect of a short scaping arc of balance motion; such details not strictly belonging to the subject in hand. I nevertheless must say, as well going of the watch depends much on the escapement, that the double roller is, in this case, indispensable for more safe detention, and I would not recommend so short a scaping arc as 27 degrees at the balance, without advising the use of a detaining roller for extra security at the lockings, and to this end the radius, or outer edge, of the small roller should just reach the back of the ruby pin. The advantage of this guard action should never be overlooked.

There is good reason for preferring the 18,000 train in this mode of using the short arc of impulse at the balance; it renews the impulse more frequently, is more detached, and the pivot friction will be less as the proportionate weight of balance is somewhat less; but the velocity and momentum will be greater, by reason of the lighter balance moving over the same extent in less time, under the high speed of so quick a train.

All these conditions are favorable to a good timing result, which is the chief object desired regarding the present question of isochronism. I may here observe that the motive power required with balance arc of 27 degrees will not exceed what is needful under ordinary circumstances. Uniformity of force is of much importance, more particularly as relates to going-barrel watches, whether keyless or not; in all such the main-spring should admit of being set-up at least one complete turn from the bottom; the advantage of setting-up is so well understood as to need no comment, but that setting-up favors uniformity of power, and also greater uniformity of vibratory motion of the balance.

RE-WINDING BARREL WATCHES.

This well-known diminution of force in the lower turns of the main-spring, and consequent reduction of the balance vibration, will, I think, justify a recommendation that all going-barrel watches, if wound up morning and night, would be found to perform with a much greater uniformity of rate, as in that case the setting-up is nearly doubled; and therefore, if the habit of winding such watches twice a day became a publicly understood advantage to the time-keeping, it might be easily adopted or remembered by the owners of going-barrel watches as worthy of their especial attention.

DETAILS OF PROPORTION IN THE ACTING PARTS OF THE DETACHED LEVER ESCAPEMENT, AS RELATING TO THE EFFECT OF IMPULSE POWER ON ISOCHRONISM.

With the view to simplifying calculation in regard to leverage, I prefer to use pallets with scaping arc of 9 degrees, as a mean between 10 and 8 degree pallets—the difference between the latter two kinds is only one degree in the pallet scaping arc from drop to drop of the wheel action; this is desirable only as throwing out fractional measurement in setting out the pitch or distance between the balance jewel hole and pivot hole of the pallet-staff. This distance may be varied a little, as it is not arbitrary; but, as a rule, the chord of five teeth of the scape wheel, from point to point, is as correct a measure of distance for these two pivot holes as can be given. This done, it only remains to divide that distance on the straight line between the holes into four equal parts, taking the first part from the balance jewel hole as the exact place on the roller for the impulse ruby pin. In this way three parts will remain for the lever fork action on the ruby pin; and by this the scaping arc will be multiplied as three to one, and giving 3 times 9 as 27 degrees for impulse on the balance. Next to this, I consider the high multiplication of the roller arc of impulse, in the ultimate arc of vibration thus effected, is of importance for giving an intensity and brevity of impulse of known value and determinate effect for isochronism, and also for permanently good time-keeping.

Under these conditions the turn-and-half vibration gives 540 degrees, and to this sum 45 degrees should be added as an extra eighth of a turn vibration, against checking and impediment from thickened oil.

A geometrical rule is given here for determining the pallet arc of 9 degrees; nothing can be more easy than to set out a rectangle or quadrant, which ordinarily contains 90 degrees. Now, having the rectangle described on paper, divide the quadrant so found into ten equal parts, each tenth part will, of course, be exactly the nine degrees required for the scaping arc of the pallets.

This method gives all that is required, and I think cannot be misunderstood. Such a scale, marked off on a small plate of brass, an inch square or less, would be at any time useful for testing 9-degree pallets; but a small disc of brass, fitted on the slip of a depth-tool, with the nine degrees marked, is still better for trial of the scaping action.

To be Continued.

The Precious Stone of China.

Lord Bacon, in an essay, says that "one who traveleth into a country before he hath some entrance into the language goeth to school, and not to travel." And it is equally true that any one who expects to enjoy or appreciate the art productions of a nation must have some knowledge of the mediums through which it speaks, or, as it were, of its art language.

A cultivated mind may intuitively sieze npon the beautiful in any form in which it is presented, but it is nevertheless true that much of our appreciation of an object of art may arise from a knowledge of difficulties overcome, and of the skill and perseverence required in its production. The increased facilities of intercourse obtained with the nations of the East during recent years have made us acquainted with a new world of art, some of whose productions are marvels of richness and beauty. In newly-formed museums and in private collections are found works of Eastern art in ivory, porcelain, bronze, gold, silver, jade, crystal, lacqner, etc., whose beauty, symmetry and cnnning workmanship are emulated in vain by the artisans of Europe. Until very recently onr knowledge of these things, and indeed the appreciation of them in Enrope, was very limited.

Among Chinese productions the jade seems worthy of especial consideration, not only by reason of its beauty and rareness, but because, when it has passed through the hands of the patient and skilful Asiatic lapidary, it captivates na with forms of the most exquisite beanty.

On account of its great rarity its history until lately has been little known, especially in this country. As long ago, however, as twelve centuries before the Christian era the Chinese were expert in the production of vessels and objects made from it, and there is no precious stone named in our literature, either sacred or profane, more frequently mentioned in the way of metaphore than this has been by the poets and philosophers of China. Confncius measures its valne by time when he says an inch of time is worth a foot of jade. When a poet wished an emblem of purity he saw it in the jade, and when the European hard sings of the lilly, the ivory, and the alabaster in the soul and person of his mistress, the Chinaman likens her mind to the spotless jade, and her skin to its brilliant polish. What is expressed to us by thrones of ivory, and vessels of gold and silver, enriched with diamonds and precious stones, the celestial comprehends in the "throne of pure jade," and feasts in which the dishes and goblets are carved from the same material.

The color of the jade varies from almost white to a dark green, but the lighter colors are the most highly esteemed. These have a fatty appearance, which, however, does not prevent their receiving a surface of nnusual brilliancy and polish. The dark green color is the commonest. There is said to be a yellow jade, and also jade of an orange color and black. The first two, if they exist, are very uncommon and are not to be confounded with agates of a similar hue.

The rarest as well as the most valued of all the varieties generally acknowledged is called the imperial jade. This is of a brilliant green, approaching the emerald in color, and is found in pieces of small size only. I have seen specimens of exquisite tint. The same shades are sometimes fonnd, as it were, in splashes running through comparatively large pieces.

Some writers have supposed jade to he identical with the jasper of the ancients, but this theory is incorrect; for the former is a silicate, or composed of silex, magnesia, aluminum, etc., while the latter is a quartz. The different shades of color depend upon the amount contained of oxide of iron, or oxide of chrome.

Exposure to extreme heat or cold, or to the continned action of water, does not affect either tho brilliancy, polish or hardness of jade. Pieces submitted to unusual tests in the furnace have come ont nnimpaired; but with all its hardness it is very fragile; an unfortunate blow or fall will shiver it into fragments, as though it were glass.

This mineral is called Yû by the Chinese, and is found mostly in the province of Yarkanda, in Chinese Tartary, or the southwestern part of the empire. The mountains of this district are said to abound in jade, which is hunted for in the fissures of the precipices and in the streams. A large share of it at present is taken frcm the rivers by divers. These men work at night, by moonlight, under an escort of soldiers, supervised by government officers appointed for the purpose, and by whom each piece, as found, is assayed and valned. One of the largest specimens ever fonnd is said to have weighed two hnndred and seventy ponnds, and to have measured thirty-three inches in length, and seven inches in thickness.

The principal city of the province of Yarkanda is Khotan. It is here, and in the neighboring towns of Chinese Tartary, that the lapidaries give to the rough mineral the lovely contours and exquisite carving we have already spoken of.

Jade is exceeded in hardness only by the diamond and similar stones, and nothing but emery, which is found of fine quallty in Central Asia, or the diamond itself, will cnt it. The methods of cutting and polishing are traditional, and our admiration of the skill and taste of the artists is increased when we know something of the amount of patient toil expended upon single pieces. In order to hasten the work it is sometimes confided to two men, one taking it in hand where the other leaves off for needed rest and refreshment. Thus, although the labor npon the piece never ceases, so slow and arduous is the work that sometimes years elapse before its completion.

The favorite forms into which jade is cut are vases of endless variety, perfume bottles, fire or incense boxes, memorial tablets, etc., which are usually mounted upon carved stands of teak wood, rivalling in elaboration and elegance of design the objects they support. The Emperor Kien Lung, who reigned a little more than one hundred years ago, was a great patron of the arts, and created an extraordinary revival in some branches. The rare objects of antiquity were reproduced and copied so as almost to defy detection, even by experts, and it is to the influence of this revival that we owe the existence of many of the beautiful objects which now enrich private collections in this country.

The high prices paid for jade led to the invention of choice imitations made from rice. These are alluded to in ancient Arabic and Chinese books. Like the paste diamonds of modern times, they are calculated to deceive the ordinary observer, and European purchasers are frequently imposed upon by them. Jadeite, or nephrite, found in different grades of quantity and color, is carved into various forms by the Chinese, and has a distant family likeness to the true jade, but it is only a variety of compact felspar.

Specimens of ancient workmanship in jade sell for large snms, and are highly esteemed by Chinese connoisseurs, who are among the keenest of collectors. Extraordinary specimens are to be found in the British Museum, the Louvre in Paris, the Japanese Palace at Dresden, and in some private collections in France and England. Good ones are exhibited from time to time in the Metropolitan Museum of Art, and some few are in private collections in New York and Boston.

Cold as an Art Material.

BY P. L. SIMMONDS.

The precious metals enter largely into manufacturing use, and more extensively now than ever, since gold has been found so widely distributed of late years over different parts of the globe. The industrial nses of gold are very numerous. From its great beauty and the ease with which it can be worked, it offers a fitting material for the noblest efforts of the modeler and the graver; but the costliness of the material, which lends additional charm to true works of Art, is a mere element of vulgar display in ill-executed and unworthy designs.

Of all the mechanical arts, the goldsmith's work is that which approaches most closely to the Fine Arts, and is, therefore, the one in which any absence of taste is to be regretted. The general diffusion of works in the precious metals exercises a great influence on the artistic taste of the masses; and it is, therefore, pleasing to notice that our artistic workers in gold and silver are now impressed with the conviction that they wield and exercise what is really an art, and hence take into consideration, not only the nature of the article they manufactnre and the nsage to which it is to be applied, but also the purity of style, the elegance of form, and the decoration which must be given

to it. It is well remarked in the Jury Report of the London International Exhibition of 1862, on the Precions Metals, that 'The trader should be a manufacturer possessed of taste, and as much as possible draw his inspirations from his customers; in fact the goldsmith and jeweler should combine a knowledge of architecture and sculpture, and be well skilled in archæology, that he may not confound the styles of different periods. In France the traders, being manufacturers, have the advantage of intercourse with men of taste, and meet with continual inspiration at every step, without the interference of a meditator." The main object of all the best workers in the precious metals now is, to combine utility with the highest possible artistic excellence; to make the object, whether an ornament for the table, a testimonial, or a memorial, valuable not only for the metal of which it is formed, but also for the workmanship with which it is adorned, and in so doing they carry out the intentions that have actuated all the most renowned workers in the noble metals. Thus their works compare with the best produced in any age or country.

The goldsmith's work may be divided into two gronps—works of high art, including church ornaments; and industrial or useful articles. In the former, France, Russia, and Prussia excel; in the latter, England takes the pre-eminence. From the earliest times the precious metals have been used in the fabrication of domestic utensils and ornaments; the possession of the one and of the other being the external evidences of a certain social superiority. The same cause which led to this result—their scarcity and consequent value, joined to their intrinsic beauty—also rendered them the most precious offerings which could be made in the name of religion. Accordingly, in ancient and mediæval times, pagan temples and Christian churches were richly adorned with lamps, candelabra, censers, vases, shrines, etc., of gold and silver. Indeed, in the middle ages, if we except some of the towns on the Mediterranean, the Church and the Princes possessed the monopoly of vessels and ornaments of this description, and with it that of all the Art. In those times a goldsmith was a very important personage; not alone in consequence of the prestige which even constant contact with the precious metals appear at all times to have communicated to men, but because all branches of Art were generally united in one person, and the goldsmith was very frequently a painter, an architect, a sculptor in stone, etc. They retained this importance even in the sixteenth century, as we learn from the whimsical negotiations of Benvenuto Cellini with popes, kings, and princes.

The total estimated stock of gold in the world previous to the discoveries in California and Australia was about £360,000,000, and since then (that is, a quarter of a century) the quantity of gold has donbled. Australia alone has contributed to this abont £300,000,000. The outlets or employments for this gold may be reduced to five—coinage, export, consumption in the arts and manufacturing industries, loss or waste, and the reserve held in banks or in private hands. It is extremely difficult to arrive at precision or accuracy on this question, from the multiplicity of documents and returns which have to be compared and tested from various centuries; but still a tolerably fair idea may be obtained of this great question, without assuming perfect accuracy. The conclusions to be arrived at, after careful investigation, are, that coinage absorbs about thirty-five and a-half per cent. of the total production; that export takes away nearly fifteen per cent.; the consumption in art and industry constitutes eleven and a-half per cent.; and the reserve held in ingots, etc., by bankers and private individuals, is about three per cent. The actual loss by direct export, by hoarding, that taken away by emigrants, wear and tear, etc., constitutes fully fifty per cent. So that the producing countries of civilized Europe and America, by the course of commerce and traffic with the absorbing countries, really after all only retain a moiety of the precious metals which they obtain from their mines and gold-washings.

The operations which contribnte to the productions of goldsmith's work are very numerous. The metalic alloys are melted in crucibles; they are afterwards cast in moulds of beaten earth or sand; when taken from the moulds the articles pass into the hands of the chaser. The chaser's work is, however, economically replaced in the case of stamped work by presses and steel dies. By means of these processes are prodneed table ornaments, certain objects of Art, and various pieces of goldsmith's work which are also made by means of the lathe, the hammer, and stamping. Mounting consists in uniting the various parts of a work together; this is done by means of soldering and also by screws and nuts. The other processes are hand engraving and biting in with acid, enameling, engine-turning, and polishing with special lathes; and lastly, finishing, which ineludes rouge-polishing, and burnishing with steel, agate, and other tools

In the manufacture of jewelery, after smelting and purifying, the gold is alloyed with copper and silver according to the karat which is wanted, ranging from 8 to 22, and cast into flat skillets or square ingots. There is a great difference in the quality of gold, according to the locality from which it is obtained, and the period varies in which it can be brought into a proper condition for working; sometimes it has to be smelted as often as a dozen times before this is done. Fluxes are employed to get rid of foreign substances. Pure gold is seldom, if ever used (except by Afrioan and Indian workmen), as it is too soft for manipulation. Wedding-rings are made of 22 karat, fine articles of from 16 to 18 karat, and other goods of a lower quality. Purification having been effected, the skillets or ingots are rolled down by machinery, for either plate or wire, to any thickness which may be required. For the latter it can be drawn out as fine as hair, and when an extra thickness is needed the almost imperceptible thread is drawn through a hole drilled in a ruby. At this stage the metal is fit to be worked, but it more resembles iron, and, later on, copper, than gold, and it is only when nearing the final process that it bears the appearance of what it really is. The plates are iron punched out by presses and fitted with stud dies of all manner of designs and sizes. The pieces are given into the jeweler's hands to make up into brooches, earrings, etc. Rings are often cast in one or two pieces. The object next reaches the chaser, who puts it into a mixture of which pitch is the principal ingredient, and then, with multifarious fine tools, ornaments it according to fancy or design. It is then returned to the jeweler, who anneals it, in order to get the pitch off, and after it has been cleaned with acids, it is ready for coloring. This is managed by boiling it in a chemical mixture, after which it is seratched with sour beer and wire brushes to give it a bright appearance, and put into a box with sawdnst till it is dry, and is then in a marketable condition.

I shall now proceed to touch upon some of the other uses and employments of gold for coinage, watches, etc.

Gold has ever been the most convenient and the most portable for the purpose of exchange. In the Holy Scriptures we find numerous allusions to countries renowned for gold. The celebrated story of the Argonautic crew has doubtless its origin in gold. In Abraham's time gold was considered a principal portion of wealth; indeed, in looking up the long vista of past ages, gold is seen to have formed an important element in the vicissitudes of mankind. The art and skill of the goldsmith were exercised in early times. There was Nineveh, famed for its abundance of gold. In Babyloa also there was a great accumulation of gold. I might quote interesting descriptive passages from Herodotus and speak of the treasures of Crœsus, king of Lydia, the gold of David and the vast riches of Solomon; the treasures of Philip and Alexander the Great, and the extraordinary accumulation of gold in the mighty city of Rome, in the reign of Augustus—for most of the mineral wealth of the world was in his dominions and flowed into his capital. The contribution of the people in the time of David for the sanctuary amounted to nearly £7,000,000. The immense treasure David is said to have collected for the sanctuary from all quarters exceeded £800,000,000, a sum greater than the British National Debt. The gold with which Solomon over-laid the "most holy place," only a room thirty feet square, amounted to more than £398,000,000.

The Egyptians need for money of exchange rings and ingots of gold; but coins of gold did not circulate much before 200 years prior to the Christian era, the *aureus* of the time of Cæsar being nearly of pure gold. About the seventh century gold coins were almost the only currency. Ainsi Abbon, who was master of the Mint of Limoges in 622, was at the same time a goldsmith, and had for apprentice St. Eloc, who became minter and treasurer of the king.

To be Continued.

Workshop Cossip.

A STRONG solution of byposulphite of soda is said to be excellent for cleaning silver.

UNSLACKED lime is excellent for cleaning small steel articles, such as jewelry, buckles, and the like.

COPPER and brass articles may be coated with zinc, by dipping them into a boiling concentrated solution of sal ammoniac containing finely divided zinc.

PLATINUM bronze, said to be entirely unoxidizable and especially adapted to the manufacture of cooking utensils, is made of nickel 100 parts; tin 10; platinum 1.

SOLDER FOR 9 KARAT GOLD.—Three parts gold, 2 silver, 1½ copper' fused together, with the addition of ½ part zinc, make a solder that will run at a dull red, and one that is in general use for jewelers' ordinary work.

To electro-plate in bronze, make a solution composed of 50 parts carbonate of potash, 2 parts chloride of copper, 4 parts sulphate of zinc, 25 parts nitrate of ammonia, and use a bronze plate as the positive electrode.

TO CEMENT BRASS TO GLASS.—Boil three parts of colophony with one of caustic soda and five of water. The soap or emulsion produced is mixed with half its weight of plaster-paris, zinc white, white lead, or prepared chalk.

BY rubbing metalic surfaces with soda amalgam, and pouring on a solution of chloride of gold, gold is taken up by the amalgam; and it is only necessary to drive off the mercury by heat, to obtain a gilded surface that will bear polishing.

THE easiest way to hold pearls, in order to drill and otherwise cut them, is to fit them loosely in holes bored in a piece of wood. A few drops of water sprinkled about the aperture cause the wood fibres to swell and hold the gems firmly. When the wood dries the pearls fall out.

BLEACHING SILVER DIALS.—Take about 1 oz. of charcoal and same quantity of saltpetre, grind them together to the consistence of cream, and apply to the dial after it is cleaned, then make just sufficiently hot to turn red, allow to get cold, and pickle in weak vitriol and water; if common silver, the vitriol pickle must be stronger.

OXIDIZED SILVER.—I abstract the following from a work which the trade generally consider reliable:—"To produce a brownish color, apply a solution of equal weights of sulphate of copper and sal-ammoniac in vinegar; and to prodnce a 'dead' appearance like frosted silver, deposit a mere trace of copper upon it in a copper solution, then well wash it and deposit a very thin layer of silver upon this."

TO HEIGHTEN THE COLOR OF SILVER.—Silver which has become much tarnished may be restored to its primitive beauty by immersion in a warm solution of 1 part oyanide of potassium to 8 of water. (This mixture is extremely poisonous.) Washing well with water, and drying will produce a somewbat dead-white appearance, which may be quickly changed to a brilliant lustre by polishing with a soft leather and rouge.

SILVER CHLORIDE.—Mix the chloride of silver with a little water acidulated with hydro-chloride acid, and place therein a few strips of clean zinc. In a few bonrs the whole of the chloride will be reduced to metalic silver, in fine state of division, which should be washed with a little dilute sulphuric acid to remove traces of zinc, and afterwards with common water, and may then be converted into nitrate by dissolving in nitric acid and crystalizing.

FROSTING SHEET BRASS.—If the kind of frosting is wanted which is seen on the inside of a watch, it is done with a stiff wire brush turned very quickly in a lathe. If a coarser freeze will do, acid will answer the purpose—common dipping, to which a very little salt has been added. Again the frosty appearauce may be made by rubbing a flat piece of pumice-stone on the sheet brass with a circular motion of the hand, either with water as a vehicle or without. A very little practice and care in the motion of the hand will give various tints.

A SUBSTITUTE FOR DIAMOND DUST.—Amongst the most important inventions of last month is one which a Mr. Mackintosh bas patented. It will command a large amount of attention, as it converts what is at present a very high cost into a comparatively insignificant one. It is a method of hardening glass to such an extent as to render it an efficient snbstitute for diamond dust. This important result is obtained by cooling the glass in refrigerating moulds. It is a matter for speculation whether the ornamental properties of the diamond are also obtained by this simple process.

BRONZING FOR COPPER OR BRASS.—Copper or brass may be bronzed in various modes. The repeated applications of alternate washes of dilute acetio acid, and exposure to the fumes of ammonia, will give a very antique looking green bronze; but a quick mode of producing a similar appearance is often desirable. To this end the articles may be immersed in a solution of 1 part percbloride of iron, in 2 parts of water. The tone assumed darkens with the length of immersion. Or the articles may be boiled in a strong solution of nitrate of copper. Or, lastly, they may be immersed in a solution of 2 oz. nitrate of iron, and 2 oz. hyposulphite of soda in a pint of water. Washing, drying, and brushing, completes the process.

RE-COLORING GOLD CHAINS.—Several methods are employed, according to color required and goodness of alloy. In all cases a preliminary cleaning with aquafortis, and subsequent rinsing, will be necessary. For yellow gold, take 6 parts saltpetre, 2 of copperas, 1 of white vitriol, and 1 of alum. Powder finely, mix, and add water, previous to application. For green gold, 1½ part of saltpetre, 1½ sal-ammoniac, 1½ Roman aloes, and 1½ a part of verdigris, well mixed, and moistened with water for use. Red gold, sal-ammoniac, blue vitriol, alum, and borax, equal parts. Powder, mix, and moisten with water. For general work, use common salt 1 part, alum 1 part, saltpetre 2 parts; the whole well powdered and mixed. To use these, place them in a plumbago crucible (not metal) with a small quantity of water. Heat until the composition begins to boil. Having suspended the work by a horschair, place it in the crucible, and allow it to remain there, moving it about for seven minutes. Withdraw, and rinse well in a pipkin of boiling water. The color will now be dark, nearly black; again dip and rinse, and repeat until the work acquires the desired rich tint. Finish with scratch-brusb or burnisher, and dry in box-wood dust.

TO HEIGHTEN THE COLOR OF GOLD.—Place 4 oz. of saltpetre, 2 oz. of common salt, and 2 oz. of alum, in a crucible. Add sufficient water to cover the mixed salts. Now place the crucible on the fire and allow the mixture to boil. When this takes place, place the article to be colored in the mixture, taking care that it is suspended by a hair. It may be left in the crucible for abont 15 minutes, when it should be withdrawn, well brushed with a fine scratch-brusb, and redipped if the color is not intense enough. For small gold articles, such as a keeper or plain ring, etc., a very good plan is to place them on a lump of charcoal and make them red-hot under the blow-pipe flame, and then to throw them into a pickle composed of about 35 drops of strong sulpburic acid to the ounce of water, allowing the articles to remain therein until the color is sufficiently enhanced. Washing the article in warm water, in which a little potash has been dissolved, using a brush, and finally rinsing and drying in box-wood sawdust, completes the operation. Another coloring mixture, which has been greatly recommended, consists of a mixture of 20 gr. sulphate of copper, 40 gr. French verdigris, 40 gr. sal-ammoniac, and 40 gr. saltpetre, dissolved in one ounce of glacial acetio acid. The articles suspended by a borschair, as before, are to be immersed into this mixture, withdrawn and heated on a piece of copper until black. They are then to be placed in a pickle of equal parts oil of vitriol and water, which removes the black coating, and brings up the color. Washing in weak potash-water, rinsing and drying as before, terminates the treatment.

Trade Gossip.

Chatelaine watches are fashionable.

Combs of silver and ivory are worn.

Tortoise shell Jean d'Arc belts are quite new.

Black velvet bracelets are fastened by gold studs.

New leather belts are called Queen Elizabeth belts.

Broad silver flagree bracelets are very pretty novelties.

Strings of large beads, either gold or silver, are fashionable.

In jewelry the burnished and unburnished gold are combined.

Pretty vinaigrettes are made of pearl shells, tipped with silver.

There are 10,836 American exhibitors enrolled for the Centennial.

Gold and silver braid are less used than they were three months ago.

Broad ribbon belts with large steel and jet buckles are to be worn.

Jean d'Arc heads of ivory or carnelian stone are among the new handles for parasols.

The novelties in porte-bonheurs are those made of tortoise shell or ebony, inlaid with silver.

Silver necklaces in the form of flowers and leaves, with the same kind of a pendant, are quite new.

The new chatelaine has three chains, one with a tablet attached, one with a pencil, and one for the fan.

A handsome fan is made of white ivory and white satin, the satin being covered with black silk lace.

Coral jewelry is increasing in favor of late, as it looks very pretty with the cream lace, so much worn.

The newest dog collars and porte-bonheurs are made of several strings of very small beads, either gold or silver.

Dom Pedro did not stop at Chicago; but when he goes to Boston he can see the men to whom Chicago is mortgaged.

Thos. Leroy has been arrested upon a charge of stealing from C. A. Covell, No. 922 Broadway, sixteen clocks valued at $1,000.

A new style of finger ring has three narrow bars of gold, one set with small diamonds, one with pearls, and one with turquoises.

Four brigands, who recently robbed a jewelry store in Hicks street, Brooklyn, have been sentenced to twenty years in State Prison.

This paying out of silver may be all very nice, but to thoughtful people it is very suggestive of feeding an elephant with a teaspoon.

It is suggested that if some folks desire to do something extraordinary to celebrate the Centennial year, they had better pay their debts.

George Weyman, formerly a John street jeweler, who is serving out a five years' sentence in the State Prison, is reported to be in a dying condition.

Madame Guilandt, a French lady recently residing at Rome, has presented a portrait of Washington, wrought in mosaic, to the city of Philadelphia.

Among the treasures recently brought to light in Pompeii is a silver altar, on which were placed two silver cups and spoons, the latter precisely like those now used.

There is an American opposition against Queen Victoria's assumption of the title of "Empress." It would undoubtedly lead to some new style of neck charm, and the trade can't stand any more.

An infernal machine, similar to that which caused such terrible loss of life at Bremer Haven, was recently sent to a chronometer maker in Clerkenwell, London, and exploded while being opened, fortunately no lives were lost.

Sam Martin, of Tilton, Me., is in possession of a pocket compass and sun dial combined, that came over in the *Mayflower*. It belonged to an ancestor of Mr. Martin, and has been in the family ever since. The instruments are set in a heavy brass case about two inches in diameter.

A quaint silver goblet was recently on exhibition at Charleston, S. C., bearing this inscription:—"A premium from the Agricultural Society of South Carolina to Gen. Washington for raising the largest jackass." It was Gen. William, not the "Father of his Country," who did it.

An enterprising watchmaker in San Francisco announces that he has just purchased a John Bliss & Co. chronometer, warranted to keep San Francisco "Mean Time." A rival who has a store on the next block placards his as an imported instrument warranted to keep San Francisco "Meanest Time."

In the case of Starr & Marcus, against John Van Valkenburg, to recover $39,980 50, the value of diamond earrings claimed to have been purchased by defendant of plaintiff, but which defendant claims he returned to them and plaintiffs refused to receive, the jury have returned a sealed verdict for the defendant.

The new fancy gold stem glove buttoners which are in size small enough to wear as an ornament on a watch guard, have the buttoner concealed in the stem. By merely pulling the head it appears and by pushing the head it returns to its place again. Shoe buttoners come in nickel plated ware, larger in size. They are both useful and ornamental toilet articles.

Victor Doriot, of Bristol, has made a wooden watch. The case is made of brier-root, and the inside works, all except three of the wheels and the springs—which are metal—are made of boxwood, while the face is made from a piece of the shoulder blade of a cow which was run over by a train and killed some time ago. It is an open-faced watch, with a glass crystal, and is an elegant piece of workmanship, displaying a good deal of ingenuity.

A design for the badge of the old Andersonville prisoners adopted at the Convention in Norwich the other day is significant enough. It is a square frame of gold or bronze, the borders representing the stockade and the pickets about the prison pen. On each corner is a representation of one of the four forts surrounding the stockade, and on the centre-piece a design of a Union soldier with a bloodhound at his throat.

A Venetian merchant who was lolling in the lap of Luxury was accosted upon the Rialto by a friend who had not seen him for many months. "How is this?" cried the latter, "when I last saw you your gaberdine was out at elbows, and now you sail in your own gondola." "True," replied the merchant, "but since then I have met with serious losses and been obliged to compound with my creditors for ten cents on the dollar." Moral—Composition is the Life of Trade.

"Got any silver change about you?" said Acheson, emptying the contents of his pocket for the dilectation of the youthful Cable. "Oh, lots of it," was the reply. "How do you like the new pieces, three of which make a dollar?" continued Acheson. "Three to a dollar?" queried Cable, "Haven't seen any of that kind. Show us a few?" Acheson then produced a half dollar and two quarters, and without further parley the youthful Cable led the way to the first banana stand.

A table-caster, with a bit of interesting history attached, was received by the Meriden Britannia Company a few days ago. It was originally for use on the Kingfisher steamship "Guy Mannering," which was lost on the isle of Matious, off the coast of Maine, some twelve years ago. The vessel was wrecked in the fall, and in the following summer divers recovered a great deal, one thing being this caster, now the property of a Captain Ames of Portland, who sent it to Gelston to be replated and fitted with bottles.

A fashionable young man, stopping at one of the principal hotels, came down the other morning, and in an excited manner told the hotel-keeper that his watch had been stolen during the night. The landlord was anxious to save the reputation of his house, and immediately gave him an order on one of the principal jewelry stores for a watch. After some time the young man returned, and in a very cautious manner informed the hotel-keeper that he had found the watch. When asked where he found the watch, he said, that in order to rid himself of the effects of a spree he had taken a bath and put his shirt on over his vest.

A. B. Snow, traveler for Messrs. S. & G. Owen & Co., Manufacturing Jewelers, of No. 5 Maiden Lane, this city, had his trunk broken open while stopping at the St. James Hotel, Richmond, Va., and a quantity of sample jewelry, valued at $1000, stolen therefrom. A detective chief, who rejoices in the euphonious sobriquet of Broken-Nose George, also a guest of the hotel, fled to Washington immediately after the robbery. Mr. Hoenniger, proprietor of the hotel in question, followed Mr. "Broken-Nose," whom he at once recognized as the fellow seen "shadowing" Mr. Snow, and had him arrested. The jewelry has not yet been recovered, but probably will be in a few days.

A watchmaker has invented a patent compenso-retarding-accelerating clock for use in families where they keep unmarried daughters in stock. If the young man is of an eligible sort, the retarding attachment is turned on and the clock compounds with old Time at eighty minutes to the hour, so that 1 o'clock the next morning it only indicates about 11:05 the night before, and the young woman is perfectly justified in saying: "O, don't! It is early yet," when the young man reaches for his hat. On the other hand, if he should not be desirable, they just shove up the indicator to boiling point, and at half-past nine it is nearly two o'clock. The patentee, casting himself upon the generosity of a discerning public, invites patrons to increase the efficiency of his invention by judicious yawns and remarks, as "Dear me! How the time does fly," and in extreme cases an admirable effect may be produced by the father coming in with a bed room candlestick, saying: "Good-night, Amanda. Before you go to bed, see that when the girl gets up in the morning she leaves out the milk pitcher." No family should be without it.

EXAMPLES OF FINE GOLD JEWELRY, FROM THE STOCK OF MULFORD, HALE & COTTLE.
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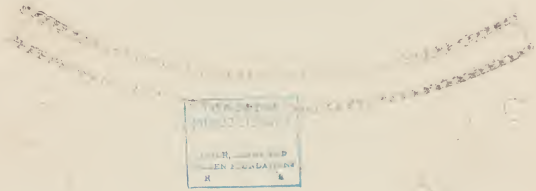

The Jewelers' Circular & Horological Review.

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THE

Jewelers' Circular & Horological Review,

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

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Notice.

Those of our friends whose subscriptions have expired are requested to give prompt attention to the notice sent them, if they desire the CIRCULAR *continued. We are making* THE JEWELERS' CIRCULAR *at great expense, as they may readily see for themselves, and love us our subscription price is, it pays us still less to send the* CIRCULAR *for nothing. We trust we have made the journal a necessity to every jeweler who has so far read it, and they will do us a favor when it comes time for the renewal of their subscriptions, if they will send them promptly.*

The Reduction in American Watches.

The consequences resulting from the sudden cutting of prices by the Elgin Watch Company a fortnight ago have been the chief topic of interest in the trade during the month. The news created at once a general excitement among all branches of the watch trade, and several consultations of different interests were immediately held in New York, that of the jobbing division calling together jobbers from the west as well as from the east. The reductions of the Elgin Company were immediately met by a circular from Messrs. Robbins & Appleton announcing that the Waltham Company had also authorized a reduction of prices. Under the Elgin arrangement the jobbers only had obtained a rebate on the goods which they held in stock. This position was of course detrimental to the present profit of the retailers, since wherever they had been loaded down with Elgin movements, they have now to sell at a loss, in competition with the new prices made by jobbers and, of course, by retailers buying at the new prices. The new policy of the Elgin Company naturally called forth criticism from the retailing class. The Waltham Company, in meeting this competition, went the logical step further and offered a rebate to all retailers upon movements in stock bought since January 1st, 1876. The difference between the new and the old price lists is considerable, and is to be payable in goods at the present reduced gross prices, on the return of the movements for verification.

We do not see that this movement will benefit the watch trade in any noticeable way. The reduction of prices has of course a tendency to increase the demand—that is a universal rule. But we doubt if in these present dull times this particular branch of trade can be stimulated to any great extent by the reductions offered. Certainly no man will buy an extra watch because it is cheap, and amongst the other classes it will not do to force sales too much in these risky times. We doubt, in fact, whether any more money passes through the hands of the trade because of the reduction. The proportionate loss of profit will scarcely be able to compensate for the somewhat increased amount of sales. It is scarcely to be supposed either, that the reduction will have the effect of entirely driving out of the market—as perhaps was the first object considered—the Swiss watch. Certain lines of watches made in that country can still be made so cheaply as to give them, with enterprise in pushing, a good hold on the American market. These can still be imported at some profit notwithstanding our considerable duties.

The chief question is as to the permanency of this reduction. It is of course a natural business expedient to attempt to foster trade in dull times by the advertising stimulus of a reduction in prices, which is to be compensated for by an increase again when the times permit. It is, however, thought that in this case the reduction is one of the signs of the times and that it will be permanent. It is the rule now-a-days to do business on a very close—indeed, sometimes too close—margin. But we understand that the managers of the Elgin Company calculate that they can still make movements at a reasonable profit, even at the reduced scale. How far these calculations are based on a considerable increase of business we do not know, but of course the larger the business done by any manufacturing establishment, the less profit it can afford to put up with. On the whole, however, we judge that this reduction will be a permanent one, and that on the other hand there will be no further reduction. We should say that by this jump the watch trade has "touched bottom," and that any further moves of the sort would simply lead to a reckless and unwise competition.

Nor is there any danger, we think, that the reduction of prices will bring about an inferior manufacture. It is true that this is frequently the second move in the game of competition; but it is one that cannot be afforded in the watch trade. The watch depends so absolutely upon its accuracy and therefore the carefulness of its manufacture that no company can afford to endanger the reputation of its movements by putting into them inferior work and lowering their grade. It would soon be found out, not only by the trade, but by watch wearers, and it would create a prejudice that would be difficult to recover from. We think the managers of all the companies are wise enough to recognize this fact, and the trade therefore may feel that they can offer the same guarantees to their customers as heretofore.

The meeting of the jobbers, of which we have spoken, which was called at the suggestion of the Elgin Company, resulted in throwing the question of jobbing profits back upon the company itself. The suggestions were so many and various that no decision approaching unanimity could be arrived at, and the trade therefore will look to the company with some interest to see what its policy will be in regard to the matter of jobbing profits.

On the whole we should say that this move is one on which the trade is neither to be particularly congratulated or condoled with. The increase of sales may perhaps diminish the loss of profits, and, at least in the case of the Waltham movements, the retailer will not lose on the stock he has on hand. It seems to us that this policy of protecting all the trade as well as one part of it, is by far preferable. We shall watch with some interest the practical results of this reduction, for it will afford interesting data to business men as to the true policy of conducting business in hard times.

The Protest of the Trade.

The article in our last issue protesting on behalf of the trade against the new methods of doing business, introduced by certain wholesalers, has met with a response from all over the country. We have several letters saying "Amen" to the views there expressed, and travelers from all sections report to us that the article meets with unanimous approval. With this hearty and general seconding we emphasise again what we have previously said, that it is the height of unwisdom for wholesale dealers of any sort to take any measures that shall put them in the position of robbing their customers of their local and natural trade. It is riding two horses, and any one trying the experiment is pretty sure finally to go down between. A flourishing wholesale trade demands a flourishing retail trade and the wholesalers would win only a losing victory if ever they got the retailers' customers into their own hands. The local dealer is the only man who can rightly develop a safe and satisfactory local trade, and without such shops the jewelry business of the country would be reduced not much less than one half. This is a strong assertion, but the knowledge of business men will carry it out.

In saying this, we are simply pushing matters to a logical conclusion. The retail dealer will doubtless exist even if more so-called jobbers than now attempt to undersell him on his own ground. Acting in concert the retail dealers are very likely to ruin any wholesaler, by leaving him severely alone, before he has a chance to ruin them. Nevertheless the practice is equally dangerous to both sides, and we again urge upon manufacturers who have fostered this unwise policy, to give the jobbers a hint. To be sure it is hard times, but flooding the country with circulars offering trade discounts to any one who will bite is not the way to better them, and he is the safe merchant, worthy of credit, who has foresight enough to look a year ahead in his business and see what is coming from what he does to-day.

The Up-town March.

The march of the New York trade up-town continues, and more and more are falling into line. On the blocks just north of Bond street several large houses have located themselves and are calling others about them. The Whiting Manufacturing Company has moved its entire establishment uptown, and its silver manufactory, case shop, silver room and office are all under one roof at 694 to 696 Broadway. Just below it, at 690 Broadway, Messrs. Rogers & Brother have occupied the extensive buildings at that number, having grown out of the old shell. They leave the old landmark with great reluctance, but have had to give way to manifest destiny and answer the demands of their trade by seeking more capacious quarters. Just below them again, at 686 Broadway, are to be found Messrs. Reed & Barton, who have recently left their old stand for more extensive accommodations; and so it goes.

With such a gathering in the neighborhood of Bond street and Broadway, we may confidently expect that a great jewelers' centre will be built up there. These houses are certain to attract others to their vicinity, and next year a great many firms whose leases expire then will make a move in this direction. The house-owners of Maiden Lane and the down-town section in general, have themselves to thank for their desertion by the trade. The exorbitant rents they have asked are chiefly responsible for driving trade up-town, as they have before been told, and as they now find to their cost. Besides this, there is a good deal more room uptown than there is down, and those most enterprising gentlemen of the trade, the advertisers in The Jewelers' Circular, find their business so steadily increasing that they have but Hobson's choice before them: they must pull down their barns and build greater—in plain English, move. It is to be hoped that the landlords of the Lane will take warning for the benefit of those who are disposed to stay, and give them the room that their retiring tenants have vacated, at a fairly reasonable price.

A Remarkable Four Hundred-Day Clock.

There is on exhibition in a Maiden Lane store a curious and skilfully constructed 400-day clock which contains several peculiar features, interesting not only to the reflective student of horology, but also to the trade at large. Before entering into a description of the various peculiarities it may be well to mention that this clock presents the appearance of a large-sized gilt traveling clock, has plate glass front, sides and back, which are secured by mouldings of a chaste pattern and of such proportions as suggest to the observer solidity and grace. The dial shows hours, minutes and full seconds, and there is also a hand which makes one revolution in 400 days, and indicates the time which has elapsed since the clock was last wound up.

It is a truth well known to experienced watchmakers and others, that the longer a clock is required to run without winding, the more the motive power must be increased. That a clock which will run one week with a given weight falling through a given space, will require four times the amount of weight falling through the same space to make the clock run one month, and so on in proportion as the time of the running is increased, with a considerable additional weight as an addendum to overcome friction and unavoidable irregularities in the extra wheels and pinions or pulleys which are necessary. In clocks previously constructed to run one year with one winding, weights varying from 80 to 500 pounds have generally been required, and in cases where weights could not be applied, very strong springs, or a *series* of springs suitably arranged, and of a length and strength necessary to produce a force equivalent to that of the weights, have always been requisite.

The clock which we have under consideration is truly remarkable for the exceedingly small amount of force contained in the single mainspring required as a motive power. Yet there is no attempt at creating power, or at the application of any of the perpetual motive theories. The secret lies in the fact that the most rigid economy is displayed in the use of the motive force, the waste being reduced to its lowest minimum. Practical men can form an idea of the strength, or rather of the weakness of this mainspring, when we state that it is contained in a box or barrel two inches in diameter and less than one inch broad, which is about the size of those in the ordinary 21-day French clocks of the largest size, and smaller than what is required for a common four-air musical box. One turn of the spring runs the clock exactly fifty days, and consequently eight turns completes the necessary four hundred. The force of the spring acts directly through the train of wheels on the escapement, which is constructed on the repose or dead beat principle, and imparts the impulse to the pendulum by means of inclined planes on the scape wheel teeth.

The pendulum is peculiarly constructed and is known in mechanics as the angular pendulum. Angular pendulums are formed of two arms or legs, like a pair of compasses, with balls at the extremity of both legs, and the time of vibration depends on the length of the legs and the angle contained between them conjointly, the duration of the time of vibration increasing with the angle. Consequently a pendulum of this construction may be made to oscillate in any given period of time, and can be made to vibrate full seconds in an exceedingly small amount of space. In this clock the pendulum vibrates once every second, and occupies a space of but a few inches, while its total weight is about one pound. The fact of a clock beating full seconds with a pendulum working in such a small space, and running such a long time with so little motive power, must be regarded as both a mechanical and a philosophical curiosity, and is in itself a study embodying some of the most beautiful laws of nature skilfully applied to accomplish a given purpose. This clock was made in France and is on view at the establishment of Messrs. LeBoutillier & Bode, No. 10 Maiden Lane, where a number of other curiosities and meritorious products of the Parisian workshops can, from time to time, also be seen.

Editorial Jottings.

We have to return thanks to the full regiment of watchmakers and jewelers who have already sent in their subscriptions to Excelsior's "Hints on Watch Repairing." The number of orders fully justify us, as we had hoped, in putting the work in book shape, and we shall have it ready for the trade with as much expedition as possible. We are already making further illustrations for it, but the work is not so far advanced as to enable us as yet to name a price. We can assure sub-

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scribers, however, that it will cost them very much less money than it will be worth to them, and indeed many of the letters express a determination to have it at any price. It is very gratifying to find the work of our contributors so thoroughly appreciated as this of "Excelsior" has been.

There is nothing like practical appreciation. We notice that Messrs. Benjamin & Ford, of New Haven, have issued a neat and tasteful little circular for the promotion of their retail jewelry trade, in which they have copied outright one of our recent articles on "Novelties in Jewelry." They have also had the courtesy to credit the article to THE JEWELERS' CIRCULAR, although in quite small type. Such enterprise as this is worthy of commendation, and if, next time, THE JEWELERS' CIRCULAR is put in larger type, we shall think it still more worthy of commendation than before.

We present to our readers this month two pages of chromo illustrations, which will speak for themselves. The designs are from the stock of Messrs. Mulford, Hale & Cottle, and they represent some of the handsomest jewelry yet made in this country. The use of the platinum in combination with gold should be especially noticed as a taking novelty that promises the further merit of permanence; and we may add for the information of the trade, that the platinum for this purpose is furnished by Mr. H. M. Raynor, of No. 25 Bond street. These illustrations make up our average to a chromo plate for each issue of THE JEWELERS' CIRCULAR in the present shape, which is twice as much as we had hoped to be able to give our readers. Some of these have been designs from the stock of prominent manufacturers and others from designs made expressly for the CIRCULAR itself. We believe we can say that no other trade journal has ever offered such features, in connection with so small a subscription price.

Centennial Notes.

We are disappointed in not beginning with this number the Centennial illustrations that we have in contemplation. The colored plate of the American watch display in the Main Building is put off until our next number, when we hope to present one of the finest yet submitted to our readers. Those who visit the Exhibition must be sure to visit both the exhibits of the watch movements and cases in the Main Building and of the processes of watch manufacturing in Machinery Hall near the great Corliss engine.

In the tasteful pavilion, which is a prominent feature in the nave of the Main Building, occupied by Messrs. Tiffany & Co., Starr & Marens, and the Gorham Manufacturing Co., one of the most noticeable is the century vase exhibited by the latter well known house. This is a wonderful piece of workmanship in sterling silver, over four feet high and over five feet long on its base. It is designed by George Wilkinson and Thomas J. Pierrepont, and tells in its rich and profuse symbolism the story of the progress of this country during its first century. The main group on the left presents the Genius of War, that on the right the Millennial of Peace. A medalion in front displays the Angel of Fame showing the portrait of Washington, and that on the other side the Genius of Philosophy holding the portrait of Franklin. A band of stars corresponding to the number of states represents the Federal relations of the Union, and the slab of polished granite, on which the vase rests signifies the solidity of their Union. Below the Pioneer and Indian suggest the early fate of civilization, and above Europe, Asia and Africa are symbolized as bringing their productions to the present Exhibition, while America, crowning all, welcomes her sister nations to centennial unity.

Messrs. L. & A. Mathey have on exhibition in the Swiss Department at the Centennial a number of Matile watches which are remarkable specimens of the finest art of the watchmaker. There are perhaps a dozen or sixteen of these watches, on some of which one or two years' time has been spent by their makers. They are marvelous time-keepers and exquisite in their beauty of finish. These watches have double chronographs, split-fifth seconds, and quarter hour and minute repeaters. One of these is of peculiar excellence and beauty. It shows also the phases of the moon, and a perpetual calendar displaying with reliableness the day of the week, the date in the month and the year. Its accuracy is shown by the record from observation of its performance during a trial of over forty days, in which the slight variation shows the absolute perfection of its adjustment. This splendid example of patience and skill employed two years of the workman's time to make it, and its wonderful performance bears testimony to his untiring industry and his superior judgment and workmanship. These are the handsomest movements that have yet been shown in this country, and visiting jewelers will not be wise if they fail to give them careful and admiring examination.

Artificial Pearls.

It was about the seventeenth century that it was tried with more or less success to imitate real pearls, and the most successful means to which recourse was had was with the aid of the "Oriental essence," or a pearly-white solution from the scales of the bleak, called guanine. In giving to this product the name "Oriental essence," it was with the intention of keeping the substance secret. In Anjou, although this industry (that is to say, the bleak fishery to obtain the "Oriental essence") is little known, it is no less certain that the fishermen of Encouflans and Ponts-de-Ce largely aid the manufacture of imitation pearls, and that they still use this name, or that of bleak white. The scale of the break is lubricated by a mucus which was for long time considered albuminous, but it is not so. This essence is very abundant, and is difficult to mix with water. It coagulates by heat to a thick white deposit, and becomes black in time if a proper remedy be not applied to prevent this deterioration, especially during the time of intense heat, during which period fishing is at its height in the Loire and the Mayenne. If the scales of the bleak are examined under the microscope, the smallest are found to be nearly round; and if the surface of one of the larger ones is lightly pressed, this "Oriental essence," under the form of a small pearly drop, issues from one of the canals and sticks to the fingers. In this mucilage an infinite number of small, rudimental, pearly scales can be seen. The largest scales are square, nearly rectangular, four times as long as they are wide; each scale has three colorless cylindrical veins. It is to M. Jaquin that this invention is due, all the more fortunate as it remedied the difficulties and bad effects of the pearls made of quicksilver placed in a glass bulb. In Anjou, in order to obtain this "Oriental essence," they only fish for the bleak; however, the scales of the dace furnish it also. The bleak (*Leuciscus alburnus*) is the only river fish which is not used for food; it is a white fish, well known in the running streams and on the flat, sandy coasts of France, where the water is not deep; it is also found in the Seine, Marne, Moselle, Escaut, etc., never descending into the Black Sea, being principally found at the mouth of rivers. In Anjou they spawn on the sand in the months of May and June. For its propagation in certain parts of France, artificial spawning places are made by the aid of heaps of sand where they multiply. In Anjou, recourse is not had to any artificial means; they breed under the shelter of the flat, sandy coast, thus avoiding becoming the prey of other fishes.

The fishermen use a mesh net, and catch the bleak by thousands as they travel in shoals in the current, taking care not to let them get entangled in the meshes, or wound themselves, or lose a part of their large scales; but, above all, not to stain themselves with blood. The following is the process of extracting the "Oriental essence":—Men and women, provided with blunt knives, take the fish one after the other and scrape them over a shallow tub, containing a little fresh water. Care is taken not to scale the black or the dorsal part, as these scales are yellow, while the white scales are very valuable. The whole is received on a horsehair sieve. The first water, mixed with a little blood, is thrown away. The scales are then washed and pressed; the essence settles at the bottom of the tub, and it is then that we have a very brilliant, blue-white, oily mass. Warm water must not be used for the washing, as it would promote fermentation. It takes 60,000 bleaks to furnish two pounds of essence. The fishermen put this guanine in tin boxes, which they fill up with ammonia; the box is then closed and sent to Paris. Others prefer to put it in large-mouthed bottles. If a drop of the essence is taken up by a straw and let fall upon water, the guanine floats, giving forth the most brilliant colors. The intestines of the bleak are thrown away. They are, however, covered with this mucus. There is here great negligence, and, in spite of all the advice given on the subject, the fishermen lose a large part of the produce. This guanine is insoluble in water, in ammonia, and in acetic acid, but combines with sulphuric and other acids.

Practical Hints on Watch Repairing.

By Excelsior.—No. 15.

(259) *Apparatus for Adjusting.*—In adjusting the compensation for heat and cold, we need an apparatus for obtaining an elevated temperature which may be of any degree required and may be maintained nearly constant for a considerable time; and another for producing cold in the same way. The former is called the adjusting-oven, the latter the cold-box. Many different constructions are in use, and the reader may perhaps know or discover some improvements on those described in these articles, although they have been found very serviceable. When only an occasional watch is to be tested or adjusted, any simple and inexpensive means available may be adopted for producing heat or cold; care only being taken that the heat never exceeds 120°, which is as high as can be employed without danger of injuring the oil, or perhaps the movement. It must also be so inclosed as to be protected from dust or moisture. And when great accuracy is required, it should be set to time, or the variation from the regulator noted down, *after* the movement has become thoroughly heated or cooled to the proper temperature in every part, which may take from half an hour to an hour. By this means, the times of exposure to the proper degrees of heat and cold will be alike. But if it is set and then put into the oven or cold-box, unless they were so constructed as to occupy the same length of time in attaining the required temperature in each case, the time during which it would actually be affected by the proper degree of heat or cold would be different, and cause an apparent error even when the compensation was correct.

(260) *For testing in heat*, some watchmakers put the movement in a tight tin box, which they bury in a vessel of sand. The whole is then heated on a stove, in the oven, or in any other convenient way, and its temperature kept as uniform as possible by frequent examination of a thermometer also immersed in the sand. Others use a cubical box of tin, zinc or copper, which is divided into four or five air-tight compartments by means of horizontal metal partitions inside. The upper compartment should be large enough to take in a thermometer with the watches to be tested, and then tightly closed. It is well to have a double glass window in the door in the top, so that the thermometer can be watched without opening the chamber. Heat it slowly by means of a small alcohol lamp underneath, till the thermometer shows the proper temperature, where it should be kept, either by reducing the size of the flame or moving it further from the bottom of the box, or else by alternately removing and replacing the lamp as needed. It is well to have a wood or pasteboard casing to set over the box to prevent loss of heat by radiation and preserve a more uniform temperature.

(261) *Adjusting-Oven.*—A very complete apparatus, and one not expensive, is shown in Fig. 11. This consists of a reservoir containing

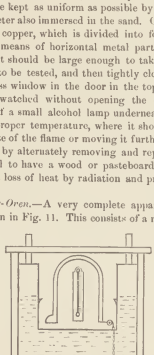

Fig. 11.

water, made of tin or copper, the bottom portion about eight inches front, by six back, and two deep, with two side branches four or five inches high and about one inch deep. The bottom and branches extend from front to back inside the casing. These branches are closed over at the top and have each a short pipe extending to the outside of the casing, for use both in putting in water, and allowing the safe escape of the vapor arising from the heated liquid. Every joint of this reservoir must be securely soldered up so that no moisture or vapor can enter the chamber containing the movements. The water should not fill it quite to the bottom of the pipes. One or two glass shelves for receiving the watches are supported by wires or cleats soldered on the sides of the branches, and at such a height as to bring them about midway up the sides of the branches, and leave unobscured the scale of the thermometer fastened at the back of the chamber. It will be observed that the front, back and top of this chamber are formed by the wood casing, leaving the heated water only below and at the sides of the movements. Experience has shown that the temperature is more even when arranged in this way than when the source of heat surrounds the watches.

(262) The casing should be either of thick wood, or made double, with an air chamber between the walls, which is preferable but not indispensable. Pine, whitewood, or any soft wood will answer. Not only should the door fit the front of the case tightly, (or be packed with tailors' listing,) but the bottom of the reservoir should fit snugly both to the box and the door, to prevent the fumes from the lamp beneath entering the chamber. In the door and the top of the casing, double glass windows are inserted to allow of observing the movements and the thermometer without opening the door. One glass should be fastened to the outside of the wall, the other to the inside, making a tight, non-conducting air chamber between them.

(263) *Automatic Heat Regulator.*—A compound bar of steel and brass, fastened by one end to the back of the chamber, regulates the heat by the motion of its free end, which curves and straightens similarly to the compensating segments of the balance. The brass is double the thickness of the steel, which may be a piece of clock spring, while the former is any hard or springy brass, the two being soft-soldered together in the form of a common magnet, with the brass outside. To one end is riveted or soldered a flat piece for screwing it in position. When finished this bar should be well washed and cleaned from the soldering fluid. (212.) To the free end is attached a cord which passes over a grooved pulley and through a small hole to the outside of the casing, thence to the valve which regulates the supply of gas to the burner. When oil or alcohol is used, the cord passes down inside the casing, through a tube which passes through the bottom portion of the reservoir, to the wheel which turns the wick of the burner. This tube is soldered in both the upper and lower sheet of the reservoir perfectly water-tight, and should extend down a little lower than the row of holes provided for the exit of the heated air from the lamp chamber, so that the fumes will not rise through it into the movement chamber. For this reason the tube should be of small diameter.

(264) The gas valve, or wick turner of the lamp, is turned by means of a lever attached to it, having a weight near the end heavy enough to pull it down. This lever is supported by the cord, which is tied to it, and it is only when the motion of the compound bar allows the cord to yield that the lever can drop and shut off the gas, or reduce the flame of the lamp, more or less according to the motion of the bar. When the temperature falls, the bar contracts, draws up the cord and lever, turns on the gas, or enlarges the flame, and an increased temperature in the reservoir results. The cord is attached to the lever at such a distance from its pivot or center of motion that the movement of the bar will give sufficient motion to the lever. For instance, if the free end of the bar moves half an inch for the increase of temperature from the mean to 95°, or any other degree chosen for the heat-extreme, then the cord should be attached to the lever at a point where that half-inch of motion will turn the valve or wick down enough to just maintain the desired temperature, and no more. This can be told by a little trial, moving the lamp to suit the changes of the cord. If preferred, the temperature can first be raised to the right degree in the chamber, then turn down the wick or valve to about the proper amount, as above mentioned, attach the lever to the valve in a horizontal posi-

tion and connect the cord. Then any increase or decrease of temperature from that degree will cause the lever to be moved in the proper direction to correct it. The gas valve, or wick turner, should be made to operate very easily, and the lever made with a sort of spring clamp to slip on the thumb piece of the valve, or the wheel of the burner, and hold itself tightly in place. In the case of a gas cock, the lever might be permanently fitted to it, if desired; but with a lamp it could not, because there is no certainty in the position of the thumb-wheel. Every trimming or attention of the wick will change the position of the wheel, and the lever must be capable of being slipped on after the right position is found.

(265) Air holes are made in the lamp chamber, through the casing, in two rows. The upper row should be an inch or so below the bottom of the reservoir, in order to retain the most highly heated portion of the air in the chamber, in contact with the reservoir,—only allowing it to escape after it has yielded up some portion of its heat and fallen to the level of the holes. Another row of holes for entrance of air is made near the bottom of the casing. Three or four half-inch holes are generally enough for each row, and all should be made on the same side, or on adjacent sides, to prevent wind blowing *through* the chamber, and disturbing the flame or putting it out. The height of this lamp chamber should be made to conform to the requirements of the lamp or flame which it is proposed to use for heating.

(266) *The Cold-Box.*—For testing watches in cold, they may simply be kept in a cold room, if the season is suitable, or placed in a tight metal box and kept in an ordinary refrigerator. It is much better, however, to have an apparatus constructed with special reference to that use, an example of which is shown in Fig. 12. It consists of a

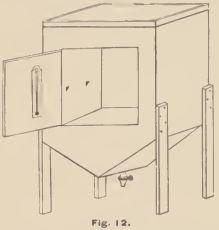

Fig. 12.

tight wooden box, with double walls, packed between with sawdust and lined with zinc so as to be water-tight. It comes to an edge at the bottom, both for convenience of drawing off the water by a cock inserted at the lowest point, and to insure contact of the ice with the metal chamber which holds the movements during the trials. This chamber may be about six inches square, and there should be at least 1½ inches space between it and the sides of the casing, to prevent the ice packing and clogging, instead of passing on to the bottom. This whole space, above, at the sides of, and below, the metal chamber, is to be filled with broken ice, well packed down with a flat ending stick. The movement chamber is to be perfectly water-tight, open only in front, where a snugly fitting wooden door is provided. It is tightly fastened and packed to the casing where it goes through, to prevent leakage, and supported by wooden strips below and at the back end, to prevent it changing position and working loose at the front. One or two glass shelves are used, as in the oven. The thermometer is here attached to the door, and windows for observation are omitted, as the condensation of moisture upon them by the cold air within would prevent seeing inside. Legs are attached to support the box, and when the cover is removed the whole top should be open for convenience of filling and packing the ice.

(267) *Degrees of Cold.*—If ice alone is used, a pretty constant temperature of about 35° will be maintained. When a greater cold is desired, common coarse packing salt should be mixed with the powdered ice, throwing in two or three handfuls of ice, then a handful of salt, mixing and packing down with the stick; then another layer, and so on. This will give a temperature of about zero. As the ice melts by contact with the salt, and the water passes off, it should be poked down occasionally with the stick and a fresh supply added at the top. When the cold-extreme chosen is only 50° or 55°, less ice must be used, and no salt. Sometimes it will be sufficient to keep a supply of ice on the top of the chamber, not being necessary to pack the whole space around it. For so moderate a degree of cold as that, the ordinary household refrigerator will answer every purpose. For regulating the temperature of the chamber in the cold-box, a compensating bar would be useless, but is sometimes used to *indicate* the temperature within the chamber. In that case it is attached to the door, and the cord passes over a pulley, with its axis penetrating the door, and on the outside carrying a pointer, which is set to point to an index corresponding to the degree of the thermometer inside. But it is much better, as well as less troublesome, to choose for the cold-extreme a temperature which can be easily produced, and kept at the same point without watching and regulating it,—as that of 35°.

(268) For breaking up the ice, the best way is to make a stout wooden box, about a foot square and six inches deep inside. Put in ice enough at a time to fill it about an inch deep when broken up. Pound it with a hard-wood pestle, with perfectly flat bottom, say three or four inches square. A stick of stove-wood, with one end cut down small enough for a handle, makes a good pounder,—its weight helping along the powdering process. Break the ice pretty fine, leaving no pieces over an inch square, and empty each box-full into a tub, till enough has been broken up to fill the cold-box, before you begin to pack it. When packed protect it from the sun, and throw an old rug or piece of carpet over it to keep it as cool as possible and save ice.

(269) *Proper order of Trials.*—Everything being ready, as in section (253), the watch being closely regulated to mean-time, and set exactly or its variation from the regulator noted down, we subject it first to cold for six hours, (252), and put down the precise error or time in the adjustment-book; then expose to heat, and again note down the error. Many workmen expose first to heat, then to cold, but I prefer the order recommended, for the reason that when the movement is taken from the cold-box it condenses upon itself the moisture always present in the atmosphere, owing to its being colder, causing a liability to rust. But by then exposing the movement to heat, it is dried off and all danger obviated.

(270) *Disturbing the Rate.*—After altering the screws to change the compensation, the trials should include not only cold and heat but also mean temperature, to see if the alterations have disturbed the rate. If so, the two (or four) mean-time screws should be changed to correct that, (215,) at the same time that the other screws are moved to change the compensation. If the error of rate is very small, as a second or so per day, it will generally be sufficient to turn *one* of the timing screws as little as it can be seen to move. But the screw thus changed should be noted, so that any similar change afterwards required may be made upon its opposite, otherwise the balance might be thrown out of poise.

(271) *Rating and Compensating.*—After both the timing and compensating screws have been changed as above, the next series of trials should commence with a test at the mean, to ascertain the rate, then in cold and heat, comparing the three results to find the error of compensation. For instance, if the rate was discovered to be two seconds slow in six hours; the loss in cold, four seconds; the gain in heat, six seconds, then if the rate had been correct the real loss in cold would have been only two seconds, and the real gain in heat, eight seconds. This was the actual effect of the compensation, but the error of rate increased the apparent loss and decreased the apparent gain. It is in the highest degree important, however, that the rate be as nearly correct as it can be got before testing the compensation, for it is often hard enough to make out the real cause of the error even then, and any further complication would make "confusion worse confounded,"

with the beginner. Some workmen follow a different system. Having first determined the rate at mean temperature, they test in cold, alter the screws for the error, test again in cold, and so on till the error in cold is removed; then test in heat, and proceed in the same way; then test in cold again, removing the error in each extreme before they leave it. This is quicker than the method above mentioned, but is not so good, unless a saving of time is the paramount object.

(272) *Irregular Compensation.*—As already stated, if the watch loses in cold and gains in heat the compensation is too strong, termed over-compensated, and the remedy is to move the weights back on the segments. If it gains in cold and loses in heat, it is under-compensated, and the screws should be moved towards the free ends of the segments. But there are frequent cases of irregular compensation. If the watch gains in both heat and cold, the compensation is too strong in heat and too weak in cold. If the screws were moved back to lessen the error in heat, we should thereby increase the error in cold to a nearly equal extent; or if we lessen the error in cold by moving the screws forward, we shall increase the error for heat. For this there is no remedy. All we can do is to get the error equal in both heat and cold, which will of course reduce the error in each extreme to the smallest amount possible. In exceptional cases, where a chronometer or watch will seldom be exposed to one of the extremes, we can locate nearly all the error in that extreme, and thus free the other extreme, in which it will be generally used, almost entirely from variation. For instance, if the balance is adjusted for 35° and 95° as the two extremes, the middle temperature will be 65°. Now if the instrument will only be exposed to temperatures between 65° and 95°, we can correct the error for heat by moving the screws in the proper manner to make the mean temperature rate and heat rate alike, and so place all the error in the extreme of cold, where it will rarely or never trouble us. Nearly as good results may be obtained with such balances by adjusting them from 65° to 95°, with the mean at 80°, but it is more trouble to adjust for a limited range, both from the difficulty of keeping the temperature just at the exact point,—which is more necessary in this case because the entire range of temperature is so small that any variation would reduce it to little or nothing,—and from the greater difficulty of noting the error of rate produced by so slight a change of temperature, requiring a longer time for it to accumulate into an observable amount.

(273) If the watch loses in both heat and cold, (as compared with the mean temperature rate,) which is a common error, the compensation is too weak in heat and too strong in cold, *i. e.*, the weights or screws are not carried fast enough, or far enough, towards the center of the balance in heat to compensate for the effects of heat on the balance and the hairspring; and they are carried outwards in cold too rapidly, or too far, causing a loss of time in both cases. For this error, like the one just mentioned, there is no remedy. We can only hide it, or get it out of the way, as above noted. (272). All the foregoing errors are due to the construction of the balance not being such as will admit of the weights being moved in accordance with the law which governs the number of vibrations, viz:—*The weight of a balance and strength of its hairspring remaining the same, the number of vibrations it makes will be inversely proportionate to the square of the diameter.* That is, a 1-inch balance will make four times as many vibrations as a 2-inch, and nine times as many as a 3-inch balance. And conversely, a balance 2 inches in diameter will make ½ as many vibrations in a certain length of time as one 1 inch in diameter, and a 3-inch balance will make ⅓ as many, etc. Hence, in order to compensate for the contraction and expansion of the balance, the weights or screws must be moved towards the center in heat in a geometrically increasing rate. When to this is added the effect of heat and cold upon the hairspring, to be compensated for by the same means, it will be seen that the weights must move towards the center in heat in a rapidly increasing ratio, while they must move from the center in cold in a less and less rapidly decreasing ratio.

(274) *Middle Temperature Error.*—This is very seldom done in a perfectly correct ratio. The smallest error is found when the difficulty in the balance is over-compensation. In these cases, by moving the screws judiciously on the segments, the variation between the rate at the two extremes and that at the mean can be reduced to a very slight error. This residuary error, which remains in spite of all we can do, is technically termed the middle temperature error. Even the best made and most carefully adjusted chronometer balances, when adjusted to give *the same* rate at 35° and 95°, or the two temperatures chosen for the heat and cold extremes, will have a different rate at those temperatures from that at the mean. Of course, the more limited the range of temperature between the extremes, the less this error will be; but it is never entirely eliminated in balances of the ordinary construction, varying from a part of a second to several seconds per day, according to the range, the skill and patience of the adjuster, and the peculiarities of the balance, its hairspring, etc. Sometimes the rate at the extremes will be a trifle faster than the mean temperature rate, but, almost invariably when the rate has been made alike at the two extremes, it will be slower than the mean temperature rate, that is to say, the chronometer being regulated at the mean temperature, it will lose time as the temperature becomes higher or lower. Or, if the rate be made the same at the mean and either extreme, the loss will be all located in the other extreme, as already stated.

(275) *Secondary or Auxiliary Compensation.*—As the ordinary compensation balance is not capable of being manipulated so as to remove this residuary error, various devices have been added to it for producing a separate and additional adjustment to accomplish that purpose—some acting in cold, some in heat, and some at all temperatures. This additional compensation is called secondary or auxiliary compensation, and balances provided with them are termed balances with auxiliaries. These, however, are generally added only for some special requirements, (358), and have not come into any general use in instruments sold for purely commercial purposes, being mostly unstable, and therefore unreliable for a permanent action, besides their cost being greatly increased. As the number of these devices is probably several hundred, acting on all sorts of principles, and by all sorts of means, it is impossible to give directions for constructing or adjusting even the more prominent makes. Frequently the conditions of success are known only to the makers, or could only be ascertained by many experiments and failures. It will generally be found more profitable and satisfactory not to meddle with auxiliary compensations or unusual constructions at all, unless the workman has skill and experience enough to make them himself. In that case he would probably be able to study out the principles of the particular device before him, without any further instruction than his knowledge of the theory of compensation. His experience will then have learned him both wisdom and *caution* in making alterations. The average workman would do well to confine his practical operations to the primary compensation, or adjustment of the ordinary compensation balance, and before going any further than that he should again read and remember the advice in the last paragraph of the introduction to these articles.

"WATCH" is from a SAXON word signifying to wake. At first the watch was as large as a saucer; it had weights, and was used as a "pocket clock." The earliest known use of the modern name occurs in a record of 1552, which mentions that EDWARD VI. had "one larum or watch of iron, the case being likewise of iron gilt, with two plummetts of lead." The first great improvement, the substitution of the spring for weights, was in 1550. The earliest springs were not coiled, but only straight pieces of steel. Early watches had only one hand, and required winding twice a day. The dials were of silver or brass; the cases had no crystals, but opened at the back front, and were four or five inches in diameter. A plaid watch cost the equivalent of $1,600 in currency, and after one was ordered it took a year to make it. There is a watch in a Swiss museum only three-sixteenths of an inch in diameter, inserted in the top of a pencil case. It's little dial indicates not only hours, minutes and seconds, but also the days of the month. It is a relic of old times, when watches were inserted in saddles, snuff-boxes, shirt-studs, breast-pins, bracelets and finger-rings. Some were fantastic-oval, octangular, cruciform, or in the shape of pearl, melons, or tulip coffins.

Proceedings of the Horological Club.

A DISTINGUISHED BODY OF WATCH AND CLOCKMAKERS.

Twenty-eighth Discussion.—Communicated by the Secretary.

SAFETY SPRING-BARREL.

The first communication laid before the Club was one from Mr. S. D. Johnson, on an improved safety spring-barrel of his invention, upon which he wished the opinion of his brother watchmakers. It was as follows:

The improvement is of the kind usually called "Safety Spring-Barrel." The main parts that are new are three in number: 1st, the main wheel, which is in the form of a toothed ring or hoop, which turns on the barrel between a stationary and a detachable collar, on the part of the barrel which is usually occupied by the teeth, so that when the barrel is complete it has about the same appearance as the common toothed barrel. 2d. The pawls or clicks, which are set in a recess directly under the toothed circlet or hoop and catch in the same and carry it, firmly with the barrel, when the watch is running, but when the spring breaks or is released suddenly, the barrel is perfectly free to recoil or turn in the opposite direction within the toothed ring. 3d. The detachable collar. The whole object of course is to save the train when the spring breaks, or is suddenly released.

Yours truly, S. D. JOHNSON.

As no one volunteered to express his opinion, the Chairman called upon Mr. Uhrmacher to speak to the question, by virtue of the authority conferred upon him by one of the new rules adopted at the reorganization of the Club.

Mr. Uhrmacher regretted to say anything which should be unpleasant to their correspondent, and would not have done so unless compelled by the Chairman's call. The difficulty with his invention was, first, the greater number of pieces and their liability to become worn and not fit accurately, and to get out of order. Then the toothed ring would need to be of considerable thickness to give sufficient strength and hold the teeth rigidly in shape, which would to that extent increase the diameter of the pitch-circle of the main wheel; or, if the usual diameter was adhered to, then the diameter of the spring-barrel must be so much less. Again, the toothed ring needed two series of teeth cut upon it, one on its exterior to work into the centre pinion, and another on the lower edge, for the clicks. And the attachment of those clicks in a satisfactory manner would not be at all easy. Besides, it would raise the teeth of the main wheel at least to the center of the spring-barrel, if not higher, instead of it being at the lower edge as usual. There are other points, which he would not mention, as he had said enough to show that the invention would not be a commercial success, although it could doubtless be patented. He thought, however, that he should show his good feeling towards their correspondent by advising him, if he had not already paid the final fee for his patent not to do so—for he honestly believed that whatever he paid out would be lost, so far as any return was concerned. The devices already in use for that purpose are simpler and entirely effective, and, were it his own case, he would consider it the part of friendship in any one to deter him from an undertaking which must result in loss and disappointment. He always wished to know *the truth*, whether agreeable or otherwise. He therefore hoped that Mr. Johnson would perceive that what he had said was spoken in kindness. But at all events he must say just what he believed to be right and true. However much the members of the Club might trifle with and soft-soap each other, any correspondent might implicitly rely upon receiving gentlemanly and respectful treatment, and having his inquiries answered honestly and candidly, according to their best judgment.

This sentiment was loudly applauded, and the Chairman, after complimenting Mr. Uhrmacher on his graceful discharge of an unpleasant duty, officially endorsed the sentiment in the name of the Club. He also hoped that their correspondent would not feel discouraged by one disappointment, for that was the lot of all inventors, but would continue his efforts at improvements, and he had no doubt that he would yet invent something which would prove pecuniarily profitable to him.

LETTING DOWN MAINSPRINGS IN FUZEE WATCHES.

Secretary Horological Club:

Is there any safe way to let down the spring in an English lever watch? It is dangerous and troublesome to turn the rachet wheel, or take out the lever and let it run down. If there is any better way, and you would inform me, you would greatly oblige

A YOUNG WORKMAN.

Mr. McFuzee said he would with pleasure answer that question in order to express his approval of the writer's evident desire to do his work in the best manner. And he hoped that others who might meet with difficulties of like nature would not hesitate to call upon the Club for help. The dial of the watch should first be removed. Then take a bench key with a large handle, or a pair of sliding hand tongs, and fasten on the square of the fuzee. Hold the tongs or key firmly in the palm of the left hand with the third and fourth fingers, while the thumb and first and second fingers hold the movement. All being safely grasped, now unscrew and take off the bridge which supports the lower pivots of the fuzee, third and fourth wheels, remove the third wheel, and replace the bridge. Then, taking the key or tongs into the right hand, slowly let the fuzee turn till it stops.

DIAMOND DUST FOR POLISHING STEEL.

To the Gentlemen of the Horological Club:

Is diamond dust good for polishing steel? Would a diamond file do for filing down pivots, etc.? My employer says it would, but I think that it should not be used for such purposes. Please settle this question for

APPRENTICE.

Mr. McFuzee said that diamond dust was not at all suitable for polishing steel. Besides, some of the fine particles would be sure to be come imbedded in the metal, and then act as so many sharp diamond chisels, to cut everything they came in contact with. Particles of the diamond would also be loosened from the diamond file and transferred to the other piece worked upon, to act in the same way. A pivot filed with such a file or polished with diamond dust would thus become in effect a round diamond file, and would soon cut its jewel hole out. Diamond dust was only used for working upon other stones or jewels. The powder called "diamantine," used for glossing steel, was an altogether different substance, and contained nothing at all like diamond dust, either in nature or effect.

DEMAGNETIZING WATCHES—TWO HAIR-SPRINGS IN A WATCH.

The Secretary reported that he had a letter from Mr. Secondshand, one of the leading members of the Club, who was now out of the city. In it he referred to "Excelsior's" last article, on "Rating," wherein the effects of magnetism upon watches were mentioned, and "Excelsior then said that he knew of no way of taking it out except by heat. Mr. Secondshand then continued as follows:—

The *Scientific American* had an article (and I also saw the same in one of your journals) on how it was taken out. (It amounted to about the same as I wrote.) Now, why can we not settle the question at the next meeting of the Club? One of your correspondents wrote that he could do it instantly, but did not tell how. Also, in the *British Horological Journal*, a chronometer maker tells us how he found one of his chronometers charged with magnetism which he took out in a short time, and all was well. Now, I know that it can be done by a horse-shoe magnet, but perhaps there is a better way. If so, the trade wants to know it, and the Club should inform them, and the best way. After that point is settled, (I like to settle one thing at a time) I would like to ask the Club's opinion on two hair-springs in a watch. I have experimented a little on them for the last ten years, and think there are some good points to be had by having the two springs. You understand the springs go on the balance staff in opposite directions.

SECONDSHAND.

Mr. Horologer arose, and said that it was well known that he was an unbeliever in the reality of demagnetizing watches by any process except exposing the affected steel pieces to a red heat. If he remembered correctly the passage in "Excelsior's" article referred to by Mr. Secondshand, he thought "Excelsior" did not say that "he knew of no way of taking it out, except by heat," but "so far as my experience goes, there is no way," etc. That is, he, like the rest of us, knows by report of ways of doing it, but either has no confidence in their real value, or believes them to be fallacious,—which was exactly the position of the speaker. He was fully aware that Mr. Secondshand was a practical workman of excellent judgment and long experience, and that he claimed to have successfully removed the magnetism from fifty or sixty watches by his method, which he had stated to be as follows:

He first took the watch apart and charged the steel pieces separately, so as to make sure of their polarity. He then took the same magnet,

and removed the magnetism from the different parts of the watch in exactly the opposite way in which he had put it in, and in just the same way that a school-boy puts it in and takes in out of his knife. He always charged one piece and took it out before lifting another. One could easily tell when it is out by trying it on small pieces of steel, but first be sure that these pieces have no magnetism in them.

A Mr. "A. B. F." had described a somewhat similar method, in the CIRCULAR, for July, 1875. But the latter claimed that his method would demagnetize a watch *while together*, which the speaker considered impossible by any such method, because the motions of the magnet which would perhaps improve one piece would be sure to make the adjacent piece still worse, if its polarity happened to be in the opposite direction to that of the former. He believed that the only effect of these or any similar methods would be to reverse the polarity of the pieces, which might in some cases render the effects of the magnetism comparatively harmless, but did not entirely remove it as these gentlemen supposed.

The Chairman reminded the speaker that Mr. Secondshand, in his letter, said that "he *knew* that magnetism could be removed by a horse-shoe magnet," which statement ought not to be controverted upon mere opinion, even that of so excellent an authority as the honorable gentleman who had the floor. The Club knew Mr. Secondshand to be a man of his word, and when he asserted that he had successfully practiced his method, nothing but a fair trial of it and failure to succeed could discredit it.

Mr. Horologer at once disclaimed any intention to question Mr. Secondshand's word or experience. So far from that being the case, he called the Club to witness that he had taken the trouble to copy off his method in full and lay it before them and the readers of these reports, so that all who felt disposed could test it for themselves and find whether Mr. Secondshand or himself was correct in their beliefs. He was sure that that gentleman himself would not consider his course lacking in either fairness or courtesy. He now proposed that all persons, whether members or not, who *knew* of any method of effectually demagnetizing a watch, either together or the pieces separately, should send in a statement of the precise course followed, extent of experience, and the exact results obtained, to the Secretary of the Club, and that at the next meeting this subject be thoroughly discussed. As to the correspondent who had written that "he could do it instantly, but did not tell how," he did not recollect the circumstance, but he wished that any one who did would send a postal card at once to that writer, requesting him to send in a statement of his method with the rest. He was as desirous of seeing this point settled as Mr. Secondshand was, and would be willing to turn their next session into a grand magnetic *soiree*, if that would finally dispose of the matter.

The Chairman thought perhaps it would not be necessary to take that trouble. We had a member here who "could answer any question that anybody could ask." He suggested that Mr. Screwsqueezer should explain this matter for the Club.

Mr. Screwsqueezer arose and said that it was no trouble at all to take the magnetism out of a watch. In fact, it was as easy as falling off a log. He had done it millions of times, and never known to fail. But as he was taken a little unawares,—by surprise, so to speak,—he would prefer to have a little time to think over the subject, and arrange it under the proper heads, as it were. At the next meeting he would present a written paper with full particulars, and he rather imagined that certain ignorant upstarts would have to hide their diminished heads in shame.

The Adjuster-of-the-French-School had no doubt whatever but that the honorable gentleman who had just spoken could explain the matter fully. But if he could not, then he, the A.-of-the-F.-S. *could* and would. The subject was one of immense importance and universal interest. There was no other of such vast and wide-spread influence. Therefore, as a matter of course, he had investigated into it, and had extricated the secrets of nature from the arcana of the universe. He had even surmised that all things were the outcome of magnetism,—in short, were magnetism in different stages of evolution,—some material, some spiritual, some etherial. He thought that magnetism first got aggregated into inciferous conglomerations of atoms till they attained the density of materiality, taking different forms according to the coincidencies of the molecular attractions, and, then, by the law of natural selection and survival of the fittest, these forms elutriated continually nearer towards perfectibility, till they became evoluted in different degrees of refrangitation as we now behold them. Consequently, we ourselves were all mere aggregations of magnetism, and our watches were but different manifestations of the same wonderful and omnipresent principle.

If a watch was magnetized, all that was necessary was to differentiate the integral arrangement of the component particles in an appropriate manner, and they instantly assumed a non-magnetic state. The great secret was in the proper manipulation of the impalpable particles. It would be a delectable task for him to elucidate the *modus operandi*, and if Mr. Screwsqueezer should unfortunately fail to illuminate the subject to the indubitable satisfaction of this honorable body, then he himself stood ready to diagnosticate all its ramifications from the terrific rushings of the winged lightnings to the heavenly titillations of a lover's kiss.

The subject was then dropped, with the understanding that every one who *knew* anything reliable about removing the magnetism should state his method in full, in writing, for presentation at the next meeting of the Club. They should be sent in time to reach the editor of the CIRCULAR by the 25th of the present month, if possible.

As no one seemed desirous of answering Mr. Secondshand's query regarding two hairsprings in a watch, the Chairman called upon Mr. McFuzee to reply. That gentleman protested against being compelled to publish to the world his difference of opinion with a member whom he considered one of his best friends. But being reminded that the mandates of the Chairman were as inexorable and unchangeable as the laws of the Medes and Persians, he heaved a deep sigh, and then proceeded to sacrifice his feelings upon the sacred altar of allegiance to the Club. It was his opinion that, although there were some advantages to be gained by having two springs in a watch, one coiling up while the other was uncoiling, yet that practically nearly or quite all of them could be obtained by proper manipulation of a single spring. In support of this belief, he quoted from "Excelsior," than whom he knew no better authority on the subject. Then there was the difficulty of so attaching the springs to their studs that they should both be perfectly free from strain. For instance, if the studs did not stand exactly over their holes when free and out, then both springs would be under compression when the studs were put in place. This must be obviated by patient trials, moving one or both of the collets around, for it was necessary that both springs should be perfectly free, in order to secure perfect isochronism. And of course the only object of having two springs at all was to improve the isochronal action. He was therefore forced to the opinion that practically the advantages gained would not compensate for the greater complexity, liability to get out of place, and difficulty of adjusting properly. Yet others might very likely think differently; and, if so, he hoped they would not hesitate to express or send in their views. In expressing his individual opinion, he did not assume to settle the subject finally, but left it open to be further discussed, if desired.

MR. COLE'S TREATISE ON ISOCHRONISM, AND "EXCELSIOR'S" ESSAY.

A communication from Mr. J. Muma, of Hanover, Pa., was then read, expressing his disappointment with Mr. Cole's Treatise on Isochronism, now being published in the *British Horological Journal*. The Chairman observed that as Mr. Muma's letter was not addressed to the Club, it would not be proper to discuss it.

Mr. Regulator arose, and wished to say that Mr. Muma was not alone in his feelings on that subject. Great expectations had been raised that Mr. Cole would give new and valuable information and that the subject would be exhaustively treated. But he had not yet stated a single new fact,—only gone over the same ground and given much the same theories as the writers of the different Prize Essays. The speaker would not criticise the good taste of driving into arguments before he came to a starting point, because it was the privilege of a writer to state his information in his own way. But as to the sub-

ject-matter, there was a general disappointment expressed by workmen in this city. He hoped, however, that Mr. Cole might yet meet expectations after he got further into the subject. But he felt proud to refer to the treatise published in our organ, the CIRCULAR, in comparison with it. He considered that there was more real and valuable information in a single page of "Excelsior's" Essay than in the whole three numbers of Mr. Cole's Treatise that had thus far appeared. In view of the fact that "Excelsior's" Essay was about to be republished in book form, so as to be obtainable by all who desired it, he now moved that the Horological Club express its approval of it by officially endorsing it to our fellow-workmen everywhere, as the most full, trustworthy and practical treatise on the balance-spring, and the different adjustments of watches and chronometers, yet published anywhere. This motion was seconded, and carried by acclamation.

NATIONAL CONVENTION OF WATCHMAKERS.

D. H. Hopkinson, Esq., the editor of the CIRCULAR, came in at this moment, and stated to the Club that he had numerous letters asking if the National Convention was *sure* to be held, and when? Also, proposing that Mr. Grossmann, Mr. Hermann, and other distinguished horologists abroad be invited to attend. He asked what action the Club desired to take.

Considerable discussion was had, all being strongly of the opinion that the Convention ought to be held, and held in this city. The Adjuster-of-the-French-School, in particular, was very enthusiastic in its favor, declaring that "it might, could, would and *should* be held. Yes, sir, it will and *shall* be held, if I have to hold it myself."

Mr. Horologer said that conversation with a large number of persons had convinced him that the time he mentioned last month would be satisfactory to a great portion of the trade, and he now proposed, more definitely, that the Convention be held in this city, on the 23d of August next. The place of meeting, etc., could be announced in due season. The date named would allow time for the final arrangements to reach the trade in the August CIRCULAR. He hoped that the attendance would be general, for he could assure all that it was of more real and practical importance to them than they could now see. It would form an era in the history of the trade in this country, from which he believed great reforms and advances would result.

As to inviting horologists from abroad, it was finally concluded that as it would be unlikely that all who were worthy would be remembered, and it would appear invidious and like favoritism if any were overlooked, it would be better to make the invitation general.

The following resolutions were then unanimously adopted:

WHEREAS, We recognize the advantages of organization and united action, as so clearly shown by the associations in other branches of business, and believe that the present time is auspicious for our own trade to avail themselves of the same, therefore,

RESOLVED, That the Horological Club, of New York City, does hereby extend a hearty and earnest invitation to the trade throughout the country, whether artisans or tradesmen, to meet in National Convention on the 23d day of August next, in this city, to discuss such questions and take such action as shall be decided upon.

RESOLVED, That members of our craft in other countries are each and all cordially invited to be present, and join in our discussions, or present papers on such subjects as they may be specially informed or interested in. And, should their number be sufficient, that a World's Convention of Watchmakers and Jewelers be held.

D. H. Hopkinson, Esq., was then appointed to act as the representative of the Horological Club, in consulting with the trade and making such arrangements as might be thought proper. Every member of the trade who intends to be present is requested to write on a *card* his full name and address, name of the firm (if any) to which he belongs, and his particular line of business, and mail it to Mr. Hopkinson at the earliest possible moment. This information is necessary for making proper provision for hall, etc. Any further remarks, such as subjects for discussions, etc., etc., should be written separately, and they will be handed to the proper committee. Every reader of the CIRCULAR is earnestly requested to bring this matter to the attention of all workmen within his reach, who may not happen to be subscribers, in order that the attendance may be general.

A WORK ON JEWEL MANUFACTURING.

The Secretary then reported that he had unfortunately mislaid a letter from a gentleman in Minneapolis, who wished an early reply. But he believed that his inquiries were as follows:

Is common coal fit for melting gold for making jewelry? Is common copper wire pure enough to use for alloying? Give the name of a reliable work on refining, alloying and working gold and silver, that will assist me in manufacturing. Also price, and where to be obtained.

MINNEAPOLIS.

Mr. Blowpipe said that the proper kinds of fuel were charcoal and coke. They should be broken up into pieces of suitable size to burn well. For small operations the pieces should be about the size of a large walnut. Ordinary copper wire is not reliable for alloying purposes. Pure copper for alloy is sold by jewelry material houses in all large cities. And commercial copper, such as copper wire, sheet, etc., would be made comparatively pure by igniting it for half an hour in a covered Hessian crucible, having added one-third its weight of nitre, which oxydizes the traces of the metals with which it is contaminated. There was an English work called "Hall Marks, or Manual of Reference for the Gold and Silversmith, by Alfred Lutschaunig," which might meet this correspondent's wants. He did not know the price, nor any other works on the subject, although very likely there were others that he had never seen. He never had a very high opinion of learning such things from books, which would account for what might seem inexcusable ignorance of them.

"Ask Mr. Screwsqueezer," said the Chairman; "he can tell us all about it." But it was discovered that that gentleman had just taken his departure. The Chairman then suggested that there were probably many others who would like the same information that this correspondent had asked for, and that any one who knew of a good work on that subject should send in to the Secretary of the Horological Club the name, and also the price, and where to be obtained, if possible. On account of an impending storm, many of the members were anxious to reach home as early as practicable, and the Club then adjourned.

Scientific Notes.

INTERNAL CONSTITUTION OF MAGNETS.—Some recent researches of M. Jamin in regard to the constitution of magnets seem to point to some curious facts. M. Jamin, having prepared a series of steel bars containing increasing proportions of carbon, those most highly carbonized, and so hard as to require *aqua regia* to dissolve them, were but feebly attracted by the electro-magnet, and feebly magnetized when placed in a coil traversed by a strong current. Experiment seems to show that for such highly carbonized bars the magnetism resides chiefly in the exterior, disappearing rapidly when the bar is submitted to the action of the *aqua regia*. Three-fourths of the imparted magnetism were found to be comprised in a layer 1 m. m. in thickness, which enveloped in a core 8 m. m. 4 thick, containing the remaining one-fourth of the total magnetism.

PHOTOGRAPHING ECLIPSES.—Since 1860 almost every eclipse of the sun has been photographically recorded—from 1860 to 1868 for the purpose chiefly of determining the nature of the red prominences, and in 1870 and 1871 to ascertain whether the corona is an appendage of the sun or an effect produced on our own atmosphere. In 1870 it was determined to adopt a properly corrected photographic lens, and by a graduated series of exposures to obtain, if possible, the whole pictorial effect. This method having been found successful, it has been adopted in all eclipse work since. Mr. Alfred Brothers suggests that for taking the image of the corona three achromatic lenses of 5 to 6 feet focal length, corrected for the ultra rays, should be constructed, and he states "that the light of the corona is sufficient atinic to produce good pictures when an instrument of long focus is used."

PROF. LIELEGG gives some details of the method by which Japanese damascened metal plates are manufactured. From thirty to forty thin sheets of gold, silver, copper, and different alloys are placed one upon another in a certain order, and welded together by the edges, so that the whole forms a single thick plate. By the aid of awls of different forms this plate is then pierced with wholes, the sides of which show the edges of the plates passed through. The mass of plates is then submitted alternately to hammering and rolling until it becomes very thin, and the holes have completely disappeared. The concentric figures are thus stretched, at the same time that their parallelism is preserved; and the result is an almost innumerable quantity of straight, broken, and oblique lines, which do not cross one another, and are distinguished by a variety of colors—a variety which can be still further increased by steeping in certain acids.

Cyanide of Potassium.

In the course of a lecture on unhealthy trades recently delivered before the Society of Arts, Dr. B. W. Richardson said: Serious symptoms are sometimes produced by the absorption of cyanide of potassium in those who are engaged at work where solutions of this substance are employed. The danger effects especially those who are engaged in photography. It seems to me to arise by direct absorption of the poison by the skin, but only when the skin is wounded, abraided or chapped. My attention was first called to this subject by a photographer, who consulted me for a series of symptoms with which I was not familiar, and which could not be accounted for by any evidence leading to the suspicion of organic nervous disease. The symptoms came on only when he was at work, but they lasted for some hours after he had left his work. I suspected they might be due to the inhaling of the vapors which are present in the working room of the photographer; but this theory was excluded by the fact that he had worked many years in the same place without being affected in the same way, and that none of the workmen who were with him in the same room were similarly affected. These circumstances led me to look out for local absorption, and I found on inquiry that the hands of the man were severely chapped, and that they were so on every occasion when the phenomena recurred; for the phenomena were repeated many times before their cause was discovered. We were now on the right track, and by his giving up that part of the employment which involved exposure of his chapped hands to the solution, the patient experienced a quick cessation of his symptoms, and recovery from them without their recurrence.

The symptoms are exceedingly characteristic; they begin with vertigo. A sense of giddiness is gradually developed, with a sensation as if all objects were passing in a circle, and then as if the body of the affected himself were turning round. At times there is a further sensation of falling, as though, of necessity, the body must pitch forward, and as if the lower limbs were unable to support the weight of the body. These symptoms may last for some hours, and if they are not exceedingly severe, they will subside when the work of the day is over, and will not recur until the resumption of labor on the following day. They may be entirely misunderstood, and indeed often are misunderstood. They are attributed to biliousness, or to indigestion, in their lighter manifestations. When they become more severe another symptom is added, the giddiness or vertigo is attended with nausea and faintness, so that it is impossible to go on with the work. But even from this more extreme condition recovery is rapid after exposure to the cause ceases.

Under still further exposure the body becomes cold, and an extreme shivering takes place, which is succeeded by a prostration that altogether incapacitates from work, and is connected with a series of new nervous phenomena of great moment. The first of these nervous signs is double vision; the patient, that is to say, in looking at a single object sees it as if it were two objects, or as if both eyes were separately discerning the one thing. Finally, there are muscular tremors which are altogether beyond the control of the will. The tremors do not amount to spasms of the muscles, but they are sufficiently active to cause involuntary movements of the limbs, and they are attended with occasional starts and twitchings. The temperature of the body is lowered, and the appetite is greatly reduced: the secretions are confined, the face pale, the action of the heart quick, weak, and irregular, and the sense of exhaustion urgent. The mind throughout is unaffected, but there is perhaps an unnatural tendency to sleep. The poison being soluble finds its way out of the system with moderate rapidity, and thereupon all the severer symptoms are removed, but some remain for several weeks. The strength returns but slowly; dyspepsia continues as a very troublesome symptom; anæmia is a marked condition, and the blood, which has been rendered very fluid, escapes too freely from wounded surfaces.

Some examples of poisoning by the local absorption of cyanide of potassium have been recorded, in which symptoms still more alarming than any I have seen have followed upon the accident. One remarkable case of this kind is given by Dr. Davanne. A gentleman who had stained his hand with nitrate of silver endeavored to remove the stain by rubbing it very freely with cyanide of potassium. In this process he slid under the nail of one of his fingers a small portion of the cyanide salt. At first he did not notice what had happened, but in a little time he felt a severe pain in the part, which, after a few minutes, was followed by an intense vertigo, so that all objects appeared to be moving around him. To relieve himself promptly he conceived the idea of washing the part freely with vinegar. The vertigo now increased, was accompanied by shiverings, extreme pallor, complete loss of sight, and entire prostration; even the power of speech was lost, but the intelligence was throughout preserved. The limbs were very cold and as the sight returned, the phenomena of double vision were manifested. These alarming symptoms were not removed altogether within a period of ten hours, but perfect recovery ultimately took place.

Davanne assumes that in this instance the symptoms were intensified by the application of the vinegar. He believes that by the use of the vinegar the cyanide salt was decomposed; that hydrocyanic acid was thereby directly produced, and that on the absorption of this poison the symptoms were so actively developed. It is worthy of remark, however, that the symptoms appeared before the acid was applied, and might, therefore, have been due to the direct absorption of the salt. The changes which the salt undergoes in the presence of the animal secretions, and in its course through the body, have not as yet been discovered. It is known, however, that the iodide of potassium salt is decomposed within the body, and the probabilities are strong that the cyanide is also decomposed, and that the symptoms are due either to cyanogen, or, as Davanne supposes, to hydrocyanic acid.

While on this topic I may with advantage offer a word of precaution respecting a practice which is commonly adopted by gentlemen who are engaged in photographic pursuits, and which had better be avoided. It is customary for the photographer, when his hands are deeply stained with nitrate of silver to clean them of the stain by using cyanide of potassium. The process effectually removes the stain, but it is always attended with some risk, and when there are any sores on the hand, the risk becomes actually dangerous. It is best, therefore, to use some other potassium salt than the cyanide for the purpose named.

Field Glasses.

A traveler who has wandered in many parts of New Zealand and Australia, writes that he wonders a greater number of good field glasses and field and opera glasses combined are not exported to those colonies, especially to New Zealand. He mentions having bought one of the latter at Melbourne, with black patent leather case and long strap of same material sewed to same for wearing round the shoulder, for £2. The glass was a black one, double-barrelled, done in morocco and extended by a screw; the length of it seven or eight inches; the best glass he ever had in his life. He used it for two years, in the bush, at sea, and at the theatres as a dramatic critic for one of the colonial papers; and he found it equally excellent in the three instances. He used it constantly, and at the end of the time specified, when traveling on foot in the middle of the New Zealand bush, sold it to a working-man, a shepherd, for the money he paid for it. He has since become convinced that a great many shepherds—and there is, of course, a considerable number of them now through out New Zealand—would gladly buy such articles if they had the opportunity; indeed, many of the squatters, or runholders, would also have been glad to obtain a similar instrument; singled barrelled ones are not nearly so good for looking after sheep. At any rate, he saw very few of any kind in the shops in towns like Dunedin, Christchurch, and Wellington. Good telescopes are much sought for by the proprietors of sheep and cattle stations in Australia, but in Queensland and the new colonies if these gentlemen and their employees had any opportunity near them of handling good field and opera glasses they would purchase them and not be afraid of the cost. A theatre has been lately started at Brisbane, and there are some at Dunedin and Christchurch, so that there is always some demand at those places for small, elegant opera glasses.

A Treatise on Isochronism and Elasticity of Metallic Springs.

BY JAMES FERGUSON COLE.

Dr. Hooke's anagram, "*ut tensio sic vis*," implies a law in nature admitting of no disproof; that, as the force of gravitating weight when attached to a vertical coil of wire, as a helical spring suspended from a fixed point, that, by the weight so attached, the teusion induced in the spring will be the just equivalent of the weight; this is a clear demonstration, but the sonorous property of a vibratory spring admits of no evidence beyond what is indicated by the tone given out, and its euphonic effect on the ear by experimental trial of only a few seconds' duration.

Now, admitting the axiom which makes the tensile force or elastic resistance of a balance spring to represent the force of gravity on a pendulum, and that the balance while in motion operates in contending with its variable resistance, the balance and spring governed by momentum follows the law of reciprocating forces, and leads to the inference that isochronism may be the ultimate result. This, however, is not known with certainty by any investigation; the question, therefore, can have no solution otherwise than by the customary test of mechanical trial, subjecting the balance momentum to be reduced by a fractional impediment from side bearings of the balance pivots.

Pivot friction operating in this pernicious way I regard as so great an evil, that the highest practical skill is commonly baffled in the endeavor to overrule its detrimental influence; it, however, is sometimes found on trial of a newly applied spring that the long and short arcs are isochronally right, without the need of any correction; but this accidental result so seldom happens it has led to no explanation of the cause.

NOTE.—The accidental right result here referred to could not have occurred without leading to the conclusion that the conditions necessary to producing it must have existed. A suitable motive power would sufficiently account for the above correctness as a mechanical consequence.

Dr. Hooke adopted another mode of experimental trial by attaching a flat-formed spiral spring to an axis with pivots, the outer coil of the spring being fixed to the frame; a brass pulley, with a grooved rim, was fitted firm upon the axis, the pulley carrying a fine thread and a light scale pan; in it was placed in succession a series of equal weights: these in their descent passed over equal spaces as marked on the pulley by an index. Now, as the several weights were added one to another, the sum of weight force accumulated, and so did the tensile resistance of the spring accumulate in exactly corresponding ratio, and illustrating the natural law of gravitating force and elastic resistance of the spring, in the closing direction only, but showing no effect of motion in the contrary opening direction of the spring. On this nothing further can be said until a new model for experimental trial of the elastic resistance of the balance-spring, in both directions of its vibratory actions, is made for the experimental purpose.

This new model is now completed, and the mechanical effect produced on the spring by successive addition of weights showed no *visible* difference on a scale of equal parts, for the moment of trial, whether in the opening or closing direction; such trials admitting of no extension, the result is conclusive only as far as getting a coarse, experimental answer as to difference in the two semi-arcs. On this question nothing can be got from the seconds hand.

The knowledge gained by this experiment, though not fully satisfactory, yet without it a doubt would have remained as to difference of indication by trials in the two directions. Disparity of force, though inappreciable by this, may possibly be supposed indicable in some other way which happens to be quite impracticable, and, therefore, no satisfactory conclusion can be reached; it, however, is evident that in the opening action of any convolute-spring, its weight of wire is carried outward from the balance centre, causing some small loss on time, like the touch of a timing-screw, and in the closing action of the spring the weight of wire is carried inward to the balance centre, causing a contrary difference of time between the two semi-arcs, which finally may have no effect on the general rate, as both are included in time of a double vibration. I mention this only to show that the question of semi-arcs has not been overlooked, and may allow some further remarks.

As relating to any scientific question, the first and most important point is correctness of the data on which the proposed argument is based; this, in the present instance, requires careful consideration, as there exists a difficulty in arriving at strictly a definite knowledge of what the data are.

1st. If it be a philosophic axiom that all vibratory bodies inherently possess the property of isochronism, the axiom, as referring to a balance and spring, can only be regarded as a *statement*, conveying no evidence of the existence of isochronism or the contrary; this being the case, the question arises, what is the evidence? In answer, it may be said, the natural sonorous effect of any mechanical spring adapted to the production of sound, apparently is such; the sound, by its uniform pitch, or oneness of tone, through the long and short arcs of vibration, being the only indication that all the varied arcs of motion producing the sound are performed in equal time for the short period of their duration, the greatest extent being only a few seconds of time after any given blow or impulsion.

That isochronism would truly be manifest, could the motion and sound be continued through a lengthened period of time for observation, is also a point on which no satisfaction can be obtained, by reason that neither the long nor the short arcs of motion can be perpetuated without the addition, and also the detrimental influence of a secondary force or complication of forces, frictional and other resistences, inseparable from the mechanism necessarily employed in such experiment.

2d. Elasticity, being a property of matter, can only be exhibited as the result of some force operating to distend, compress, or bend the material or spring to be acted on, from its apparently quiescent condition; but that such quiescence is naturally a state of absolute rest is denied by the fact that all matter is held, at all times, in only a condition of apparent repose by a balance of the force and resistance constantly exerted, as by gravity on the one hand, and elasticity or resistance on the other; such force and resistance operating in the instance of a simple mechanical spring as it is supposed to do universally.

Take, for example, a straight, square bar of tempered steel, of any convenient dimensions which admit of being bent; fix the bar horizontally by one end, held firm in a vice or otherwise, and to the free end of the bar attach or suspend a suitable weight, by which the bar will be deflected as an elastic lever; in this operation of the weight, it is evident that no flexure, however small, can take place in the bar, without compression of the particles on one side, and distension on the other side, while the mean centre line remains neutral, and a degree of tension is raised in the bar corresponding to the power applied, in addition to the effective weight of the bar itself, and its influence as a lever.

NOTE.—Suppose the steel bar 12 inches long, two-tenths thick, and deflected by a suitable weight.

The bar and weight under these circumstances will become quiescent, and thus establish the apparent stability just implied by the equilibrium of force and resistance, as the normal condition of matter appearing at rest.

3d. Under suitable proportions of length, breadth, and thickness, the two ends of a *flat* steel bar may be bent to a complete circle, or more, if continued as a spiral or helix, the inner and outer extent of circumference, by difference of measure, showing a definite change of radial length in the two sides of the flat steel bar, and being so bent, another effect arises from the bending; that while the inner surface of the bar is rendered concave lengthwise, the same inner side is rendered convex in its breadth, "theoretically" a consequence of the excess of lever force applied in compressing the greater number of particles contained in the length of the bar, against the lesser number of particles contained in the breadth.

These particles, by compression, necessarily occupy more space in the transverse direction, and thus give the form of an arch across the inner surface or width, as observable in ordinary main-springs and other similar instances; in effect, thickening the spring, and increasing the ratio of resistance, as compared with the deflection of the bar, or

otherwise dependent on the extent of winding from the lower to the higher degrees of tension.

4th. Springs formed of round wire are also subject to increase of strength by similar deflection, as may readily be proved by accurately fitting the diameter of a straight length of perfectly round steel wire between the edges of a parallel notch, cut in a thin plate of steel; if the round wire for experiment be one-tenth of an inch diameter, and bent to a curve of about one-fourth of an inch radius, the wire in one direction of the circular bend will not enter the steel gauge, as by the bending and compression of particles the round wire is rendered permanently oval.

This evident change of form, though not detectable in a vibrating spring, must, in a proportionately small degree, necessarily take place in action, and, while bent, produce the before-mentioned effect of increasing the resistance as compared with the extent of flexure, and whether the bar or spring in its general form be a straight line or a curve, the effect of any deflection from the natural set of the metal will be same in all cases.

A straight length, or bar of perfectly round wire, will necessarily vibrate at the same rate while perpendicular, and produce the same sound in all horizontal directions of its radial vibratory motion. The foregoing remarks refer entirely to observed mechanical facts, resulting from carefully made experiments, and which facts may reasonably be regarded as favoring the theory of a natural isochronism in the vibratory action of *free* elastic bodies, though not a primary principle of elasticity.

5th. The matter forming any flexible body must have weight, and, however small in amount, and though at rest, necessarily has a gravitating tendency in some direction; and by the force of its own gravity, dependently on the disposition of the matter as regards its centre of motion, the rate of vibration of any simple spring, of whatever form or character—with only one exception, "the free suspended helix of Dr. Hooke"—will vary in rate of vibration, proportionately to the difference of the force of gravity arising in itself from any change in position of the spring here considered.

MODES OF TRIAL.

The term isochronism implies only equal time under unequal arcs of vibration, without bearing at all on the principles which produce equality of time in the relative vertical positions of the watch, though the customary process of trial for what is usually called isochronism is by taking the mean result of any two opposite vertical positions, say for three hours each, against six hours in the horizontal or laying position, as being more simple and expeditious than the mean of four vertical positions, all of which *four* should finally be tested for rack trials.

By this mode of trial it will be seen that the mechanical conditions differ, as in the vertical or hanging position, the usual turn-and-half vibration, with a free escapement, will be reduced about one-fifth of the whole motion produced on the balance pivot end, or at least to a turn and a quarter as the sum of the two semi-arcs of the balance vibration, by the greater friction of the balance pivots on their side bearings, and that more or less in proportion to the diameter of the pivots, or by excess of weight over diameter of the balance. Increasing the diameter, and diminishing the weight, modifies the pivot friction to some small extent, but still a frictional fault remains to be corrected.

Again, if the short arc be produced while on the pivot end in the laying position only, by artificial suppression of the motive power, as by letting down the mainspring, the pivot friction will remain alike in this dual case of trial in the horizontal position only, in which the experimental means taken for reducing the vibratory arc will alter the primary condition of the balance, such reduction of balance motion, by diminished motive power, being impedimental to the former freedom of the balance, by the diminished impulse power and consequent reduced momentum, both but imperfect tests of natural isochronism in the spring, and, therefore, the first conditions being altered, the results arising cannot be taken as evidence of the improperly assumed fact.

Suppose, therefore, the motive power restored to its first condition, the time now given by short arcs of vibration, whether produced by change of position, by casual impediment to the balance by thickened oil retarding the general mechanism or otherwise, can only exhibit what is called error, or truth of isochronism, by comparison of the rate of going for a given period, say 12 hours on the pivot end in the horizontal position.

Now, if with a perfectly poised balance, the two vertical positions, 12 and 6, are afterwards tried six hours each, and are proved to agree one with the other (and which, with *any* kind of balance-spring, properly applied, will be near the truth), other conditions being right, the mean result of these two six-hour vertical trials should be added together as the standard for comparing as a 12-hour trial, with the previous 12 hours tried on the pivot end in the horizontal or laying position, and if these two 12-hour results are equal, the chronometric isochronism will be regarded as correct. This, however, must not be taken as the isochronous effect of the spring alone. On this point the question arises: By what means can the isochronous property of a spring, as applied to a balance, or any other kind of simple spring vibrating quite independently of a balance, or of any recording mechanism, be demonstrated?

The answer to this requires but little thought, as the proof is a mechanical impossibility, there being no evidence beyond sonorous effect of a vibratory simple spring, whose vibrations cannot be recorded or perpetuated at any extent of vibration under any conditions whatever beyond the sonorous limit, without destroying its natural property; and, therefore, notwithstanding the assumed evidence by the equality of sound from the simple tone of a musical spring, with its gradually diminishing arcs of vibration, the solution of this problem of its natural isochronism through higher arcs will ever remain obscure, though it be a theoretically probable truth; while the commonly expressed isochronism of an ordinarily complete chronometer can only be the mean result of all the forces and resistances between the motive power and the escapement lockings, together with the varying resistance of the stud and collet leverage, pivot friction, etc., balancing each other through the long and short ares of the balance vibration. According to my own experience and judgment, pivot friction, and other resistances in the escapement mechanism, are the chief causes of isochronal defect in pocket chronometers and watches, it being, in regard to these, and also to marine chronometers when under trial for isochronism, quite irreconcilable that the necessarily great resistance of a chronometer locking spring, or the locking resistance of lever escapement pallets, can be brought into action without some retardation of the short ares, during which the balance momentum is frictionally reduced, and, consequently, is less effective than when the balance, at its full extent of vibration, is at its highest velocity, showing, therefore, a mechanical cause of error through a few degrees of the short ares of vibration, which, under ordinary conditions, may, in some instances, be corrected by destroying what should be the natural equability of a properly applied balance-spring, and thus creating a second evil by correction of the first, through artificial deformation of the true figure of the spiral, which, in connection with a right state of the escapement and equilibrium of the balance, should be strictly preserved. So strongly have I regarded the detrimental influence of pivot friction, that as early as 1850 I was induced to make an instrument for testing the amount of impediment to motion of the balance by simple change from end-bearing of the one pivot to side-bearings of both pivots from friction.

TEST OF FRICTION—REFERENCE NO. 3.

The bad influence of friction was fully shown by this small instrument, which was constructed simply as a brass pillar four inches high, mounted on a suitable stand; on the top of the pillar was fitted an arrangement convenient for allowing a jeweled plate, cock, and pivoted balance to be attached, with liberty of being moved for adjustment to any required position. All being so far ready for trial, with balance pivots free in the jewel holes, with also a slight tempered impulse-spring for action on a pallet, there was also in the balance rim a check-pin, and a set-off catch to hold the pin and spring

ready for action, after setting the spring to a strength sufficient for giving impulse to the balance, so that it would continue to run on the rounded pivot end during 100 seconds by the clock.

In this case the balance motion was the result of momentum only, without a balance-spring; this determined, the position was altered so that the balance, of 20 grains weight, should rest on side-bearings of the pivots; and repeating the trial under this change as before, the balance came to rest in exactly 20 seconds. The opposite pivot was finished with a perfectly square end, and set again on trial with this square end-bearing, and in this way the motion continued exactly 20 seconds, as in the previous trial on the side-bearings of both pivots. After this the balance was set at an angle of 45 degrees, and by this, causing both end and side friction of the pivots, and tried diagonally in this manner, the motion of balance contained only 16 seconds.

The results obtained by these experimental trials were that the balance momentum lost, by friction on the pivot side-bearings, was four-fifths of the whole motion given by action of the balance when on its rounded pivot end; but still, in this condition of the trials there remained a further amount of friction to be accounted for, or the run of the balance would have continued longer than the 100 seconds shown by the first experiment.

Regarding position adjustments, it must be understood that every department of the watch has been thoroughly and carefully examined; and if so, the timing results on trial of position ought to be satisfactory with a balance exactly poised; but as there is no means of ascertaining in case of an apparent error, whether the fault arises from a frictional defect of isochronism or from a defect of equilibrium cannot be known, as neither of these mixed influences admit of separate trial. Comparative trials, therefore, cannot be judged of otherwise than as an obscure, though sometimes accidentally right result when it happens, showing how great would be the value of a principle by which pivot friction could be overcome.

Acceleration of daily rate is another influence of well-known interference with result; this is an invisible principle—so obscure that no clearly defined reason has been given, otherwise than as shown by long-continued trials and observations, or as hypothetical conjectures. I have never known of any conclusive argument being advanced as a satisfactory base of theory on this subject. Acceleration is a consequence attendant on recently completed chronometers and conspicuous on early trials; it goes on for a considerable time until after long-continued action of the balance-spring, the molecules of steel forming the spring are supposed to concentrate more closely, and progressively assume a settled state of mathematically less bulk, and consequently less strength until the acceleration is ultimately lost.

It may be asked, Why are the usual inward curvatures from the general coils in a cylindrical spring is made use of? The answer is, that without the terminal curves, the spring attached to to a collet and stud at the full radius of the spring would produce not only an extremely distorted action, but would destroy the power of correction for any but a very limited arc of vibration, the absence of the curve being incompatible with the requirements of a more extended arc, and hence the necessity of terminal curves, which, if good in effect when carried inward to the half-radius of the spring, as is customarily done, will, in conjunction with a right condition of escapement, be still better when carried nearer to the balance centre, as satisfactorily proved in practice. For this reason some cylindrical springs are made with a few spiral coils at the bottom, in order to reach a smaller collet; this is found of good effect as tending to preserve the equilibrium of the weight of wire in the cylindrical body of the spring, in harmony with the equilibrium of the balance.

After this I believe it will be sufficiently obvious that whatever may be done for preserving the conjoint equilibrium of the balance and spring, that even absolute perfection on those points can have no influence or interference whatever with the simple isochronous property of the balance-spring itself, that property of the spring being an entirely distinct question, requiring careful consideration, inasmuch as by the combined operation of the two principles of gravity and elasticity jointly existing in the balance and spring, the mixed results may be confounded; and, moreover, it being the customary practice to test isochronism by trials in the hanging and laying positions of the watch, which produce a difference of about one-fifth of motion on the whole extent of a turn-and-half vibration, and show only the results belonging to these two specific distances as ares produced, how can such results prove the isochronism of intermediate ares, or ares of any other extent in which the crank leverage of the collet and stud produce through the whole range of action varying but undefinable influence? Under these circumstances the results are found, and where correction is needful the supposed causes of error will have to be dealt with as experience and judgment might determine. No rule can be given for this.

I may here remak that as loss of time in the short ares is the common consequence of mechanical impediment to free vibration of the balance, such fault in some cases would be corrected by the accelerative force of impulse from the escapement; but this, if put as a question, can have no solution, as no definite value can be assigned to either of these contrary influences. It is, however, certain that the impulse force and locking resistance, as contending principles, correct each other to some extent; but if by trial an error of isochronism remains, it will have to be corrected artificially.

In the ordinary chronometer escapement the resistances of the locking spring and discharging spring take effect near the balance centre, while the impulse force, acting as it does on the impulse pallet at a greater distance from the centre, is more effective in quickening the short ares; but it must be observed that the impulse given at this greater radius becomes gradually of less effect in the long ares up to the limit of a full vibration, as will be shown by the following reasoning:

A balance, set in motion from a state of rest, goes on increasing in velocity by a succession of impulses, when, on reaching the maximum extent of vibration, the whole of the impulse force per beat is expended by the chronometer scape wheel tooth following the impulse pallet or roller with a diminished intensity until the two velocities of the wheel and roller becoming equal, no higher velocity of the balance can arise from a repetition of impulses from the motive power. This being the case, it is evident that only a very small amount of acceleration from the wheel force, in the long ares of vibration, can take place, as, if not so, the vibratory motion of the balance would have no limit. On the other hand, impedimental resistances, opposed to the balance in the case of short ares, will necessarily be of less effect in retarding the long ares, as the impediment in unlocking the escapement will be overruled by the higher momentum of the balance, which is greatest at the moment of passing the normal point in both directions of the motion where the short arc resistances occur.

Having thus far examined the causes of a losing rate under short ares of vibration, the converse of the foregoing observations will have to be taken in explanation of the contrary results of a gaining rate, under the same extent of vibration as before for short ares.

Gaining in short ares, though not so frequent a result, is, when it happens, nevertheless, a fault to be corrected, and in most instances is remedied by opening the terminal curve of the over-coil of a flat spring, or the curve at each end of the cylindrical spring, for keeping the upper and lower curves uniform, and thus artificially shortening either spring, with regard to the stud and collet without unpinning. By this process the difference of mechanical leverage between the stud and collet so produced is commonly found to correct the gaining error in short ares, though by the former argument given on mechanical influence of the escapement, it may less properly be done by strengthening the chronometer locking spring, or by giving more drop on the impulse pallet—both very objectionable methods; a weaker mainspring is, in such case, the better remedy if the vibration is in excess.

To be Continued.

The gigantic telescope to be placed in the Paris Observatory for the French Exposition of 1878 will be fifty-five feet in length. Plans for the proposed instrument have been accepted, and its construction will be commenced at once.

Electro-Plating.

By F. L. F.

Gilding watch parts and other small articles for watchmakers has been for a long time a monopoly in Switzerland but is now applied to a large extent in France. These processes as given here were imparted by M Pinaire, gilder at Besanson, and are used by him in his own work. In the gilding of watch parts, etc., gold is seldom applied directly upon the copper, but in most cases there is a preliminary operation called graining, by which a very desirable grained and slightly dead appearance is given to the articles. By examining the inside of a watch we can see the peculiar pointed dead lustre of the parts. This lustre is entirely different from what we have already mentioned in speaking of the dead lustre caused by a slow thick deposit of gold, silver, or copper, the latter being much coarser and duller than the watch parts. It also differs from the dead lustre obtained with the compound acids, which is the result of a multitude of small holes formed by the action of the acids; whereas the grained dead lustre is formed by the juxtaposition, upon a previously even surface of a quantity of more or less large grains always in relief. The graining may be produced by different methods, and upon gold, platinum and silver—and since the latter metal is preferred we shall describe the process applied to it. First prepare the watch parts by obliterating the file marks, rubbing upon a wet stone and lastly upon an oil stone. The oil and grease which then soils them is removed by boiling the parts for a few minutes in an alkaline solution made of one hundred parts of water and ten of caustic soda or potash and rinsing them in clean water which should wet them entirely if all the oil has been removed. The articles are then strung upon a brass wire, after which some operators cleanse them rapidly in the compound acids for a bright lustre; others simply dry them carefully in sawdust from white wood. The parts thus prepared are fastened by means of brass pins with flat heads, upon the flat side of a piece of cork. Some use gutta-percha in place of cork, but the results are not satisfactory as with the use of cork, consequently not as popular. The parts thus held upon the cork are thoroughly rubbed over with a brush, entirely free from grease and charged with a paste of water and of the finest pumice stone powder. The brush is made to move in circles in order not to abrade one side more than the other. The whole is thoroughly rinsed in clear water and no particle of pumice dust should be allowed to remain upon the pieces or the cork. We next plunge cork and all into a weak mercurial solution which very slightly whitens the copper, and is composed of

Water	10 litres.
Nitrate of binoxide of mercury	2 grammes.
Sulphuric acid	4 "

The pieces are simply passed through this solution and then rinsed. This operation is neglected by many gilders, but when used it gives strength to the graining, which, without it, possesses no adherence, especially when the watch parts are made of white German silver dignified by the name of nickel by watchmakers, or when the cuvettes contain tin in their composition. In this state the parts are ready for the graining, that is a silvering made in a particular manner. We find the composition of the graining powders endless in variety; almost every gilder having his own according to the fineness of the grain. Below we give the formula used in the works of M. Pinairie:

Silver in impalpable powder	30 grammes.
Bitartrate of potassa (cream of tartar) finely pulverized and passed through a silk sieve	300 grammes.
Chloride of soda (common salt) pulverized and sifted as above	1 kilogramme.

This silver powder is obtained by immersing cleansed copper plates in a very diluted solution of nitrate of silver made with distilled water. The more diluted the solution is, the finer the kind of moss silver which is precipitated upon the copper and the more easily this moss is removed from the copper plate. The following is the method of conducting the operation: Dissolve 20 grammes of crystalized nitrate of silver in ten (10) litres of distilled water, then plunge into this solution five or six bands of cleansed copper having these bands long enough to leave a portion out of the liquor. Use for this solution any suitable dish of glass or porcelain, and keep the whole in a dark place for twenty-four hours, stirring the liquid now and then by the copper bands. This motion will loosen the deposited silver, and also present fresh surface of copper to the action of the liquid. When no more silver is deposited the operation is completed, and there is remaining a blue solution of nitrate of copper. This deposited silver powder is then washed by decantation or upon a filter until there remains nothing of the copper solution. Lastly, give it another washing with distilled water, after which the powder is carefully dried, avoiding contact with hard bodies, which may render the powder compact and produce a sort of cohesion of the molecules which is injurious for the further graining. At the present time most operators prefer buying the Nuremberg powder which is produced by grinding a mixture of honey and silver foil upon a ground glass plate until the proper fineness is obtained. The separation of the silver is accomplished by dissolving the honey in boiling water and washing the deposited metal in a filter until there is no trace of honey; after which the silver is dried at a gentle heat. This silver powder is sold in packages weighing a German ounce.

Correspondence.

TO WATCHMAKERS, JEWELERS AND OTHERS.

CAUTION.—It having come to our notice that one Myer Tobias, formerly a resident of Boston, is now traveling in Pennsylvania and by his representations fleecing the trade. We therefore caution the trade that we have no connection with said individual, nor has he any authority to buy, sell or make drafts in our name. Description of person—five foot six or about, dark complexion and a rapid talker.

S. & J. MYERS, 236 Washington Street, Boston, Mass.

SHALL THE WORST MEN HAVE THE BEST CHANCES?

Editor of Jewelers' Circular:

I noticed the article in the last CIRCULAR headed "A Noble Example," and read it with a great deal of interest, and can but wish we had men in our Jewelers' Association like Mr. James. And I wish it might be carried still further, not only by the jobbers but by the retailers. I think that the honest retailer who pays one hundred cents on the dollar would do well to refuse to buy of the jobbers that will settle with dishonest dealers for from 10 to 25 per cent. Then, too, there should be a distinction made in prices between the dealer that pays his bills when due and the one that the jobbers have to carry on their shoulders month after month by renewing notes, etc. I really think that the honest retailer should be protected in such times as these but it seems sometimes that the dishonest ones are thought the most of and if there are any favors shown they are apt to fall to the ones that deserve them the least.

Yours truly, WATCH.

[The following letter, substantially a copy of that wrote to a Chicago firm by the Western writer who signs it, is transmitted to us by him for publication. ED.]

NEOSHO, MO., MAY 31st, 1876.

MR. ——, *Chicago, Ill.*

SIR:—I herewith return you your price list. I do not deal with such houses as yours which send their price list to every other man in the country, and which—nobody can deny it—breaks up and ruin the jewelry trade. I have seen here several of your price lists, laying publicly in the stores on the counters. I, with a good many other honest jewelers in the country, (and more will join) are determined to work as a body against such houses as they do against the whole retail trade. I will send this letter to the JEWELERS CIRCULAR in New York so that the 4000 jewelers in the United States shall have knowledge of it. I will do the same with all houses who act in this way. I am not afraid of coming to the front, as I have proof of what I say and write.

P. SCHUMANN, Jeweler.

We call the special attention of our readers to the announcement elsewhere of the new fine line of watches introduced by the Messrs Tiffany & Co. These superior movements are of beautiful finish and their accuracy is guaranteed to be of a very high degree. They are among the finest of the high classed movements introduced into this market, and the trade will do well to look thoroughly into this line of goods. Mr. George R. Collis, who is manager of the wholesale watch business—and, as is well known to the trade, Messrs Tiffany & Co. have a special office for that branch down town—is a gentleman of long experince, who has an excellent reputation with his many friends in the trade, and to those who don't already know him, we can promise that a visit to him for the examination of his new line of goods will be both pleasant and profitable.

Workshop Gossip.

LATHE FOR SCRATCH BRUSHES.—An ordinary lathe is used for scratch brushing, upon the spindle of which is fixed a circular brush of brass wires. A wooden frame covers the wire brush; it is open in front; the top supports a small reservoir, from which a slender jet of water runs upon the brush. A board receives the projected water, and lets it fall into a zinc pan resting on the bottom of the box.

TO PIVOT.—When you find a pivot broken, you will hardly be at a loss to understand that the easiest mode of repairing the damage is to drill into the end of the pinion or staff, as the case may be, and having inserted a new pivot, turn it down to the proper proportions. This is by no means a difficult thing when the piece to be drilled is not too hard, or when the temper may be slightly drawn without injury to the other parts of the article.

WATCH DRILLS.—The making of pivot drills is a great source of annoyance to apprentices and improvers. The cause of a drill not cutting is as often the fault of the material as the tempering; for instance, make a drill of a common black steel needle; if not sufficiently hard it will not cut, and if hard enough, it will chip or break, therefore we want the best material. Although soap, oil, or candles will temper a drill for brass, such as an ordinary Geneva pivot-drill, what is wanted is to prevent so many watches from being spoiled by having their pinions softened to drill them and put in pivots.

What I would recommend is this: Take a piece of broken steel wire that has been used in a pianoforte, fasten one end in the vice, and stretch it until it breaks; make a drill of it, size required, and for brass it may be made hard enough by waiving it in the air after making sufficiently hot, always commencing with the body first in fire, so as to let the heat run down gradually to the blade. Drills for pivoting are best hardened in oil, but the difficulty is to get the drill in before it gets cold, therefore I put a small piece of brass tube on the body of drill, and blow a light at it until the blade gets sufficiently hot, then put it in oil, take off tube, hold the blade with plyers, and hold body in the gas until the blue runs up to the blade.

To drill a pinion, procure a hollow runner to fit turns, make drill stock to fit inside runner, solder steel cap on end of runner with small hole in centre for drill to come through, chamfered on the outside to receive shoulder of pinion; place the pinion between old centre and cap of new one, put the drill through and drill slowly; this will save all bother of centering, and the pinion will not require a softening if the drill is properly made.

ON WATCH CLEANING.—The greatest care is necessary in taking the watch down and separating its parts. First, remove the hands carefully, so as not to bend the slight pivots on which they work, next, remove the movement from the case, and take off the dial and dial wheels; next, let down the main spring by placing your bench key upon the arbor, or winding post, and turning as though you were going to wind the watch until the click rests lightly upon the rachet then with your screw driver press the point of the click away from the teeth and ease down the springs; next, draw the screws or pins, and remove the bridges of the train on the upper plate, as the case may be, next, remove the balance with the greatest care to avoid injuring the hair spring. The stud or small post into which the hair spring is fastened may be removed from the bridge or plate of most modern watches without unkeying the spring, by slipping a thin instrument like the edge of a blade knife, under the corner of it and prying upward, this will save much trouble, as you will not have the hair spring to adjust when you reset the balance. If the watch upon which you propose to work has an upper plate, as an American or an English lever for instance, loosen the lever before you have entirely separated the plates otherwise it will hang and probably be broken. The watch being now taken apart, brush the dust away from its different parts, and subject them to a careful examination with your eye-glass. Assure yourself that the teeth of the wheels and leaves of the pinions are all perfect and smooth; that the pivots are all straight round, and highly polished; that the holes through which they are to work are not too large, and have not become oval in shape; that every jewel is smooth and perfectly sound; and that none of them are loose in their settings. See also that the escapement is not too deep or too shallow; that the lever or cylinder is perfect; that all the wheels have sufficient play to avoid friction, but not enough to derange their coming together properly; that none of them work against the pillar-plate that the balance turns horizontally and does not rub: that the hair-spring is not bent or wrongly set so that the coils rub on each other on the plate, or on the balance; in short, that everything about the whole movement is just as reason would teach you it should be. If you find it otherwise proceed to repair in accordance with a carefully weighed judgment and the processes given in this chapter, after which clean; if not, the watch only needs to be cleaned, and, therefore, you may go on with your work at once.

To Clean.—The best process is to simply blow your breath upon the plate or bridge to be cleaned, and then use your brush with a little prepared chalk. The wheels and bridges should be held between the thumb and finger in a piece of soft paper while undergoing the process; otherwise the oil from the skin will prevent their becoming clean. The pinions may be cleaned by sinking them several times into a piece of pith, and the holes by turning a nicely shaped piece of pivot wood into them, first dry, and afterwards oiled a very little with watch oil. When the holes pass through jewels, you must work gently to avoid breaking them.

SCRATCH BRUSHING.—Scratch brushing is to remove the dead lustre on an object by the frequently repeated friction of the points of many stiff and straight metalic wires, called a scratch brush, or wire brush. Its shape varies with the articles to be operated upon. A hand scratch brush is made of numerous wires, stiff and straight, taken from a bundle or coil of large diameter, so that the wires have little tendency to curve. For delicate objects, scratch brushes are made of spun glass, the fibres of which are very thin and elastic. For making a good hand scratch brush, choose a bundle or coil of brass wire of the proper thickness, and wrap a good string tightly around it for about two-thirds of the intended length of the instrument, usually about 8 inches Then with a cold chisel cut the bundle of wire close to the string at one end, and at 2 inches from the other end of the string wrapping. Dip the end closed by the string into a neutral solution of chloride of zinc and plunge into melted tin which solders all the wires, and prevents separation and injury to the hand of the operator. The tool is then fixed to a thin wooden handle which projects above the soldered end. Very small scratch brushes are necessary for reaching very small holes and corners. An old scratch brush, the wires of which have been bent in every direction, and fixed to a long handle, is useful for rubbing the inside of certain pieces, such as Etruscan vases. Scratch brushing is seldom done dry, the tools and pieces must be constantly wetted by a stream of water, which carries away the impurities. Good metalic deposits are only polished by the friction of the scratch brush; bad ones scale off from the defective adhesion. A large tub, with a board placed across it, on which to rest the pieces, may be used; and various solutions are employed to assist the brushing, such as vinegar and water, or sour wine, or solutions of cream of tartar, or alum when it is desired to brighten a gold deposit which is too dark; but generally a decoction of liquorice-root, horse-chestnut, marsh-mallow, or bark of Panama-wood all of which allow of a gentle rubbing with the scratch brush, with production of an abundant seum. Every five or six days the old liquid is carefully decanted, so as not to carry away the deposits at the bottom, which always contain some of the precious metals which are collected to be afterwards treated. For small objects and articles of jewelry, hold the scratch brush as a writing pen, and the motion is imparted by the wrist only, the forearm resting on the edge of the tub. For larger articles of bronze, hold the fingers extended, close to the forepart of the scratch brush, so as to maintain the wires, with a raised elbow, strike the piece repeatedly, with a sliding motion at the same time. When a hollow is met which cannot be rubbed lengthways, a twisting motion is given to the tool. Circular wire brushes fixed on the spindle of a lathe, and the wires of which move all in the same direction, have been constructed for certain pieces of silversmith work, such as forks and spoons.

Trade Gossip.

Leather belts are revived.

Fine cameos are much sought after.

Paintings are again appearing in bracelets.

Turquoise is largely introduced into bracelets.

Queen Victoria wears the Koh-i-noor as a brooch.

The *porte bonheur* bracelets continue to be popular.

Egyptian and Byzantine styles of jewelry are in vogue.

Fine rubies are rarer than any other jewels, and far more costly.

Shopping bracelets are composed of a chain and pencil attached

A combination of platinum and gold is universal among ornaments for gentlemen.

Black garnet jewelry has been revived for second mourning and plain demi-toilet.

Country merchants are more numerous at our hotels. They are buying at "hard-pan" prices.

New necklaces are composed of rows of gold beads divided at intervals by square blocks or bars of gold.

Who's the enterprising Yankee that's going to invent an ornamental whistle to be attached to a lady's bracelet, with which she can call a horse car?

There is some talk of the formation of an eccentric club in Chicago —none to be eligible to membership but those who pay 100 cents on the dollar.

Mr. E. F. Post, of the late firm of Post, Beach & Decker, can now go with his regiment to the Centennial. It has arrived, and weighed just *nine* pounds.

A petition is in circulation among the watch and jewelry trade asking that business be closed on the 3d and 4th of July, so as to give the boys a two-days' holiday.

"What is a dollar?" innocently asks the Chicago *Inter-Ocean*. Why, you ought to know well enough; it's the price of four brandy cocktails in Chicago.

A widow on Madison avenue wears with becoming pride a massive gold ring made from the plate of her departed husband's teeth. She takes to kissing that very naturally.

Messrs. Strasburger & Co., whose disgraceful failure will be remembered, have the audacity to offer their creditors 33 cents on the dollar in settlement of their claims.

Richelieu's remark, "There's no such word as fail" should be modified to meet the present unpleasant times, so as to state about how many cents will be paid on the dollar.

Fans of Russia leather remain fashionable; other plain kinds most in vogue are the silk ones with colored paintings and monograms, and the ordinary fancy Japanese, which sell this season at very moderate prices.

Mr. Eugene J. Cuendit, of the opulent jewelry firm of Eugene Jaccard & Co. of St. Louis, has led to the hymenial altar Miss L. C. Sells, one of Missouri's fairest daughters. The happy couple will go to Europe.

The gold dinner set, consisting of eight pieces, presented to the female department of the Catholic Protectory at Westchester, by Pope Pius IX., has been raffled and won by Mr. James Usher, on ticket No. 728.

A fellow from the country broke with his elbow one of the glass show cases of a New York jeweler. The liability amounted to $6.50, while his assets consisted of one lonesome nickel in cash and the balance in profound regrets.

An auctioneer, at a late sale of antiquities, put up a helmet, with the following candid observation: "This, ladies and gentlemen, is a helmet of Romulus, the Roman founder; but whether he was a brass or iron founder I cannot tell."

Mr. John A. Lee, of Mansfield, Ohio, reports that the clock furnished by the Seth Thomas Clock Company for the Court House there is running excellently well. He set the clock, and without any regulation at the expiration of 1 year and 10 days it was only 2 minutes and 26 seconds slow.

A curious method of looking at a watch through a beetle's eye is described by an Australian contributor to the monthly *Microscopical Journal*. The eye of a beetle is used with the microscope as a lens with which to observe the small circle around which the second hand moves, on the face of the watch.

The Philadelphia Centennial women have started a newspaper called the *New Century for Women*. It is a fresh effort to teach the sex to sing bass, and, in the language of the late lamented Lincoln, we should say that for those who like that kind of a newspaper this will be just the kind of a newspaper they will like.

It is figured up by a newspaper man that there are eighty thousand articles on exhibition at the Centennial. Wherefore, if a person who visits the Centennial wishes to see every article, he must devote five hours a day for five months to the job, giving one-half minute to the examination of each object. Encouraging to proposed visitors.

An explorer for Roman antiquities tells the *Athenæum* how in 1873 he had a sewer examined, and in the course of a few minutes there were found a pugilare (writing table) in carved ivory of the third century, a bracelet cut out of jet from the Lycian River Gagis, three amphore (flasks) of glass, a gold ear ring, seventeen coins of the largest size, "and a slight touch of typhoid fever."

Diamonds said to be worth over ten millions of dollars were sent to this country as a part of Brazil's exhibit, and a great safe and a handsome show case were prepared as their receptacles by night and day. Four Brazilians were to act as a constant guard over the treasure. A regulation, however, prevents the transfer of the diamonds from the Custom House to the exhibition. A bond of double their value is required as a guarantee that they will not be sold in this country without the duty being paid, and the Brazilian Commissioner cannot comply. Dom Pedro made a personal effort to arrange the business, but he was told that even Secretary Bristow had not the power to vary the rule.

The jewelry store of Kirby & Snow, New Haven, Ct., was broken into on the evening of the 29th ult. The burglars attacked the safe in which the firm kept most of their stock. The rivets were drilled out, the clasp bar pried off, and the outer edges to the doors forced apart, leaving exposed the mechanism of the locks, which was broken to pieces, and the safe opened. Everything of value in it was taken, including one hundred gold watches, $10,000 worth of diamonds, and all the other precious stones in sets and rings, bars of pure gold, and silver watches. The loss is fully $30,000. A burglar's set of burglar's tools of the finest make were left behind. The cases which contained the jewelry were strewn about, and everything denotes that the robbery was committed by a thoroughly skilled gang. The robbery was committed between half-past 10 on Saturday night and half-past 6 on Monday morning, and was discovered at noon. Many of the watches and diamonds were the property of customers of the firm.

For sometime past Mr. Thomas B. Bynner, the well-known jeweler of No. 527 Broadway, has had in his employ a traveler named George Woods, who was considered a strictly honest young man. Some days ago two ladies' gold hunting-case watches, valued at $70, were missed from the store, and it was suspected that Woods had stolen them. Subsequent investigation developed the fact that he had taken the watches from the store and sold them for $42.80. The case and the circumstances connected with it were reported to the Police, and Detectives Thompson and Adams were detailed to work it up. They obtained a warrant and arrested the fashionest salesman at a hotel in Huntington, Long Island, where he was stopping. He was brought to the Tombs and held in $1,000 bail to answer. Mr. Bynner has for a long time been missing various articles of valuable jewelry, but until before he had occasion to suspect Woods as the guilty party. When arrested he not only admitted having stolen the two gold watches, but also confessed to having since his connection with the establishment stolen many other things of like nature, in all valued at upward of $1,000, which he has sold at various places in this and neighboring cities.

George F. Foye, a Boston dealer in jewelry, went into bankruptcy in 1874, and then fled. Some of his creditors were New York merchants. He returned to New York recently, representing that he came from some foreign country, and as he displayed a large number of diamonds, he was proceeded against for evading the customs duties. In the investigation, some of the set diamonds were shown to Foye's creditors, and were recognized as property furnished to Foye by these firms, and not paid for. Thereupon these creditors took proceedings to have him punished criminally for his flight from Boston, the proceeding for evasion of payment of duties on jewelry being necessarily dropped. A seizure was made of the baggage of Foye, in which considerable jewelry was found, but the diamonds had disappeared. Commissioner Shields committed the prisoner to be transferred to Boston for trial. Samuel Morris, the assignee, in the matter of Foye's failure, of the New York creditors, thereupon had him brought before Judge Barrett, in Supreme Court, on habeas corpus, and then served him with process in a civil action to recover the diamonds, and with an order that he be examined as a witness before trial as to them. Mr. Foye demanded time to employ counsel, which was granted. He then appeared with counsel, and offered to surrender the diamonds rather than be detained from his criminal trial in Boston. The offer was accepted, whereupon he gave up 48 rings, valued at nearly $3,000, and was turned over to the United States Marshal to be conveyed to Boston.

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THE

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

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The Business Outlook.

Perhaps the most comfortable thing to be done in these dull and bot times is to look forward for any hopes of betterment that the approaching season may offer. We think it may be said that there is fair reason for hope of a reviving trade later in the year, although the fall season itself is likely to open much later than usual. The Centennial Exhibition, it has generally been found, has rather hurt trade than helped it, so far as immediate effects are concerned; we must look to its later influence on our American industries for the rewards which our enterprise in this direction should bring about. The Presidential campaign will of course produce the usual effect of diverting attention from business and the buying of goods. Both the Centennial and the campaign close early in November, tho one on the 10th, the other on the 4th, and it is not therefore until about the 15th of that month that we may look for the real opening of the business season. Business men must then get ready to make hay while the sun shines. The season will be short, to be sure, but during its continuance we must hope that it will be a better season than we have had for some months past.

There is one reason for hope which is broader than any mere calculations or the wishes of business men. The one way out of our present difficulty is "touching bottom" and reaching the hard pan of specie payments and specie prices. Towards this desired end we are taking daily great strides. The political campaign, however it results, is likely to prove an incentive to an early return to specie payments. The Republican party has put forth a hard money platform and hard money candidates. If the Democrats, on the other hand, win, it will be because of the hard money votes which will be secured to it by the head of the ticket; if the Democrats lose, it will be because they have handicapped their specie candidates and specie utterances by their soft money Mr. Hendricks and the anti-resumption exception of their platform. Either way we may say that the country will be committed to early specie payment and we may hope that by the end of another year this question may be fairly settled. Hereafter, American industry can build on a solid basis, the one thing needed for the resumption of its old time prosperity. Already prices, as in the case of American watches, have been accommodating themselves to the new basis, and these movements will help the general advance.

We must repeat, however, what has often been said, that merchants must give up the idea of forcing business by encouraging the volume of sales rather than safe business dealings. We cannot have prosperity without common sense, and it is largely because the inflation of our currency has led to carelessness in our dealings, that we have been obliged to meet the difficulties so disastrous within the past few years. In other words, merchants must accommodate their ideas of business to the new and more healthy conditions. They cannot have more business than there is, nor any one more than his share of what there is. Competition will still be the life of trade; but we must get over that undue competition which is nothing less than recklessness and commercial suicide. If during this dull season our merchants can bring their minds to the practical realization of such principles as these, we may hope very much for the business of the immediate future.

The Teachings of the Centennial Exhibition.

Those who control our industries, and are responsible for their progress, will make the great mistake of their careers if they fail to realize the real usefulness of the Centennial Exhibition. It is, to be sure, a national glorification, but that is by no means its best meaning. It should be regarded by all thinking men with their eyes open as chiefly an opportunity not for glorifying what we have done, but for laying the foundation for better work in the future. Nowhere is this more true than in such art industries as the manufacture of jewelry; and we urge upon our own trade the vital importance of careful study of the interesting objects exhibited by the jewelry trades of other nations.

There is one department in which it is generally agreed at the Exhibition that America leads all other countries, the art of manufacture in silver; for grace, delicacy and other good qualities, the American silverware equals and even surpasses the exhibits of England and France, although the criticism has been passed upon some of the great silver pieces displayed there, that they are better as work than as art. Whether this be true or not, it suggests a useful observation, namely, that the art idea is that in which American industry needs most training. Our detail and our execution is apt to be far in advance of the artistic conception of our work. It is here, perhaps, that the chief good is to be gained. In jewelry proper there is, certainly, a great deal to be learned. The exquisite filigree work displayed by other countries proves among the most interesting objects of the Exhibition, and attracts crowds daily. In this feature they are far in advance, and it may be a long while before American jewelry attains superiority in this specialty. Nevertheless it can aim at it, and we have no doubt will ultimately achieve it.

But we did not desire, nor have we the material at present in hand, to go into a practical estimate of the characteristics of American and of foreign work. It is our purpose simply to call the attention of

jewelers to the fact that the Exhibition is a grand school-house for them; that unless they go there as patient scholars of their trade, they will throw away its chief value to Americans.

The Trade Convention.

The suggestions for a trade convention, although taken up heartily in some quarters, have not called forth the general endorsement which we had hoped. It seems to us that if there were no business considerations involved, it would be worth while to have such an official gathering of the trade, for the purpose of bringing its members as far as possible under the educational influences of the great Exhibition at Philadelphia. But it is also worth while to have the gathering for the sake of the gathering itself. By bringing different parts of the trade together, a great deal will be accomplished beyond what might be planned for before hand, or be directly accomplished in any convention work. A general organization would, in the first place, promote state and local organization; and this of itself is exceedingly useful in all trades, not least in those where consultation and the benefit of general experience are so useful as in our own. Special business questions and subjects connected with the manufacturing part of the business, might be profitably discussed, and in fact a convention would have three fold value in its social, business and educational results. We repeat urgently our suggestions that the leading members of the trade should take hold of the matter, and, before the close of the Centennial Exhibition, unite in calling a general convention of the watchmaking and jewelry trades at Philadelphia.

Keep it Up!

The action which has been taken by the New York creditors in the Levi bankruptcy case will be fully approved by every member of the trade—nay, more, by every merchant in the country. We have had too much prosperous roguery amongst us, too many fortunes made by failures; but at last a decided stand has been made and the victimized creditors have resolved to prosecute the guileless Levi, until the full penalty of his conduct is enacted. If every case of dishonest trading were handled in like spirit, then the black sheep of commerce would soon discover that this was not their pasture ground, and the rascals who go round robbing honest men would be induced to exercise their genius in some other sphere of industry. We grant that there is a temptation in such cases to compromise and get out of the whole business. Such affairs are not pleasant to any of those concerned, and the gentle quality of mercy has often moved creditors to say: "Well, pay up so much and we will let you go." But this situation of compromise is weak, wrong and in the end productive of infinite injury. Such leniency places a premium on crime, it puts the cheating swindler in a better position than the honest trader, it encourages villany and discountenances industry.

There are cases where a man finds himself in trouble, calls his creditors and says: "Here is all my property, take it and let it go as far as may be in liquidation of my debts." He does so with the best intentions for the interest of his creditors, and if they believe in his honesty, and prove the accuracy of his statements, they accept the offer and help him to a new start in life. But where we find absolute evidences of fraud, where there is barefaced villany in the affair, where the criminal finds money to defend his ill deeds but none to pay his creditors, there let there be no compromise with the evil doer. Let him suffer the full penalty of his crime, and serve as an example to those who contemplate his conduct.

The creditors of this man have done the right thing at the right time, and they are going to persevere in doing so. Let men like the Levis learn that they cannot purchase freedom and wealth with stolen goods, and we shall see that there will not be so many fraudulent failures in the future.

Tempus Edax Rerum.

Another gone! We have to chronicle the demise of another of the mushroom watch companies such as have come up and faded in an hour, ah! so many times before. The assignee's sale of all the property, real and personal, of the Lancaster Watch Company, was announced to take place on the 12th of this month. This was the latest creation of the champion originator of watch manufactories, but alas! it had scarcely time to get started before it came to the end of its career, like the new born infant, whose sad epitaph reads:

> "If so soon I was undone for,
> What on earth was I begun for?"

A lofty monument, fittingly ornamented with "new movements," should mark the spot on which it has been laid to rest, as a warning to future capitalists who have a hankering for the watch business. To speak seriously, it is the difficulty of most of these new companies that they quite underrate the capital necessary for the immense undertaking which they attempt. By the time that the trustees have elected each other President and Secretary, etc., and have put up the buildings and bought part of their machinery, they find their working capital reduced to a few thousand dollars, a sum quite inadequate for the continuous outlay which this business, above most others, requires. Starting a watch company is like starting a New York daily; it can only be accomplished by an immense expenditure of capital and a staying power which not only deserves success, but gives time to win it.

Editorial Jottings.

The orders for "Excelsior's" "Hints on Watch Repairing," in book form, continue to pour in upon us and the greatest interest is shown in the endeavor to learn who is the able writer of these articles. Two of our correspondents put forward the suggestion that the trade ought to make some recognition of the excellence of these articles, which are characterized by one of the writers as beating all the prize essays yet published, by offering to "Excelsior" a gold medal or some other mark of appreciation. It is a somewhat delicate matter for the JEWELERS' CIRCULAR to second the motion; at the same time, as the honor is to be paid to our contributor and not to us, it seems only right that we should take up the suggestion. Those who wish to take part in offering some such testimonial to "Excelsior," may therefore communicate with us on the subject. It is naively suggested that in this way at least the real name of "Excelsior" can be at last found out, since if a testimonial is to be awarded, some one must come forward for the presentation.

The American Watch Co. have called forth the enthusiastic gratitude of the whole retail trade, by the wholesale liberality with which they have protected their retailers. We do not overrate the feeling in using these strong terms. When the reduction in movements was first announced, the trade in general, and the retailers especially, looked forward with anxiety to what might be the course of the American Watch Company, as the natural leaders in this department of the trade. Their decision, to offer to all retailers the rebate which had been offered by their rivals to jobbers only, fulfilled the expectations that the American Co. would not act to the disadvantage of any of its customers, no matter whether they stood in direct or indirect relations with it. The company, in fact, came to their rescue in really heroic fashion and at no little immediate sacrifice to itself, for so large is its business that the rebate offered on movements, sold since January 1st, will necessitate an extraordinary amount to be paid out in these dull times. The American Watch Co. has greatly strengthened its popularity and position in the trade—as it deserves. It has thus assured dealers that its goods can be ranked as staple articles, which will not depreciate to their loss.

The committee of creditors of M. Strasburger & Co., have issued a circular to the trade under date of June 30th, in which they recommend a settlement on the basis of 30 per cent. at six, twelve, and eighteen months, these payments being fully secured by mortgages and other property owned by various parties. The committee includes some of the strongest names in the trade and their deliberate judgment is of course to be listened to with respect. Their final opinion is that nothing more will be made by further prosecution in this matter, and although we are sorry to see the matter drop in this way, they doubtless have reasons for their action. The settlement will doubt-

less be made on the basis proposed, although many houses in the trade sign off with great reluctance. Possibly the vigorons fashion in which Mr. Strasburger and his worthy partners have been followed up by the committee will be some bar in way of others imitating their noble example.

In describing the great Bryant vase, presented to the poet last week, the *Tribune*, while taking exceptions to the general conception of its designer, as a work of art, pays this tribute to its manufacturers:

Of this workmanship may be said—and how pleasant it is to be able to say it freely and without reserve!—that it would be impossible to surpass it in delicacy and precision. When it is seen at the great Exhibition in Philadelphia, as it will be seen in a few days, it will be generously acknowledged, we have no doubt, by the best judges from all parts of the world that, merely as a piece of silversmith's work it would do honor to the best hands in Paris, Vienna, or London. In some respects it is one of the most noteworthy pieces of *repousse* work ever made, and the firm that produced it have reason for honest pride in the fact that on this great anniversary they are able to show in one single object an epitome of American ingenuity, conscientiousness, and mechanical skill that may stand up in the face of the world and challenge its criticism with sure confidence.

The Messrs. Tiffany may well feel proud of this testimony.

We are authorized from the judges at the Centennial Exhibition to deny the rumor that they will throw ont from competition all watches that cannot show certificates of observatory tests. While they will very properly take such evidence into consideration, this will be by no means the only or the chief basis of their awards. The trade will be relieved to hear this, for the decision rumored would have been most injurious in its practical workings.

The Pneumatic Timer.

It is a well known fact that ever since watches reached their present state of perfection, innumerable devices have been contrived for the purpose of stopping the seconds-hand, starting it off again and otherwise controlling its motion at pleasure, so that the time occupied by any operation or event interesting to the astronomer, medical practitioner, the lovers of aequatic or equestrian exercise and others, could be measured with the greatest accuracy. The majority of the devices used for this purpose will doubtless be familiar to many of our readers, and at present we pass them over with the remark that all the old arrangements, and many of the comparatively new ones, are all more or less complex and delicate in construction, and cannot safely be subjected to the severe and careless usage such instruments are unavoidably subjected to when used by persons engaged in exciting bodily exercise like horsemen, oarsmen, and others.

A substantial and unique instrument, named the "Pneumatic Timer," which has been specially designed to obviate the drawbacks incident to other timers, has lately come under our observation, and appears to be the most practical instrument for the purpose yet produced. It is the only one that can be safely used while a person is in the act of riding or driving a horse, because hand manipulation is entirely dispensed with when starting or stopping the instrument, and what must be of much importance to the rider, the proper handling of the animal is not interfered with, as both hands are free to be entirely devoted to the management of the reins. This result is accomplished by an ingenious application of the science of Pneumatics. A flexible tube, fitted with a suitable mouthpiece, connects with a valve or small bellows placed in the movement, which is so arranged that the hands of the Timer are started by a slight puff in the end of the flexible tube, and instantaneously stopped again by a quick suction. This action is both positive and certain on all occasions.

The movement may be described as a very small sized lever clock, finished in nickel. It beats quarter-seconds, has a minute hand to record long distances, and a fly back arrangement to bring both hands to the starting point on the dial when necessary. No moveable winding key is necessary, as a suitable and permanent attachment on the main spring arbor answers the purpose. The dial is worthy of special notice, and in general appearance bears a close resemblance to the beautiful frosted silver dials seen on fine Aneiroid barometers. The movement and dial is enclosed in a strong morocco case, and the general appearance conveys the idea that strength and durability is not incompatible with taste and elegance.

The driver of a horse may carry one of these timers in his pocket, and by placing the mouthpiece of the flexible tube between his teeth, can "catch" his horse with perfect accuracy for a quarter mile, half mile or any other distance he desires, without any one but himself becoming possessed of the information. It is of the same practical value to oarsmen and others; drivers of locomotive engines, with the help of this little instrument, may easily determine their rate of speed without even removing their hands from the throttle valve of their engine during the period of trial, and there are doubtless many other uses this little instrument could be advantageously applied to. Messrs. Aikin, Lambert & Co., 12 Maiden Lane, N. Y., are the sole agents.

The Hall Mark.

Mr. Alfred Lutchannig, in the course of a paper on the hall-marking of jewelry, read to the Society of Arts, advocated the abolition of the hall-mark on articles of gold and silver, and proposed, in lieu thereof that jewelers should be compelled to give every purchaser of gold and silver manufactures a written guarantee of the quality of the material. He considered that there should be but three standards of gold used—12, 18, and 22 carat, and that, to detect fraud, Government should appoint inspectors to purchase articles, in any stage of manufacture, for the purpose of assay. He also proposed that all plated articles should be marked "plated." The proposals of Mr. Lutchannig, if carried out, would amount to a serious interferance with the liberty of trade. There is nothing at present to prevent any purchaser of gold or silver stipulating for a written warranty, if he doubt the honesty of the person with whom he is trading, and we are unable to see why 12 carat should be fixed as the lowest quality of gold permissible for jewelers, or why the legislature should interfere with any person whose vanity induces him to hope his friends will mistake his plated ware for the real metal, by compelling him to have the mockery stamped on it. To our mind, the forging of the English hall-mark on watch cases exported from Switzerland and America which was one of the reasons given by the reader of the paper for abolishing the hall-mark, is a strong argument in favor ot retaining it, as showing the high estimation in which the English hall-mark is held. The deception is to be deplored, but in countries where there is no enactment to prevent it, fraudulent imitation will be carried out by unscrupulous persons on manufacturers of gold and silver, or anything else offering a chance of gain. But the people who would be misled by such a forgery, would, with the three fixed standards of gold proposed, be just as likely to be gulled by a watch case, or other article, got up to resemble English work.—*British Horological Journal.*

Uncut Gems.

A lecture on precious stones was delivered a short time back by Mr Ruskin. The object of the lecturer was to give a sketch of the mode in which nature formed the more precious minerals, and the various purposes—symbolic, useful, and ornamental—to which when dug out of the earth they were put by man. Heraldry, he complained was despised by modern science, but yet, as understood by our ancestors, it had a deep and important meaning. *Or*, or gold, which was represented by the topaz, stood between light and darkness; *coarlate* was the sacred color of the living flesh as represented in the blush of the virgin and the flush of valor on the cheek of the young warrior. *Vert* was the green of the emerald, and *gules* was rose-colored, from the Persian word "gul"—a rose azure was the clear, sacred blue of the sky, typical of the joys of heaven. The ruby and sapphire were, in fact, the same stones, and in combination produced the *purpure*, or purple, which formed the covering of the tabernacle. Out of the above colors came the combination of the rainbow. *Argent* typified the silver color of hoar-frost, and *sable* meant sand, in which the diamond was always found. Gray was the color of the pearl, and suggested humility; and thus all the phrases of Heraldry which applied to color and to precious stones, although now looked upon as jargon, had a deep symbolic meaning. At the close of the lecture Mr. Ruskin advised the ladies to have all their gems uncut, and he cited the ruby in her Majesty's crown as the most beautiful specimen of an uncut precious stone in the world.

Trade Gossip.

An extensive vein of amethyst has been found near Monticello, Ga., some of the stones are reputed very large and brilliant.

Our sturdy friend, Collis, is the happiest man in Brooklyn. It's a little girl.

Don't never trust a man at the rate of 50 cents on a dollar—if yu kant konfide in him at par, let him slide.—*Josh Billings.*

A watch has been set on a Texas jailor who is suspected of having liberated a female prisoner. It must be a leave-'er escape-ment.

Tellurium has been found in great quantities on Rock Creek near Sacramento, Cal. This rare metal is worth about $2,500 a pound.

The watch protecting pocket is another novelty, designed to protect the watch from pick-pockets. It is made of kid, lined with wash leather, and bound with metal like a porte-monnaie.

Now that the great occasion is past, we shall have leisure to cultivate our thermometers, and project our imagination across the distant frontier of the hog and hominy season.

An enterprising firm of photographers advertise a new series of photographs in miniature. This ought to take. Most of us have friends of whom it may be said that the less we see of them the better we like them.

The supposed diamond recently discovered on Pioneer Bar Mountain, and which it was stated was sent to London for examination and cutting, has been returned to this country with a certificate that it is a genuine gem, and is worth fifty dollars.

Thirteen years ago a man was driven out of town for an offence which he did not commit. News now comes that he is settled in a Chicago jewelry store. Thus we see how an unjust accusation may blast and ruin a man's whole career.

A Rockland merchant went home the other night and said cheerfully to his wife, "Well, my dear, I've failed at last." "Oh, that's good!" exclaimed the wife, with a radiant face; "now we can go to the Centennial sure."

We are pained to hear of the illness of our amiable friend, H. Howard, of the firm of Nicoud & Howard, importers of the celebrated Nicoud Watch. Mr. Howard is suffering from a severe attack of inflamatory rheumatism, which confines him to his room.

It is stated than many of the English Exhibitors at Philadelphia have expressed their dissatisfaction with the British Commissioners. Mr. Joplin has resigned and the appointment of Prof. Archer to the place of Mr. Cunliffe Owen is not met with approbation.

The factory of J. F. Bradley was broken into on the evening of the 12th inst., and a quantity of finished gold and silver-headed walking canes, valued at $600, stolen therefrom. Dealers would serve the ends of justice by making known any attempt on the part of the thieves to dispose of their stolen goods.

THE IRISH TIMES.—Small Girl—Plaze, Misther Donovan, what o'clock is it?" Horologer—"Half-past wan." (Exit Small Girl.) (An interval of one minute. Reenter Small Girl.) Small Girl.—"Plaze, Misther Donovan, what o'clock is it?" Horologer.—"Sure, ann't I afther tellin' ye?" Small Girl.—"Och! but 'tis another woman towld me to ax ye this time."

Mr. A. J. Shattuck, of Nashua, N. H., whilst on a visit to his old home in Chester writes that while fishing in Island Pond, he found in the hollow of an oak tree an old clock. There was no case or pendulum, and only one hand. The dial, which is made of brass and britannia, has no minute marks, but indicates the quarter hours. The works are made of brass, and there is engraved on the dial: "Made by David Brisdell, of Almsbury, MDCCLII."

At the Royal observatory, Greenwich, England, there are now 161 chronometers, 17 of which have been placed there by the proprietors for the annual competitive trial. The others belong to the Government, and await issue to the ships of the Royal Navy. The time-keepers are compared once a week, and placed for three weeks in an atmosphere of 100 Fahrenheit. The Westminster clock has upheld its high character, Big Ben having been out only one second in 273 days.

A novel instrument for measuring time is just described by an Engish contemporary. It consists of an oval gilt plate about 3 inches by two, engraved like a sun dial and having a small mariners compass in the left hand corner. It folds over to half its size and is thus easy to carry in the vest pocket. To tell the time it is opened out and turned till the compass finger points directly to a star engraved on the plate. The star being thus in the north, the true position of the dial is found as accurately as though fixed in a garden or elsewhere.

John E. Elliott, of Clinton, has presented to the Memorial hall of Hamilton College an historical clock. It has timed at least two hundred and forty-five years, and is still a good timekeeper. It was brought from England by the Rev. John Elliott, "the apostle to the Indians, who landed in Boston from the ship Mary Lyon, Nov. 3, 1631." It was handed down as a family inheritance from him to his son, Joseph Elliott, who was graduated from Harvard College in 1658, from Joseph to his son Jared Elliott; from Jared to his son John Elliott; from John to his son Edward Elliott; from Edward to his son John E. Elliott of Clinton, sixth in descent from "the apostle to the Indians."

Some marvels of human ingenuity may be seen at the London Scientific Exhibition. Thus, a machine, loaned by Sir W. Armstrong, the great gunmaker, measures thickness up the one-thousandth part of an inch, and another, on the same principal, to the one-millionth part. The delicate balance of Mr. Oerting carries 3,000 grains, and turns distinctly with the one-thousandth part of a single grain. Among the historical implements is a chronometer sent by the Royal United Service Institution, which was twice carried out by Captain Cook, and again by Captain Osligh, in 1787. When the crew of the Bounty mutinied this veteran timekeeper was carried to Pitcairn's Island, by the mutineers and sold by Adams, in 1808, to an American captain who touched there. He sold it in Chili, and in 1840 it was bought at Valparaiso by Sir Thomas Herbert, taken to China by him, and finally brought back to England in the Blenheim.

There is at least one button in Waterbury, that city of buttons, that has a history. Fifty or sixty years ago Dr. Frederick Leavenworth, David Hayden and James M. L. Scovill were associated in business in Waterbury under the firm name of Leavenworth, Hayden & Scovill, and were widely known as enterprising button makers. When Gen. Lafayette visited this country in 1824, the patriotism and gratitude of this firm found expression in a set of solid gold buttons, seventeen in number, fourteen being the full set for a dress coat, and three additional buttons being made to be kept by each of the three partners as a memento. They are said to be made from a lump of gold actually ploughed out of a field in North Carolina. On the face of the buttons was a well executed head of Washington in profile, the die of which was cast at the Mint in Philadelphia. On the reverse were the words: "Presented to Gen. Lafayette by L. H. & Scovill, button manufacturers, Waterbury, Conn." One of the three buttons kept by the partners has come down to the Hon. Elisha Leavenworth of Waterbury. What became of Lafayette's buttons is not known. In the Philadelphia Mint is a facsimile of this button in wax, and large offers have been made for the button itself.

The latest Parisian swindle is clever. A well dressed woman called on a prominent mental physician and implored his aid in curing her son, who was laboring under a delusion that some one owed him 30,000 francs for diamonds which he had sold. "Bring him here in an hour and I will see him alone," said the doctor. The woman went at once to one of the best jewelers and choosing 30,000 francs worth of diamonds, asked the proprietor to send his assistant with them to Dr. J.'s, who was her husband and would pay for them. The name was well known and the clerk was sent to the doctor's with her. In the anteroom she said, "I will see if my husband is at home." She then told the Doctor that her son was without, and the doctor said, "Send him in here." So she sent the clerk, telling him to leave the diamonds with her. Arrived in the doctor's room the clerk was politely seated and courteously asked after his general health and habits. After replying to these questions for some time, the young man hinted that he was rather pressed for time and would be glad if the doctor would kindly pay him for the diamonds. "Ah, true," said the doctor, "the 30,000 francs. Well, by and by." Then ensued a funny scene, which finally ended in both parties going in search of the "mother," and finding that she had got tired of waiting and had gone, forgetting to leave the diamonds.

Practical Hints on Watch Repairing.

By Excelsior.—No. 16.

[The first article of the series on the Lathe had been written, containing several cuts of new tools and attachments, which it was found impossible to get engraved in time for this issue. The writer has therefore acceded to requests to give an article on cleaning watches, examining and adjusting the escapements, correcting defects in the train, proper way of oiling, etc. Excelsior.]

(276) *Cleaning watches and putting them in order.*—Many workmen consider cleaning a watch to be so unimportant a matter that they reduce it to an invariable system, by which they can rush it through in the shortest possible time, doing each kind of work all at once, in order to save even the trouble of laying down and picking up tools. They remove all the screws at one operation, all the bridges at another, put the bridges all back at another, put all the screws in their places at another, turn them all in at another, and so on ; wind the watch, stick it in the case, listen to the tick during the fraction of a second, hang it up on the board as "done," then consult the regulator to see how many minutes and seconds they have been about the job. I have heard workmen boast that they had cleaned and put together a watch, case included, in thirty minutes. I can only say that such a man could never clean a watch for me, even if he would do it for nothing.

(277) The conscientious workman follows an altogether different system. He knows that he cannot be sure that everything is right about the mechanism unless he has put it in thorough repair himself and even then some part of it may have been changed or damaged in the meantime. He therefore goes on the principal that every thing is wrong, until he finds by actual inspection that it is right. His rule is to examine and test every part, as he comes to it, to see if it is correct, and, if not, remedy the error, either at once or at least before cleaning. And in putting it together again he follows the same system. In movements with separate bridges, he first replaces the main wheel and bridge, screws all permanently fast, and examines. It is supposed to be right, but he makes it a point to *see* that it *is* right before going further,—tests the winding action, uprightness, trueness, and perfect freedom of the spring-barrel part, when turned with the key. Then he puts in the centre wheel, screws the bridge fast, and tests that in every way, including perfect freedom of motion when the key is turned. So on through the whole train, testing it as he goes along. In a full plate movement, he first puts in the train and pins or screws the plates together, leaving out the lever or other piece that would prevent its free motion, tries the end shake of every piece, and freedom while turning, and with either side up,—applying very slight power to the main wheel for this purpose. Then he opens the plate, inserts the lever, tests that, then the balance, and so on. All this takes time, yet no more than will generally be wasted in taking a watch apart again and doing something more after it has stopped, as it is very likely to do after it has been cleaned in a hurry. The young workman may be assured that *nothing is ever gained by slighting his work*,—that is, if he desires to give satisfaction. Experience will teach him that, even in the most hurrying times, the way to turn off work the fastest is to do it thoroughly, so that it will *stay done*. Otherwise, it may, and probably will, (as it ought to) come back to bother him when he is in just as great a hurry, or more so, and occupying more time than it would to have done it properly at first.

(278) If the customer is so opinionated or stingy that he wants only cleaning done, whether it needs any more or not, the "hurry-scurry" system of cleaning might be excusable. But few will insist on that if properly talked to. When a man is sure that his watch wants nothing but cleaning, say "Very likely it does not, but I cannot be sure of that without taking it apart to see. There are many things entirely out of sight when it stands together. Now, when I come to clean it, if I find that it needs other work to put it in good order, shall I do it, or leave it as I find it?" Generally he will say he wants it right, of course. If he says, "Just clean it," reply "Very well, I will clean and put it together properly. If your watch is in good repair now it will be so then ; but if there is anything wrong now it will be just as bad off then, and you must not hold me responsible for defects that you will not allow me to remove. You must take the risk of that yourself. I will warrant *what I do* to be properly done, but I cannot go further than that." This puts the responsibility directly on his own shoulders and relieves the workman. The owner will seldom like to give an order to leave his watch in a broken or defective condition and take his chances of its running ; but, whether he does so or not, there is a clear understanding between him and the workman. Always write on the tag, besides the full name of the owner, the precise directions given and the day of the month promised to be done. When a price is named put that down also. If you agree to put a watch in good order for a certain sum, do it if it costs you double. Never go back on your promise. But it is better to say "If it needs nothing more than I see now I will do it for so much. If it needs anything more, I will do it as reasonably as I can afford, or will wait and see you first, just as you prefer." It is still better to have customers put confidence enough in you to believe that you will deal honorably with them without requiring any price to be set beforehand. Such confidence can be gained only by invariably doing thorough work, and pursuing a straightforward, honorable course with all.

(279) There are three ways of cleaning watches : —with benzine and soft cloth ; with alcohol and whiting, and a brush, and with chalk and brush, moistening the pieces with tongue or breath. The first is preferable, especially for new work or fine movements, as least likely to scratch or wear the gilding. The benzine should be kept in a bottle with a mouth wide enough to take in a balance or other part, but the body of the bottle should be considerably larger and only partly full, so that if it gets tipped over, which will occasionally happen, there will be no great loss of contents. The cork should be rolled in smoking hot paraffine, and the loose drops shaken off. This will prevent evaporation through the cork. The paraffine can be melted in an old tin blacking-box, or any dish without joints. Twist half a dozen pieces of binding wire together, stick the rope thus formed into the cork, and bend up their lower ends into as many hooks, on which to hang the pieces in the liquid and lift them out by the cork. Pure benzine, suitable for watchmaker's use can be obtained from all material houses. Buy no stuff that is put up for removing grease from clothes or similar preparations, as they also contain ammonia or other ingredients injurious to gilding. Take nothing but pure benzine, to test it, try if it will dissolve shellac readily. Also put into it a gilded piece, daubed over with old grease, let it soak, and see whether there is any change of color in the gilding. If so, it contains some foreign substance. Nor should there be any difference of color between the parts that were or were not greased, unless stained by the action of the oil itself. Benzine should not be heated to dissolve oil or wax, but should be kept away from any flame, as it is very explosive, and the vapor from it will take fire at a considerable distance. The cocks or other parts having laid long enough in the bath, as they are removed by the hooks or tweezers, are taken hold of with a piece of soft cloth and wiped clean and dry, then held in the tweezers and any adhering fuz removed with a brush. This cloth may be either cotton or linen, but should be old and well worn, so that it is soft, smooth and free from grit. It is cut into pieces three or four inches square, and kept in a tight box free from dust and dirt. As fast as they get all dirty they are laid aside to be washed and the grit beaten out.

(280) The second method, with alcohol and whiting, is more often followed, while the third is generally scouted as botch-work, although with proper care as good results can be obtained as by the second. When alcohol and whiting are used they are kept in bottle similar to that described for benzine, and a camel's hair brush with the handle stuck through the cork, so that it can be pushed further through as the whiting is exhausted More or less of the whiting is taken up by the brush, as desired, rubbed on the piece to be cleaned, which is then brushed till it is dry and the whiting has all been removed. The great fault of this method is that too much whiting is generally put on with the alcohol, and by the time it is all cleaned off the gilding is injured as much as, or more so than, by the chalk process. Some improve on this by using the alcohol in a saucer, and soak the pieces in it to dissolve the oil, etc., then brush and dry, or wipe them dry with a cloth. But no piece having parts fastened by shellac should be cleaned in this

way as the alcohol would dissolve the cement and loosen the parts. In using the alcohol bath, it is well to wipe off the old grease with a soft cloth, before throwing the pieces into the alcohol, to avoid stains or different colors on the gilding. Other workmen use both the alcohol bath and the whiting bottle.

(281) The common alcohol bought in stores is often very far from being either pure or strong. The following is a good way to purify it. To one pint of alcohol, add half an ounce of powdered pearlash or salt of tartar, which has been made hot, and shake well at frequent intervals, during half an hour,—the alcohol being in a bottle which it only partly fills. Let the sediment settle and pour off the clean liquid into another bottle, add another half ounce of hot pearlash, and shake as before. Repeat this process till no sediment except the pearlash is separated, then add, to the clear liquid poured off, one ounce of powdered alum, heated but not burned. Shake this up frequently for some hours, and the clear spirits cleared off will be equal to the best quality sold. The different lots left with the sediment can be poured off, then strained, and will be good enough for burning in the lamp. Alcohol otherwise good is often watered so much that it will not dissolve shellac or grease, and will hardly even burn. It may be concentrated by keeping it in a warm place in a bladder, the substance of which will permit the passage through it of water, but not of alcohol. Get a sound ox-bladder, soak it well in water, then inflate it and scrape it clean from all adhering parts or substances. Turn it inside out, and clean that surface also, then inflate and let it dry. It is well to brush a solution of isinglass over it, both inside and outside, two or three times, as the bladder is more durable and operates better. Then fill nearly full with the alcohol, tie up the mouth tightly, and hang near a stove, in the sun, or any place where a temperature of about 120° or 125° can be kept up, and in a few hours the common alcohol may be made equal to the 95 *per cent.* By keeping it near the stove in the bladder it will be easy to have always on hand alcohol pure and nearly free from water, sure to act and act quickly.

(282) In the chalk process a small box (a cigar box will do) has one end cut out, except an inch at the sides and ¼ inch at the bottom to keep the chalk in. A large lump is selected, as safe and free from gritty spots as possible, placed at the end of the box, which is then fastened up under the bench just to the right of the vise. In cleaning, the brush is rubbed on the lump to take up the desired quantity of chalk, but the loose powder that gathers in the box is not used, except for cleaning cases, etc. By thus controlling the amount of powder taken on the brush, and wetting the parts to be cleaned with alcohol, this process is as good as the second. When the alcohol or benzine bath is not used, the holes and adjacent surface of jewels should be cleared from the oil before brushing, otherwise it would be smeared over the whole surface and require a good deal more chalk and scouring to clean it off again.

(283) My own practice with the ordinary run of work is to combine the three methods before given. The balance, with its hairspring, table roller, etc., the lever, the chronometer locking spring, and similar parts, are dropped into the bottle of benzine, which clears off the grease much quicker and better than alcohol, yet will not loosen the jewels as it does not act on shellac as alcohol does. But pieces which are all metal or have no parts cemented together, I drop into a dish of alcohol to soak till wanted. If there are spots or stains on the gilding or nickel plating, they should first be removed by rubbing them with a pig-wood point dipped into a solution of cyanide of potassium in water. As soon as the spots disappear the cyanide should be thoroughly cleaned off, and the pieces may then be put into the alcohol or benzine. Chronometer balances, if tarnished, are dipped in the benzine to free them from grease, then for an instant only in the cyanide solution, immediately washed off thoroughly in clean water, the balance and hairspring then dipped into alcohol to absorb the water, keeping the rollers with their jewels out, then returned to the benzine bath to soak. Tarnished brass wheels, etc., can be cleaned in the same way, but they are generally polished up with the buff, or on a cork and rouge.

(284) I use different brushes for different parts of the work. On the tops of the cocks, plates, etc., I use a very fine soft hair brush, as smooth as a camel's hair pencil. This cannot scratch the gilding, and the grease having been dissolved in the bath, nothing remains to be done but to brush off the loose dirt. If the piece needs brightening, use a soft clean buff stick, well supplied with rouge rubbed into it with a piece of chamois skin, then the stick well beaten to shake off any loose rouge. Always brush a bridge or similar piece in the direction of its length, not crosswise, as by the former way the buff is more likely to touch the whole surface, and less liable to injure the gilding at the edges and corners. Hold the piece you are cleaning (by this method) in a piece of tissue or other thin clean paper. Never touch the finger to a piece after cleaning, as the chemically clean surface is sure to receive a stain from the secretions of the skin, which are both greasy and acid. But if you have accidentally done so, clean it, again, or, if the watch is together, the mark should be wiped off as soon as possible with the chamois or buff, first gently breathing on the part. Even before cleaning, a gilt surface should be handled as little as practicable with the bare fingers. For the backs and sides of bridges, and like surfaces, I use a bristle brush, but still fine and soft, with chalk if needed. If a new brush feels rough, rub it on soft clean sand paper to grind the ends of the bristles down fine and smooth, or else use it on coarse work till the roughness is removed. When the parts are held in a rag, while cleaning, the brush should not be used, as it will rub up the lint and cover everything with it.

(285) If the bristles or hairs come out, make a weak solution of shellac in alcohol, and run a little into the holes in the back of the brush being careful not to spread it through the bunches, and when dry the bristles will be securely cemented in. Brushes should be washed as often as they get at all dirty, either with clean white soap, or, what is better, a solution of washing soda or caustic potash in water. The solution should only be strong enough to feel slippery to the fingers, and make a lather when rubbed. Wash the brushes thoroughly, favoring the backs as well as possible, rinse in several clean waters, then lay them in the sun or a warm room to dry. This may take two or three days, but brushes are so cheap that there is no excuse for being in the condition of the man who had to go to bed and stay while his only shirt was being washed.

(286) Having your bottles, two or three good brushes of different stiffness, and a supply of tissue paper in pieces three or four inches square, nailed up by the corners in a handy place so you can tear one off as wanted, you need some good pigwood. The article sold under that name by material dealers is excellent if fresh and soft, as it is very tough and safe from breaking off in the hole. But after it gets dry and hard it is not fit for use, as it is almost sure to crack a thin jewel, and its cleaning power is very small. If you have no good pig-wood, go to a wagon-maker's shop, and get pieces of soft, straight-grained whitewood or basswood, free from gummy smell, and you have a very good substitute. In pegging out the holes, go over them again and again, from both sides till the stick comes out perfectly white and clean. Be sure that no ends or dust are left in the holes, then lay away under your glass cover.

(287) You should have four or five screw drivers of different sizes, from the large and stout, down to one for the screws for hair-spring studs, jewel settings, etc. Always use one that is a little narrower than the head of the screw to be removed. Screw holes with their corners worn off are a sure sign of botch workman, as is a screw head all marred up, blueing rubbed off, or cock scratched by the slipping of an improperly shaped tool. A screw-driver should be filed rather taper than blunt, the surfaces perfectly flat and straight to the point, never polished, but left as they come from the file. They should invariably be filed crosswise, then hardened in oil, and the temper drawn down to a blue, leaving about ⅛ inch at the point a straw color or purple,—just so that a sharp file will bearly act on it. Made in this way, it will not slip out of the slot, nor break or bend. Other tools will be described when we reach the work for which they are used.

"What kind of a clock do you call that, landlord?" asked a visitor, comparing his watch with the mantel timekeeper in a country hotel. "That?—oh! that's one o' them eight-day fellers," replied the landlord; "every eight days you have to take it around to get it fixed, you know."

Proceedings of the Horological Club.

A DISTINGUISHED BODY OF WATCH AND CLOCK MAKERS.

Twenty-ninth Discussion.—Communicated by the Secretary.

MARK IN WATCH CASES.—NOTICE TO CORRESPONDENTS.

Mr. J. M. D., of Mexia, Texas, writes to the Club, through the Editor of the CIRCULAR, inquiring the cause of the curved mark found in the front case of hunting watches, commencing near the joint and carving upward and backward.

Mr. McFuzee replied that it was produced by the glass-bezel hitting the inside of the case when it was opened and the outer case partly shut. The frequent rubbing finally made the mark referred to by their correspondent.

The Secretary wished to state that he had received a slip of paper a month or more ago, cut from a business letter to the Editor of the CIRCULAR, in which some one referred to a question previously asked and not yet answered. The slip did not state what the question was, nor even who had asked it, and it was therefore returned to the CIRCULAR office with a request for further information. Nothing had been heard in relation to it till the present letter of May 29th, in which J. M. D. speaks of his question asked March 23d, and repeated April 21st, and inquired why it had not been attended to.

His object in making this statement was not merely to explain matters to Mr. J. M. D., but also to say explicitly to correspondents that all communications designed to be presented before the Club should invariably be written out in full, on a separate slip of paper, and addressed to the Secretary of the Horological Club, care of the Editor of the CIRCULAR. Many appear to think that the offices of the Secretary and of the CIRCULAR are together. But the fact is that they are not so, but are as separate and distinct as if they were a thousand miles apart. Letters to the Editor he naturally prefers to keep in his own office; nor can he always spare the time to copy off the portion designed for the Club and forward it to the Secretary. Those who wish to avoid delay or disappointment should heed the above hint.

Correspondents were also in the habit of requesting the Club to ask "Excelsior" how to do this, his views on that, or his decision about the other, etc. The members of the Club would be very glad to comply, *if they could*, as no one could be more ready than they to learn from so high and trustworthy authority on all subjects pertaining to our trade. But the Club has no more idea who "Excelsior" is than their correspondents have. Some have judged from inherent evidence that "Practical Hints" were the work of a well known English horologist; others, of a prominent chronometer maker in this country; and many other guesses as to his identity had been made, even one member of the Club having had the honor of being suspected, but modestly denied the soft impeachment. If friends will just mention in their letters who "Excelsior" is, the Club will ask him all the questions they see fit to propound. Until then, they can only say, don't.

EASILY FLOWING HARD-SOLDER.

Secretary Horological Club:

Will some one of your honorable body be kind enough to inform us, through the JEWELER'S CIRCULAR, how to make the cheap, common yellow solder that is used on, or in making cheap jewelry? There is a solder of the kind that must flow at a low heat, and we think it would be very handy indeed in a country shop in repairing many articles; but we must own our ignorance by saying that we do not know how to make said yellow solder, and if you will give the desired information, you will oblige, truly yours, etc.,

DAVID PECK & SON.

Naples, June 5th, 1876.

Mr. Blowpipe said that an easily flowing 5 karat solder was made of five dwts. gold, 13 dwts. silver, and 6 dwts copper. Melt and cast into a bar; as soon as it can be handled, break into pieces and throw into the melting pot while the pot is hot, add 15 grains of brass and melt again, when thoroughly mixed cast in a bar, and roll out thin for use.

Another solder much used for low grade gold was made as follows: 3 dwts. of gold, 2 of silver, 1½ of copper, melt as above and at the second melting add when liquid ½ dwt. of zinc in small pieces, and as soon as mixed pour in the mould. This solder runs at a dull red heat. ⅔ dwt. of zinc, instead of ½ would flow sooner, but would be apt to eat into the work if too high or too long heat was used. But that would be of little consequence if the article to be soldered was of brass.

FITTING TABLE-ROLLER IN LEVER WATCH.

To the Gentlemen of the Horological Club:

Will some one be kind enough to tell me how I can determine the exact number of degrees of pallet and roller action? Supposing the roller was lost and must be replaced. We can assume the pallet motion to be, say, 10° and that of the roller 40°; the center distance being known, we can make one of the right diameter. But how are these angles to be determined in a particular movement?

A. D. LINSLEY.

Mr. Horologer said that in replacing a table-roller that had been lost, the exact angles of the pallet and roller actions were not material, All that is necessary is to find the size of roller that will work freely past the fork of the lever at both extremes of the pallet motion, and the accuracy of the result will depend largely on the quality of the measuring instruments used. One way is to drill a hole in one end of a small slip of brass, drive it on the balance staff to the position of the roller, and file off the point of it till it has the proper freedom at the end of the lever, then take it off and measure from the centre of the hole to the point, which will be the semi-diameter of the roller. Another way is to measure directly the distance from the balance pivot hole to the end of the lever when in its position in the watch. To do this a pair of fine-pointed dividers was needed, with parallel points, one of which could be projected beyond the other. This must be held perfectly vertical, or perpendicular to the plate of the watch, while measuring. A similar measurement from the balance pivot hole to the inner corners of the horns of the lever, while banked, will give the proper distance from the centre of the roller to the outside of the ruby pin, in order to clear the horns.

But if Mr. L. really wished to know the angles of motion, he should first measure the distance between the balance and lever pivot holes, and mark it on a straight line, which will be the line of centres. Then measure from the centre of the pallet-arbor to the end of the lever fork, and with that distance as a semi-diameter strike a part of a circle across the line of centers, which will represent the motion of the lever fork. Now cut out a concave curve of about that form on a small piece of writing paper make a fine pen mark near one end of this curve, set the mark exactly opposite the point of the lever when resting against one of its bankings then hold the paper still while the lever is moved over to the other banking, and carefully mark opposite the point again. Transfer the distance between these two marks to the curve first drawn, one half on each side of the line of centres. Then from the other end of the line, corresponding to the balance pivot pole, strike a circle passing through these two points. The angles of both the pallet and roller motion can now be measured by means of the ordinary circle protractor.

FROSTING AND ORNAMENTING NICKEL MOVEMENTS.

To the Secretary of the Horological club:

How is the frosting done on nickel movements? Also how the ornamenting is done? For example, the finer grades of the United States watches. K.

Mr. McFuzee stated that the frosting was done in the same way as on gilded movements. The circular marks are made by a sort of knurling tool which is held in contact with the surface while revolved, generally in a special machine, but it could be done by hand, although not so well. The tool may be a circular brush of fine wires, or a round emery stick flat on the acting end. The centre is generally cut out. Or a piece of freestone, or even of charcoal, may be used. The machine for working the tool is made so that the grinding or scratching can be done in either separate or interlinking circles, or spirals, or waved in lines, by setting it to move the tool or the work correspondingly. When the work is done by hand, the workman must exercise his ingenuity with the means he employs, to secure equivalent motions of the

tool or work. The "damaskeening" or ornamenting of the highest grades, is understood to be a secret.

NATIONAL CONVENTION OF WATCHMAKERS.—DEMAGNETIZING WATCHES.

Owing to the fact that the JEWELERS' CIRCULAR for June was published rather late, and there not having been sufficient time between then and the present meeting of the Club to hear from the trade in relation to the Convention as suggested in last month's report, nothing further can be added as yet to what was then said. It is to be hoped, however, that those suggestions may be promptly and generally acted upon.

The same reasons have prevented the general response to the suggestions on the subject of demagnetizing watches, which is desirable before debating the question, and the discussion of it was, therefore, postponed to another meeting.

A FREAK OF LIGHTNING.

Mr. W. H. Seewald, of Fort Smith, Arkansas, sends the following item as one of interest to the Club:

During a recent thunder storm the house of Mr. P. B. Morris, of Sulphur township, was visited by a strange freak of lightning, doing no further damage than to wholly unfit his clock for its daily duty. The lightning is supposed to have come down the chimney, and along a nail driven into the wall about two inches above the clock, entering the top and melting and blackening all parts in its path. It first came in contact with the movements at the escape wheel, melting eight or ten cogs; thence to the third wheel, melting eight or ten cogs; from thence to the verge, which is hardened steel, melting part of it; thence down the verge and pendulum wire and out of the bottom of the clock, which was a new eight day one. The strangest part of the performance was, that twenty-five cents will repair the damage done to the house.

The Adjuster-of-the-French-School said that it was as clear to him as irrefragibility itself, that the owner of that clock was a man who refused to patronize his watchmaker, but left his family to endure the excruciating agonies of starvation, and his suffering children to cry aloud to heaven for vengeance, till an infuriated Providence had to interpose and punish the vile wretch, and furnish a job for that much abused watchmaker. The reason why the house was not injured, was so the man could not explaterate about the expense of fixing up his house, and make that an excuse to ask the watchmaker to trust. Providence always watches over his own, *i. e.* the watchmakers, and doeth all things well.

The A. of the F. S. was going on to explain that as all things were composed of electricity or magnetism, Providence itself was magnetism in an animated state, omniscient, omnipotent, omni-present, omni-everything else, and therefore capable of detecting injustice and executing its decrees by means of its own substance in the form of lightning, etc., etc., when he was interrupted by the Chairman, reminding him that the subject of magnetism had been reserved for discussion at a subsequent meeting.

Mr. Screwsqueezer hero arose in great apparent distress of mind, and inquired if that decision would exelnde his paper on demagnetizing watches, and debate upon it, at this meeting.

The Chairman replied that it did.

"Very well," said Mr. S., meekly, "I bow to the decision of the Chair." And theu, as the lugubrious clouds disappeared from his florid countenance, and a smile of ecstatic joy usurped their place, he added, "It's all right, Mr. Chairman, all right. And now I must depart. Duty calls, and I must go. I leave you, not in anger, but with regret. May heaven smile on you and bless you. Be virtuous and you will be happy. Farewell!" And then he departed.

There being no further business before the meeting, the Club adjourned.

Ancient Prints Relating to Horology.

The Worshipful Company of Clock-makers have just printed a catalogue of the books, MSS., paintings, and prints relating to horology, together with the collection of ancient clocks, watches, and watch-works preserved in their library and museum. These are now deposited in the Guildhall Free Library. The list, compiled by Mr. W. H. Overall, is a foundation for the bibliography of horology.

Among the prints is one representing a very extraordinary clock, the production of Jacob Lovelace, of Exeter. It took thirty-four years to complete the work; he died in 1716. The movements are: First, a moving panorama descriptive of day and night; day is represented by Apollo in his car, drawn by four spirited coursers, accompanied by the twelve hours; and Diana in her car drawn by stags, attended by the twelve hours, represents night. Second, two gilt figures in Roman costume, who turn their heads and salute with their swords as the panorama revolves, and also move in the same manner while the bells are ringing. Third, a perpetual almanac, showing the day of the month on a semi-circular plate, the index returning to the first day of every month on the close of each month without alteration even in leap years, regulated only once in 130 years. Fourth, a circle, the index of which shows the day of the week, with its appropriate planet. Fifth, a perpetual almanac, showing the days of the month, and the equation of time. Sixth, a circle, showing a leap year, the index revolving only once in four years. Seventh, a time-piece that strikes the hour and chimes the quarter, on the face of which the whole of the twenty-four hours are shown and regulated. Within this circle the sun is seen in his course, with the time of rising and setting, by a horizon receding or advancing, as the days lengthen or shorten; and under is seen the moon, showing her different quarters, phases, ages, etc. Eighth, two female figures, one on each side of the dial plate, representing Fame and Terpischore, who move in time when the organ plays. Ninth, a movement regulating the clock as a repeater, to strike or be silent. Tenth, Saturn, the god of time, who beats in time while the organ plays. Eleventh, a circle on the face shows the names of the ten celebrated ancient tunes played by the organ in the interior of the cabinet every four hours. Twelfth, a belfry with six ringers, who ring a merry peal *ad libitum*. The interior of this part of the cabinet is ornamented with beautiful paintings, representing some of the principal ancient buildings in the City of Exeter. Thirteenth, connected with the organ there is a bird organ, which plays when required.

English Jewelry.

Although the production of jewelry is by no means confined to a few towns—being, in fact, pretty general throughout the kingdom—yet the great centres of the manufacture are undoubtedly London and Birmingham. The census of 1861 showed that there were in the metropolis 9,000 gold and silver workers, and since that time the number must have greatly increased. It is computed that in Birmingham not fewer than 30,000 persons of both sexes are engaged in the jewelry and its collateral trades. Yet half a century ago the industry occupied such an insignificant position in the hardware metropolis, that the well-known jewelry manufacturers might have been told off on one's fingers. The number of small makers in Birmingham is legion, as the explorer of the St. Paul's district, the "jewelry quarter" of the town, is not long in discovering. But little capital is required to enter on the business, the tools are inexpensive, and the small manufacturer can turn to account the whole labor of his family. The week's production as a rule finds a ready purchaser in a large manufacturing house or a factor, and a proportion of the proceeds is again invested in gold and other materials of manufacture.

A great deal of jewelry sold as of London make originates in Birmingham, and at one time the latter town was most careful to efface itself in connection with the best specimens of the goldsmith's art that issued from its factories. Of late years, however, a change has been brought about, which may be said to date from the International Exhibition of 1862. On that occasion the Birmingham manufacturers exhibited on their own account and in their own names, boldly dating their wares from Birmingham, instead of, as in the old times, showing their manufactured goods through a middle house, a Regent Street shop, or a London merchant. Since then the tendency to assert themselves has become yet more marked. Another notable change within the last few years in connection with the jewelry trade may be mentioned. The English makers of jewelry were formerly accustomed to make yearly journeys on the Continent, in order to avail themselves of the superior patterns there in vogue. This is no longer

requisite, and now the French and German jewelers absolutely buy Birmingham work to copy for their continental customers. The statements in the periodical returns from the ports of shipment that the outgoing steamers have taken out so many thousand pounds worth of "French jewelry" are, after all, very misleading, if not mythical. It is well known that the buyers for the American and Indian markets mostly reside in Paris, and these gentlemen enter their jewelry consignments "outward" as of French origin, although the goods are for the most part made in Birmingham and purchased in London.

The jewelry trade—like all other trades embracing *articles de luxe* is subject to sudden changes, caused by the vagaries of fashion. For example the Marie Stuart ruffles entirely displaced long ear-rings, until then very much worn. To such an extent did this caprice of fashion run that a simple point in the lobe of the ear and nothing dependent became the rage; now, however, a moderate taste prevails, and suites of severe classic design in ear-rings and brooches are "the mode." Obviously the business of the manufacturing jeweler necessitate considerable eantion; he must, so to say, feel the pulse of the fashionable world, for after producing a large stock of goods of a certain pattern he may find what was once the rage all of a sudden unsaleable, and himself, to borrow an expressive Stock Exchange phrase, "stuck with the stuff." There are no means for obtaining returns of the quantities of gold and silver annually consumed in the manufacture of gold and silver wares in the United Kingdom. They must, however, be very considerable, as articles of precious metals are produced in almost all large towns. It has been ascertained that not less than 1,000 ounces of pure gold are used weekly in Birmingham, and that the consumption of gold leaf in eight manufacturing towns is equal to 600 ounces weekly. For gilding metals by electrotype and the water-gilding processes not less than 10,000 ounces of gold are required annually.

A recent writer well observes:—"At no period in the world's history could the yearly produce of the precious metals have been compared with what it has become in recent times. The number of goldsmiths and the extent of business they severally command have both increased. Factories have arisen where formerly only the benobes of single artificers were needed; and machinery now lightens the labor of the gold-beater, the wire-drawer, the embosser, and the engraver, and performs processes once so toilsome with a rapidity and perfection which hand-work could never have approached. Articles in gold and silver, cheaper and of finer workmanship, are thus produced—the demand for them is stimulated, and the number of artificers employed is greatly increased."

There are assay offices at the following provincial towns, besides the Hall of the Goldsmiths' Company, London:—Birmingham, Chester, Sheffield, Exeter, York, Newcastle-on-Tyne, Glasgow and Dublin. There are special hall and standard marks to each of these localities:

	Hall Marks.	Standard Marks.
Birmingham	An Anchor	A Lion passant.
Chester	Three Wheatsheafs and a Dagger,	" "
Sheffield	A Crown	" "
Exeter	A Castle with two wings	" "
York	Five Lions and a Cross	" "
Newcastle-on-Tyne,	Three Castles	" "
Edinburgh	A Castle and Lion	Thistle.
Glasgow	A Tree and Salmon with a ring in its mouth	Lion rampant.
Dublin	A Harp and Figure of Britannia,	A Harp Crowned
London	A Leopard's Head	Lion passant.

Articles of all standards capable of bearing a stamp are marked with the arms and marks of the particular assay office, and a letter for the date of the year. Different kinds of letters are used by the Goldsmiths' Company; the one now employed is the old black letter. The alphabet was begun in 1856, Q being the letter for the year 1871. It runs on to twenty letters, J being omitted; a fresh alphabet is then again commenced. Twenty two carats fine is the legal assay mark for gold. Gold of 18 carats fine bears the legal mark of the Crown; silver of the new standard, 11 ozs. 10 dwts. fine, the figure of Britannia.

The cutting, and, it might be added, manufacture of precious stones is an important branch of the jewelry trade. Diamond cutting is an industry peculiar to Amsterdam, but it is not unknown in Birmingham. Artificial precious stones are produced largely in Paris, and likewise in the industrial villages of the Jura. Of the latter Septmoncel is famed for its colony of lapidaries. About 4,000 individuals, indeed—men, women and children—are here engaged upon the cutting of precious stones. The lapidary of the Jura works alone, with his family, in a little workshop, furnished with two wheels, at a rent of from about fifty cents to one dollar for twelve hours' use of it and the machinery. He never touches a diamond; otherwise every natural stone of value is welcomed by bis hand, as well as those others artificially manufactured, which be can set forth in a manner to deceive all except the practically initiated. The lapidary of Septmoncel, indeed, often begins by fabricating the gem which be afterwards cuts and polishes; and it is marvellous how be can simulate at once the tint, the degree of hardness, and the weight, upon which, in genuine stones, the value of course depends. These ingenious villagers, as they are termed, although the centre of their abode resembles rather a township, recognise eleven classes of gems, giving the foremost rank to the diamond, which, however, as we have said, they do not profess to deal with; but next to it they rank as colorless stones, the white sapphire, the white topaz of Brazil, and all the varieties of rock crystal.

In succession they prize the red qualities—the many varieties of ruby, the garnet, and the crimson tourmaline; thirdly, the blue, comprising most of the sapphires, the beryl or aequamarine, and second variety of tourmaline—very rare, at Septmoncel at least. The color green they hold to be represented solely by emeralds, whether Brazilian, Peruvian, or Oriental, regarding the apple-green crysolite and its kindred as mere mixtures; while of the yellow they acknowledge the topaz of that tint, the Singhalese crystal—often mistaken for diamond—and so on, through all the glittering list of crysolites, amethysts, hyacinths, opals, moonstones, sunstones, the turquoise, agates, and an inferior family which are not precious in the strict sense of the term, and include malachite, jasper, lapis-lazuli, cameo, and cornelian.

Whatever of these are destined to be operated upon at Septmoncel are received there from an agent. The local craftsman does not know whence, in the course of commerce, they come; he takes them in their rough state, executes his task according to exact instructions given, and returns them to the same agent, without the slightest idea of their destination.

Old Violins Sold in Baltimore.

A rare collection of old violins, tenors and celli, belonging to the estate of the late Louis Smith, have been sold at auction. The instruments went as such things often do, the excellent ones at low prices, and the medium poor ones at fair figures. The undoubted Jacob Stainer, 1612, went at the low figure of $50. A violin marked "Andreas Guanarius, 1630," went at $90. This instrument was used by Max Kaiser, the young soloist, while in this city. It is an old eremona belly, set in a more recent back and ribs. The belly has the unmistakable, inimitable ancient Italian varnish, but it was a very small one, and has been pieced out very ingeniously to the larger size, and is of beautifully even and refined quality of tone. A superb tenor, by Peter Wamsily of London, brought $150. This instrument is of quaint and peculiar pattern, in perfect preservation, and of most exquisite richness and volume of tone. The fine Nicholas Lupot of Paris, 1818, went for $70. It was worth three times the price. An old Schmidt of Vienna, a David Hups, and a quaint old instrument with antique carved back, went at low prices. The most interesting instrument of the collection, however, was the St. Cecelia bass, a magnificent cello that sold for $575 to Koenig of New York. Mr. Asger Hannick, of the Peabody Conservatory, bid $350. When Blogga, the Italian cellist, was in this city, he spent a morning with that cello, and could hardly tear himself away from it. It was brought to this country some half a century ago by Mr. Bodisco, the Russian Minister. It has been in Mr. Smith's collection for a long time, and he is said to have refused $3,000 for it. Another excellent instrument, a little yellow bass, was sold to Koenig for $190. It has a brilliant tone, and is known to be an old Italian instrument, but the name of the maker is unknown.

The Use of Plants in Ornament.

Plant-form has been a prolific sonrce of suggestion to the artist of every age. The Egyptian, Assyrian, and Greek artist found abundant material in the vegetable kingdon for their ornamental design; the papyrus, lotns, or water-lily of the Nile, the honeysuckle and the acanthus leaf were the types of the most beautiful ornamentation. The medeæval artist, to a still larger extent, horrowed natural forms—as the oak, vine, maple, trefoil, ivy, stone-crop, nettle, holly and fungus, which were in a thousand ways transmnted and appropriated hy the carver, into capitals, archmoulds, hosses, and horders, that, for simplicity and elegance cannot he surpassed. And a deeper significance than the æsthetic was hidden under these adaptations; they were frequently symholic also. Thus the lotus of the Egyptians symholized Plenty; while the vine was in allusion to the "True Vine;" the lily meant "Spotlessness," and the palm "Victory." But to the artist, deep and poetical as the inner meaning of plants may he, they possess a nobler power, derivable from the abstract beauty of their endless forms and structure. Apart from their symholic teaching, which springs from association, they appeal to the broader sympathies and emotions of man—they teach us that nature works hy exact laws; that her molecular forces are not capricious, but develope symmetrical forms, as regular and heautiful as any geometry could desire. The terms of hotanical description deter many from a study which is coextensive with nature. Mr. F. E. Hulme says a "very slight expenditure of time and trouhle" is required hy the designer in understanding the commoner terms of hotany; and, when once this knowledge is obtained, the student is more than compensated for his trouhle by the great facility the scientific term gives him of comprehending in all its fulness the meaning of a particular part or peculiarity of growth which can hardly be conveyed hy a circumlocution of common words. There are some very valuahle distinctions which the designer should constantly keep in mind in arranging his designs of plant-form, and these have relation to the manner in which the leaves are joined to the stem; whether singly, as in the watercress and oak, or in pairs, as in the ground ivy; how they alternate with one another; whether they grow out at different positions round the stem, or spirally, or are placed all in one place; what angles they form with the stem, and so on. As regards the leaf, the following points of interest should be carefully observed—1. Its position on the stem. 2. Its general form as a mass. 3. Character of outline. 4. The venation, or disposition of the leaf-veins. 5. The texture. Then, again a leaf may he stalked as, that of the apple; or stalkless, as in the pimpernel; it may surround the stem, as in the perfoliate, honeysuckle, or it may he decurrent or continued down the sides of the stem, as in some thistles. Leaves, when they occur at intervals, and singly, often grow iu a spiral; such is the case with the oak, where each leaf forms an angle with its adjacent one, and five leaves complete one revolution round the stem. In the meadow saffron three leaves make one revolution; whereas, in the ivy, (*Hedera helix*), the third leaf comes over the first. When leaves grow in pairs the pairs sometimes alternate, the second pair being at right angles to the first; in others, as in pond weed they are over one another; in others the successive pairs are ranged spirally. In the pines and firs the leaves are in hundles (*fasciculus*). In the American water-weed, (*Anacharis alsinastrum*) the leaves are whorled, composed of three, four, or more parts. It is a universal law that the greater the number of parts the less regular they are, the simple opposite or two leaved arrangements heing most regular while in the goose grass the whorls vary in the number of their leaves. Of leaf-form there is an exhaustless variety; those leaves whose divisions do not extend to the rib or leaf-stem are simple; while others, where the division extends, are compound. Of the latter kind, also two distinct types prevail—one where the parts radiate, as in the horse-chestnut leaf; the other, where the parts are thrown off at intervals, as in the ash, called pinnate leaves, from their resemblance to a feather. The divisions or leaflets also may be of varying or of equal size. Decompound leaves are those in which the divisions are numerous and complex and a still greater subdivision, as in the hemlock, is known as the supra-decompound. Among the leaves given as examples of the form and subdivision suitable to the ornamentist, is the sycamore (*Acer pseudo-plantanus*), in which the radiating form is ohserved, and the five lobes are of varying proportions, and of an outline that has doubtless suggested to the artist many forms of architectural character as a cinquefoil. Another ornate form is the leaf of the pelargonium also radiate, the outline of the mass being circular, and composed of similarly-shaped lohes. Of quite a different class are leaves of the lanceolate kind (from resemblance to a lance-head) as in the evening primrose (*Ænothera biennis*). Others are oval, spatulate, or battledore-shaped, as in the daisy and London pride; hastate, or dart-shaped as in the corn convalvulous; cordate, or heart-shaped; as in that of the hlack hryony (*Tamus communis*); sagittate, or arrow-shaped, as in the arrow-head (*Sagittaria sagittifolia*); or peltate (or shield-like) as in the nasturtium, where the stem seem to pierce the leaf, its attachment heing at some distance from the margin. Another peculiarity the artist should study, and that is the manner the central line of leaf terminates. Generally it does so in a point, though sometimes there is a depressed appearance at its end, as in the box, and in other cases the leaf is actually divided at its extremity, and is then known as bifid as in the leaf of the ginkgo. This pecnliarity may be made a marked ornamental feature. The venation of leaves is important to the ornamentist. The oak (*Quercus robur*) and the vine leaf (*Vitis vinifera*) illustrate two great distinctions. In the first the veins or leaf-ribs are nearly parallel, and thrown off at intervals along the centre: it is then called "penninerved;" in the vine leaf the veins or rihs are radiate from the hase of the centre rib like a hand, and it is then known as "palminerved." Mr. Hulme says, the sycamore has rarely, if ever, heen applied in decorative art, "though the maple (*Acer campestris*), an allied species, was one of the greatest favorites of the carvers during the decorated period of Gothic." The pelargonium or geranium leaf is highly suggestive also; so is the corn convolvulus, or small bindweed, a common hedge-row plant, also seen entwined round the stalks of growing corn, and exceedingly adapted as the author remarks, for a light class of design. A stall in Wells Cathedral is decorated with it, and it would he well adapted for wrought iron foliation. The leaf of the coltsfoot, called also coughwort, is a highly ornamented form, though Mr. Hulme says he is unahle to cite any instance of its application. From its simple and angular outline, it is well adapted to stone carving. The black bryony, a common plant of our hedges, with its trailing stems, its red herries, and large cordate or heart-like leaves, is also a plant particularly suggestive to the designer, The knap-weed (*Centaurea scabiosa*) has a leaf of a compound form, and very ornamental. The corn marigold is another leaf well adapted for ornamental purposes, and for the same reasons we may name the leaves of the ivy-leaved speedwell (*Veronica hedzrifolia*), which exhibit a remarkahle variation during growth. Outlines of leaves are variously indented, called "entire," "serrate," "dentate," "crenate," "serulate," "erosc," as they are respectively of one unbroken line, with teeth pointed toward apex, with teeth perpendicular to the outline, rounded teeth, small saw-teeth, and irregularly formed. Among the characteristics of leaf-form we may notice the surface of leaves—some are flat, others have their margins waved, or their surfaces hetween the veins wrinkled or convex. These are peculiarities which are very valuable to the decorative artist, as flat leaves are of course more adapted for flat representation, while in carving, a crisped or wrinkled leaf like that of the holly enables the carver to vary his work and give an effect of light and shadow of much value in relief work. Such leaves are the wood-sage and the coltsfoot. Though leaves are generally symmetrical, they are not invariably so. In some cases the portions on each side of the middle rih are of different size. Leaves that show an unsymmetrical disposition are generally alternately placed on the stem. De Candolle says: "This inequality ought to he referred to the position of the leaf upon the plant favoring the developement of one of its sides more than the other, and in this case it is always the lowest which is developed most."

Every now and then a man gets a hullet in his brain and still lives. The frequency of such instances is significant. Nature so abhores a vacuum that she is willing to accept most anything to fill up with.

A Treatise on Isochronism and Elasticity of Metallic Springs.

BY JAMES FERGUSON COLE.

The reverse of the process just described for the correction of short ares by an altered curve is the remedy for gaining in long ares, which in effect is the same as losing in short ares; this may be done by carrying a little more wire from the general coils into the over-coil of the flat spring, or terminal curves of the cylindrical spring; these alterations of the curves, which only produce a change in the collet leverage, are generally found to be effectual, and when not so, the fault will arise from defects elsewhere.

I use the last expression as referring to a practical instance of a pocket watch with a chronometer escapement and going-barrel in which the short ares were slow; it was desirable, in this case, not to interfere with the balance or spring justly at time, and vibrating one turn and a quarter—an extent not too great. After some thought on this, it occurred to me that a stronger main-spring would have the effect of driving the balance quicker through the short are during the impulse, and possibly lessen the error. The stronger main-spring was applied without any disturbance of the escapement or balance, which was exactly poised at first, and the vibration increased by the change of mainspring to a turn and five-eighths (when fully wound), after this it was found that the mechanically isochronons result, by the same mode of trial as before, was so correct as to need no alteration.

Many similar instances have occurred, with like results.

Defects of isochronism with the ordinary flat spring, having an index regulator and curb pins, and, therefore, admitting no correction by curvature, will, in some instances, require the spring to be really shortened or lengthened, as the case may be, by unpinning at the stud; but when pinned technically at the whole turn (that is, when the two points of attachment at the collet and stud agree on the same radial line from the center of motion with balance at rest), the result may, in some instances, be made correct either by opening or closing the curb pins, or by laying the outer coil more or less against one of the pins, so that the wire of the outer coil will quit its contact at any are of vibration suiting the requirement. Closing the pins to diminish the play, or laying the outer coil against one pin or the other, will correct a loss on short ares, the liberation of contact by the coil having, of course, the contrary effect; and as a really altered length, by taking in or letting out more wire at the stud, will effect the mean time, it will be observed that, in all instances of trial for isochronism, the watch must be again brought to time before a new trial is commenced.

An altered length necessarily implies an altered strength of the spring, and its consequent influence on the rate of vibration; and supposing the points of attachment at the stud and collet to agree on the radial line at first, or with some other specific point near the line as a normal, before this alteration of length, they would not agree after. Again, suppose the mean time restored by alteration of the balance weight or diameter, and the isochronism proved correct as the assumed consequence of the displacement of the collet by the already altered length; in such case an over-coil spring, or a cylindrical spring, may have its curvature so altered by re-bending as to replace the stud and collet at the normal point on the line again, without any material disturbance of the mean time previously corrected.

In this case, though apparently right by the first alteration of length which now remains as altered, the isochronism will be found still in defect as before the change of length, whether longer or shorter than at first.

These results show that the altered length of a spring has of itself no influence as a principle in counteracting errors of isochronism, the correction of which is chiefly affected by the change of length altering the mechanical relation of the collet with the stud; the change of length, therefore, can only be regarded as a misconception of the governing power or principle of crank leverage between the collet and stud. The length of any vibratory balance-spring must necessarily bear a definite relation to strength, in order to determine the rate of vibration required for the balance, and though the length may be much increased, the needful strength for governing the balance at time will, in all cases, have to bear the same proportion one to the other, and, therefore, no law can rule the relation of length to strength; but the weight and diameter of the particular balance under consideration, and so regarded any length determined on, and adapted according to the rate of vibration, whether for a quick or for a slow train, will admit of being isochronised under proper management; but this cannot be done in exceptional cases where the motive power is extremely variable, as in eight day going-barrel movements, to be noticed hereafter, as a practical instance in illustration.

In connection with this subject, there are two collateral facts, arising from an altered length, under contraction of the coil, by bending; these facts must not be over-looked, as both are involved, and may operate conjointly with the collet leverage, as secondary elements of the effective power for correction of loss in the short ares, the first effect being an increased length from the bending, becoming part of an extra coil while the spring and balance are at rest; and as an exact revolution of the balance from that point of rest will raise the tension of the spring to a given degree before displacement of the collet by contraction of the curve, the same motion of the balance, after the contraction by bending, will not raise the tension to the same mathematical amount, consequent to the bent portion of the coil lying nearer to the center of motion than before. The converse of this applies equally to extention of the curve by bending it more by as open, this operation the outer coil being more distant from the center, and more strongly opposed by the stud, a greater deflection of the coil, as a flat spring, takes place in a proportionately less amount of balance motion, and hence a gaining result in the opening semi-arc.

It must again be understood, that any convolute spring, having 12 coils, will, by an exact revolution of the balance in the opening direction, become a spring of only 11 coils, and, by an exact revolution of the balance in the closing direction, will become a spring of 13 coils, showing, as in the case of an altered curve, that the spring in opening when in vibratory action, meets more opposition at the stud, by any given motion of the balance; and, further, as the degree of angular measure of the motion, at a shorter radius, is less on the mean circumference of the spring than before, and the degree near the axis bearing a less proportion to the linear measure of wire in the spring, its elastic resistance, for that reason, would not accumulate as rapidly in the closing direction, although the whole alternating force of the spring is exerted between the two determinate points of attachment.

Notwithstanding this, some small difference of effect may theoretically arise, though it admits of no demonstration, but as conjectural observations; pointing out that under the impossibility of indication by a seconds'-hand, or otherwise, it does not follow that there is absolutely *no* influence on the general rate of going, though a difference by the changing weight of wire in the spring cannot be detected, it might have *some* small governing power.

ON THE EFFECT OF VARIABLE MOTIVE POWER—REFERENCE NO. 4.

The influence of variability in the force of an ordinary main-spring from the higher to the lower degrees of tension, is found to operate so detrimentally on the regularity of rate in the performance of balance time-keepers generally, that I think it well to give an instance of the consequent effects of such inequality of motive force on time-keeping, especially on such pieces as are wound up only once a week, as an eight day portable time-keeper, such as referred to.

This was an instance of a portable carriage-clock, with a going-barrel movement, lever escapement, and compensation balance; this clock was found to lose on its rate, from the first winding up to the going down, during each week so considerably, that it was much complained of for irregularity of performance, and for this reason it was asked by the owner, Can anything be done to rectify the fault?

Accordingly, I proposed a remontoire escapement, with secondary spring, one end of which was fixed by a collet on the fourth pinion arbor, and the other end of the spring fitted by a similar collet on the fourth wheel itself, which was a bevel wheel geared into the former scape pinion, the bevel-wheel socket-pipe was now freely fitted on the fourth pinion arbor, and carried only by the secondary or re-

montoire spring. The mode of action was as follows: Between the first fixed collet end of the spring and face of the fourth pinion, from which the old fourth wheel was removed, there was a small disc of steel fixed to fourth arbor was an eccentric disc. At a short distance from the fourth pinion a pivoted arbor was planted, carrying a broad forked lever, which was led by action of the eccentric disc; on the same pivoted arbor was fixed a pair of knife-edged locking pallets, the pallets engaged in a lever scape wheel of eight teeth; this scape wheel was fixed on the third pinion arbor above the third wheel, which geared in the fourth pinion, as at first. This this wheel carried the scape wheel of eight teeth, and when unlocked by the pallets, drove the fourth pinion and wound the remontoire spring, by which the lever escapement and balance was kept going. In this way, by motion of the eccentric and its action on the fork and locking pallets, a reciprocating action was renewed every 30 seconds, and was found to answer so well that no variation of time was found after this amendment was completed.

It must be further understood that the habit of using this carriage-clock was to lay it down casually, any side up, and to guard against those varieties of position the small frame of the escapement, instead of being fixed either on the top or back of the movement, was firmly fixed at 45 degrees, on a bent corner of the square-formed pillar-plate so that the balance axis, holding an attitude or angle of 22½ degrees, was preserved at that angle in every position, front, back, and sides, together with the top and bottom; by this, the balance weight induced the same amount of pivot friction and the same extent of vibration, and to this simple arrangement, combined with uniform impulse, the regularity of time-keeping was wholly attributable.

INFLUENCE OF INERTIA—NOTE 10.

The first effect of impulse from motive power on the balance of a chronometer or watch at rest is the power overcoming the inertia of the matter and other resistances, and giving the balance momentum. Suppose only one impulse given, the momentum oppose by the increasing tension of the balance spring pivot friction, and atmospheric pressure, is gradually diminishing until arriving at the extreme point or limit of motion due to that first impulse—the momentum exactly balanced by the tension of the balance-spring—motion in that direction ceases, and the matter may be supposed to rest for an instant so small that no temr can express it, if this were not the case no reversion of the motion could possibly take place, the line of motion being on the same geometrical curve.

The elastic resistance or force of the balance-spring, induced by the equivalent momentum caused by any single impulse, is in return now exerted in checking the matter and acquired momentum of the balance which again acquires an increasing velocity and momentum by the constant though decreasing force of the balance spring tension so raised: the impulse power in the first instance having only acted through a few degrees in one direction, equal to about the one-tenth part of the whole motion of the first semi-arc; to this the primary point of rest, the momentum and velocity have both increased the matter in its progress, and other resistances to this, the quiescent point, having absorbed all the tension force of the balance spring; the momentum and velocity now go on diminishing, until both are again overruled by the increasing tension of the spring and other resistances as before.

In this, the second semi-arc of motion, the supposed stop at the extreme limit of vibration again occurs, and the balance returns under similar circumstances, commencing a second impulse from the escape wheel within about 15 degrees before reaching the quiescent point, repeating the action, and gradually exhausting the motive power of the main spring.

Having traced the forces and resistances through the two semi-arcs, for the purpose of showing how inertia of matter in the balance operates in conjunction with friction and atmospheric pressure as a third element of resistance, and as no assignable period of time, at the turning point of the matter, can be conceived more reasonable than that motion in the two directions is, in "mathematical expression," continuous, I am of opinion that the varying momentum is constantly opposed through every minute degree of motion, not by the gravitating tendency of matter to rest, but by the property of inertia which disposes matter to remain in the same state, whether of motion or rest, the inertia, or vis inertia, being only made an impediment by some change in the prior condition of the matter, and, therefore, while the rate of motion of a body is constant and invariable in one direction, there will be no effect from inertia, as exemplified by the uniform rate of motion observed in planetary bodies.

Inertia regarded as a property of matter is, of coarse, quite distinct from gravity; gravity, by the constant tendency of matter to fall to a lower position, implies motion only, in opposition to rest. Inertia therefore, may be understood to signify circumstantial impediment to motion or rest, whether as regards falling bodies or bodies propelled in any other direction by other forces. If this view be admitted, then arises the question, What constitutes the impediment?

A body in motion, when moving in any specific direction, having its impetus diverted or opposed by any secondary force, will have its innate property of inertia, instantly excited; or if moving in any direct course at a certain rate, if the speed be accelerated or retarded, that property of matter called inertia stands against the force or momentum in whatever direction the body may be moving, as deducted from the established laws of matter and motion.

It therefore may be: that as the chronometer balance, immediately after receiving an impulse, goes forward gradually diminishing in speed, and, as before stated, returns to its quiescent point gradually increasing in speed (as the point of rest at first is now the point of highest velocity), and, like converging lines, there being no two consecutive points of distance between such lines in the range either way, which agree in rate of motion for the distance traveled, every minute degree of motion is, for that reason, constantly at variance with the condition of the next degree, the momentum being opposed, more or less, as the speed or rate of motion may vary from the distance gone through; the impediment, therefore, from inertia is constant, though varying in intensity with the varying velocity of the balance.

Under this view, inertia of the matter of the balance is included with the friction and atmospheric pressure, admitting the conclusion drawn, that as the weight and diameter of the balance is reduced, so will be the reduction of pivot friction, atmospheric pressure, and inertia of the matter in the balance; but if the diameter only be reduced, as the same weight will will be more concentrated, and though traveling at a quicker rate in the measure of time, the circumferential measure of distance, or space, through which the same matter will have moved (at the centre of gyration in all cases), will be less in a corresponding ratio or proportion, and hence the admissability of the conditions mentioned herein.

The influence of inertia on a clock pendulum, moving at the rate of seconds, or any other rate, while the extent of motion is exact for each semi-arc, so also will be the measure of time. The same reasoning applies to the chronometer balance, under all conditions of action, if the extent of motion is uniform, so will be its rate, and this, when the balance and spring give like results of time, under varied changes of position and extent of vibration, is *called* the isochronism of the balance spring. The same influence of inertia will be understood to operate continuously through every degree of the whole extent of vibration, alike in both cases of the chronometer balance and the clock pendulum. Influence of temperature, under these remarks, is left out of consideration.

A defect of isochronism is usually corrected hy extending or contracting the terminal curves of a spring.

This mode of correction chiefly applies to the cylindrical high spring, generally used in marine chronometers, but the principle of the isochronising curve is also made available as a means of correction in chronometers and watches with flat springs of the volute form, tempered as in the chronometer. This mode of spring was first adapted by the talented watchmaker, M. Breguet.

To effect this in the flat spring, attached to the collet as usual at the inner end of the spiral, the whole circumference of the outer coil is raised above the level of the other coils by a gradually inclined curve, sufficient in elevation for allowing the general plane of the spring to

pass properly free under the pinning end of the stud, to which the over coil is attached, the radial distance of the outer pinning at the stud, where no index is used, being made as near as convenient to the balance centre; but where the index is used the circle of the index should be small, and the curb-pin holes drilled as near as possible to the centre, and with the stud end of the spring adapted to agree with the curb pins. The raised outer coil may now be gradually curved in towards the centre, making about one complete turn from commencement of the rise, and the circumferential place of the outer pinning at the stud should, as a rule, be exactly over the radial line of the inner pinning at the collet, but this, though I would always observe as a rule, with only one coil over, as, if the outer attachment at the stud be made to differ a little from the exact whole turn, with a sufficient amount of wire in the over arrangement, and showing an equable, true, and uniform apparent action in the general coils of the spring, the isochronism is usually found so correct in both lever watches and chronometers as to need but little alteration.

The satisfactory result is also found with the over coil adapted to a properly arranged index, though in this case the pinning, or attachment, will not be so near the centre; the curb pin at the half radius of the spring have been always found to do well; strict adherence to the whole turn, as a principal, by pinning the inner and outer ends of a flat spring with only one over coil in the same radial line, is of importance to the isochronous effect; but, for flat springs, as commonly pinned in the horizontal plane at the full radius or diameter of the outer coil, the whole turn should be taken from the place of the curb pins; the spring, in this case, being longer by the difference between the stud and the curb pins. This apparently simple principle of the whole turn for long and short arcs of vibration, though generally found effectual, is much more troublesome than the over coil mode of springing, as any change of length, if required for correcting the arcs, demands a corresponding alteration of weight in the balance, and retiming the watch. This process may also have to be repeated, while the over coil admits of being pinned a trifle long or short, to accommodate the timing, as adjustment for isochronism may be done afterwards by a curve of the over coil.

Jewelry and Silverware at the Centennial.

The design of the present article is, to give the salient features of the exhibits of jewelry and silverware, made by the different countries at the great Exhibition in Philadelphia, reserving for a future occasion, a more detailed account of individual enterprises.

With this object in view we turn our steps towards the centre of the Main Building, where, in an elegantly fitted up pavilion, will be found three leading New York houses and one Philadelphia house, constituting in themselves the most important exhibit in this line to be seen in the whole building, and offering the most attractive display probably in any line made on the ground, judging from the immense throngs of people which surge all day long around the show cases.

Beginning with our own city, we give the place of honor to the Gorham Manufacturing Co., which exhibits several special designs in vases and figures from solid silver, and one of the most complete and elegant collections of silverware for general table use, taken directly from stock, ever brought together. While other houses may equal these manufacturers in the beauty and finish of their goods, and even excel them, as in the case of the English house of Elkington & Co., by the artistic workmanship of some one article, upon which all the wealth of design and labor of years seem to be expended, none can reach them in the uniform excellence noticeable all through their stock, and in the rare manner in which the artistic element has been utilized, as it were, to lend a greater attractiveness to the smallest piece of silverware made for every day use.

Their chests of solid silver, consisting of various kinds of spoons, forks, knives, etc, and designed for wedding presents, are in numerous patterns and all in exquisite taste, and show a finish in detail that is remarkable.

These chests, a specialty of the Gorham Co., for the display of their goods, are among the most beautiful things in this line to be seen. The most perfect taste is displayed in the contrasting colors of the satin linings, and in the finish of the exteriors, which are in oak (Eastlake style), French walnut, seal skin, etc. The most elaborate and prominent object in this exhibit, is the "Century Vase," designed by Geo. Wilkinson and S. J. Pairpoint, and manufactured by the Gorham Co. It measures five feet four inches in the length of the base, and is four feet two inches in height, weighs two thousand ounces (2,000) in solid silver, and is valued at twenty-five thousand dollars ($25,000). It consists of groups of figures, and medallions, in bas-relief, all telling the story of our country during the past one hundred years, and typifying our progress in the arts and our advancement in commerce, etc. The work is a very spirited one, and displays a fine artistic conception on the part of the designers. A model of a group in wax, bronzed over with silver bronze, by Mr. F. A. Heller, of Buffalo, will strike the eye as one of the finest objects this company exhibits. It is about a foot and a half in height, and is entitled "The King of the Prairie," and represents an Indian woman, a chief's wife, upholding in her arms her infant son to the admiring gaze of the tribe. She is seated on a buffalo, which has its head held low in a vain endeavor to disentangle, with its foot, a ribbon or band of some kind which has fallen over its forehead. The wonderful finish of the details of this group, and the perfection of its conception which is thoroughly national, make it one of the most characteristic things shown. It must be remembered also that it is in wax, while in appearance it has all the solidity and grace of metal. The company intend to reproduce it in metal, and consider it one of the most successful designs they have ever possessed.

Several pieces of metal castings in the rough which they exhibit show the great excellence of the work they make even in the very germ; they seem to be as well finished as if already polished and rounded off. Among other noticeable articles in this exhibit is a Japanese tea set in satin finish, ornamented by a border in rolled work, called the "Hymen" border, and of course emblematical of marriage and life after marriage. There are three large and five small pieces in the set, all chased by hand in lines and bands of gold in Japanese designs. The set is worth $520, and is put up in a seal skin case valued at $60. Another new and characteristic design is a set for nuts—a silver dish ornamented with figures of squirrels, and the nut picks having squirrels on the handles. A "christening" set is an expensive and elegant novelty, designed no doubt for that rare baby born with a silver spoon in its mouth, we have all heard about, as it is valued at the small sum of $600. There is a waiter, saucer, plate, bowl, night lamp, saucepan, napkin-ring, pap-spoon, etc., all solid silver in satin finish and highly polished lines, with a charming allegorical border. The case in which it is put up is itself a work of art, being of Russia leather on the outside, and a beautiful combination of *ecru* and brown satin inside. The coffee, tea and dinner sets which this house shows in sterling silver, are especially to be mentioned for the simplicity and elegance of their designs, and their adaptability for constant use. They range from quite a moderate price to *objets de luxe*, consisting of six pieces and a waiter, for $3,500. Some fine pieces of *repoussee* work are exhibited also, such as a portrait of Dickens, and a highly polished salver as clear as a mirror, the border of flowers and fruit in *repoussee*.

Passing out of the exhibit of the Gorham Co., one comes directly into that of J. E. Caldwell & Co., of Philadelphia, who display a very fine line of silverware, jewelry and diamonds. Their specialty in silverware is their "Queen Ann" silver, which is also characterized as "especially Philadelphian," though Tiffany & Co. have shown the same kind of work in individual pieces made for their stock during the past year. The ornamentation is a reproduction of old English chasing, is called hand made, and is effected by the *repoussee* process. The pieces present a mass of brilliant decorations in raised figures of flowers and foliage, which is rich and showy in the extreme. The shapes are rather more antique, than of Queen Ann's time, and are singularly graceful and appropriate. Apart from the richness and effectiveness of the dinner and tea sets shown in this style of work, is first, their durability, as it is impossible to scratch or dent their surfaces,

and second, their saving of labor, as they can be used constantly for fifty years if possible, without any other cleaning than that obtained from soap and water, retaining forever the same brightness. The dinner set exhibited is valued at $4,500, and the tea set at $1,200. The centre of Caldwell's exhibit is occupied by a small case in which will be found two of the largest diamonds in the Exhibition, and a necklace and earrings of single diamonds, which if not so large and extensive as others shown, are noticeable for the purity of the stones, and the care with which they have been cut and set. The *solitaires* mentioned as among the largest in the Exhibition, are of forty-two carets weight, and valued at $7,000.

The line of jewelry which this house calls attention to, is taken directly from stock, and consists of necklaces, pendants, earrings and brooches, bracelets, etc., in solid gold, with settings of diamonds and other precious stones and cameos, all elegant in design and of the very best workmanship. A novelty in a ladies' pin for a lace scarf or veil, though but a mere trifle, is perfectly exquisite. It represents a white moss bud with leaves, the bud being almost entirely silver, just enough gold being mixed with it to slightly color it, while the petals of the flower and the leaves are in shaded gold of green and yellow. Though the price is but $60, the artistic excellence and fidelity to nature which the ornament displays, would make it cheap at twice that sum. In their cases are also some new goods in enamels on gold, little sets of brooches and earrings, varying in price from $25 to $40, and specially suitable for young girls; the brooches are either a single violet and a field flower in their natural colors, or a bunch of violets with leaves of burnished gold, or a large Parma violet with a diamond in the centre, the earrings matching. Nothing could be prettier than the designs offered.

Tiffany & Co.'s (New York,) exhibit is on another side of the same pavilion, and is characterized by variety and richness and by the excess of silverware it displays over jewelry. The place of honor, however, is given to their diamonds, which are in a case, standing in front of the entrance. They are estimated to be worth in gold $111,000, and are really wonderfully beautiful. They consist of a necklace and earrings of solataires, and one ornament for the hair, made in the form of a feather, having an enormous Brazilian diamond on the tip of it. A necklace of pearls is in this same case, of five strings of small pearls, beautifully white and well matched. Also some very large pear shaped pearls and rare opals. Other rare pieces of jewelry are found here, such as a rose made of diamonds and pearls, and an exquisite set of pearl ornaments.

Little else is shown outside of this case in the way of costly jewelry, though some in moderate priced ornaments in an adjoining case are very fine. Such as earrings and brooches, necklaces, scarf pins, etc., in entirely new designs in raised gold work of different colors; red, green and yellow gold being mixed with platina in very effective combinations. The designs are all strictly Japanese, and are very unique. In several a figure is seen blowing bubbles, the bubbles are represented by pearls and opals; the bubble coming from the pipe being an elongated pearl or opal, with, apparently, the bright glow of the sun upon it. In the favorite conch shell ornaments they have several new styles for bracelets and necklaces, in carved heads with pearl settings transversely connecting them. The many rare and artistic pieces of silverware displayed by this house enter into close competition with Elkington & Co.'s exhibit. They are markedly different in design, leaning most altogether to old or antique forms and decoration; severly beautiful, if less splendid and less orientally rich than are the damascene traceries and ornamentations which are displayed on almost all the pieces of the English house.

Tiffany & Co. have scarcely done themselves justice in their *piece de resistance*, the "Bryant Vase," which occupies a prominent place, as one of their finest specimens of *repousse*. There can be no doubt as to the work in detail. It is of the very finest character and most elaborate in every particular, but its artistic effect as a whole is very poor compared to many other pieces of their work, such as have been displayed at former exhibitions, and which now they have gathered again together from various sources to enrich the present collection. They have revived with excellent effect in the ornamentation of table silver and also in larger designs, the old niello decoration, a metallic enamel in black used in the ornamentation of various kinds of metals before the art of engraving was invented. They show a very exquisite specimen of the work in a "Communion Service," gothic in style with the lettering and ornamental lines in niello. The "nef" style of the sixteenth century is also illustrated in a table design for fruit or flowers in the shape of a sailing ship of hammered and *repousse* work, valued at $2,000. The most wonderful specimen of *repousse* work they exhibit, is a tea set of five pieces; Persian in outline, with the flowers and foliage so beautifully brought out, that a botanist could classify every leaf and flower.

It is impossible in our space to enumerate the many novelties they do exhibit in the way of silverware,—Assyrian, Indian, Russian, Greek and North American in designs and outline, and ornamented in every known style of modern and ancient decoration,—we can only say that the reproach so often thrown at us for our want of artistic perception, falls groundless in the face of this and the other exhibits in the pavilion.

Starr & Marcus, of 22 John Street, New York, completes this admirable quartette. Their exhibit is small but extremely rare and costly, and consists entirely of gems in diamonds, cameos, etc., in three small cases. A diamond necklace, pendants and solitaire earrings, a number of fine pink orientals pearls, and diamonds set as an aigraffe, and a brooch of delicate pink coral cameos, and a necklace of pink coral beads of rare perfection fill the first case. The second is occupied by a superb collection of cameos and intanglios; and the third case by a collection of cameos also, selected and set by this house for the wife of a New York merchant. The cameos are not only very remarkable, but the settings are also heavy and massive in rich cloissonne enamel, and of the most elaborate and splendid character.

Bailey & Co., of Twelfth and Chestnut Streets, Philadelphia, adjoining this centre pavilion, make a small but very rich display. They show in the centre a case of unset cameos, that they have been years in collecting, and which are not excelled by anything of the kind in the Exhibition. They are the very perfection of cameo cutting, and are both mythological and historical; the most perfect likenesses appearing among them of well known characters in history. They also exhibit a necklace and cross, and brooch and earrings of diamonds, valued at $50,000. The diamonds are not very large, but of the very finest quality. Specimens of the "Queen Ann" silver, similar to Caldwell's exhibit, fill another case.

With these few houses the most important part of the United States exhibit is covered.

GREAT BRITAIN.

Great Britain is represented in silverware solely by the world renowned house of Messrs. Elkington & Co., London, who make a most noticeable display of art works in gold, silver and other metals; plain table plate in solid silver and electro silver; decorative table plate, relieved with electro-gold and oxidized silver; Cloissonne and Champleve enamels on silver and copper, and a number of antique art treasures in metals from the South Kensington Museum. The centre of the exhibit is taken up with one of the most elegant and elaborate pieces of *repousse* work in silver and steel probably ever constructed, and is from the bands of M. Morel Ladenil. It is entitled the "Helican Vase," and is illustrative of music and poetry, and was six years in process of making and is said to represent $30,000 in gold.

It is not possible for us to attempt to do justice to the fullness and beauty of the design, or the perfection of the technical execution. It is a masterpiece of skill and rare artistic conception.

The second important work that catches the eye is the "Milton Shield," a fac-simile copy of the original, which was manufactured for the International Exhibition of Paris in 1867, and purchased by the English government at a cost of $15,000. The subject is taken from the Sixth Book of Milton's "Paradise Lost." The present copy has been reproduced by the electrotype process, and shows the most exquisite finish. The original work was like the "Helican Vase" in

silver and steel, with enrichments of damascened gold and wrought by the *repousse* process. Morel Ladeuil was also the artist.

The "Pompeian Toilet" is a plaque about twenty inches in diameter, made especially for this Exhibition, and is the latest work of the artist of the two foregoing specimens. It is similar in materials and wrought by the same process. It represents a Pompeian lady at her toilet, and is valued at $7,500 in gold. The gilt and oxidized tables exhibited by this firm are among the most beautiful things the fancy can conceive; the other articles for house decorations they show are of most graceful forms, and almost oriental in their rich decorations. The one style of damascene tracery in gold, and the combination of highly colored gold and silver, runs through everything, imparting a barbaric splendor to the exhibit that is perfectly dazzling. We need palaces to put these things in, and kings and queens to buy them, for though named for domestic use, they are really art treasures that the eye delights to rest upon, but the fingers fear to handle.

With these beautiful specimens of the art of the silversmith the English exhibit of silverware closes. It is to be regretted that none of the other great London houses have honored us. Their absence is even more noticeable in the jewelry department, where, with the exception of Mr. John Neal and Mr. John Jefferys, and Francati & Santamaria, who offer a very fair collection of gold and silver jewelry, precious stones, etc., the great jewelry centre of London remains wholly unrepresented. If it were not for the display of Mr. William Gibson, Belfast, Ireland, the United Kingdom might hide its diminished head, in the presence of its great American rival. As it is, Mr. Gibson saves the country's honor by coming up to the mark bravely, with the most exquisite and choice display of precious stones and ornaments to be found in the building. Though his exhibit does not cover much space, it has been estimated to represent more money than any similar exhibition. This is accounted for by the special beauty and value of each piece of work, and the choice manner in which they are displayed. The designs seem to be altogether original, and are specially marked by a refinement of fancy and chaste daintiness of taste which gives to the whole character of the exhibit a certain elegance that is very attractive. A set of diamonds and emeralds here shown is valued at about $20,000. The emeralds are said to be the finest exhibited. The diamonds are of the purest water though small, and show to great advantage in their setting of silver.

Noticeable in this case are the number of fine pink corals, set in brooches and bracelets, with diamonds and pearls, and also in a very fine contrasting setting of blue enamel. The solid goodness of every piece in this display, and the number of fine precious stones of all kinds that it embraces, places it among the prominent features of the whole exhibit. Naturally it also embraces bog-wood ornaments of all kinds, set in gold, such as are rarely seen in this country.

Mr. James Aitchison, of Edinburgh, has a characteristic display of Scottish jewelry in gold and silver, and Highland ornaments and stones (cairngorms) found in Scotland; and Mr. Charles Bryan, West Cliff, Whitby, displays all kinds of ornaments of the celebrated Whitby jet.

FRANCE.

The display here of gems and fine gold ornaments is equally meagre, and chiefly noticeable for the absence of well known Paris firms. Fils Boucheron, 152, 153 and 154 Palais-Royal, Paris, exhibit $80,000 worth of diamonds, made into a coronet and necklace of very elaborate pattern. The stones are small and not well matched, and the design and setting not effective. The contrast of our own settings in diamonds is in no place so strongly brought out as here. While this *parure* represents a good round sum in dollars, it does not much exceed in effectiveness its paste sisters around it, and this may be as much attributed to the clumsy manner in which the gems are mounted, as to their lack of brilliancy. In any one of the American diamond exhibits, the radiant style in which their best points manifest themselves, with their airy, limpid appearance, is almost too much to put into words, and cannot but strike even a prejudiced beholder.

MM. Boucheron also show a number of costly diamond ornaments in the form of sprigs and flowers; some very fine pearls in pink and smoke color, said to be the largest exhibited; gold ornaments, very massive and showy, and a coral set, necklace and hair ornaments, unique and striking in design.

M. A. Fornet exhibits a novelty in the way of transparent enamel jewelry, very pretty and not expensive, the sets selling from $24 upwards. He has already disposed of all his specimens. The ornaments have the appearance of being encrusted with various kinds of stones of different colors, which is, however, the enamel very cleverly put on, on an open ground of variegated enamel. As the articles are showy and pretty, and what is called "becoming," they are destined to have an ephemeral success with the ladies.

Emile Philippi, Paris, shows some Egyptian jewels (scarabees) from authentic sources; and Cleruent & Co., Paris, a fine collection of pearls and diamonds. Outside of this there is not much more to note, except the number of dealers who make exhibits of gilt and imitation and stage jewelry, and imitation precious stones.

ITALY.

Ettore Geraldini, Rome, exhibits a rich and varied collection of all kinds of costly jewelry and precious stones. The special point of his display is the exquisite sets of Byzantine and Florentine mosaics.

C. Salvo & Sons, Genoa, and Emileo Forte, Genoa, show some of the finest specimens of gold and silver filigree work it is possible to imagine, personal ornaments of all kinds, and card receivers, card cases, boxes, etc. The workmanship of these articles is of the very finest description, the coloring warm and rich, and the designs graceful and artistic; altogether exceeding the exhibits of this sort of work made by Portugal and Sweden.

Guiseppe Gioiuzza, Naples, has the finest collection of coral displayed, in beads, necklaces, bracelets, brooches and earrings, combs and hair ornaments. He numbers in his collection many of the largest pieces of coral to be found. One, a head set as a brooch, is almost two inches in diameter, and richly encircled with pearls. This is kept for private inspection only, as is also a rare necklace in the beautiful pale pink coral so difficult to obtain, valued at $1,000. It is Pompeian in design, and set in fine filigree work, and was ten years in making on account of the trouble and time it cost to match the corals.

Niccolo Bellezza, Rome, exhibits a very costly and striking collection of jewels and ornaments. Specially noticeable are a necklace of intaglios in Egyptian design, and some Roman ornaments for the neck of very singular shape; a collar of diamonds and pale pink rubies, valued at $20,000, and a large turquoise, said to be worth $2,000. Also a gold filigree collar for a lady, set with large pearls, pink rubies and diamonds encircling the pearls, and fastened in front with a slide which imitates a cord and tassels, the tassels being formed of pear shaped pearls; the pattern is very unique.

Alessandro Castellani, Rome, exhibits in a small case some facsimiles of antique jewels, which are very interesting, ancient sards with intaglios and cameos, and a necklace of engraved emeralds. Signor Castellani has also a collection in one of the small rooms of the Italian Department in Memorial Hall, which will delight the lovers of the antique. Gold ornaments of the ancient Lombard style; bronze and silver ornaments of military use by the Crusaders in the 11th, 12th and 13th centuries; gold ornaments taken from the "Cemeteries of Etruria," and from the "Cemeteries of Cœre," 700 B. C.; Phœnician ornaments; sixteenth century jewelry, and gold Italian-Greek ornaments from Tarentom, 350 B. C., are there to be seen, besides a number of fine cameos and intaglios.

SWEDEN AND NORWAY.

P. A. Lie exhibits a case of ornaments in silver filigree work, the designs of which are very simple, though the execution is extremely fine; also several pieces of work in solid silver. J. Tostrup, Christiana, Norway, also exhibits silver filigree work in personal ornaments, card receivers, &c., and solid silverware, such as a centre piece for fruit and flowers, coffee spoons, candlesticks, etc. The extreme beauty and finish of the work has surprised every one who has seen it.

PORTUGAL.

Little Portugal makes a very fine collective display of gold and silver filigree work, quite artistic in design and very nearly equal in work and finish to the Italian display. She also shows some toilet sets in solid silver.

GERMANY.

Germany's exhibit consists of two collective displays of gold ornaments, precious stones, and silver and plated ware. Out of the fifty exhibitors who contribute their mite to this poor display, there are but two or three names which are even deserving of mention, and these are C. Bissinger & Sons, and C. Hertel & Sons, Hanau, and H. Keller & Wild & Co., from Pforzheim. They all have a few things which are very pretty and attractive, Bissinger & Sons especially showing two very beautiful sets, one in diamonds and pearls and the other in turquoise, diamonds and pearls. The rest of the exhibits can only be characterized as mean and poor in the extreme, consisting of the cheapest kinds of gaudy ornaments set with the cheapest kinds of stones in all the colors of the rainbow.

AUSTRIA.

Markowitsch & Shera, exhibit a case of silver ornaments in niello enamel, very striking in design. Michael Goldschmidt (P. Bissinger, 13 John St., N. Y., Agent), exhibits a large case of gold and silver ornaments, thickly set with garnets. The case is filled with the same style of jewelry.

M. Kerch, Prague, shows a small case of real Bohemian garnet jewelry, similar to the above.

Joseph Zasche, Vienna, has a very pretty and effective collection of porcelain and enamel jewelry, figures and flowers on a black ground.

RUSSIA.

Here will be found, to the surprise of every body, two collective exhibits of some of the very finest silverware in the Exhibition, not only unique in design but remarkably original, and different from any thing in silverware the world has ever seen. The exhibit is a collective one and not large, only filling two cases, and consisting of massive drinking pitchers or tankards, cake baskets, and a number of small ornaments. The baskets are in electro-gold and imitate plaited straws, and have thrown over them a fringed damask, wrought in silver. The tankards have a grand, barbaric appearance, they are in gold and silver, with groups of figures in relief upon three sides of them. The most careful work is shown on every piece exhibited, the *repousse* process, eloisconne and niello enamels being used with great effect and with taste and judgment.

W. Adler, Moscow, has a case of colored gold ornaments of very original designs,—burnished leaves with bugs as jewels upon them and a moss rose and leaves, the bud being one large pearl.

Otto Krambrugal, Moscow, exhibits some costly stones in necklaces and ornaments, and agrafe in diamonds and pearls which is a perfect blaze of light. All the jewelry designs shown by this and other Russian firms differ from other countries, and is well worth inspection.

SWITZERLAND.

Petit, Pierre & Bryson, and Shaineck & Co., both of Geneva, exhibit two small cases of watch chains and gold brooches and earrings of very ordinary designs.

BRAZIL.

Natte has a small case of Brazilian scarabees and other insects set and unset. Further than this there is no exhibit of the native wealth of the country in precious stones. It is a matter of great regret that the superb collection of diamonds sent by this country could not have been entered, as they would have added wonderfully to the interest of this section of the building.

SPAIN

This country has a collective display of silver ornaments, plain and in enamel, not noticeable for the work or design.

The above notes give a hasty, yet comprehensive view of what is to be seen at the great Exhibition in the way of jewelry. The department of watches we shall treat of in a separate article, and our readers may expect also in future numbers more detailed description of individual exhibits. The colored plate of the American Watch Company's exhibits could not be prepared in time for this month's issue, but will be ready for that of August.

Master Humphreys' Clock.

Until a few weeks ago the original Master Humphreys' Clock was to be seen over the door of the late Mr. Humphreys' shop in Barnard Castle, County of Durham, England. Mr. Humphreys was a clock and watch maker, and rendered great service to Charles Dickens in supplying him with the material for his *Nicholas Nickleby*, and it was this worthy horologist's clock which suggested to him the title of that book. The Humphreys' family have in their possession a letter from Mr. Dickens stating this, and a copy of the work containing the autograph of the author. Mr. Humphreys directed Mr. Dickens and his friend Phiz, to the school which the two travelers rendered infamous by their pen and pencil, but it was by no means the worst of those institutions. The schoolmaster had been very successful in obtaining pupils, and had become very tyrannical and insulting to strangers. He received Mr. Dickens and his companion with extreme hauteur, and did not as much as withdraw his eyes from the operation of penmaking during their interview But "Phiz," who did not dare to display his drawing materials openly, sketched him on his thumb nail, and reproduced him so exactly that soon after the appearance of the novel the school fell off, and was ultimately deserted. Since that period the "Dotheboys" description of the school has altogether ceased in the district, although many of the prison-like structures still remain.

The clock was recently purchased by an eminent and wealthy firm of leather factors, George Angus & Son, of Newcastle and Liverpool, England, and has been sent by them as a present to the Hon. Isaac H. Bailey, of this City. It was first intended that the clock should be placed in the Centennial Exhibition, but owing to the lateness of its arrival, this matter has been left entirely to the discretion of Mr. Bailey. It is now placed in the office of its owner, No. 17 Spruce street, where it will tick out the hours and minutes with the same regularity that characterized it in its honored place in front of the shop of Master Humphreys; there it will permanently remain unless it should be sent for a period to the Centennial. The clock is a solid structure, with a dial two feet in diameter, and the hours marked in yellow Roman numerals on a slate-colored ground. A massive pendulum swings beneath, and heavy weights move the works. The oaken case with the clock, does not accompany it, either because it was too bulky for convenient transportation, or because it was an necessory introduced by the fertile imagination of the author, which is probably the fact.

A New Engraving Machine.

A Mr. Atchison, of Boston, Mass., has patented a new machine for engraved or chased ground work on gold or plated jewelry, silver, plate, or washed ware. The inventor claims that it can be applied as well to the highest plated surface as to solid metal, and will produce a beautiful matting on gold, rolled to a thickness of note paper. The working of the machine is also said to be very simple, the engraving tools being easily removed and fitted, so that they may be changed in accordance with the kind of work to be executed. The ground work is produced on the metal with great rapidity, the tools delivering 5,335 cuts per minute, and the instrument can be worked by a child. As the sale of jewelry and silverware depends almost entirely upon the ornamentation, it need hardly be added that a machine of this description, making a very excellent imitation of hand work, is one of considerable economical value to manufacturing jewelers We are informed that the machine will produce fourteen styles of groundwork claimed to be superior to satin, pearl or sand blast finish in depth, durability and beauty. It is also adapted to certain kinds of wood carving especially for panel work and for the routing of engravers' blocks.

The International Metric Commission at Paris.—The construction of the new standard metres of kilogrammes of platinum-iridium, intrusted to the French section of the commission, is approaching completion, and comparisons with old standards and with each other will probably be commenced very soon. The committee consists of representatives from the following countries :—Spain, Germany, Austria, Belgium, France, United States, Russia, Sweden, Norway, Turkey, Italy and Switzerland, our own representative being Prof. Hilgard. Three governments—Great Britain, Holland, and Greece—have so far declined to take part in the convention. Though willing to take part in the convention in a certain sense, if the object of the inquiry was limited to the verification of the new metric standard, they refused to form a part of the convention, which established a permanent international institution for other and larger scientific objects, and for promoting the progress of a metric system.

The Jewelers' Circular & Horological Review.

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THE

Jewelers' Circular & Horological Review,

THE RECOGNIZED ORGAN OF THE TRADE.

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

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What will become of the Trade?

It is a startling and alarming fact that the jewelry trade is rapidly losing its special character. Year by year the number is increased of outside dealers who lay in a sufficient stock to rob just enough trade from the local dealer to take the butter off his bread, and finally to cut down the bread itself to such a short allowance as to drive him out of the business. Every week we hear of more and more dealers in dry goods, groceries, stationery, books, drugs, etc., etc, going also into the jewelery business, and in manifold ways demoralizing our own trade proper. In fact there seems to be scarcely a country dealer of any kind who does not keep a line of cheap jewelry, while in the large towns and cities the jewelry trade proper is almost being dried up by the gentlemen's furnishing stores, fancy goods dealers, and similar establishments that sell more or less of jewelry.

It is a fact worth noting that this is a general sign of the times, in which the jewelry trade is not the only, although it is a chief, sufferer. The book dealers have been making the same complaint, and in fact the book and jewelry businesses have many points of resemblance in which they can condole with each other. In both cases the effect of the movement we have pointed out, is disastrous alike to the trade and to the public. The reason for this breaking down of the lines of specialties, is undoubtedly the desire of men in these hard times to save themselves by grasping all the trade they can get, whether in their own specialties, or in any other. So the bookseller perhaps lays in jewelry and the jeweler, books; and the grocer, books and jewelry both; and then the grocer-bookseller-jeweler adds a barber shop or lunch room to his already amalgamated business. In such times as these every penny counts, and no channel is forgotten through which a possible penny may come. In a word, there are too many men in (or out of) the trade to be supported by the present amount of business; they have consequently taken to cutting each others throats, and slashing into any business other than their own in which they think there may be the slightest chance of profit. While this is true about the retailers, it also affords the explanation of the action of questionable wholesale houses, of whom we shall speak later.

The important point to be considered is the result of this cutting-up of business, on the two classes chiefly interested. It is said that "competition is the life of trade," and so it is; but competition in that sense does not mean the present cut-throat demoralization. That is the death of trade, and not its life, and it is alike unhealthy whether we look at it from the trade point of view, or from the standpoint of the public. It is often supposed that the trade and the public interest are at odds,—that the one is interested solely in getting high prices, and the other in getting low prices; but this is only a narrow and imperfect view. The present state is detrimental to both interests in almost equal degree. So far as the public are concerned, it deteriorates the quality of the goods they buy, and therefore the public taste; for these shops which go into the jewelry business as a makeshift, buy only the cheaper and less artistic line of goods. They have neither the capital nor trade knowledge on which to stock up with first class goods, and they pour into the channels of trade goods which are either of a deteriorated quality or imitation trash. It is the case of the watchmaker who knows his business, and knows he cannot afford to do a certain piece of repairing less than his three dollars, against the fraud who knows nothing properly about watch repairing, and to whom you pay your dollar, probably for spoiling your watch.

The comparison holds true in many ways; as to the trade, the effect is this. The invading dealers sell the inferior goods on which capital is quickest turned over; they leave to the trade proper the expensive goods for which a customer must be sought, and which must perhaps be kept in stock for a considerable time. The edge is thus taken off the business of the dealer proper, who is left to pay his store-rent from goods which yield a comparatively slow and low profit. The result is that he cannot make a profit, and soon, that he cannot make a living; he must shut up his store and leave the business to the invaders, unless he is stronger than most dealers are in these hard times. Thus the local jewelry store is driven out of existence. The stores which peddle in jewelry cannot afford to keep really fine stock, and so the local trade is utterly destroyed. In this way the reaction comes upon the wholesaler, who feels the effect last, though not least.

We should say right here that we are not referring to that general amalgamation of trade, which is the first stage of American store-keeping. The country variety store is an American institution that no one can speak of but with respect; it is the out-post of internal commerce, and as the village grows into a large town, new and different stores are required, for the new and diversified community. On one side the variety store becomes a grocery, on another a book store, and on another a jewelry store. What we are speaking of is the retrogression from the better system, to the older and cruder plan. The variety store is in its place in a small, scant, new population. It is bad for trade always when any community "goes back" on its special shops.

Now this evil is difficult to remedy; but there is one direction in which it can be directly attacked. The encroachment on the legitimate trade has been brought about chiefly by a certain class of wholesale dealers, whose head-quarters are, for the most part, in Chicago. These so-called jobbing houses have flooded the country with seductive circulars and illustrated catalogues, until the whole community is demoralized. The bait is held out to all sorts of other dealers, and in fact to individual consumers, until by and by the customers of local dealers are themselves as familiar with the net prices of jewelry and watches as William B. Clapp & Co., and Kronberg themselves. The western and southern dealers in particular are constantly treated to the most tempting offer sent through the mails, so that he who runs may read. Trade discounts are offered to everybody on postal cards, and there is no distinction left between the dealer and the man who buys of the dealer. And it is too often this class who unblushingly offer twelve

and fourteen karat rings, marked sixteen and eighteen, and who cheapen in design and workmanship every novelty of real excellence that is put in the market. It is through them that business is demoralized, the public defrauded, and the public taste depraved. The calling is not an honest one, and the trade ought to stamp it with dishonesty, for its own benefit and for the benefit of the public.

We have been repeatedly urged to put in print the names of these parties, so that honest men may be on their guard against them. That is however rather the work of the trade itself, and we may best call upon all dealers interested to vindicate the trade, by coming forward and stating who these parties are, and what they are doing. Those who are alive to the interest of their calling will then know whom to encourage, and whom to fight. We ask retailers to keep the trade posted, by sending us circulars of the sort of which they complain, and otherwise informing us of this demoralizing movement. It can only be met by vigorous action, and it must be met, if the trade is to keep the position it should hold.

The Jewelers' Association.

The time is near at hand when the members of the Jewelers' Association will hold their second annual meeting to exchange congratulations upon the good work which has already been achieved, and to discuss proposals for an extension of its sphere of action. A most important question which will probably be brought before the meeting will be the establishment of a credit bureau in connection with the association, special reference being had to the methods, objects and results of such an organization as has already been created under similar circumstances in the crockery trade, and still more lately by the hardware, cutlery and iron houses.

The objects of such a credit bureau are to obtain reliable information concerning the standing of merchants who do business with the New York houses; to guard against unnecessary extension of credit; to provide for a thorough examination of insolvent and bankrupt estates, and to do the work of a collection bureau. Inquiry slips with the names of buyers in the market are sent round to all members, and the collected responses are in turn distributed so that every individual is possessed of the combined knowledge of the trade.

Such is the primary object and daily labor of a credit bureau as that projected. The plan speaks for itself and is fortified by the success of actual experiment. One point merits special reference. The information given by such a bureau is gathered by trustworthy agents from reliable sources—not picked up or guessed at by unscrupulous detectives or careless correspondents.

The other aims of a credit bureau are such as naturally grow out of such an organization. Its officers are possessed of all available information, and hence are able to discover weakness and rout out fraud. They are backed by the associated power of the trade, are not cramped for want of funds while they are debarred from extravagant expenditure. Hence the work is well done at the lowest figures, as our readers will better comprehend when we tell them that thus far the collections for the crockery trade has been made without charge to members of the association. This is a fact more eloquent than any words we could use, and points out practical benefit which all must recognize.

The attention of the trade has of late been so painfully directed to the question of fraudulent failures that there is little need for us to return to so unpleasant a theme. The Jewelers' Association has done well in the Levi and other cases, but how much better would it have succeeded if the hands of its officers had been strengthened by the information of a credit bureau. Nay, more—had that credit bureau been in operation, it is probable that those cases would never have disgraced the world by their existence, and it is certain that many persons who now regret heavy losses would be clearly convinced that the Jewelers' Association and the credit bureau connected therewith are active agents for good in this mixed-up community. If we can't make men honest, we can at least point out who the tricky scamps are.

Individual Journalism.

We have some delicacy in treating the subject of trade journalism, since it may be considered that we are impeaching rivals of our own, and acting, therefore, only from self-motives. But we think the CIRCULAR has fairly shown itself above that, and there is one feature of commercial journalism, so-called, that should be held up to reprobation. We refer to the journals published nominally as representatives of the trade or of general interests, while they are actually organs of private dealers or enterprises whose names do not appear or are subordinated, and such influence as the journal has is thrown entirely for selfish purposes. They aim chiefly to get enough outside advertisments to pay the expense of the issue, the remainder of the paper being filled up with fulsome puffery of the goods of the parties in interest themselves. Too often the reading matter is apt to consist largely of plagiarized articles, for which no sort of credit is given. We call the attention of those interested to this subject, because it is scarcely fair that reputable journalism should be made to suffer by such caricatures of it as these.

The Circular at the Centennial.

We would direct the special attention of our readers to the article upon the exhibits made by the trade at the Centennial Exhibition, which appears in our columns. We believe that this is the first and only attempt which has been made to do justice to the important industries which we officially represent, for other periodicals have held off from their duty in the hope of extorting extra remuneration for the conveyance of that information which we have collected at great pains, but proffer freely and willingly. The importance of the Centennial Exhibition cannot be overestimated, but the benefits to be derived therefrom are greatly facilitated by distinct and careful treatment, such as that which we have bestowed upon the various exhibits. Nor will our good work conclude with what has been already done. We have important designs—some of which are already perfected—to place before our patrons, and thereby we purpose to give those who stay at home a clear understanding of the world's fair, and enable those who visit it to see what interests them most, quickly and thoroughly. By such work, honest, painstaking and reliable, we would prove ourselves conscious of the responsibility we owe to our readers, and would discharge our obligations to them, so that all concerned shall be satisfied with our efforts to support the elevated standard we have always made it our object to establish and preserve.

Editorial Jottings.

There has been some criticism in the trade of the management of the Swiss department, as regards the presence of the Swiss representatives appointed to show goods and give information. It is simple justice to state that this is owing chiefly to the fact that the judges in our department has laid violent hold on Mr. Grihi, the Swiss representative, and kept him quite busy as an expert in testing movements. Unfortunately he has been unable to be in two places at the same time, and this accounts for the difficulty.

We present with this number another interesting plate in chromolithography, the long-promised illustration of the American Watch Company's exhibit at the Centennial. The illustration, we confess, does but poor justice to the display, but this is not because of the promises of the former, but to the exceptional excellence of the latter. This tasteful and remarkable exhibit attracts many visitors, and the many hundred movements shown are a great surprise, not only to foreigners, but to the many Americans who had little idea of the variety and excellence of American watch industry. The case has until recently been exhibited in the Main Building, but the location there was not central, and it has lately been removed to Machinery Hall, just on the other side of the Corliss engine, near the miniature Waltham Factory. This is an excellent position, and each exhibit will be the more interesting because of its proximity to the other. The exhibits, both of processes and products, are most tastefully showu, and is new proof of the wise enterprise of the American Watch Company and of Messrs. Robbins & Appleton

We are pained to record the sudden death, at Locle, Switzerland, of a brother of Mr. Favre of the Swiss Commission. It was the result of reckless shooting, and was under the most distressing circumstances, and we convey to Mr. Favre the sympathy of his American friends.

It is pleasant to see the judges at the Centennial dwelling together in unity and working like beavers through all this hot weather. The most eminent of our scientists are there to be found, coats off, hard at work, and the cordiality which prevails among them, and their earnestness in their difficult work, is surety that the awards will be made wisely and fairly.

Mr. Ernest Saudoz, of Chicago, has opened a practical horological school, at 224 State street, for the instruction of young men who desire to perfect themselves in special branches of watchmaking. The trade has long been in want of some such educational institute, and as Mr. Saudoz is no stranger to our readers, we have every hope of his ultimate success, and proffer him our best wishes.

The Adams & Shaw Company.

An event of interest to the trade is the opening of Adams & Shaw Company's sample office at No. 1 Bond street, New York, for wholesale orders in high-class sterling silver-ware and electro-plate. It is well known that the firm of Tiffany & Company have, for many years past, thrown their unsurpassed resources in the manufacture of those original and *recherche* styles of silver and silver-plated ware which have distinguished their own salesrooms. It is not so generally known that Messrs. Tiffany & Company are interested in the manufacturing and wholesale business of the Adams & Shaw Company; Mr. C. L. Tiffany himself being its treasurer. It is needless to suggest the advantage to the general trade from this association.

Mr. Thomas Shaw, who is at the head of the manufacturing department, was apprenticed to the famous Elkingtons of Birmingham, more than twenty-five years ago, where he became practically skilled in every process connected with the manufacture, including design, which he studied indefatigably in the art schools of England. Eventually Mr. Shaw was induced to remove to this country, where he was employed in the establishment of the Gorham Company, at Providence, until, in connection with Messrs. Tiffany & Company, he formed the manufacturing firm of Thomas Shaw & Co., in the same city. The development of this combination and of this manufacture has resulted in the amply equipped organization now known as the Adams & Shaw Company, of Providence. Mr. C. C. Adams, who stands at its head, is perhaps as well-known a representative of what is "sterling" in the silver trade as could be named, having been identified with it for nearly twenty years. It is but a few months since we noticed Mr. Adams' retirement, with the expressed hope that his absence was to be but temporary; a hope which we are glad to find so speedily and auspiciously fulfilled.

For the sterling silver branch of their business, the Adams & Shaw Company are in active preparation. Their electro-plate, it may not be amiss to explain, even to many in the trade, is a body of the favorite and beautiful metal nickel, properly modified for practical use, being coated with silver of absolute purity to a thickness practically indestructable; lacks nothing of solid silver ware in effect. All joints are united with silver solder, which fuses and amalgamates with the material to be joined, making the article one solid piece of metal throughout; whereas the "soft solder" more frequently used is merely adhesive, and readily separates under force or heat. The trade will find every guaranty of the most substantial and durable satisfaction to their customers, in the goods to be offered them by the new combination.

Our Centennial Report.

In the last issue of this periodical we treated in general terms of the exhibition of jewelry and silverware at the Centennial. It is our purpose in the present article to deal with the leading exhibits in detail, confident that by so doing we shall interest the trade, who like to know what is going on, and also render some small service to those spirited manufacturers who have not hid their light under a bushel, but who have put their wares in successful competition with the industry of the world.

Only those who have visited the Exhibition and compared the American and European displays, can know how triumphantly our domestic manufacturers have asserted their ability to produce fine and durable goods. Hitherto we have been consumers rather than producers, but the displays of original art and industry made by our leading manufacturers, show that we can design and execute for ourselves.

It is true that the exhibition is not perfect in arrangement, and it is not the easiest matter in the world to discover any particular display in the chaotic confusion which is the result of phenomenal mis-arrangement. We have, however done our best to give the correct centennial address of each exhibitor, and this will, we trust, enable our readers to inspect for themselves and verify our remarks by personal observation. This much we will at least say—that every member of the trade should make it his business to visit the exhibition and spend some time in the careful study of the wares therein exhibited. By so doing, pleasure, information and profit will without fail be had. We can all of us learn by observing and considering, and no better industrial school can exist than that which is afforded by an international exhibition such as that now in progress at Philadelphia.

THE MERIDEN BRITANNIA CO.

It is a refreshing fact that among all the show-cases in the exhibition the handsomest and most tasteful is that which has been erected by the Meriden Britannia Co., and which is situated on the nave near the music staud in the centre of the building. The Pavilion, which is furnished and fitted by E. A. Lauten, of 63 Prince street, N. Y., is quadrangular in shape, being walled in by four handsome cases in black varnished wood, lined with gold, set with large sheets of plate glass. The arrangement of the cases is such that the visitor can look at the goods from the outside and then enter the interior of the edifice, where the representative of the firm is to be found. Thus every article can be perfectly inspected. The pavilion is set around the base with slabs of Tennessee marble, and is surmounted by a dome in blue and gold, which adds much to the general effect. The edifice is, in fact, the finest in the exhibition, and the goods which are therein contained are well worthy of so admirable a casket.

The case on the nave next the music staud contains a number of salvers, dinner and tea sets, including a new dinner set just completed, which is finished with figures of children serving dishes. A gold-plated set is also worthy of attention, and several toilet sets will be of interest to the fair sex. The Buffalo Hunt, a statuette representing a mounted Indian pursuing the horned monarch of the plains is placed on a pedestal fronting the nave. The design, execution and finish of this piece are artistic in the highest degree, and the qualities of the work compel attention from the multitude and admiration from all who are skilled in such matters.

In the same case is a very handsome set, of punch bowl, salver, ladle and twelve goblets, plated on nickel, which have been pronounced by experts as one of the finest examples of modern art, while the sloop yacht in full sail, Forest and Stream cup, and "Indian" epergne are other instances of elegant design and exquisite workmanship. The "Neptune" epergne is a most important feature of the show-case on the other side, and an interesting centennial novelty is to be found in the "Elder Brewster" tea set which has been manufactured after an original design brought over in the Mayflower. There are also a number of the porcelain-lined baking and table service dishes, ice pitchers, and other specialties of this house, and a full line of the well-known "1847, Rogers Bros. XII," spoons and forks, plated by the sectional process, by which the wearing parts of spoons and forks are coated with an extra thickness of silver. This manufacture is a specialty of the Meriden Britannia Co., and worthy of particular attention. Specimens may be inspected, as also of the new resonant white metal with silver ring made by them under Silliman's patent. There are many other matters in this exhibit deserving of special notice, but we must close with a reference to the nickel plate metallic mirrors, which are accurate in reflection and perfect in polish, as may be seen in the *plaques* of the "Neptune" epergne and sloop-yacht above referred to.

REED & BARTON

Messrs. Reed & Barton, of 690 Broadway, occupy a handsome pavilion at column N, 47, where they exhibit a very fine assortment of electro-plated nickel, silver and white metal table and presentation ware. A prominent feature of their exhibit is the very spirited and finished statuette of a trotter driven to sulky, which is a worthy companion for the best work in the English and Russian departments. The statuette is perfect in every detail, and both horse and driver seemed inspired with life. The work is national and should be secured as a prize for some of the competitions on our trotting tracks. There are several epergnes worthy of special notice, including one very beautiful article finished with forns, colored in enamel, which has been sold to go to Vienna. Other noteworthy exhibits of this house are the china ice cream dishes mounted in silver and trimmed with the ferns enameled after nature, which we have above referred to, and a very handsome tea set in gold, which has been disposed of to the Spanish Commissioner. There are also a number of patterns in the patent china-lined ice pitchers, which are a specialty of this house.

SIMPSON, HALL, MILLER & CO.

Messrs. Simpson, Hall, Miller & Co., of Wallingford, Conn., whose New York place of business is situated at 676 Broadway, have contributed an exhibit to the Centennial which is away from the general display of silverware, but which will repay, in more senses than one, the visitor who seeks it out. This enterprising firm have donated to the State of Connecticut the largest water cooler which has ever been manufactured, and which is now on exhibition in the Connecticut Cottage, near the entrance to the U. S. Government Building, where it is kept filled with good water at a grateful temperature. This magnificent trophy is octagon in shape, fifty-six inches in height, and has a capacity of twenty gallons. There are four faucets alternating with four superb bas-reliefs representing the genius of Science, Art, Industry and Commerce, while the entire is surmounted by a statue of Columbus of finished excellence in modeling and execution. At the close of the exhibition this magnificent work of art will be taken to the State House at Hartford, where it will find a permanent home until the next Centennial

MITCHELL, VANCE & CO.

Messrs. Mitchell, Vance & Co., of 597 Broadway, occupy an extensive stand at column N, 49, where they present a most honorable display of clocks, bronzes and gas-fittings. We purpose to confine our attention, however, to the former goods, and would direct special attention to the clocks mounted with gold trimmings in red marble from Orange Co., N. Y., and black marble from Lake Champlain. These are American goods throughout, and are quite equal to any of those imported from Europe. The highest commendation was expressed by the judges, and the praise thus bestowed was fully deserved. One set in black marble and trimmed with gold and silver, another mounted with vases in Mexican onyx, and a set reproduced after the Egyptian are special objects of attention, while the bronzes include medallions and brackets decorated with game and fish and designed for dining rooms; vases of exquisite contour and finish, and statuettes —specially a magnificent Egyptian head mounted on a ourious pedestal, which is one of the most effective works of art in the exhibition.

TIFFANY & CO.

In our last number we gave a general description of the display made by Messrs. Tiffany & Co., and we now propose to give a somewhat detailed reference to their exhibit of watches. The Tiffany watch is especially designed for the first-class trade of the country, is a stem winder with lever movement in nickel, damaskeened rayed or stoned. Is exqnisitely jeweled throughout. There are conical pivots to the balance staff, pallets and escape wheel and pinion, while the compensation balance is made with double roller, and the hair-spring is either cylindrical or Breguet. Every movement is tested to beat, cold and position both in Switzerland, where it is manufactured, and subsequently on arrival in this country, by a thirty days' trial made by a most skillful adjuster in the special employ of the firm. Then only is the watch permited to go forth to the purchaser, and no single instance is on record where it has failed to conform with the representations made concerning its merits. The horological exhibit of the Messrs. Tiffany is, as might be expected, of exceptional interest. It includes a tiny stem-winder three lines in diameter to be bidden under a three-cent piece, and which is believed to be the smallest stem-winder ever made, and a very great variety of fine and intricate watches. Among such we would specify a very fine hunting stop watch, 1-5 seconds, with bas-reliefs of sporting subjects in platinum and colored gold on each side, a calender watch with split seconds which show the day of week and month, phases of the moon, and is a minute repeater; a lady's watch and chatelaine of great beauty, set with oriental onyx and diamonds in blue enamel, a lady's watch and chatelaine in pink conch shell, set with diamonds; a lady's watch finished with bas-relief, *a la Japanois*, in colored gold and platinum, besides many handsome designs in enamel, inlaid and engraved work. These cases are in exquisite taste, and worthy caskets for the fine works which are therein contained. The Tiffany watches rank among the best in the market, and the demand is steadily on the increase. We may in this connection mention that Mr. G. R Collis, a gentleman well known to the trade, has charge of the wholesale business of the watch department, No. 14 John street, N. Y., and also state that the Tiffany watch is retailed at a certain fixed price, and that the firm refuse further supplies to any house underselling that figure, thus ensuring a fair profit to all parties handling their goods.

AIKIN, LAMBERT & CO.

Messrs. Aikin, Lambert & Co., of 12 Maiden Lane, N. Y., have located their show-case at column N, 53, and a glance at the edifice is sufficient to attract public attention and inform the beholder of the specialty of the exhibitors, as four gigantic gold pens and penholders support the canopy under which a wonderful array of gold pens, pencil cases, and other articles in that line are displayed. The pens are in every design and of all patterns, some fine as a needle's point, others square and broad as a small chisel, some regular and even, others twisted and one-sided, in accordance with the latest experiments of caligraphists. The exhibition of penholders and pencil cases is large and superb, some of the extensive combination cases being studded with mother of pearl or exquisitely chased in handsome designs. It is safe to say that this exhibit has been rarely equalled, and Messrs. Aikin, Lambert & Co. are entitled to congratulation upon their representation.

SIMONS, OPDYKE & CO.

It is no easy matter to give a present to a friend which shall be moderate in price and yet certain to suit, but no one need make a mistake who presents a gold-headed cane to a gentleman or a gold thimble to a lady. Each is sure to come handy, and those who have generous ideas in their mind's eye should not fail to take a good look at the designs in these articles exhibited by Messrs. Simons, Opdyke & Co., of 611 and 613 Sansom street, Philadelphia, at column P, 43. The specialties of this house are gold chains, string pearl jewelry, gold-headed canes, batons for orchestra leaders, and gold and silver thimbles, and they make a magnificent display. There are numerous patterns of thimbles, while the cane handles are handsomely chased or set with onyx, ivory, ebony, sardonyx, and other precious stones. The novelty of the season is the centennial cane topped with an eagle's head in gold, admirably modeled and finished—just the thing to support a patriotic statesman and help him through the fatigues of the coming campaign.

CELLULOID NOVELTY CO.

The wares of the Celluloid Novelty Co. are so well known to all the trade that none will wonder when we say that their exhibit at N. 43 is one which does infinite credit to the management of this branch of industry. The show-case includes articles in ivory, malachite and coral, all of which are perfect in imitation and exquisite in finish. The sets of pin and earrings are particularly deserving of notice, while the combs finished in coral are not excelled by the genuine article as exhibited in the present exhibition.

AMERICAN WATCH CO OF WALTHAM.

The one exhibit of all others which does honor to America in the Philadelphia Exhibition of 1876, is that of the American Watch Co., for they have proved that it is possible for energy and enterprise to outstrip all competitors, and to put goods on the market, which in quality and price, defy the efforts of their coemporaries. It is no easy matter to say anything new of the American Watch Co., for the public demanded to know concerning the conduct of that triumphant house, and the required information was liberally and freely accorded. This is an age when division of labor and utility of mechanism are understood and put into practice, and the American Watch Co., have set their house in the avant guard of the manufacturing world by the perfection of machinery and system which distingnishes their factory. They have advanced far ahead of the tedions methods still prevailing in Europe. They are not dependent upon the irregular labor of scattered human workers; their industries are centralized so that no energy is dissipated, and thus it comes that they are the natural leaders of the watch industry in this country.

This is no small tribute to render to an American institution, but a glance at the show-case of the American Watch Co., which is now located in the machinery hall near the Corlies engine and a little removed from the Waltham exhibit of watchmaking, will more than convince our readers that we have not misstated the facts. There are displayed in the exhibit of this Company, (a facsimile of which we present elsewhere,) twenty-two hundred (2,200) cased movements, and this vast number merely represents the work of one week at their factory. Think of it for a few minutes, and let the immensity of the figures be fully appreciated. Twenty-two hundred watches a week, over ninety-five hundred a month, and one hundred and fourteen thousand two hundred (114,200) a year. We need not remind our readers of the quality of these goods, for every one who peruses these lines knows that the guarantee of the American Watch Co. is as valid as any Hall Mark, while the policy has been liberal in protecting, without distinction, the interests of all dealers. In this exhibit may be seen examples of the various movements manufactured by the Company, from the cheapest to the most expensive, while on the other side of the aisle the practical watchmaker can inspect the wonder-working marvels of automatic machinery, which make screws, pinions, wheels and jewels with greater accuracy and perfection of finish than can be obtained by manual labor. These automatic machines have already been described at length in these pages, but none should visit the Exhibition without bestowing careful personal attention upon their operations. There they will be enabled to understand how the American Watch Co. have attained their present honorable position as leaders in the manufacture of watches.

By way of contrast to the finished masterpieces of horological art which represent the work of to-day, two old watches are shown in the exhibit, one of which belonged to Col. Ethan Allen, of Ticonderoga fame, while the other is of greater antiquity, being a Hollister timepiece dated 1658. The former is a plain silver watch, somewhat discolored by age, while the latter is encased in brass, and a very rudimentary example of the watchmaker's skill. There is no hair-spring; it is made on the Verge principle, with catgut instead of chain; has only one hand, and cannot be set right, but must run down and then be started again. These watches are of peculiar interest at this centennial exhibition, and show in no uncertain fashion the progress which has been made during the past hundred years.

Returning to the contents of the case, we would direct the special attention of the trade to the display of watch cases, which are now a specialty of the firm. In a recent number we gave a handsome illustration in gold and colors, of the enamel work introduced by Messrs. Robbins & Appleton, and the examples of this very handsome manufacture, which are exhibited at the Centennial, should be examined by all dealers. Since the world's fair of 1851 wonderful progress has been made in this department, and nowhere has a greater advance been achieved than in this country. Much of this is due to M. Ulysses Jeanneret who is the designer for the firm and whose work is already famous throughout the country. There are, of course, numerous patterns in silver and gold, and as a novelty we may notice the cases finished in silver with gold mountings. There are also a large variety of fancy cases finished and set with diamonds, pearls, turquoise, onyx, and other precious stones, the chasing and minor decorations being of exquisite delicacy. There is also a very fine exhibit of fancy dials in different designs and various patterns.

Much more might be said concerning the display of the American Watch Co., and all that could be said would be fully deserved, but the reputation of the house needs no heralding. No one in the trade will fail to visit their stand and inspect their exhibit, and as they have moved from the situation originally occupied by them, we would impress upon our readers that both the working machinery and display of finished movements and cases are in the immediate vicinity of the Corlies engine in the main hall devoted to machinery. Mr. E. A. Lauten, of this city, designed and furnished the interior decoration of the display case of this company.

AMERICAN CLOCK CO.

The exhibit of the American Clock Co., of 581 Broadway, N. Y., includes a very large variety of styles and patterns. Here may be found the one and eight-day clocks manufactured by Messrs. Hine & Thomas, the grandsons of old Seth Thomas, who, 65 years ago, made timepieces for by-gone generations, and whose reputation has been well supported by the achievements of his descendants. Also the calculators, regulators, calendar and office clocks made by the Seth Thomas Sons & Co., the New Haven Clock Co., and the E. N. Welch Manufacturing Co. The calendar clocks merit special attention, being perfectly accurate, even to the extra day in leap year, and are finished in the French, Spanish and German language, according to orders received. This exhibit also includes examples of the turret and tower clocks, manufactured by A. S. Hotchkiss, which are among the best of their kind.

MORGAN & HEADLY.

Messrs. Morgan & Headly, who may fairly be regarded as the representative jewelry house of Philadelphia, are to be found at column N, 42, where they exhibit one of the choicest and most tasteful displays in the building. The most important item of their exhibit is a diamond necklace composed of twenty stones, ranging from 2½ to 8½ carats, and valued at $25,000. Close at hand is a diamond cross of six stones, which is valued at $8,000, and two pair of solitaire earrings, one worth $4,000 and the other $4,200. There are also several sets of diamond studs and other ornaments in precious stones, including a very handsome set in emeralds and diamonds, valued at $1,300. The contents of the case are estimated at about $125,000, and on the other side is a choice assortment of bracelets, pins and sets manufactured in Roman gold set with faceted gold, platinum and other materials

SAMUEL C. JACKSON.

Mr. S. C. Jackson, of 180 Broadway, N. Y., offers an exhibit of show-cases which is specially interesting to the trade. A valuable jewel is greatly improved by a fine setting, and again the completed ornament or a handsome set of silver appears to greatest advantage when disposed in a tasteful casket. Mr. Jackson shows a number of cases, trays, etc., made in rosewood, French and inlaid wood, covered with morocco or velvet, and lined with delicate shade of sheeny silk. Special attention should be given to his centennial case, which is indeed a masterpiece in its way, being adorned with extra finished adornments and a very handsome monogram in embroidery.

THE ANSONIA CLOCK CO.

The Ansonia Clock Co., of 19 and 21 Cliff street, N. Y., exhibits a working model of O'Neill's Planished Nickel-Copper Movement and a number of handsome clocks fitted with the above and enclosed in bronzed and black walnut cases. These clocks are very chaste and rich, and specially suited for the better class of trade, where taste is desired rather than splendor. The patterns are very numerous, as may be seen by examination of those on exhibition, and by inspection of the illustrated catalogue, on which each is represented under its title. Dealers can thus choose for themselves, and send orders for such designs as are suitable for their markets.

HAGSTOZ & THORPE.

Among the exhibits which are specially interesting to the trade, few if any surpass that which is presented by Messrs. Hagstoz & Thorpe, of the *Ledger* Building, Philadelphia, which is located at column P, 43. This firm have now the sole control of Boss' patent stiffened watch case, which combines strength, fine quality and cheapness to no ordinary extent. Every one is aware that a gold watch case must be heavy to be strong, because the nature of the metal demands a large use of material to secure durability and stiffness. The blanks for the various parts of the case are prepared by rolling down bars of composition metal faced with fine gold, are stamped by a powerful lever press, and then worked by the Boss spinning process, which turns over the gold so as to completely cover the composition metal. The cases are then fitted, engraved, engine turned and polished, so that when finished they can scarcely be distinguished from solid gold cases. The manufacturers guarantee their cases for twenty years, and we may mention that the interest or the difference in price will at the end of twelve years amount to a sum which would purchase a new case. They also furnish a patent cap which can be adjusted to all the leading movements manufactured in this country.

JOHN BLISS & CO.

As long ago as 1835 John Bliss established himself in New York, and at once assumed a leading position in the marine chronometer and transit business. In 1846 he exhibited at the Institute Fair and was awarded a gold medal; now the firm of which he was the founder are represented at the Centennial by chronometers, which are throughout of American manufacture, and which exemplify the present condition of this branch of horological industry. Their exhibit includes pieces of chronometrical mechanism in every stage of manufacture, from the rough casting to the "grey" condition in which the fitter takes them up and the peculiar excellencies of cutting which distinguish the wheels and pinions of this firm may be observed by the expert. There are also two transit instruments of fine finish, and other marine-mechanisms, all of which do high credit to American industry as evidenced by the exhibiting firm.

VULCANITE JEWELRY CO.

The Vulcanite Jewelry Co., of 191 Broadway, N. Y., have located their exhibit at column P, 43, where they display a large and varied collection of those articles which have of late become so popular. There may be found watch cases, chains, bracelets and ladies sets—plain or mounted in fine gold, all of which display taste and finish. We would direct special attention to the monogram lockets and watch cases in which the design is chased in fine gold and then inlaid in vulcanite, so as to appear to the best advantage. This exhibit also contains a number of goods in Whitby Jet, and also the combination jet and vulcanite wares manufactured by the company under Byron's patent.

WILLIAMS, COOKE & KLINE.

Although the separable sleeve button has been in existence but a very few months, yet the comfort and economy which are the result of its use have made it popular from the start, and the demand for this ingenious device is rapidly increasing. Messrs. Williams, Cooke & Kline, 206 Broadway, New York, who control the article, have a desirable location, where they display a number of designs in sleeve links and collar studs, all of which are well suited to popular taste, while the prices are adapted to the pocket-book of the period. All who have tried these separable sleeve buttons declare that once used they are absolutely indispensable.

H. MUHR'S SONS.

Messrs. H. Muhr's Sons, of Philadelphia, are located at P, 43, where they present a magnificent display of cameos, intaglios and real stones, including amethysts set with initials and floral devices, besides a very large selection of samples from their regular stock of finger rings. The designs and patterns are all in excellent taste, and as each is numbered, orders can be easily given by visitors to the Exhibition. The display of cameos and intaglios is very fine and deserves special attention, while country dealers will find much to interest them in the collection of the filled plain rings so well known by the trade mark "crown 18k, lion."

THE ARCHER & PANCOAST MANUF'G CO.

The Archer & Pancoast Manufacturing Co. make a very fine display of their special manufactures, which is surrounded by a remarkably handsome railing in polished brass and steel, which noticeably excels in grace and power of design. Here may be found several choice patterns of fine bronze work, including vases, mantel sets, card receivers, etc., while in brass they display a variety of ecclesiastical goods, such as sanctuary lamps, tabernacle doors, candelabras, etc.

The Swiss Society of Arts.

TRANSLATED FROM JOURNAL DE GENEVA.

The celebration of the Centennial of Swiss Society of Arts, has, this year, taken place under more than usual interesting circumstances; invitations were extended to watchmakers of all countries to compete, and the conditions imposed were more rigorous than in former years. The trials lasted fifty-two days, during which the competing chronometers were tested 7 days in 7 different positions; they were then submitted to a temperature of 30°, 35° heat, afterwards at one of 0°, 5° of cold, and the observations were classed as follows:

1°. Mean daily rate, not to exceed $\frac{4}{5}$ seconds per day. 2°. Variation in seven positions not to equal two seconds during the seven days trial. 3°. Error in compensation produced by differences in temperatures not to exceed $\frac{3}{10}$ seconds per each degree of temperature. 4°. The regularity of rate as maintained by the chronometers after having been exposed to the various tests.

The third test is the same as that imposed in 1875, the others being much harsher than those of the previous year.

In all, eighty-four chronometers were entered for competition, seventy-five manufactured in Geneva, seven in Locle, and two in London. Two were withdrawn, and twenty-seven failed to comply with the requirements of the various tests. The performance of the remaining fifty-five were far above what was required. In some few cases, however, during the first few days the rate was strikingly irregular, and suddenly they settled down and performed with wonderful accuracy, and the impression is that had these arrived a few days earlier their rates would have been much more satisfactory. In all, twenty-nine of the chronometers obtained prizes.

The premium of honor was awarded to Mr. Ulysse Nardin, of Locle. Mean variation $\frac{44}{120}$ seconds per day; mean variations in seven positions, $\frac{4}{10}$ seconds; error of compensation, $\frac{1}{114}$ seconds; variations before and after test to heat and to cold, $\frac{25}{100}$ seconds.

Next came six chronometers, whose performance was so similar that they each obtained equal premiums, viz., silver medals:

E. Kegren,	0.34	1.26	0.05	0.48
Parkinson & Frodsham,	0.47	1.35	0.02	0.04
J. M. Badallet & Co.,	0.49	1.22	0.01	0.20
H. Radard & Fils,	0.39	1.56	0.03	0.13
Perregaux,	0.50	0.44	0.02	0.86
Fleuhmann & Co.,	0.68	0.67	0 03	0.08

The second premium, a silver medal, was awarded to a chronometer whose maker withheld his name, but regulated by Mr. George Reymond, the test was as follows: 0.31, 1.04, 0.15, 0.43.

Then came seven more, to which were voted "honorable mention." E. Kegren, 2; Parkinson & Frodsham, 1; J. M. Badallett & Co., 1; H. Redard & Fils, 1; rated hy Geo. Reymond, 1; Ulysse Nardin, 1. Together fifteen chronometers having obtained prizes; fourteen more were so close to the test that they might almost have won premiums. All have performed much more satisfactorily than those competing in 1875, and it is a matter of sincere congratulation that such good results have been obtained this year.

Proceedings of the Horological Club.

A DISTINGUISHED BODY OF WATCH AND CLOCK MAKERS.

ThirtiethDiscussion.—Communicated by the Secretary.

FULL-SECONDS MERCURY PENDULUM (GRAHAM ESCAPEMENT) REGULATOR.

To the Gentlemen of the Horological Club:

Below please find a question, by answering which you will oblige me, beside others in the trade, and especially those who have a great deal to do in regulating fine watches, for which they must have the correct time: Urban Jurgensen, Copenhagen, in his treatise of 1812, gives as length of hanging spring 12 1-16 Rhineland, or 13-16 of an American inch. Is this spring right length and right form? What can you recommend for the nearest isochronal hanging spring for a pendulum 6½ lbs. and one 9½ lbs. weight? First, how long; second, how broad, and which form; third, how stiff, and by what standard measure? Where is the proper place to connect it with the lever pivot, to have no up and down friction of the rod in the fork?

If you would put the above in the CIRCULAR as a question, it might be read by some, and thus get the correct solution to the same, and so I and others could get the information.

F. SCHNEIDER.

As Mr. Regulator, who is our authority on the points mentioned in this letter, is now absent in Europe, it is published as requested, so that the questions may be seen and answered by some person thoroughly conversant with the subject. The following note is also published for the same purpose, of eliciting a reply from any possessing the desired information:

DATE WANTED FOR AN OLD WATCH.

We have in our possession a very old English verge, double case, of silver gilt, the outer case originally covered with a kind of shell. The name of maker, John Richardson, London, No. 146. An old watch paper inside bears the address of Jacob Carver, cor. Front and Chestnut streets, Philadelphia, who probably once repaired it. Could you post us as to its age or probable date of manufacture, and oblige

EDWARD MEAD & CO.

DESCRIPTION OF A COMPENSATION BALANCE.

First, the balance is in general features of the usual form, except the rim is not cut nor any brass around it, and between the centre and between the centre and circumference is a light steel rim or circle (set down on a level with the main or outside one), which is cut into two, three or four segments (the number to be as the maker sees fit), these segments to be connected firmly with the outer rim by a slender brass bar; these brass bars, it will be seen, are to stand like the spokes of a wheel; then as the brass contracts with cold it will draw the segments towards the outside, and heat vice versa. My object in this invention is to make a balance that will compensate more accurately. I think the ordinary compensation balance is an imperfect thing.

S. D. JOHNSON.

Mr. Urmacher was called upon to attend to this communication. After an unavailing protest, he said he was sorry to be compelled to speak discouragingly to the gentleman for the second time. His balance would not effect the desired object for several reasons, among which only two need be mentioned. First, even if the principle was correct, the expansion and contraction of the brass rods would not be anywhere near sufficient to produce a compensation. But, secondly, the principle was wrong, for the effect produced by the longitudinal changes of the rods would be uniform with the changes of temperature, whereas they ought to change in an increasing and decreasing ratio. Mr. J. evidently has not given much thought to the subject. He should read the recent articles of "Excelsior" on Compensation, also the description by Mr. C. E. Fritz of his new balance, published in the JEWELERS' CIRCULAR for January, 1875, and he would have a better idea of the requirements of a perfect compensation balance. It was the object of profound study with many of the best minds in the trade. Hundreds of different devices had been produced, but, according to "Excelsior," an undoubted authority on the subject, out of them all only four were worthy of special mention. One of these, he was happy to say, was the invention of an American, Mr. Fritz, now an active member of this honorable body, and whose sayings and opinions were familiar to the public through the published reports of these meetings, although, like the rest of us, his identity was concealed under a *pseudonym*. Hence Mr. J. would see that the improvement of the compensation balance was by no means an easy task to be thought out at a sitting or dashed off at a moment's notice, but a very intricate and difficult problem, requiring a thorough knowledge of both the practical requirements of a balance and of the theory of compensation, together with careful reflection on the lessons to be derived from the successes or failures of previous investigators in the same line.

SCHWERTER'S JEWELING TOOL.

A specimen of this new tool had been sent in to the club for their examination, and referred to Mr. McFuzee for trial, who reported that he had tested it thoroughly, and was very much pleased with it. This tool was designed for cutting out settings for jewels where there were none before, for which purpose it was very complete and effective. Mr. McF. exhibited a brass plate with a number of settings cut with it, both with and without jewels in them, which were pronounced exceedingly well done by the members present—in fact, as well as could have been done in a lathe. For workmen not provided with regular jeweling apparatus this tool is a desideratum. Its price, etc., are set forth in the advertising columns of the CIRCULAR.

RATCHET WHEEL IN A WATCH.

Mr. McFuzee then answered the question of Mr. John B. Graves, as to whether a watch has a "rachet wheel." If Mr. G. was disposed to quibble over technicalities, then it might be said that it has not, for, strictly speaking, the piece into which the click works is a "rachet." But, inasmuch as it is a rachet formed on a wheel, it is certainly entirely proper to call it a "rachet wheel," though it might not be technically correct.

LEARNING ABOUT PRECIOUS STONES.

Secretary Horological Club:

Will you please inform me through the JEWELERS' CIRCULAR how to get acquainted with all the different precious stones which are used for jewelry, as to their color, hardness and value? Is there any sample book or sample stones to be got? SUBSCRIBER.

Mr. Lapidary said that the only true way was to take a regular course of instruction, aided by possession and examination of the real stones, the same as one would learn anything else. There were a number of books on precious stones, but they were more historical and descriptive than practical. Perhaps as good as any was the work of Dr. Feuchtwanger, the cost of which he believed was $5, and could be had through any bookseller in the city. There were no "sample books," but "Subscriber" could, of course, purchase samples of the principle stones used in jewelry from any manufacturer who followed that specialty. The more rare and costly varieties could be examined in some mineralogical collection or at a lapidary's. These samples, however, would only instruct him in the appearance and hardness of the stones. Their value was constantly changing; even the diamond fluctuated considerably in price during a term of years. Besides, the value of a stone was largely dependent on size, shape, unusual shade of color, freaks of fashion, the supply, etc., so that only an experienced jeweler could judge as to their market value. But a great deal of information could be given in a few short practical articles on the subject that would be of great value to watchmakers generally, especially in the country, and it was to be hoped that some expert would contribute such for the JEWELERS' CIRCULAR.

THE NATIONAL CONVENTION OF WATCHMAKERS.

Mr. Horologer said it was with great regret that he had to report the probable failure of the National Convention. D. H. Hopkinson, Esq., the representative of the Club in the matter, had informed him that but a small number had signified their intention of being present, and a large share of these would to be deducted on account of unavoidable delays and disappointments, thus reducing the number who would actually appear too low for any real practical good. He could not account for the apathy of the trade. All could plainly see the importance of the project, and the great benefits that would accrue from it. The advantages of such associations had been amply proven in most other branches of business, and are known to everybody. Never was there a better time for our own trade to make a move than

now, and probably there would not be another opportunity as good during the lives of those present. Yet it had been regarded with indifference in all quarters, in the city as well as throughout the country. He felt it his duty to say that the situation in which American watchmakers had placed themselves was not at all complimentary to their enterprise, intelligence or judgment. He must acknowledge that his estimation of them was very considerably lowered. The club had done all it could to make the project a success, but its efforts had not been seconded by those interested, and it now withdrew from any further connection with the scheme.

Several other members expressed similar feelings in terms more or less emphatic. Mr. Chalkbrusher declared that he had expected it would turn out so. It was just like the ordinary run of watchmakers —don't care for anything but the almighty dollar, and hold a penny so close to their eyes that they can't see the gold piece just beyond. They were a nice lot! No ambition, no enterprise, no sense, no nothing. When we offer them a benefit and rub it under their noses, they are too stupid to smell of it. They are a set of darned fools, who don't know enough to know a good thing when they are told, or to take it when it was urged upon them.

Mr. Chalkbrusher was just getting warmed up to his subject, ready for business, and was rubbing his hands preparatory to going for the obnoxious offenders in earnest, when he was checked by the chairman, who ruled that such language could not be allowed, whether it was deserved or not.

The Adjuster-of-the-French-School pronounced the situation unutterably ridiculous, diabolical and shameful. This was the centennial anniversary of the birth of liberty and freedom. All the nationalities had come from afar to join in our demonstrations of rejoicing and happiness. We had announced a national convention of watchmakers, and invited all the horologists of the globe to conventionate with us, and now there was to be no convention! What would we say when the foreign hosts of illustrious celebrities swooped down upon us and wanted to know where that convention was? On the one hand the iridescent American eagle was punctiliously soaring aloft amidst the admiring gaze and plaudits of a sympathizing universe; on the other hand, the American watchmakers were disgracefully skulking away to their holes, with their caudal attachments located between their pedunculur extremities, hiding from the scornful countenances of the whole human family! It was a spectacle to make angels and horologizers weep and blush for the regeneracy of their kind. "Oh, heavens!" he cried in accents wild, "I'd rather been salivated or bilod than had my sensibilities riled in such an outrageous, ungodly style!"

But although the low-born, untransmogrified masses of the trade might prove themselves unappreciative, unprincipled, unfaithful and untrue, it should never—no, never—be said that the Adjuster-of-the-French-School had failed to sacredly and solemnly keep his promised word. Gentlemen of the Horological Club, I have said that a national convention of watchmakers should be held if I had to hold it myself. And I hereby give notice to the assembled world that I *will* hold it on the appointed day, and no postponement on account of the weather, earthquakes, epidemics, or any other hyperbolical catastrophes whatsoever. I don't care a continental whether another living soul attends or not. This world may be overturned and disappear in our universal deflagration—no matter what may happen, that convention shall and will be held. I'll save the honor of the trade, the nation and the race, or perish in the attempt. I know not what others may do, but as for me, give me a national convention or give me death!

A mournful silence fell upon the distinguished gentlemen present at the contemplation of disappointed expectations and hopes deferred, and feeling entirely unfitted for the transaction of ordinary worldly business, they then adjourned.

For many years an old chest, supposed to contain valueless papers, has been standing in the Town Hall at Bautzen in the Tyrol. It was opened the other day, and several beautiful drinking cups, with the dates of 1672, 1684 and 1732, some silver spoons, and a gold ring were found.

Miscellaneous Items.

Polishing Watch Wheels.—Put a cork in the vice, cut flat on top, place the wheel on the cork as far as the pinion will allow; take a blue stone and water, and stone the wheel smooth and flat, at the same time keep turning the wheel round with the left hand, wash it out and put in a box with some slacked powdered lime. The object of this is merely to dry it, and prevent the pinion getting strained or rusty. Then brush it out nice and clean, put another cork in the vice, cut clean and flat; pound on a stake some fine red stuff. Some workmen add a little rouge, but that is according to fancy. Take a slip of tip, about the size of a watchmaker's file, only thicker, file the end of one side flat and smooth, charge it with a little of the red stuff, and polish the wheel, keeping it turning all the time by the left hand, and don't leave off until the wheel and tin polisher are almost dry, so that you can see the polish; and, if to your satisfaction, clean it off with piece of soft bread, and brush it out. If it has scratches on it, bread them off, and clean off the tin, and charge it again with the red stuff. Cleanliness is of great importance, for if there be any grit about the red stuff, polisher, or the fingers of the workmen, the work will be full of scratches. The above system applies to bar-wheels only. Escape-wheels are polished in the same way, but before they are put on the pinion. Solid wheels, such as fusee and motion wheels, are polished in the turns, using soft wood or burdock pitch instead of tin. Different workmen vary, but the above systems are adopted by the majority of the trade. If you are not accustomed to polishing, I have no doubt you will find it difficult, as wheel polishing, like other watch-work, requires a great amount of practice and personal instruction.

Desilverisation of Lead.—The London Lead Company have just adopted a new process for the desilverisation of lead, which promises to be attended with a very extraordinary degree of economy. The process is the invention of a Frenchman named Rozan, and was first adopted in England, by Cookson, of Newcastle. The principle of the Rozan process is much the same as that of the Pittinson process. Unlike this process, however, that of M. Rozan is carried out by means of the mechanical agency of steam, which, conveying the oxygen to the lead, exercises a purifying influence upon it, while at the same time it desilverises the ore and extracts the silver more thoroughly than has yet been done by any other means. The steam is applied at a pressure of 55lb., which is sufficient to support the lead and prevent it from going down the steam pipe. It is calculated that by this process there will be a saving of nearly one half the cost of labor, and other expenses will also be materially reduced. But desilverisation of lead may be carried too far—the extraction of the silver spoiling the lead for many purposes where it would be most useful. It is a questionable economy after all.

A marvellous piece of mechanism in the way of clocks has just been exhibited in Paris. It is an eight day instrument, with dead beat escapement maintaining power. It chimes the quarters, plays sixteen tunes, plays three tunes every twelve hours, or will play at any time required. The hands go round as follows:—One, once a minute; one, once an hour; one, once a week; one, once a month; one, once a year. It shows the moon's age, the rising and setting of the sun, the time of high and low water, half ebb and half flood, and by a beautiful contrivance, there is a part which represents the water, which rises and falls, lifting some ships at high tide as if they were in motion, and, as it recedes, leaves these little automaton ships dry on the sands. The clock shows the hour of the day, day of the week, day of the month, month of the year, and in the day of the month there is a provision made for the long and the short months. It shows the signs of the zodiac; it strikes or not, chimes or not, as may be desired; and it has the equation table, showing the difference of clock and sun every day in the year. If it would sing a song and smoke a cigar, and drink the health of observer in champagne, its round of usefulness and wonderfulness would be complete.

Switzerland's Watch Industry at the Centennial.

BY MR. THEO. OBRI.,
Swiss Commissioner to International Exhibition, Philadelphia.

Switzerland, the little sister Republic, is well represented at the Exhibition. Modest in the display of show-cases, she exhibits beneath their homely covers some rare specimens of the horological art. Unquestionably the finest and most varied assortment of watches the world ever saw together at one time is seen there, from the size of a small pea in diameter to that of a full-grown chronometer, and varying in price from $4 to $1,000 and more apiece. Some have plain polished cases, some engraved ones, while others are beautifully decorated with diamonds, pearls, and other precious stones, or with new and elegant designs in enamel, in paintings and figures in relief. We shall notice these severally and with due appreciation when we come to the individual exhibits; but first let us turn our attention to another and more important feature of the exhibits—that of the quality of the watches—where we will find really wonderful results. There are watches whose variation from a fixed rate does not exceed 0.1 to 0.2 of a second a day, and whose running is practically uninfluenced by any change of temperature. Of course they are adjusted to heat and cold, position and isochronism to a greater or less degree of perfection, and are accompanied by official certificates of their rate to this effect. It may, perhaps, be interesting to know that Switzerland supports four astronomical observatories. At these observatories there are annual competitive trials of chronometers and watches, which have been instituted especially to stimulate the zeal of the workmen and develop a higher standard of excellence in the art. For rewards honors are conferred and prizes given. It is needless to say that this effort has met with the desired result; as a glance at the watches themselves and their accompanying certificates will attest it. There is a feeling abroad that Swiss watches are degenerating in their quality, and that the American made watches are superior and are going to take their place. With all due deference to our worthy competitors; we beg leave to say that there never has been a more erroneous conception. It would be useless to reiterate statistics; every one knows that Switzerland has supplied the world with the greatest number of watches for nearly two centuries; that it is, so to say, the cradle of the watch industry. During all this time we have not been inactive; we have multiplied our means; we have simplified our system; and by taking advantage of all that modern science and the researches of skilled artizans have placed at our command, we have facilitated the production of a really unexcelled time-keeper, so that it is no exaggeration for us to say that, to-day, Switzerland can defy the world for both cheapness and quality of a watch. What the world wants is the best watch for the least money, and that we believe can be seen in the Swiss Centennial Exhibition.

It is our object to give a detailed account of every individual exhibit, as much as our space will permit, believing that our friends will be pleased to know what we have, and that it will enable them more fully to appreciate it when they shall favor us with their visits.

We shall begin with the exhibi' of

LOUIS AUDEMARS.
Represented by J. EUGENE ROBERT, *No. 1 Bond St., N. Y.*

The watches of Mr. Audemars have long been known as among the best ones manufactured in the world. The testimonies of merit universally awarded to him for his productions, and particularly the extraordinary prize given him by the Emperor of Austria at the Vienna Exhibition of '73, are ample proof. He exhibits 19 watches, all of them stem-winders, and a choice selection. Among them may be mentioned as particularly noteworthy No. 12111, a clock-striking minute repeater, striking the hours and quarters like a clock, and repeating the hours, quarters and minutes at will.

No. 12608, a ten-line minute repeater, and probably the smallest complicated watch on exhibition. There are six minute repeaters, of which No. 12140 has a perpetual calendar besides.

The rest of his watches are either complicated in some way with double independent fly-back seconds or plain time-keepers, all of them adjusted to heat, cold and positions.

J. M. BADOLLET & CO., Geneva.
Represented by RIGGS BROTHERS, *No. 221 Walnut St., Philadelphia.*

Exhibit a fine assortment of plain and complicated watches, sixty-two in number, comprising a range of sizes from a four-line watch up to a twenty-four-line, and all, except the four-line one, stem-winders. Their exhibit is one of the most attractive in the Swiss section, particularly on account of some rare specimens of decoration. Some of the larger cases show some very finely made figures in raised and different colored gold, such as the Austrian coat-of-arms on a blue enameled surface; the American eagle, with the rising sun behind it, carrying in its rays the motto "E pluribus unum;" another, called "The morning," in enamel after Greuze, is a bust of a young lady just rising from her couch with unfinished toilet. Bnt the decorations on the ladies' watches are the most varied and exquisite. One eight and a ten-line watch are embellished with beautiful designs in diamond; another, a twelve-line one, is covered all over, case and bow, with some of the purest pearls of great uniformity in size. A fourteen-line open face has the bezel and back set with diamonds, the back of the case being a handsome cameo bearing the allegorical figure of "Night." Two fourteen-line hunting cases, with open fly lid, showing dial in Chinese letters on outside of cases, are decorated with Chinese figures on plain Roman gold surface, one gathering fruit and the other fanning a butterfly. There are many more elegant designs in enamel, in painting and figures in raised gold too numerous to mention. Their assortment comprises probably the smallest stem-winding watch on exhibition.

PATEK, PHILIPPE & CO., Geneva.
Represented by TIFFANY & CO., *N. Y.*

The watches of this house are too well known in this country to need special mention. This firm exhibit 60 watches in all the various sizes, from an eight-line up to a twenty-line all of them stem-winders. Among them are a few complicated ones, but their best show consists in plain, fine time-keepers, watches accompanied by official certificates of rate from the observatory, some of which have remarkably good records. The styles of their watches are as varied as the imagination is fertile, and the decorations on many of the ladies' watches are really exquisite, particularly a few rare designs in diamonds and figures in raised gold. They show a few watches in charms, lockets, etc., which are a novelty. The workmanship on their watches, from the smallest to the largest, is irreproachable in character. One would seek in vain for superior.

H. L. MATILE, Locle.
Represented by L. & A. MATHEY, *119 Fulton St., N. Y.*

This maker exhibits 13 watches, all of them stem-winders. Among them may be noticed particularly a pocket chronometer, No. 10045, of elegant design and exquisite workmanship. He exhibits several "minute" and "double" chronographs with new and simplified mechanism. Among them is one minute repeater, with double chronograph and perpetual calendar, showing the months of the year, the dates of the month, the days of the week and the phases of the moon. He also shows a few plain and adjusted lever watches with observatory certificates.

DANIEL DUCOMMUN.
Represented by the same Firm.

Shows some beautiful and well-made lever movements, altogether 16 in number, both stem and key-winders.

CHAS. H. MEYLAN, au Solliat.

Also represented by L. & A. Mathey, exhibit three watches of complicated construction, chronographs with new and single mechanism, which, with the addition of a wheel and a heart and spring, can be made minute chronographs. They are all three of the very best quality, one of them, a minute repeater, accompanied by a very good observatory certificate.

JACOT FRERES, Locle.
House in New York, 31 Nassau St.

This firm has 9 watches on exhibition, all nineteen and twenty-line. Among them is a sight chronograph, minute repeater, with self-discharging minute work, an improvement of some importance in minute repeaters. There are other complicated watches, all of the very

highest type of workmanship. Among the exhibit may he noticed particularly a plain adjusted lever watch, with an *up* and *down* hand on dial. The addition of this hand is a new feature in going barrel watches. The arbor of a going barrel watch being stationary during the running of the watch, the difficulty was to combine the motion of the arbor when being wound with the motion of the barrel when running, so that the former would move the hand one way and the latter the reverse way. This is accomplished by very simple and effective mechanism in this watch. Most of the watches of this make are accompanied by observatory certificates.

DAVID PERRET & SON, Neuchatel.

Exhibit a number of movements in all stages of their construction, from the first state to the completion of the watch. Their exhibit consists of watches made entirely by machines, most of them automatic, and on the system of uniformity of parts. They are a plain, well made, good running watch, just suitable for a regular line of commercial goods. Their prices are among the most moderate of those on exhibition. Messrs. Perret & Son have no agents in this country, but would be glad to form the acquaintance of some reliable house with a view to enter into relations with them. Propositions may be addressed to the writer of this at the Centennial Exhibition, Swiss Commission.

H. R. EKEGREN, Geneva.

Represented by J. E. CALDWELL & Co., *Philadelphia.*

Mr. Ekegren exhibits a full line of watches, 36 in number, all of them stem-winders. While there is nothing particularly observable in their exterior, they bespeak an elegance of taste in their very simplicity. A few ladies' watches are neatly decorated with diamonds, and some of them are engraved. One or two others have the year 1876 in enameled monogram on plain polished gold surface; but all of them are plain in exterior decoration. For quality of workmanship, however, Mr. Ekegren is probably not surpassed by any manufacturer in the world. Assiduous and talented workman himself, he does not bestow too much attention to the outside of his watches, but thinks the movements of the greater importance, and indeed the practised workman will at once recognize in his watches a superior quality. We do not hesitate to say that Mr. Ekegren is one of Switzerland's most skilled and conscientious workmen; in this every visitor to the Exhibition will agree with us. The number of flattering observatory certificates which accompany his watches speak better than words can tell of their excellency. There are also a few complicated watches, among which is a notable one with a perpetual calendar and phases of the moon.

Mr. Ekegren has received the grand reward from the Society of Arts for the best record of watches on trial at the Observatory of Geneva in 1874–1875, and the first prize and the first honorable mention from the same society at an international competition for the best adjusted chronometer, held in Geneva in 1876 at the centennial celebration of the society's existence.

A. HUGUENIN & SONS, Locle.

Represented by A. HOCHET, 41 *Maiden Lane, N. Y.*

Exhibit a number of plain but very fine watches, all of them nineteen and twenty-line, and all of them stem-winders. Particularly noteworthy among them is a chronometer with "Tourbillon" escapement, the only one of the kind on exhibition. This is an arrangement by which the entire escapement with the balance is continually revolving around the centre of the balance, and was originally designed for the purpose of avoiding the differences of rate in different vertical positions. Aside from this important consideration, it permits a beautiful arrangement of the plan of the watch. Messrs. Huguenin & Sons are the originators of a peculiar but simple stem-winding calibre, which, with very little change in the position of the barrel, can be used for both open face and hunting case watches. In our opinion this is a very practical arrangement, particularly in the case where watches are to be made by machinery on a uniform system, like they do in the American factories. They exhibit several complicated watches, minute chronographs, with split fly-back seconds, among them one with perpetual calendar. Among their exhibits are specimens of very fine engravings by Mr. Favre DuBois, of Locle, which are well worth noticing.

LOUIS FRANKFELD & CO., Geneva.

Represented by A. LIMBURGER, 20 *John St., N. Y.*

Exhibit 18 watches, ladies' and gents' sizes; several of which are complicated. In this display is one with four chronographs, two fifth seconds and two minute chronographs. This is probably one of the most complicated watches on exhibition. The specialty of this firm is horse-timers, either plain, double or split and fly-back seconds chronographs. One of the features of their plain watch, called star watch, is that the escapement is on a separate plate, made independent from the other parts and is interchangeable among the movements. Beside other advantages which this arrangement has, it affords means of adjusting the balances to temperature without the rest of the movement where it is to go into, on a model movement. A number of their watches are very elaborately decorated by designs in relief; among them one with the American eagle with complete coat of arms in different colored gold; another with an allegorical figure in relief, a copy of the painting "Aurora" drinking a drop of dew from a morning flower. The figure is beautifully chased, the lire of her robes being artistically rendered. On the other side of the watch is a trophy of ancient music, also in relief, supported on each side by an amor. One of the most attractive features of this exhibit is a stem-winding calendar watch in the top of a gold pen, with three dials three-sixths of an inch in diameter each; one showing the time, the other the days of the week, and the third the dates of the month. This is probably the smallest stem-winder and complicated watch in existence.

ERNEST HUMBERT, Locle.

Exhibits 10 watches (in gold cases) of good running quality. The main feature of this exhibit consists in the decoration of the cases, a new style with faceted edges and centers. One of them has the picture of Washington photographed on enamel on the outside, and on the inside that of Franklin.

JAMES NARDIN, Locle.

Represented by Ve. J. MAGNIN, GUEDIN & Co., 653 *Broadway, N. Y.*

This maker's goods, well known and celebrated in this country for their excellency of quality, are well represented. He exhibits 25 watches which, though mostly in plain cases, are of the very best workmanship. Mr. Nardin uniformly employs high numbered pinions in his watches, which, in the hands of good workmen, always insures a good train. Besides a line of good, plain adjusted watches, Mr. Nardin exhibits several complicated ones, notably double and single chronographs and a few minute repeaters. Two of the latter are sixteen-line, lady's size; they are of the very highest type of workmanship and quality. There is also a perpetual calender watch among them, showing the phases of the moon, etc. Altogether the exhibit is a very fine one, and attracts considerable attention.

ALLIANCE HORLOGERE, Chaux-de-Fonds.

This is a society of watchmakers represented by Mr. J. B. Gondy & Co. in La Chaux-de-Fonds, who exhibits watches of various sizes, styles and qualities. The attractive feature of this exhibit consists in the decoration of the cases, some of which are exquisite. They show a new style of decoration called "niele," which consists in fine engravings of subjects or decorative figures on silver cases, filed in with a dark blue substance, admitting of a high polish. They have no agents in this country.

BRETING FRERES, Locle.

Represented by HENRY E. DROZ, 92 *Fulton St., N. Y.*

Exhibit two very fine watches, both of them accompanied by official certificates of their rates. Both very flattering.

CHARLES MARTIN & CO., Geneva.

Represented by L. A. MARTIN, 76 *Nassau St., N. Y.*

Have 28 watches on exhibition, all of them stem-winders, ladies and gents' sizes. They are all of a very good quality and moderate in prices. A few of them are handsomely decorated in enamel, pearls and diamonds, and figures and monograms in relief. A little ten-line open face, Louis XIV. style, has a large solitaire diamond in the back which attracts the attention of many a fair visitor. One centennial watch has the figure 1776 on one side and 1876 on the other in black

enameled monogram; another has the American eagle on one side and the bust of Washington on the other. They show a few minute repeaters, one with perpetual calendar. There are also a few complicated watches among the exhibit, two minute chronographs of simple construction. Altogether their display is varied and fine.

ERNEST FRANCILLION, St. Imier.

Represented by J. EUGENE ROBERT, 1 *Bond St., N. Y.*

This exhibitor makes the well-known Longine watches, which are manufactured by machinery on the principle of uniformity and interchangeability of parts. A good part of his exhibit consists of movements of different sizes and qualities, and a few are in gold and silver cases. They are a very excellent commercial watch, and recommend themselves both by their quality and comparative low prices. Ernest Francillon is one of the few Swiss manufacturers who follow the American system of making watches by automatic machines and on uniform sizes.

MAURICE STAHL, Chaux-de-Fonds.

Exhibits 8 gold hunting case watches, six of which are with chronometer escapements, and two are eight-day watches, the only ones of the kind on exhibition. They are all of the very best quality and very moderate prices.

Has no agent in this country.

A. and E. CHATELAIN & WOELFLIN, Geneva.

Exhibit a number of silver open-face watches of a current grade and very nice ones; also movements without cases; also a few automaton lockets, watch materials of all kinds, diamond powder and jewels in all stages of the process of making them.

Have no agents in this country.

FAVRE FRERES, Neuveville.

Exhibit 24 silver watches, mostly open-faced ones, of a current, cheap, but reliable grade.

They have no agents in this country.

AEBI & LANDRY, Madretsch, near Bienne.

Exhibit 37 watches, some in gold and some in silver cases, all of them stem-winders. This firm too has established the factory system, making all the parts of their watches in their own establishment and by mechanical means on the system of uniform sizes. They manufacture good and reliable commercial watches of various grades of qualities, and considering their prices, which are very moderate, they are just the watches for the general market. They have no agents in this country, can furnish in any quantities to order and would be glad to form connection with some reliable dealers here. Propositions may be addressed to Swiss Commission, Centennial Exposition.

G. HONEGGER, Bienne.

Exhibits a number of movements, both stem and key winders, modeled on the plan of the ¾ plate Appleton & Tracy movement. They are of a superior quality in both nickle and brass. He also shows a few in gold and silver cases, with one or two complicated watches.

GABRIEL DIDISHEIM, St. Imier.

Exhibits some cheap but reliable silver open face and hunting case watches and stem winders. Has no agent in this country.

HENRY GRANDJEAN & CO., L. ch.

Represented by PAUL A. BREZ, 30 *Maiden Lane, N. Y.*

This firm has one of the finest exhibits in the Swiss department, comprising a great variety of watches of the very highest type of workmanship, with a few rich decorations. Several of the watches are of the complicated type, such as chronograph and repeaters; one of them a repeater with double time and minute chronograph, perpetual calendar, and phases of the moon, is one of the finest watches on exhibition. But the distinguishing feature of their exhibit consists in ship chronometers, of which they have six, the only ones in the Swiss department. Messrs. Grandjean & Co., have long been favorably know:s as marine chronometer makers. At several of the worlds fairs they have taken the highest prizes, and it may be fairly expected that they will stand among the foremost in the list of those who will be rewarded at the Centennial Exhibition.

Last, but not least, comes the firm of

BOREL & COURVOISIER, Neuchatel.

Represented by Messrs. QUINCHE & KRUGLER, 15 *Maiden Lane, N. Y.*

This firm does not make a very large show, but a very creditable one. Besides one or two complicated watches, they exhibit a number of the very finest time keepers, all being accompanied by official certificates from the observatory. The production of a really unexcelled timekeeper has been for years one of their principal objects and a special branch of their business, and the many laudatory mentions they have been the subject of in the reports of the Director of the Observatory, as well as the many prizes they have won, sufficiently attest the success of their endeavors. They also make and have on exhibition a more current commercial watch of very good quality. Appreciating the advantages of the system of uniformity of sizes they have lately introduced and are still making some improvements in the manufacture of this class of watches. All their movements can now be eased on easing blocks.

These finish the watch exhibitors. There are many other valuable articles connected with the watch manufacture on exhibition, such as materials of all kinds and tools. Among the exhibitors of this class of goods may be mentioned the firms:

Dufaux, Lutz & Co., Geneva, hairsprings.
Montandon Gentil Lutz, Geneva, hairsprings.
Aime Perrenoud, Geneva, hairsprings.
Baehni Freres, Bienne, hairsprings.
Charles Jeanjaquet, Neuchatel, mainspring.
Aubert Freres, Savagnier, mainsprings.
E. Klein, Geneva, mainsprings.
E. Berlie, Geneva, mainsprings.
F. S. Grobet, Vallorbe, files.
J. Lerosch Golay & Co., Vaulion, files.
S. Vautier & Sons, Geneva, files.
J. Marc Servet & Sons, Geneva, files.
Borel-Petitpierre, Convet, tools.
J. B. Bitterlin-Schmidt, Locle, jewels and jewel setting.
Eug. Besancet, Blanc, Travers, jewels and jewel setting.

Among the latters exhibit is a ruby pinion for an escape wheel which is an exquisite sample of jeweling.

Guyot, Lupolt, Locle, diamantine and enamel.
Amblet & Poncet, Geneva, watch oils.
L. Vaucher, Fleurier, watch oils.
J. E. Antony-Bovy, Chaux-de-Fonds, watch materials, stem-winding mechanism and hands, etc.

F. P. Ingold, Chaux-de-Fonds. This latter exhibits the celebrated Ingold fraises (cutters) the only cutters in the world used in wheel cutting, which give to the teeth of wheels the true epicyelodial shape. Mr. Ingold is a gentleman of ninety years old, has formerly lived in this country, and has devoted all his life to the advancement of horology.

J. Corvelle & Co., Geneva, watch dials.
Ami Rauss, Geneva, watch dials.

Both of these firms exhibit very fine samples.

We will close our sketch by mentioning the exhibit of

M. HIPP. Neuchatel.

This not only occupies the front rank of the Swiss exhibition, but is one of the most important and most interesting to the scientific visitor. The leading feature of this exhibit consists of a system of electric clocks, nine in number, governed by a regulator of ordinary Graham escapement, but whose mechanism of remontoir is at once novel, simple and effective. The mechanism is Mr. Hipp's own invention, as is also the means he employs for transmitting the current from the battery to the dials, and is the fruit of forty years of incessant, intelligent application. It evinces a thorough and intimate acquaintance with not only the principles but with the secrets and caprices of electricity, and a ready inventive mind to apply and control it by ingenious mechanical means. His electric clocks are thoroughly guaranteed against atmospheric influences of any kind, the most subtile and treacherous disturbances the electric clock maker has to encounter, and, unlike certain of his compeers who have sought a panacea in the discovery of a constant battery, he, on the contrary has made himself and his good performance of his clocks independant of the constancy or inconstancy of a battery. It would lead us too far to give a detailed description of the means he employs and the construction of his clocks, let the interested reader come to the exhibition and we shall be glad to furnish him with all that. Mr. Hipp's electric clocks have been in successful opperation in many of the principal cities in Europe, and in hundreds of public and private institutions for years, going without interruption and giving but little trouble. We may safely make the claim that they are the only electric clocks in the world that will perform satisfactorily.

Besides these clocks, Mr. Hipp exhibits a number of other scientific apparatuses of his own construction, and many of his own invention. Among them are an electric registering barometer and thermometer, telegraph instruments, chronograph and relevour for recording astronomical observations, a chronoscope and fall apparatus, an instrument for measuring the speed of railroad trains, a fluviometer, etc., etc., all of which we respectfully recommend to the inspection of the welcome visitor to the Swiss Centennial Exhibition.

For any further particulars, please apply to Theo. Gribi, Swiss delegate for the department of horology and scientific instruments, Main Building, Centennial Exhibition.

Practical Hints on Watch Repairing.

By Excelsior.—No. 17.

(288) In taking down a watch for cleaning and repairs, the first thing is to notice if the center pinion or post, or cannon pinion, touches the glass. If so, see whether the case will take a higher glass. If it will not, proceed as in section (193.) The next thing is to see whether the movement is firm and tight in the case. If not, either fit a new holding screw, or alter the case, or both, as needed, at once, or notice what is required and do it before cleaning. The movement being out of the case, the order of proceedure is, first to remove the hands, dial, and face wheels. Observations on the proper treatment of these parts will be found in sections (193 to 199.) For taking off watch hands there is nothing better than a pair of small cutting pliers, with diagonal side jaws. The edges should be thin, and nearly parallel with the handles. Get the points under the hand, resting the heels of the cutting edges on the dial, and by gently tipping the handles backward you can raise a seconds-hand straight off its pivot, with no danger of bending it. The hour hand is taken off in the same way, but the minute hand must generally be pulled off, placing the forefinger over it to prevent it snapping away, and assisting its removal by slightly wiggling the handles from side to side. If the socket of the seconds-hand is too long, or the hole needs opening, to let the hand down close to the dial, it is easily held in a pair of tweezers having a hole drilled through both points,—the socket passing through one point, so that its end can be filed off, and a broach will pass through both. The same will form a good tool for taking hold of roller tables and other round pieces, by rounding out the holes on the inside of the points a little, when the pieces will naturally fall into the hollow and be securely held. Another handy tool, for holding jewels and settings, is made from a pair of narrow pointed tweezers by cutting a shallow circular groove into the points, inside, near the ends, and lengthwise of them, with a circular burr wheel or even a graver. Held in these, a jewel can be brushed off on both sides and the hole pegged out with safety. For filing off the socket of the hour hand, fit a piece of peg wood tightly in it, and use as a handle, cut off the projecting wood, then file the end of both wood and socket as required. See that the cannon pinion turns truly and concentrically; that there are no teeth bent on the hour or minute wheels, that the pin which carries the latter is upright, fast in the plate, the wheel free on it, without too much play up and down, and all the depthings correct.

(289) *The dial.*—It the dial holes are large enough, but are not concentric with the pivots or parts passing through them, it can be moved in any direction by bending the posts in the opposite direction. But great care must be taken lest you crack the enamel. Should pieces be scaled off, they can be replaced with the dial enamel sold in little boxes for the purpose, by all material dealers. Put a small piece of the enamel in the hole, and slowly heat the dial over the alcohol lamp, constantly moving it about, to heat the whole equally and prevent cracking the enamel. When the piece becomes soft, press it down and spread it out with a clean knife blade, till it fills the hole evenly and smoothly. Then soften it a little till the surface glistens. If the enamel is burnt by overheating, the discolored part must be scraped off and more applied. If a still finer job is wanted, put on enamel enough to fill the hole a little more than level, then file or stone it down about level and polish with powdered rotten stone and water on a flat strip of hard wood. The file or stone must be handled carefully to prevent slipping and scratching the sound part of the dial. Missing figures can be restored by grinding up black enamel with thick gum-arabic water, and painting them on. When nearly dry, the figures are corrected by rubbing off the ragged edges and superfluous breadth of lines, with a peg-wood point. When dry, they can be melted on permanently by heating, like the white enamel. A good way is to take good copal varnish, and add enough dry lamp black to give a good body, but still be thin enough to flow freely from a pen. This is finished when dry. But this is rather too fine work for most watchmakers to do successfully, unless one is considerable of an artist. India ink ground up, and even common writing ink, are sometimes used. If the dial is concentric with the plate of the watch, but the holes need filing out, always put the file through from the face side, and file by pushing, only,—never press on the file while pulling it back, nor push it through so far that it gets tight in the hole, or you will scale off the enamel and make an ugly spot. In cleaning enamel dials, wash with soap and water with a stiff clean brush, and wipe dry with clean paper. If not very dirty, paper alone will do. Never clean them with the buff stick or a dirty brush, as you will get dirt into the fine cracks which nearly all dials have, making them perceptible, and the owner will at once say that you cracked it.

(290) Should a dial post be broken off, a new one can be soft-soldered on to be quite strong and serviceable. First, file off the stub of the post down level, then scrape away the enamel around the place till you have a copper surface ¼ inch in diameter, perfectly clean and bright. Then take a piece of *soft* copper wire of the right size for the post, two or three inches long, and hammer out a thin head on one end, finishing it by putting the wire through a hole that just fits it, in a staking block, and hammer the head down flat. Now bend this wire so that, while the head rests in the hole made for it, the rest of the wire is curved over the edge, with the other end formed into a sort of ring which rests against the *face* of the dial, encircling the locality of the post. Thus, by placing the head just where the old post was, the ring will hold it in position by clasping the dial between it and the head, saving a great deal of time and bother in holding it in place by hand while soldering, as is usually done. The head should previously have been well tinned by rubbing it over a piece of tin plate on which soft solder is melted, the hole plentifully supplied with soldering fluid, a lump of solder placed in contact with the edge of the post, and heat carefully applied till it flows all around the head. Wash off in soft water, without soap, straighten up the post, cut off to proper length, trim away the solder if rough, and drill the hole for the pin or file the notch for the screw, putting the dial on and marking the proper place, and if well done it will last nearly as long as the original.

(291) Metal dials with metal figures should be cleaned by washing with soap and water with a tooth brush and dried off with tissue paper. Metal dials with other than raised metal figures must be handled with great caution, as their figures are generally painted on, and will come off if rubbed much or brushed while moist. In such case they may be restored in the same way as directed for enamel dials, except that the final melting on of the enamel should be omitted, as the heat would probably change the color of the metal, and if not perfectly clean would burn the dirt in and make an indelible stain. The best way with such dials is to use the varnish for restoring the figures. To clean dials with painted figures, if they must be washed to remove the dirt, first cover the *figures only* with a coat of copal or other good varnish, and let dry thoroughly.

(292) Silver dials which have become dull and rusty, can be whitened with the ordinary silver-blanching pickle, made of two parts of sulphuric acid, and one part of nitric acid, which is then diluted with soft water till it is only strong enough to "set the teeth on edge" when tasted, but not be unpleasant in the mouth. You also want a cup or saucer in which to boil the pickle over the alcohol lamp. In blanching dials the dish must be large enough to let it lie flat in it, and be covered with the pickle. Everything being ready, take the dial off the false plate, if it has one, bend up a long wire into a ring on which to lay the dial, and heat it evenly to a low red heat over the lamp. Cool it in water, and scour it clean with pumice-stone dust and water, with a stiff tooth brush. Now bring your pickle to a boil, over the lamp, stick a piece of peg-wood tightly into the center-hole of the dial, as a handle, and hold it in the boiling liquid until it becomes of a dead white color. If there remain any dark spots, wash the dial off clean, heat, scour and boil out again as before. Repeat the process till every part is perfectly white, then wash off the acid very thoroughly, and dry it by warming it over the lamp. Before using this process be sure that the dial is silver and not merely silver-plated, as the acid, although very weak might take off the silver if thin; 2d, that the pickle has not been used for blanching articles con-

taining copper, as the dissolved copper might settle on the dial and prevent perfect whiteness; 3d, that the figures, if black, are enameled, and not merely painted on, as the latter would be entirely obliterated by the process. Enameled figures, with care, will stand it, but the novice had better confine his blanching operations to dials with metal figures. And it is advisable to blanch a dial only by express agreement with the owner; as, if he had not cared much about its appearance, he would hardly like to pay $1 or more for blanching it. After this treatment the chemically clean surface must not be touched with the fingers nor allowed to get dirty, as it is very sensitive. If the raised figures need brightening, they can be carefully burnished, but with very little pressure, as they are often very thin.

(293) We have now come to the escapement, every part of which should be closely examined and tested while taking down, to see that their form, condition and action are correct and in accordance with the most approved principles relating to the particular escapement and construction under treatment. In order to show what is right or wrong, it will be necessary to consider each of the principal varieties of escapements by itself, commencing with the horizontal or cylinder, and ending with the spring-detent or chronometer escapements. On many points opinions differ more or less, but I shall quote from those I consider the best authorities, taking the liberty to modify even their statements, to make them accord with my own judgment in the matter, or else give both their and my opinions. It is difficult, in a strictly practical article to decide what points to give, and what to omit as being too theoretical. The beginner wants all the details, which, on the other hand, may be considered trivial by such as are posted on the subject. And yet, those who wish to go to the bottom of it, may think those articles incomplete. But all this cannot be avoided. I shall endeavor to tell all that is important to know, so that those may know who do not know—and let those who know be thankful that they do know. Much of what is said under the head of the cylinder escapement will apply equally to all the others, and will not need to be repeated hereafter. Hence whenever anything appears to be lacking to completeness, it will probably be found by referring back to the earlier portion of the article. But when certain things are directed to be done, or tools to be used, but without descriptions or instructions *how* to be done, that information is intended to be given in the articles on the Lathe.

THE HORIZONTAL OR CYLINDER ESCAPEMENT.

(294) We will begin with the ordinary mechanical defects, and then consider the principles which should govern its construction and action. In the first place, it is evident that the workman cannot tell whether a part is right or not unless he can *see it*, and see it clearly. To see some parts it may often be necessary to remove the hair-spring and collet. But when he cannot see them distinctly in the watch, the parts must be removed and tried in the depthing-tool. Feel of the end stones with a sharp point to see if they are fast. Test the end-shake of the balance by putting the point of the oiling-wire under the hub, and see how far you can lift it, first getting your eye on some part, either of the cylinder, the hub, or the pivot, when you can see even the smallest motion that occurs. If the end-shake appears to be very minute, press lightly on the cock while the balance is vibrating. If it stops, it is fitted very closely, or else the cock is not screwed fast, or is not firm in its place. If the last, it must be remedied so as to be perfectly firm, or the watch can never be depended upon. Lift the balance and let it fall, to see if the pivots are free in the holes. See if the balance clears with sufficient room for safety everywhere; the escape-wheel bridge, with its jewel, and the end of the pivot; the fourth wheel arbor and pinion leaves; the banking-pin in the balance cock, tested by holding the watch so that the balance will fall towards the pin, then get the light so that you can see distinctly between the pin and the edge of the rim, and vibrate it to its fullest extent in that position; turn the movement upside down, push the center wheel to its lowest end shake towards the balance, vibrate and watch; while upside down see if it clears the end of the regulator-pins and the hair-spring stud, by moving one or more of the arms slowly past them with the oiling wire (53) resting vertically, not slanting, against one of the arms.

(295) See if the balance is true in its plane of vibration. If it wobbles, see if either pivot is bent. If so, heat a pair of pliers as hot as you can handle them, take hold of the pivot endwise, and when thoroughly warmed through, bend it straight. Do not let the pliers rest against the shoulder, as you would probably pull the pivot off by the powerful leverage. Don't bend too much; better try two or three times than have to bend it back again. Before bending, be sure of two things:—First, the right direction to bend it, found by turning the balance around while looking across it with the eye-glass, till you get the position in which the pivot is seen to tip over the most, then notice the part of the balance towards which the pivot leans,—this is your guide in taking hold of it with the pliers. Second, be sure that it is not too hard to bend, by trying the shoulder with a file if it appears to be very hard, as a pivot may be a little crooked and yet be hard to brittleness, having been crooked in the hardening or before. But if it has been *bent*, it will generally do to bend it back, unless it is considerably strained. If you are doubtful, or the pivot is an important one and troublesome to replace, reduce the temper to a light blue before bending, by the "temper drawer." This is a thick piece of copper wire an inch or so long, with the ends flattened, a groove cut in them, and then bent together. Clasp the points on the shoulder of the pivot, and blow the flame of the lamp on the bend of the wire, which, being a good conductor of heat, will convey it to the pivot and so draw the temper while keeping the flame at a distance.

(296) Whirl the balance slowly in the calipers, and watch if the pivot runs perfectly true, or bobs up and down next to the shoulder. If the body of the cylinder (above the narrow slot) runs truly in the watch, it shows that the pivots do not need bending, but the trouble is in the balance itself. In that case, cause the balance to vibrate freely, and notice in which direction it should be sprung, in order to clear everything, whether up or down. For instance, if the "wobble" brings a part of the rim too near the center wheel, find which arm is too high, and bend it down level with the rest. Never bend a balance while in the watch, but take it out and entirely off the cock, and when bending place the finger nail against the hub at the center, letting all the strain come on that, not on the rest of the rim. Then put it in the calipers, with the sharp corner of the slip-piece almost touching the under side of the rim; turn it slowly with the finger, and see whether the arm is yet too high or is too low, using the eye-glass constantly. Then test the poise of the balance (69, 70, 71).

(297) See if the cylinder pivots fit their jewel holes closely and are yet free; if the balance has the same extent of vibration with the dial up and underneath; if not, find whether the cause is that the pivot is too short to reach through to the end-stone, or the end-stone is broken, loose, or too far off. If broken, put in a new one that will support the pivot properly; if loose, fasten (190, 191); if too far off, put in a thicker one if admissable, or, if it is fastened in a setting, alter that by filing the surface down level with the jewel, or in some other way, to bring it nearer to the hole jewel. When the end-stone has been got as close as possible, and the shoulder of the pivot still rubs on the hole jewel (which can be told by noticing if the vibration is as large with the end-stone off as on, also whether the pivot projects through beyond the jewel when the end-stone is not there to support it), the shoulder should be removed by means of the "shoulder-scraper." This is a three-cornered piece of steel, two or three inches long, with sides say $\frac{1}{4}$ to $\frac{5}{8}$ inch broad, perfectly flat and polished, $\frac{1}{2}$ inch at the end being rounded off to a point the edges kept keen and sharp. This is set in a stout handle, and resembles the ordinary scraper. It is best used with the "turns" or Jacot lathe, but with care it can also be used with the live-spindle lathe. The short pivot being in a notch of proper size, the flat side of the scraper rests on the pivot, while the edge is pressed against the shoulder and shaves it off as the piece is turned with the bow and collet. Thus the pivot is not injured, but only polished, while the shoulder is being removed with perfect safety. Conical pivots, however, should have the shoulders ground down by a round-cornered grinder with oil-stone dust, and polished with sharpe, being careful to neither reduce the pivot itself during the operation, nor to grind off so much at the shoulder as to make it smaller

than the pivot. In working upon a cylinder in the lathe, with a collet, a solid brass one should be used, having a hole about fitting the cylinder, which should be filled with wax to strengthen it and cement the collet on. When done, remove the collet by warming it, and dissolve the wax by boiling the cylinder in alcohol. For this purpose the glass "test tubes" used by chemists are excellent, being to ig, so that the flame will not reach the vapor of the alcohol, and transparent, allowing a view of the articles while boiling. A wire stand can easily be fitted to the wick-tube to support it. Different sizes may be had, and at a slight expense, from any large drug store. The wire should only encircle the tube at the top, just under the lip, not touching it anywhere else.

(298) If the cylinder itself is bent in the small cut near the bottom, it is seldom safe to try to straighten it, and never except with heated tools, for the central portion of a cylinder is always left very hard, while the temper is slightly drawn at the ends. The only ways are, first, to drive out both plugs, string the cylinder on a wire that about fills the bore, heat the end of the wire in the lamp, holding it with a pair of cold narrow pliers, with one jaw pressing lightly on the wire in the large cut, the other against the back of the cylinder. As soon as the lower cannon and the column become purple, press hard with the pliers to straighten the column, then thrust the whole into oil to cool. Polish the color off with sharpe, not with acid. Another way, not so good but not requiring the removal of the plugs, is to hold the impulse lips in contact with the pliers as above, touch the column with a heated iron till it becomes blue, then carefully pry it back straight with a warm wedge-shaped piece. The common coarse, and perhaps the safest and best of all if the column is not much bent, is to drive out the lower plug and fit a new one, on which you file a center that will cause the cylinder (above the small cut) to run truly, then turn up the pivot. The cannon being left a little out of center will do no hurt, if it is not pitched up so high as to touch the escape wheel. To drive out the plug safely, take a piece of brass with a hole large enough for the plug to pass through freely, then bevel the upper end of the hole till the end of the cylinder-shell will enter the bevel and rest on it by its outer corners or edge, and start the plug with a plug-driver. Finish driving it out by resting the cylinder on a common stake, over a hole that will support the shell but just take in the plug.

(299) The small lip of the cylinder (307) is frequently cut or worn, on the inside edge, while the remainder of the lip is not worn much if any. This shows that the points of the escape-wheel teeth are too sharp, or not polished properly, and the constant striking, as they drop from the large lip, wears it at the point of impact. Try the teeth by rubbing the points on the finger nail. If they scratch, they may be polished up with the pivot-burnisher, but this process must be very minute, so as to merely remove the roughness, but *never* to round the point, or shorten the length of the impulse plane of the teeth. If the lips themselves are worn considerably, the cylinder would probably be opened too much (308) to work well, if the grooves should be stoned out and repolished. The best course, when practicable, is to cause the teeth to act upon a sound portion of the shell. It this cannot be done without causing the wheel to rub either the top or bottom of the small cut, or if the lips are not much worn, the grooves should be stoned out with a narrow slip of oil-stone, and then repolished. If you have no oil-stone slip, you can use a soft steel or bell-metal slip with oil-stone dust and oil, for grinding the lips—or even a sharp file, finishing with the slip and oil-stone dust. Polish with bell metal slip and sharp or rouge. The most workmanlike way, however, is to use two ruby files, one coarse, and one fine for polishing. To hold the cylinder while working at the lips, take a piece of hollow wire, or drill a hole large enough to receive the cylinder in the end of a solid brass wire, file away the upper half (or a little more if polishing the large lip), then wax the cylinder in it with the hollow up and the lips exposed. This wire serves as a handle, which should be rested upon some notched support, to prevent slipping, and also strengthens the cylinder. The small lip when done must be parallel with the length of the cylinder, for it it is slanting the cylinder is worthless. The same may be said of the large lip.

(300) Sometimes the bottom of the small cut hits the arm of the escape wheel tooth, causing it to recoil before the banking-pin hits the bank. First, examine if the banking action is correct, (304). If so, the recoil is caused by excessive width of the column of the shell at the bottom of the small cut, and may be remedied by making the cut deeper, with the appliances above described, except that the edges do not need polishing, as they perform no part in the action of the escapement. This standing part or column need not occupy over one-quarter of the circumference of the cylinder. This recoil must be distinguished from the more common recoil caused by the escape wheel running too high, and the arm of the tooth, instead of playing in the small cut, as it should, hitting against the small lip. This can be remedied in different ways. Sometimes the escape wheel does not run truly, or is bent, and only a few teeth strike, and it should be straightened up. If the whole wheel strikes, and it is upright and correct, with only the proper amount of end-shake, the cylinder may often be raised, by altering the end-stones, or driving out the lower plug a little when the cannon is long. The small slot can be made wider, so as to clear the wheel, by filing the metal above it with a sapphire or ruby file, or it may be ground away with a very thin slip of bell metal and oil stone dust. This, however, is a dangerous process for the novice, as the least slip will pry in the slot and snap off the lower cannon and pivot. The cylinder should be waxed on a piece of metal slightly grooved so as to take it in deep enough to save the columns from abrasion while grinding, and hold it as in section (299). Sometimes the escape wheel itself can be lowered by turning off the shoulder of the lower pivot in the lathe. As a last resource, the potance slip carrying the cylinder may be raised. The proximity of the teeth to the *bottom* of the cylinder may be observed by getting the light on the end of the lower plug so it looks bright, and the distance between it and each tooth will be plainly seen as the wheel passes through. This will also show whether the wheel runs truly in the cylinder. If not, it must be straightened. If the wheel is true, but runs too near the bottom of the cylinder, or touches it when the dial side is upward, take off the end of the lower cylinder pivot, if it is plenty long enough. When that cannot be done without causing the shoulder to rub, lower the end of the potance.

(301) Having found all correct thus far, try if the escape-wheel pinion has proper end-shake, either by moving it up and down with the oiling-wire, or by pressing down on the cock and observing how much it gives down before resting on the pinion. The amount of end-shake should be small, as the small slot of the cylinder in which it plays is narrow, but it must be clearly perceptible. The web of the wheel should be shoulve in the center of the slot. To observe its position, turn the balance till the small lip of the cylinder passes over the arm of the tooth, and hold it there while moving the wheel up and down, through the extent of its end-shake. Then see if the teeth rub in the circular groove on the under side of the cock, by holding the movement dial side up, throwing the wheel towards the cock, and watching the teeth while running in that position. Also, look for any cut or bright mark in the groove. If the touching is caused by too much end-shake of the wheel, bend down the end of the cock a little to correct that. If the end-shake is right, and the teeth still touch, the groove may be turned out in the universal lathe, or, if you have none, the groove may be scraped deeper by a narrow graver having the end ground square across, while the cock is laid on some proper support to prevent springing. In case the groove is already so deep that the metal left cannot safely be made thinner, which sometimes occurs, make a bur at each of the four corners which rest on the plate, to raise the whole cock up, and spring the end down to give the proper end-shake to the wheel. Make, also, two additional burs, one near and on each side of the screw hole, so that screwing the cock down fast will not spring the end up and alter the end-shake.

(302) The proper condition and treatment of the hair-spring, regulator, etc., has been fully given in previous articles. To put a watch in beat, press against the fourth-wheel, or the one that carries the second-hand, with a pin-push, causing the balance to slowly vibrate in each direction, as far as the teeth carry it, but with no momentum to carry it any farther. Note on the plate the two extreme positions of the banking-pin, an arm of the balance, or any other conspicuous part most convenient, and when the balance is at rest, perfectly free from the motive force or any restraint, the banking-pin, arm, etc., should stand midway between those two positions. If not, move the collet (51) till it does. A watch may sound out of beat when it is really in beat, from the pivots of the cylinder not being in the center of the shell, either from being bent, or not having been made in the center; also, from the shell being too thick; or from a want of proportion between the sizes of the cylinder and the teeth of the escape wheel, etc., causing difference in the two "drops" of the wheel which produce the audible "beats." These points will be treated further on. We will now consider the parts and proportions of this escapement in a more scientific aspect.

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Gold and its Uses.

Pure gold, on account of its very rich color and non-liability to tarnish in air or water, either by oxidation, or from the action of sulphuretted hydrogen, is used for a variety of commercial and ornamental purposes. Being very solid it has a high specific gravity, one other metal only being superior; this metal (platinum) being the heaviest known substance; it is, however, not much employed in commerce. The specific gravity or specific weight of gold is 19.2, but by hammering it becomes 19.5. It will be well to explain, before proceeding further with our subject, the meaning of the term specific gravity, in order to remove from the minds of those of our readers who are unacquainted with chemical phraseology, the technical expression, any doubt which may arise hereafter as to the true nature of its meaning. The specific gravity of a substance is the proportion it bears in weight to the weight of an equal bulk of water. Specific gravity is then the expression of the difference subsisting between the weights of equal bulk, or given dimensions of liquids, or solids. For example, if we take two pieces of gold wire, each of the same size and length exactly, and place them separately in the opposing pans or pair of scales, the scales will exactly balance, the gold wire being identical in weight, and therefore of the same specific gravity. If we now remove one of the pieces of gold wire and substitute one of silver exactly the same size and length, by balancing the scales we shall at once see that the gold wire is much the heaviest, and the difference between the two metals is the specific gravity. Water in consequence of its lightness in comparison to the metals, and the ease with which it is obtained pure, is taken as the standard of specific gravity. Taking water as the unit, we write after it the figure 1, or 1000; these numerals may represent grains, pennyweights or ounces. The metals employed by the jewelers in the manufacture of their articles or wares, would be numerically expressed thus:

Water, sp. gr. (specific gravity)		1 or	1000
Spelter,	"	"	7 2 or 7200
Copper,	"	"	8.96 or 8960
Silver,	"	"	10.5 or 10500
Gold,	"	"	19.5 or 19500

The weight of gold is nineteen and a half times that of water of the same bulk, silver ten and a half times heavier, and copper nearly nine times, as indicated by the above table of specific gravity weights. Perfectly pure gold, or fine gold as it is more generally called, cannot be procured in commerce, in consequence of the long chemical process in refining, which would make it too expensive for the trade, as manufacturers of jewelery in the midst of present cutting prices. The different qualities of gold are expressed in carats; the finest gold, which should be quite free from any alloy, is commonly expressed as 24 carats, but the fine gold of commerce only consists of about 23¾ to 23¾ carats, and this is quite good enough for ordinary practical uses. The fine gold of commerce consists of irregular minute grains of a dull yellow color, but it can be made brighter by heating and boiling in hydrochloric acid, but then this is only a matter of taste, which makes not the slightest difference to the working of the metal; in fact, some masters give a preference to the dead color; in so far as our experience goes, we unhesitatingly say, for manufacturing purposes, the one is quite as good as the other. The melting point of fine gold is 2016° Fahrenheit's thermometer, and appears of a greenish shade when fused in the pot; at the above fusing point it reflects like a mirror. Flukes will change the color of gold; borax makes the color rather paler, whilst saltpetre deepens it. The chemical nomenclature of fine gold, and of the other metals used with it in jewelery, are represented as follows:

NAME OF ELEMENT.	SYMBOL.	EQUIVALENT.
Gold (aurum)	Au.	197
Silver (argentum)	Ag.	108
Copper,	Cu.	31.7
Spelter (zinc)	Zn.	32.6
Hydrogen (a gas)	H.	1.00

These various elementary bodies have symbols of a very simple character, being generally formed by taking the initial of their names; but in cases where two or more elements are the same, some other letter must be taken for distinction; the symbols therefore of metals represent or express their chemical names.

The equivalent of a metal is only another name for atomic weight, and these equivalents of atomic weights are at present practically recognized by the principle of the atomic weight of hydrogen being taken as the standard unit of 1. In order to assist the reader we will give a definition as to how these equivalents are arrived at. It is well known to every reader that pure water consists of two elements or bodies, hydrogen and oxygen, and that these ingredients or gases exist not in equal, or variable proportions, but in quite fixed proportions. Every atom of water contains eight times the amount of oxygen to that of hydrogen. Therefore, hydrogen being the lightest it is taken as 1. *Equivalent chemical weight* expresses the different proportions by weight in which substances, whether solids or fluids, chemically unite with each other. For example, one part by weight of hydrogen goes as far in combining with eight of oxygen to form an oxide, as 108 of silver, or 197 of gold, and these equivalents will not neutralise the eight of oxygen more effectually than the one of hydrogen does, but just the same, and produces a similar compound. The same remarks apply to all the other equivalents of elements. If we take, to show this more clearly, one grain of hydrogen and eight of oxygen, exactly nine grains of water are formed. But if we were to take two grains of hydrogen and eight of oxygen, and submit them to the same treatment, the same amount of water would be formed as before, and the surplus hydrogen found uncombined; so it is with gold—if we were to take more than the 197 equivalents of gold to eight of oxygen to form oxide of gold, the surplus in this case as in the above, would be found uncombined; therefore to form oxide of gold we say eight oxygen, 197 gold.

Fine gold is of a very malleable temper, and extends or spreads under the hammer more than any other metal, and may be worked into almost any form or design by the hand of a skillful workman. There is no metal that can be extended by the hammer or by rolling to the extent pure gold can. "One ounce," says Smith in his School of Arts, "beaten into leaves, would cover ten acres of ground." "It will so yield to mechanical force," says Lutschaumig, "that it may be reduced to the 200,000th part of an inch in thickness." For manufacturing purposes these extremes are seldom or never reached. Practically the limit to which fine gold is now reduced in thickness, is, in the gold-beater's art, where it is so beaten that 100 square feet of it weigh only one ounce, and which would only cover the 480th part of the space mentioned by Smith. The gold employed by the gold-beater should be pure, or very nearly so, but it generally consists of about 23 carats. The various colors which gold-beaters' gold presents, are obtained by alloys with silver and copper in different proportions. The pale leaves consist of 23 parts of fine gold and one part of silver; the deep leaves approaching to a tint of red, contain 23 parts of fine gold and one part of best Swedish copper; the fine orange-colored leaves, more commonly met with, contain half part of silver and half part of copper to 23 of fine gold. Too much silver in the alloy is an obstacle in the way of the gold-beater, in consequence of its hardening properties, therefore it should be avoided as much as possible. Gold-beaters' gold is prepared by taking the proper proportions of fine gold and alloy and melting the mixture in a crucible, when it is cast into small oblong ingots, each about three-quarters of an inch in width, and one and a half inches in length, weighing about two ounces. Each ingot is then rolled very thin between two reversable polished steel rollers, the gold being often annealed during the process in order to render it soft, which is made hard by rolling; by this means it can be reduced with little expense to a very fine ribband of not more than one-eighth-hundredth of an inch in thickness. It is then cut into lengths about one inch square. A number of these are taken and properly secured in a most useful contrivance of the gold-beater. With a sixteen pound hammer, having a smooth convex face, the gold is then well beaten until its dimensions are considerably extended, when it is again cut as before, hammered again, and if necessary the process repeated until it is of the proper thickness for transfer to the

books in which it is sold to the public, and which usually consist of twenty-five leaves, when trimmed each about 3½ inches square, costing to the trade from 1s. to 1s. 3d. each book.

The uses to which gold-beaters' gold is now put, even in every day transactions, are more numerous probably than the majority of workmen, who are constantly manipulating in the art, and through whose hands it regularly passes in the different stages of manufacture, contemplate; suffice it to say, that almost every article, both in business enterprise and domestic life, is beautified and enriched by studious and skillful artisans with traces of gold. Even the paper upon our walls, our china, our tea trays, our book edges and covers, our sign boards, our sewing machines, and wares of pottery; in fact, almost every article and trinket of the household, is decorated more or less with gold. We have also printing in letters of gold, gold lace, and by no means least, our best pictures are all embellished with gold, and although the metal may appear to be uninitiated, thus described, as very extensive and costly, it would not indeed, if recovered from a whole host of such articles and trinkets, amount to more than two penny-weights, if melted, of the value of eight-and-sixpence. We have deemed it desirable to supply this information, which may, perhaps, be considered beside the chief branch of our subject, the uses of gold and its connection with the jewelry trade, and the currency—money—to show the wide spread usefulness of the precious metal, and the very extreme of malleability to which it is reduced, in order that it may be applied to so vast a circle of uses for purposes of ornamentation, and that at comparatively reasonable cost. Fine gold is even quite as remarkable for its ductility as its malleability. The ductility of a metal is the possession of that property of yielding to mechanical force which renders it capable of being drawn into wire successively through a series of graduated holes in a steel plate, called by wire-drawers a draw-plate; if the metal manipulated upon be perfectly ductile, wire of almost any thinness may be thus obtained. Pure gold is at the head of all metals for ductility; it is supposed that wire-drawers have extended out of an ounce of gold, a thread 230,400 feet long. The inlaid vessels, and work in gold *filigree* from India, are examples of the great ductility and admirable mechanical qualities of this noble metal. In India the greatest perfection seems to have been obtained in the art of drawing gold wire, as witness, the gold embroidered housings of the elephant and howdah, as exhibited by Her Majesty in Hyde Park, 1851. But then it must be understood that the majority of filigree wire is not all similar to the real filigree of London and Birmingham; the Indian wire being thicker round wire, screwed, and then flattened, and afterwards so placed upon the different designs for the filigree of the edge to show itself, whilst the London and Birmingham filigree is wire considerably thinner, doubled and twisted into a fine cord of extreme delicacy. The extreme of ductility is never practiced in England, there being no advantage gained in the commercial world, the finest wire required for manufacturing purposes being either for the purpose of filigree or gold lace. The latter is drawn very fine and afterwards flattened between a pair of steel rollers any size as desired, so as to suit the object in view. There is reason to believe that the ancient Egyptians had some knowledge of the ductility of this metal, and the art of making round wire was known to them. Exodus xxxix, 3, "And they did beat the gold into thin plates, and *cut it into wires*, to work it in the blue, and in the purple, and in the scarlet, and in the fine linen, with cunning work." It is not reported to what extent these wires were reduced in thinness, but no objects but those purely experimental, would aim at the extension of an ounce of fine gold into a wire the length we have mentioned. And we much question whether the most experienced wire-drawer of the present school would accept an order such as the above, even at his own price. The drawing of a penny-weight of gold by mechanical force into a wire 11,540 feet long, and a single grain into a wire 480½ feet, is a difficulty not to be easily overcome. We have practical knowledge of the art of wire-drawing, and we distinctly say that unless the wire was previously coated very strongly with silver, any attempt on the part of the workman to produce the desired length, must result in failure. If the object can be acquired by those means, which we much question, then the silver may be removed from the surface of the wire, by dissolving with nitric acid, and although the nitric acid has no effect upon pure gold, still in consequence of the thread of gold being so extremely fine and delicate, it must be done with very great care to prevent the wire becoming disunited. The tenacity of a metal is its strength and toughness, that property of a metal which prevents, when mechanical force is applied, the easily tearing asunder of the metal—the separation of the particles when under restraint—and the power of giving way when supporting any particular weight. In this respect gold is not at the head of the list for tenacity and toughness; for while a piece of gold wire of the thickness of No. 14 size Birmingham wire gauge, supports a weight 150½ lbs. avoirdupois, a wire exactly the same dimensions in silver will support 187 lbs., and a similar one of iron supports 549 lbs. Thus the position that gold occupies regarding its tenacity and toughness, is not equal to its ductility and malleability.

Fine gold is too soft to stand the wear and tear of use, hence arose the necessity for the incorporation of some other material to give increased hardness. The following table gives the relative value of the different carats, and the proportion of alloy to be added, taking 24 as the unit of fine gold:

QUALITIES OF GOLD.	£	s.	d.	ALLOY TO BE ADDED.
24 Carats.	4	5	0	None.
23 "	4	1	5¼	1 carat.
22 "	3	17	11	2 "
21 "	3	14	4½	3 "
20 "	3	10	10	4 "
19 "	3	7	3½	5 "
18 "	3	3	9	6 "
17 "	3	0	2¾	7 "
16 "	2	16	8	8 "
15 "	2	13	1¼	9 "
14 "	2	9	7	10 "
13 "	2	6	0¾	11 "
12 "	2	2	6	12 "
11 "	1	18	11¼	11 "
10 "	1	15	5	14 "
9 "	1	11	10¾	15 "
8 "	1	8	4	16 "
7 "	1	4	9¼	17 "
6 "	1	1	3	18 "
5 "	0	17	8¾	19 "
4 "	0	14	2	20 "
3 "	0	10	7¼	21 "
2 "	0	7	1	22 "
1 "	0	3	6¼	23 "

The above value represents the ounce troy, and is quoted at the mint price of purchase. The purchasable price of fine gold from refiners will be a little dearer than that expressed in the above table, on account of the expense in refining; in large quantities, say over ten ounces, it will cost from 85s. 3d. to 85s. 6d. per ounce; in smaller quantities it will cost from 85s. 6d. to 86s. per ounce; therefore, if one ounce of fine gold is required, it will cost 86s. nett, from all houses. In judging a piece of work of alloyed gold, the value (if with a view of sale) must not be calculated upon the amount of fine gold the piece of work contains only; if so, the calculation as to the real value will be wrong and misleading, because in the alloy there is a certain proportion of silver, and as this metal is rather expensive, a loss would occur by the transaction; for example, if we take the proper proportion of fine gold as existing in an ounce of eighteen carat gold, at the mint price of value as given in the table, £3 3s. 9d., to obtain that amount of gold from the refiner in the best market it will cost £3 4s. 3d., the increase being due to expenses in refining, in order to produce that fine state of division required for alloying. Now, in order to produce 18 carat gold, five pennyweigbts, or six carats of alloy, must be added to the quantity of fine gold of the above value; if we say half silver, and the other half copper, at the lowest trade price, it will cost 9d., so to practically produce an eighteen carat alloy of gold it will cost 65s. per ounce to the manufacturer of jewelry before he actually introduces it into his workship. All other alloys should be thus calculated after the same manner, and we should say an ounce of eight carat gold is worth 30s.

The Jewelers' Circular & Horological Review.

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THE

Jewelers' Circular & Horological Review,

THE RECOGNIZED ORGAN OF THE TRADE.

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

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

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D. H. HOPKINSON, 42 Nassau Street, New York.

Advertising Rates made known on application.

How to Remedy the Evil.

There is good vigorous talk in the letter signed "Up-town," in another column. If most of the trade would show the spirit shown in this letter and then have the pluck to carry it out into action we should have much less demand for new laws, such as that which our correspondent proposes. The chapter of legal swindles grows longer and longer every day, and it does seem to the trade as though there were no possible end to it. And yet we make bold to say, as we have said before, that the end is within their own reach. It is perfectly true that with all the agency reports possible any trade must depend largely upon the honor of debtors. That is only another way of saying that all business is founded upon commercial integrity. It is a truism. The salvation of any one trade, like our own, consists in protecting this honor and ensuring this integrity.

And that is just what the jewelry trade have not done. There is only one way to do it and for too many years the trade have not chosen to take that way. If a man is dishonorable he must be tabooed. But so long as leading dealers turn about and make the same terms to a man who has failed that they do to a sound dealer, and make those terms whether he has failed honestly or dishonestly, so long they will not only encourage swindlers, but offer a premium to reasonably honest men to become dishonest. Sound laws are of great importance but a sound public opinion in the trade is of infinitely greater importance, and this we would suggest to our correspondent is much more important than the revision of the statute book which he suggests.

We may say incidentally that it is not possible to put personal property on the same legal footing as real estate. The laws in the one case are based on the fact that the property cannot be taken away, and the law system regarding real property could not be made to apply to that which can be spirited away or otherwise moved. A comparison between the two therefore does not hold good. Moreover it is not well to try the dangerous experiment of making laws solely with the dishonest class in view; that might be too hard on honest men. A chattel mortgage, for instance, may be a method of raising money, which an honest man must sometimes resort to; and yet we quite agree with our correspondent that the law should be very strict against such evasion of honest debts as are possible under present legal conditions.

To return to our text, the remedy against the repetition of such cases as our friend cites, is that these men should be ruled out of relations with the trade. Why, in a word, is A. "behind the counter as usual?" It is because the trade are again selling him goods as usual. If he were cut off, as he ought to be, from credit and trade relations, and were made to feel also that all honest men regarded him with scorn, we should not have the case of A. often repeated.

This is the true story—the long and short of it. There is no use impeaching the law until the trade itself has done its duty. The efforts of our correspondent should be directed toward arousing a public opinion which will shut down peremptorily on such men as A.; and certainly his vigorous letter is one blow in the right direction.

The "Cheap John" Business.

The article in our last issue headed, "What will Become of the Trade," has called forth more general and hearty commendation from responsible and leading houses than any which we have published for many months. The sentiment of the trade on this subject is all right; the important point is that this sentiment shall be made effective in action. How to stop or at least to check the "Cheap John" business is one of the chief problems before the trade.

It must not be forgotten that every man has a right to transact business in any commodity or in such wise as he pleases provided he does not interfere with the rights of others. In a word, it is not possible, nor is it desirable, to attempt to keep out of the jewelry trade, or any trade, new-comers who desire to enter into that business. That is the philosophy of trade-unionism and it is a philosophy which has failed time and time again. It is not on any such theory of business as this that our article was based.

The point to be reached is that those dealers who devote themselves to the trade and become properly members of the trade should be protected by the encouragement of the wholesale houses which they support. In other words, the jewelry dealer proper should receive from the wholesaler such discounts and credits as are not granted to any persons outside of the the trade,—a matter which is the business only of the trade. The very carelessness with which net prices have been advertised, on postal cards, etc., even when parties did not intend to bid for retail business at net rates, has, as we have again and again pointed out, been of itself the most serious discouragement to retailers. It is upon the principle of discounts made exclusively to the trade that all retailing success must be built, and the moment it is given up, as it has been in too many cases, the retailer must begin to go under, and the alternative is presented to the wholesale houses whether they will again adhere to the true business principle or whether they will take their chances with the "Cheap Johns," whom some of them seem so anxious to encourage.

As we have already pointed out, this is more than a trade matter. It is a matter that concerns the public as well. The "Cheap Johns" will always do a "Cheap John" business, and demoralize instead of building up trade, alike in the quality as in the quantity of the goods which they sell. If the public want goods of purity, art character and true workmanship, they must be assured they will not get them of the "Cheap Johns." These can only be had by building up a trade which is a trade.

It is then for the members of the trade proper to decide whether they will fight their own battle, by refusing countenance to houses which encourage not the trade proper but the "Cheap Johns" who are demoralizing it so dangerously.

Neuchatel Hall Marks.

The following communications were received at the Custom House recently, and will explain themselves :—

TREASURY DEPARTMENT,
WASHINGTON, D. C., Sept. 4, 1876.

COLLECTOR OF CUSTOMS, New York.

SIR.—I transmit herewith a copy of circular of the Council of State of the Republic and Canton of Neuchatel, Switzerland, in reference to the modification of the law of December 18, 1865, concerning the "hall mark" for articles of gold and silver by the adoption of a second standard for gold. This information being of interest to importers, dealers and purchasers of such articles, it is suggested that it may be proper for you to furnish a copy of the circular to such prominent newspapers in your city as may desire the same for publication. Respectfully,

H. J. FRENCH, Assistant Secretary.

THE OFFICIAL NOTIFICATION.

The following is a copy of the notification in question :

The Council of State of the Republic and Canton of Neuchatel, Switzerland, hereby inform foreign authorities, and all whom the matter may concern, that the Grand Council of our Canton, by a decree bearing date the 19th of June, 1873, and in force since the 1st of January, 1874, has modified our law of the 18th December, 1865, on the "hall mark" for articles of gold and silver, by adopting a second standard for gold, viz., fourteen karats, equal to 583-1000 fine, with distinctive stamp.

The introduction of the standard of fourteen karats as a legal standard, with the government mark is intended to protect traders and the public against impositions caused by the inscription upon watch cases of very low standard, and even of gilt metal, of the figures "18 K," or "14 K."

The Council of State considers it to be its duty to point out that these marks, thus affixed, afford no guarantee, if they are not accompanied by the government stamp.

The first chapter of the law of the 18th of December, 1865, and its terms are now as follows :

THE NEUCHATEL HALL MARK AND ITS GUARANTEED STANDARD.

ARTICLE 1.—The official warrant for articles of gold and silver is given by affixing distinctive marks or stamps.

ARTICLE 2.—The government, warrants and in consequence stamps only three standards ; two standards for gold and one for silver, viz., 750-1000 fine for gold, answering to the denomination of eighteen carats; 583-1000, answering to the denomiuation of fonrteen karats; 800-1000 for fine silver. There are two stamps (the old and new) for gold of eighteen karats, and one stamp for gold of 14 karats, bearing a rams head with the mark "14 K." There are two stamps for silver namely the old and new.

By affixing one or another of these stamps the Stamp office guarantees the standard corresponding to it. The law has been supplemepted by the following article :—"The punishment of imprisonment from a period of from one to six months will be inflicted on such, as shall have engraved upon articles of gold, silver or any other metal, marks intended to deceive or likely to deceive, as to the standard and value of the object bearing the said marks.

Signed in the name of Conncil of State. CORNAZ, President.
N. BOURQUIN, Secretary.

Good News.

We are more than glad to chronicle a revival in trade to such an extent as to surprise many and to delight all. Reports from leading centres show that, in very many branches of business, prices have advanced to a considerable extent, and started buyers into wholesome activity. Especially in Boston and Philadelphia, where merchants were, last spring, the bluest of the blue, general trade is looking brighter than it has for some seasons ; while in the Lane and other jewelry centres in New York, a good many buyers are already to be seen. The dry goods houses in this city have been busy day and night and an improvements in such staple trades as this, is sure, ultimately, to benefit our own.

We are glad to note that those in town are buying cautiously, which every thoughtful merchant must recognize as a healthy sign. What we want now is not a great rush of business, which shall soon be over but a reasonable and steady flow, which shall build the trade up again into an abiding prosperity. To bring this about there is need of good common sense on the part of both sellers and buyers. If the wholesalers persist in overloading buyers with small capital with more goods than they can handle, and the retailers permit themselves to be thus overloaded we shall have only a repetition of the trade history after the war—a new flood of compromises, bankruptcies, etc. Let the dealers, on the contrary, trust only those men who are worthy to be trusted, and press them to buy such goods as they can sell within a reasonable time, they are then likely to pay their debts and come back for more goods, and on this system we shall begin to get trade back into a prosperity which will last.

Look out for Them!

The burglars and swindlers are at work again in their devious ways of raising money without earning it. The former gentry are already paying their visits to the Lane and its vicinity, and the daily press have accordingly chronicled an unusual number of burglaries of jewelry stores in this and other parts of the city. In one case only was an arrest effected. Let us again therefore call the attention of the trade to the importance of doubly securing their establishments, for there is scarcely a day but that some notorious thieves prowl around the jewelry quarters seeking every opportunity either to make immediate raids or to reconnoitre for night attacks.

The other class, who have less bravery but more cunning, seem also to open the Fall season quite early. Every day we hear of some plansible swindler presenting himself and making off with a remunerative amount of some one else's property, this some one else being frequently firms of experience which might be supposed to be proof against such tricks. A favorite device lately has been for confidence men to represent themselves as cash buyers laying in a Fall stock. They would cause to be laid out a considerable bill of fine gold goods and then casually select some special article for the wife or some friend. When the salesmen asked who they were or called for actual cash, they would enquire the way to Wall street or make pretense of starting off to cash a draft, meanwhile taking with them off-hand the little item which they had selected for the wife or friend. When the large cash buyer failed to come back, the salesman found that he was victimized again. There has of late been repeated also the trick of having goods sent to the care of some house down town and on their delivery presenting a check. When the next day the check is found to be hogus the swindler has disappeared and the people whose office he used, are found to know nothing about him. Against these and other multiform devices of the arch enemy the trade should be very wary just now.

The Swiss Commissioner.

We have to note the departure for Europe of M. Favre, the Swiss judge in the department of watches at the Centennial Exhibition. It is with real regret that the American trade parts with a gentleman who alike by his character and his ability, has made so decided and favorable an impression during his stay among us. While he has been here he has had not only the opportunity of the Centennial Exhibition for judging of our work, but he has been welcomed by our leading manufacturers into their establishments, where everything has been shown to him, according to our American habit, without concealment. M. Favre is a gentleman well qualified both to see and to state what he has seen, and we expect that his report will be one of the most valuable documents the Centennial Exhibition will produce. Previous to his departure he had a consultation of much interest with the Swiss importers of watches, as to the business relations of the two countries, which promises to prove of great value in both. We trust that what he has to say in his report will be listened to with attention on both sides of the Atlantic, for we are sure it will repay careful consideration. We hope to present at least a summary of it to our readers at an early date.

Editorial Jottings.

Our friends will note with pleasure the excellent show which this number of the CIRCULAR makes, both in its reading matter and advertising. It extends now to fifty pages, and we hope that we shall not fall below this number during the rest of the season. We must return hearty thanks to those who have endeavored to assist our efforts to make the CIRCULAR more and more worthy of the trade, and we have only to repeat our own promise that the more we are supported the more we mean to make of the JEWELERS' CIRCULAR.

We learn that the Postmaster at New York has decidedly shut down upon several of the sheets whose real character was exhibited in an article in our last issue. It has been the custom of the publishers of many of these representatives of "individual journalism" to send any quantity of their circulars through the mail at regular newspaper rates, whereas with no special subscription list they were bound to pay postage at full circular prices. It is this which has very rightly been stopped by the post office authorities,—but their action will nevertheless be very hard upon "individual journalism."

One of the Swiss Commissioners at the Philadelphia Exhibition, in a letter to the *New Zurich Gazette*, has the following remarks on one of American product, namely, the "Protection of American industry:" "If a protective tariff were really as great a blessing as its apostles declare it to be, then should the United States, with their boundless resources, be the most prosperous among nations. But what do we see? Stagnation of business, an unparalleled distrust, scarcity of labor, and, as a consequence, open and secret want. Let no one believe that the American business depression is a result of the European crisis. Hard times were felt here before they were in Europe, and America will suffer after Europe has recovered. Better times will not return here until a sounder financial policy has been adopted."

We are glad to note that the fellow-workmen of "Excelsior" have responded right heartily to the suggestion of a testimonial in acknowledgment of his services to the trade. A great number of individual contributions, not large in themselves, but amounting in the aggregate to a considerable sum, have already reached us, showing how thoroughly and widely "Excelsior's" work has been appreciated. This is of itself the best encouragement in the world for others to do good work. Let us add that the purpose of this testimonial is not to raise a great sum of money for a costly medal or piece of plate, but to present him with some modest token of the trade's appreciation of his endeavours. We would suggest therefore that those desiring to take part in this offering, should send in contributions not to exceed twenty-five cents each. If half those whom "Excelsior" has helped to better workmanship will join even to this extent, these little sums will amount up of themselves to a really handsome testimonial.

We record with sorrow, the death of a most promising and estimable member of the trade, Mr. W. H. Evans, a young man in the employ of Wheeler, Parsons & Hays, and a son of Mr. Thos. Evans, late of Reed & Barton. Mr. Evans was accidently killed on the morning of August 5th, at Newark, N. J., by being run over as he attempted to jump on the cars while in motion. The deceased was in the habit of jumping on the cars a block or so from the depot, before they had gained great headway, and had done so for several months with safety, but on the fatal morning of the disaster he made a false step, and while hanging on to the railing with his body over the steps, the handle of a switch which stood between the tracks struck him and threw him under the wheels, cutting him in two. The deceased was of steady and industrious habits, and was held in the highest estimation by his employers, who closed their store in respect to his memory, on the occasion of the funeral. Young men of such promise are not easily to be spared.

Tales of the Trade.

No. 1.—THE WATCH THAT DIDN'T GIVE SATISFACTION.

Mr. H. is one of the quietest, cleverest old files in the trade. A good half century has passed away since he cut his first (epicycloidal) tooth, but he is still apt as ever to speed "caged pinions" on their allotted course, or render "Celia's dainty arbor" fit for the wearing of that beauteous dame. His glazed hermitage looks out on John street, and there he sits day in day out, scarcely noting the flight of time, so deeply is he absorbed in regulating the indicators of the flying moments.

The other morning Mr. H. was peering into the inside of a S. Frodsham, which had been cleaned by "that precious baby" with papa's tooth brush, when he was aware of a solemn visage and a seedy straw hat peering over the counter. Mr. H. proceeded to admire the mischief which the well-minded urchin had achieved and also to ponder over the eternal fitness of things which would result in his little bill for repairs, and meanwhile the rural attachments to the seedy straw hat were severely agitated. The mountainous frame heaved and writhed, until at last a rusty elbow dragged forth a silverish looking turnip. The owner fixed a pair of specs under his hat, looked at the watch, then at the regulator in the store, then again at the watch, and then at Mr. H.'s left ear. The prospect was encouraging for it wiggled under his gaze, and the man with the straw hat spoke:—

"Say, Mister."

Mr. H. inclined his ear to listen, at an angle of 45° from the perpendicular.

"Is-that-time-of-yours-kreek?"

The last word was shot out like a bullet, and it hit Mr. H. hard. His clock was not wont to be questioned, and he felt touched in a tender spot.

"Yes, sir. I set it by the stars."

"Don't-say-Mister!" And the old fellow glanced up at the sunlit sky and then back at quiet Mr. H. with a vague idea that it was just possible he was being hazed.

"Well, that is curious, too.—But, Mis.er, I called in to see you about this watch.—It don't give me satisfaction, so it don't."

He handed the weapon over to Mr. H. who, from sheer force of habit, took it and glanced over the works.

"What's the matter with it?"

"That watch cost me fourteen dollars and four old hens to a traveling pedlar last Spring, and it don't give satisfaction."

Mr. H. inclined his ear further, and the man went on:—

"I set my watch by the church clock striking twelve o'clock every day at meal time, and it aint right—no never. One while the hands come together at the first tap of the bell, and next time they wouldn't lap till last stroke was done. It was mean, and I've been trying to fix it my self by jerking that ere regulator as Sam Dennison tells me. But things is worse since, and that watch don't give no satisfaction."

Mr. H. regarded the watch and the man in silent awe.

"Well, Mister, can't you do something?"

"I can do two things," replied Mr. H. "If you will bring the church clock in I can make it go by your watch."

"But them works would fill a cart!"

"Oh I can fix the matter easier. You don't use the watch much, do you?"

"Well, no.—I'm used to go by the sun, and I don't never look at it 'cept when I hear the clock striking twelve at meal time."

"All right," said Mr. H., as he quietly let the watch run down and set the hands accurately to the numeral XII. "There is your watch. Put it in your pocket and keep it there until you get home, and you see if it don't point just right with the church clock every time it strikes twelve. Only be sure and don't try to regulate it—don't even wind it up."

"You York fellows is real clever now. What's to pay, Mister?"

"Oh it's not worth mentioning."

"Well, if you say so, I can't go agin you. But I like to do what's right, so I'll leave you this winding key, Mister, now I don't want it. Good-day, Mister, Good-day. I'll mention your name down our way. Shouldn't be s'prised if some of our folk come in to see you. Good-day, Mister, Good-day."

And he dawdled up towards Broadway, and Mr. H. looked at the dirty old brass key. And he was looking at it when we come in, and that's how we heard this story.

Practical Hints on Watch Repairing.

By Excelsior.—No. 18.

THE HORIZONTAL OR CYLINDER ESCAPEMENT.—CONTINUED.

(303) The parts having been found sound and true, wind the watch half way up and notice the extent of the vibration of the balance. The majority of ordinary watches will probably not average much over half a turn. But it will be noticed that with such small vibrations they will never be very accurate time-keepers. A vibration of about 280°, or a little more than three-quarters of a turn, is the one which gives the best possible result. The balance should vibrate at least 250° to 275° in order to enable it to most advantageously overcome the various resistances to which it is subjected. However, very small, light balances frequently have but small vibrations, on account of their mass not being sufficient to overcome the resistance of the air, thickening of the oil, and other frictions. But, on the other hand, when the vibration is so large, it is liable to be further enlarged by the disturbances of motion in carrying, causing the banking-pin in the balance rim to strike the bank, deranging the uniformity of the rate and rendering perfect regulation impossible. Many watches will stop when the banking pins come together, from some adhesion between them. And they may stick together for a long time, if kept still, or will start off on any jar, or on opening the case; as the watch is then found running, it is difficult to detect the trouble. If there is any adhesion, scrape both pins perfectly clean with the graver, then clean them thoroughly with either benzine or alcohol.

(304) It is very important that the *banking* be correct. This action is accomplished, in the cylinder escapement, by means of a pin in the balance rim striking another pin (generally attached to the balance cock) before the parts get around so far as to be out of proper working range,—the limit of the motion of the balance being one turn, less the width of the banking pin and bank. To test the banking, the watch being in beat, fold a piece of paper loosely and put under the balance, so that it will be held in any position by the force of the paper unfolding, not by pressure of solid paper. Then move the balance slowly around till the pin touches the bank, in each direction, the watch of course being wound. When the pins meet, there should still be a little freedom between the arm of the escape wheel tooth and the standing part of the cylinder at the bottom of the small cut, so that the banking is done entirely by the pins, as it should be. If, then, the balance will return to the point of rest without catching, it is correct. But if the point of the tooth comes too near the edge of the lip of the cylinder, or passes by it, or the bottom of the small slot hits the arm of the tooth and causes it to recoil, before the pin touches the bank, it will catch and be held on one side or the other, called "overbanking." This shows that the pin is placed in the rim too far off on that side, and must be changed so it will hit the bank sooner. The proper place for the pin, in the rim, is exactly opposite that point in the rim that is nearest to the bank when the balance is at rest. This can be marked by "sighting" across, and is the point that is exactly in a line from the bank, through the pivot, to the front side of the rim. When the pin is not there, we can either cut it off, drill a new hole in the rim and set in a new pin, or we can often change the bank instead. In the latter case, we find the proper place by sighting across from the pin in the rim. But the former is the better way. In exceptional cases, when either way would be objectionable on account of marring the movement, we can drive the balance off its hub and restake it on to suit. This is the proper course when the pin is not set in the rim exactly opposite the center of the back part of the cylinder. The pin should be long enough to strike square on the bank, *i. e.*, not partly pass by and wedge in with the end pressing against it. If too short, either bend the bank outward, or put in a longer pin there or in the rim, being careful to finally turn the balance slowly around and see that the pin is not so long as to touch anywhere that it ought not to. If there is not room enough for a longer pin, on account of striking the fourth-wheel arbor, that may be used as the bank, setting the pin into the balance rim exactly opposite the arbor, when at rest and free from the motive force. But this changing of the construction of the watch will seldom be necessary.

(305) The extent of the vibration, when the other parts are correct, as already noted, depends on the hight of the inclines or impulse planes of the escape wheel teeth; the depth of the opening in the cylinder; the form of the lips; the depth that the escape wheel works in the cylinder; the adaptation of the length of the teeth to the size of the cylinder, etc. We will commence with the cylinder, the size of which should be such that it will go between two teeth of the wheel and have a space of about one-half the thickness of the shell to spare, *i. e.*, the outside diameter of the cylinder, *plus* one-half the thickness, equals the space between the point of one tooth and the heel of the next. This, supposing the thickness to be correct, will give about the proper "drop" to the teeth. The thickness of the shell should be no more than will give strength, and is generally one-eighth the length of the incline of the tooth, or, what is about the same thing, one-tenth the exterior diameter of the cylinder. The tooth should go inside the cylinder, near the edges but not on the inclines, and have about one-half the thickness of the shell to spare. Many workmen make the cylinder to be just free between two teeth, and the tooth just free in the cylinder when placed as above. But it must be evident that such closeness requires perfect condition and mechanical fitting of all the parts, and that any error or inequalities will very likely prove fatal to its running. It is therefore only to be recommended in fine work. On the other hand, the amount of "play" mentioned is the utmost that should be given, being ample for all requirements, and any excess would be as detrimental as too close fitting, by causing too much "drop," lessening the impulse and endangering the pivots. To test the freedom of the tooth, get the cylinder in a position in which the tooth is included in the shell, neither the point nor heel touching either of the rounded edges of the lips, then hold it there by pressing lightly upon the balance with the fore-finger, and see how much the wheel can move back and forth, *i. e.*, how much play the tooth has in the cylinder. To test the freedom of the cylinder between the teeth, get it in the same way so that the heel and point of the teeth rest on the circular part of the exterior of the shell, then try the play of the wheel with the tweezers as before.

(306) The cylinder has two openings cut in it. The large opening is made by cutting away about half the shell of the cylinder, and the two edges are shaped up and called the lips or impulse planes. The first one that the tooth comes to is called the large lip, the other, on which the tooth drops from the former, is called the small lip. The small cut takes away half of the remaining portion of the shell, leaving only about one-quarter of the shell standing, which part is called the column. The only object of this cut is to cause the cylinder to be free from the body of the escape wheel during the vibrations, and its width is only enough to insure against touching at either top or bottom. The hight of the large opening is one-and-one-half times the thickness of the wheel, that of the small cut is from two to three times the thickness of the web of the wheel.

(307) The shape of the two impulse lips of the cylinder is entirely different. The large lip should be nearly straight or flat, and in line with the beginning of the incline of the small lip. The corners of the large lip should be rounded off the smallest amount possible. Any approach to a semi-circular form, which is very common, is objectionable, increasing the drop and lessening the impulse. The direction of the face or incline of the small lip is not straight across towards the other lip, but is nearly in a straight line with the center of the back part of the cylinder. For instance, we draw, on a large scale, a circle to represent the inside of the cylinder, and another a little larger, around it, for the outside; mark off on the outer circle 196°, and draw a line across from one end of this arc to the other, to show the opening. The 196° is the part of the shell left standing, the rest is filed away. Then from the center of this standing part, on the inner circle, draw a straight line to strike the outer circle at the end of the 196°. This line shows nearly the proper inclination of the small lip, which should be filed through the thickness of the shell from the inner to the outer circle along this line. In reality, the lip is rounded up a very little, in

Editorial Jottings.

Our friends will note with pleasure the excellent show which this number of the CIRCULAR makes, both in its reading matter and advertising. It extends now to fifty pages, and we hope that we shall not fall below this number during the rest of the season. We must return hearty thanks to those who have endeavored to assist our efforts to make the CIRCULAR more and more worthy of the trade, and we have only to repeat our own promise that the more we are supported the more we mean to make of the JEWELERS' CIRCULAR.

We learn that the Postmaster at New York has decidedly shut down upon several of the sheets whose real character was exhibited in an article in our last issue. It has been the custom of the publishers of many of these representatives of "individual journalism" to send any quantity of their circulars through the mail at regular newspaper rates, whereas with no special subscription list they were bound to pay postage at full circular prices. It is this which has very rightly been stopped by the post office authorities,—but their action will nevertheless be very hard upon "individual journalism."

One of the Swiss Commissioners at the Philadelphia Exhibition, in a letter to the *New Zurich Gazette*, has the following remarks on one of American product, namely, the "Protection of American industry:" "If a protective tariff were really as great a blessing as its apostles declare it to be, then should the United States, with their boundless resources, be the most prosperous among nations. But what do we see? Stagnation of business, an unparalleled distrust, scarcity of labor, and, as a consequence, open and secret want. Let no one believe that the American business depression is a result of the European crisis. Hard times were felt here before they were in Europe, and America will suffer after Europe has recovered. Better times will not return here until a sounder financial policy has been adopted."

We are glad to note that the fellow-workmen of "Excelsior" have responded right heartily to the suggestion of a testimonial in acknowledgment of his services to the trade. A great number of individual contributions, not large in themselves, but amounting in the aggregate to a considerable sum, have already reached us, showing how thoroughly and widely "Excelsior's" work has been appreciated. This is of itself the best encouragement in the world for others to do good work. Let us add that the purpose of this testimonial is not to raise a great sum of money for a costly medal or piece of plate, but to present him with some modest token of the trade's appreciation of his endeavours. We would suggest therefore that those desiring to take part in this offering, should send in contributions not to exceed twenty-five cents each. If half those whom "Excelsior" has helped to better workmanship will join even to this extent, these little sums will amount up of themselves to a really handsome testimonial.

We record with sorrow, the death of a most promising and estimable member of the trade, Mr. W. H. Evans, a young man in the employ of Wheeler, Parsons & Hays, and a son of Mr. Thos. Evans, late of Reed & Barton. Mr. Evans was accidently killed on the morning of August 5th, at Newark, N. J., by being run over as he attempted to jump on the cars while in motion. The deceased was in the habit of jumping on the cars a block or so from the depot, before they had gained great headway, and had done so for several months with safety, but on the fatal morning of the disaster he made a false step, and while hanging on to the railing with his body over the steps, the handle of a switch which stood between the tracks struck him and threw him under the wheels, cutting him in two. The deceased was of steady and industrious habits, and was held in the highest estimation by his employers, who closed their store in respect to his memory, on the occasion of the funeral. Young men of such promise are not easily to be spared.

Tales of the Trade.

No. 1—The Watch that didn't give Satisfaction.

Mr. H. is one of the quietest, cleverest old files in the trade. A good half century has passed away since he cut his first (epicycloidal) tooth, but he is still apt as ever to speed "caged pinions" on their allotted course, or render "Celia's dainty arbor" fit for the wearing of that beauteous dame. His glazed hermitage looks out on John street, and there he sits day in day out, scarcely noting the flight of time, so deeply is he absorbed in regulating the indicators of the flying moments.

The other morning Mr. H. was peering into the inside of a S. Frodsham, which had been cleaned by "that precious baby" with papa's tooth brush, when he was aware of a solemn visage and a seedy straw hat peering over the counter. Mr. H. proceeded to admire the mischief which the well-minded urchin had achieved and also to ponder over the eternal fitness of things which would result in his little bill for repairs, and meanwhile the rural attachments to the seedy straw hat were severely agitated. The mountainous frame heaved and writhed, until at last a rusty elbow dragged forth a silverish looking turnip. The owner fixed a pair of specs under his hat, looked at the watch, then at the regulator in the store, then again at the watch, and then at Mr. H.'s left ear. The prospect was encouraging for it wiggled under his gaze, and the man with the straw hat spoke:—

"Say, Mister."

Mr. H. inclined his ear to listen, at an angle of 45° from the perpendicular.

"Is-that-time-of-yours-kreck?"

The last word was shot out like a bullet, and it hit Mr. H. hard. His clock was not wont to be questioned, and he felt touched in a tender spot.

"Yes, sir. I set it by the stars."

"Don't-say-Mister!" And the old fellow glanced up at the sunlit sky and then back at quiet Mr. H. with a vague idea that it was just possible he was being hazed.

"Well, that is curious, too.—But, Mister, I called in to see you about this watch.—It don't give me satisfaction, so it don't."

He handed the weapon over to Mr. H. who, from sheer force of habit, took it and glanced over the works.

"What's the matter with it?"

"That watch cost me fourteen dollars and four old hens to a travelling pedlar last Spring, and it don't give satisfaction."

Mr. H. inclined his ear further, and the man went on:—

"I set my watch by the church clock striking twelve o'clock every day at meal time, and it aint right—no never. One while the hands come together at the first tap of the bell, and next time they wouldn't lap till last stroke was done. It was mean, and I've been trying to fix it my self by jerking that ere regulator as Sam Dennison tells me. But things is worse since, and that watch don't give no satisfaction."

Mr. H. regarded the watch and the man in silent awe.

"Well, Mister, can't you do something?"

"I can do two things," replied Mr. H. "If you will bring the church clock in I can make it go by your watch."

"But them works would fill a cart!"

"Oh I can fix the matter easier. You don't use the watch much, do you?"

"Well, no.—I'm used to go by the sun, and I don't never look at it 'cept when I hear the clock striking twelve at meal time."

"All right," said Mr. H., as he quietly let the watch run down and set the hands accurately to the numeral XII. "There is your watch. Put it in your pocket and keep it there until you get home, and you see if it don't point just right with the church clock every time it strikes twelve. Only he sure and don't try to regulate it—don't even wind it up."

"You York fellows is real clever now. What's to pay, Mister?"

"Oh it's not worth mentioning."

"Well, if you say so, I can't go agin you. But I like to do what's right, so I'll leave you this winding key, Mister, now I don't want it. Good-day, Mister, Good-day. I'll mention your name down our way. Shouldn't be s'prised if some of our folk come in to see you. Good-day, Mister, Good-day."

And he dawdled up towards Broadway, and Mr. H. looked at the dirty old brass key. And he was looking at it when we come in, and that's how we heard this story.

Practical Hints on Watch Repairing.

By Excelsior.—No. 18.

THE HORIZONTAL OR CYLINDER ESCAPEMENT.—CONTINUED.

(303) The parts having been found sound and true, wind the watch half way up and notice the extent of the vibration of the balance. The majority of ordinary watches will probably not average much over half a turn. But it will be noticed that with such small vibrations they will never be very accurate time-keepers. A vibration of about 280°, or a little more than three-quarters of a turn, is the one which gives the best possible result. The balance should vibrate at least 250° to 275° in order to enable it to most advantageonsly overcome the various resistances to which it is subjected. However, very small, light balances frequently have bnt small vibrations, on account of their mass not being sufficient to overcome the resistance of the air, thickening of the oil, and other frictions. But, on the other hand, when the vibration is so large, it is liable to be further enlarged by the disturbances of motion in carrying, causing the banking-pin in the balance rim to strike the bank, deranging the uniformity of the rate and rendering perfect regulation impossible. Many watches will stop when the banking pins come together, from some adhesion between them. And they may stick together for a long time, if kept still, or will start off on any jar, or on opening the case; as the watch is then found running, it is difficult to detect the trouble. If there is any adhesion, scrape both pins perfectly clean with the graver, then clean them thoroughly with either benzine or alcohol.

(304) It is very important that the *banking* be correct. This action is accomplished, in the cylinder escapement, by means of a pin in the balance rim striking another pin (generally attached to the balance cock) before the parts get around so far as to be out of proper working range,—the limit of the motion of the balance being one turn, less the width of the banking pin and bank. To test the banking, the watch being in beat, fold a piece of paper loosely and pnt under the balance, so that it will be held in any position by the force of the paper unfolding, not by pressure of solid paper. Then move the balance slowly around till the pin touches the bank, in each direction, the watch of course being wound. When the pins meet, there should still he a little freedom between the arm of the escape wheel tooth and the standing part of the cylinder at the bottom of the small cut, so that the banking is done entirely by the pins, as it should be. If, then, the balance will return to the point of rest without catching, it is correct. But if the point of the tooth comes too near the edge of the lip of the cylinder, or passes hy it, or the bottom of the small slot hits the arm of the tooth and causes it to recoil, before the pin touches the bank, it will catch and be held on one side or the other, called "overbanking." This shows that the pin is placed in the rim too far off on that side, and must be changed so it will hit the bank sooner. The proper place for the pin, in the rim, is exactly opposite that point in the rim that is nearest to the bank when the balance is at rest. This can be marked by "sighting" across, and is the point that is exactly in a line from the bank, through the pivot, to the front side of the rim. When the pin is not there, we can either cut it off, drill a new hole in the rim and set in a new pin, or we can often change the bank instead. In the latter case, we find the proper place hy sighting across from the pin in the rim. But the former is the better way. In exceptional cases, when either way would be objectionable on account of marring the movement, we can drive the balance off its hub and restake it on to suit. This is the proper conrse when the pin is not set in the rim exactly opposite the center of the back part of the cylinder. The pin should be long enough to strike square on the bank, *i. e.*, not partly pass by and wedge in with the end pressing against it. If too short, either bend the bank outward, or put in a longer pin there or in the rim, being careful to finally turn the balance slowly around and see that the pin is not so long as to touch anywhere that it ought not to. If there is not room enough for a longer pin, on account of striking the fourth-wheel arbor, that may be used as the bank, setting the pin into the balance rim exactly opposite the arbor, when at rest and free from the motive force. Bnt this changing of the construction of the watch will seldom be necessary.

(305) The extent of the vibration, when the other parts are correct, as already noted, depends on the hight of the inclines or impulse planes of the escape wheel teeth; the depth of the opening in the cylinder; the form of the lips; the depth that the escape wheel works in the cylinder; the adaptation of the length of the teeth to the size of the cylinder, etc. We will commence with the cylinder, the size of which should be such that it will go between two teeth of the wheel and have a space of about one-half the thickness of the shell to spare, *i. e.*, the outside diameter of the cylinder, *plus* one-half the thickness, equals the space between the point of one tooth and the heel of the next. This, supposing the thickness to be correct, will give about the proper "drop" to the teeth. The thickness of the shell should be no more than will give strength, and is generally one-eighth the length of the incline of the tooth, or, what is about the same thing, one-tenth the exterior diameter of the cylinder. The tooth should go inside the cylinder, near the edges but not on the inclines, and have about one-half the thickness of the shell to spare. Many workmen make the cylinder to be just free between two teeth, and the tooth just free in the cylinder when placed as above. But it must be evident that such closeness requires perfect condition and mechanical fitting of all the parts, and that any error or inequalities will very likely prove fatal to its running. It is therefore only to be recommended in fine work. On the other hand, the amount of "play" mentioned is the utmost that should be given, being ample for all requirements, and any excess would be as detrimental as too close fitting, by causing too much "drop," lessening the impulse and endangering the pivots. To test the freedom of the tooth, get the cylinder in a position in which the tooth is included in the shell, neither the point nor heel touching either of the rounded edges of the lips, then hold it there by pressing lightly upon the balance with the fore-finger, and see how much the wheel can move back and forth, *i. e.*, how much play the tooth has in the cylinder. To test the freedom of the cylinder between the teeth, get it in the same way so that the heel and point of the teeth rest on the circular part of the exterior of the shell, then try the play of the wheel with the tweezers as before.

(306) The cylinder has two openings cut in it. The large opening is made by cutting away about half the shell of the cylinder, and the two edges are shaped up and called the lips or impulse planes. The first one that the tooth comes to is called the large lip, the other, on which the tooth drops from the former, is called the small lip. The small cut takes away half of the remaining portion of the shell, leaving only about one-quarter of the shell standing, which part is called the column. The only object of this cut is to cause the cylinder to be free from the body of the escape wheel during the vibrations, and its width is only enough to insure against touching at either top or bottom. The hight of the large opening is one-and-one-half times the thickness of the wheel, that of the small cut is from two to three times the thickness of the web of the wheel.

(307) The shape of the two impulse lips of the cylinder is entirely different. The large lip should be nearly straight or flat, and in line with the beginning of the incline of the small lip. The corners of the large lip should be rounded off the smallest amount possible. Any approach to a semi-circular form, which is very common, is objectionable, increasing the drop and lessening the impulse. The direction of the face or incline of the small lip is not straight across towards the other lip, hut is nearly in a straight line with the center of the back part of the cylinder. For instance, we draw, on a large scale, a circle to represent the inside of the cylinder, and another a little larger, around it, for the outside; mark off on the outer circle 196°, and draw a line across from one end of this arc to the other, to show the opening. The 196° is the part of the shell left standing, the rest is filed away. Then from the center of this standing part, on the inner circle, draw a straight line to strike the outer circle at the end of the 196°. This line shows nearly the proper inclination of the small lip, which should be filed through the thickness of the shell from the inner to the outer circle along this line. In reality, the lip is rounded up a very little, in

the first half, so that the last half points a little back or to the right of this line; but it should not vary much from flatness in the first half, and not any in the last. Neither corner of this incline should be rounded, only any feather-edge removed by polishing the lip. The point of the tooth, as it drops from the large lip, should strike the interior of the cylinder just anterior to the beginning of this incline, not *on* the incline itself, as then it would produce the same effect as if the escape wheel tooth in a lever watch should strike on the impulse plane or driving face of the pallet, instead of on the locking plane. For this reason, the point of the teeth should never be rounded off, from the outside, towards the center, but, if any change is made, round it from the inside towards the point, leaving the incline or outer surface in its natural form and length entirely to the point of the tooth. If the wheel is set too deep, the cylinder can be moved back by means of the potance. If the points strike on the incline of the small lip, the cylinder can be set up closer to the wheel. If this should make the depthing too deep, and the teeth must be shortened, always take them off on the back end, not at the points, and across the end in line with the center of the wheel, or a little to the right of the center.

(308) The most advantageous depth for the large opening is when the cylinder is so cut as to have 196° of the shell left standing. But if the "angle of escape" is small, and the watch will not start of itself, but must be shaken to start it, the opening should be made deeper, by polishing away the large lip principally (as it is the easiest to finish off again), or, by setting back the cylinder, in rare cases. The cylinder should never be cut away more than one-half, *i. e.*, the line across running from the large lip through the center of the incline of the small lip should divide the cylinder in half, which, allowing for the projection of the leaving edge of the lip beyond this line, will make about 185° on the *outside* of the cylinder, as the *minimum* arc of the shell to be left standing. Measuring on the inside, from the large lip to the beginning of the incline of the small lip will be about 175°, as the lip extends through an arc of about 10° of the shell, measuring on the outside. But cylinders with openings cut in so deep, are apt to have small vibrations and be very difficult, if not impossible, to regulate closely. And if the escape wheel is not round, or not riveted on the pinion perfectly concentric, or the teeth are sprung in or out, it is impossible to get any service out of them, as, if we make the wheel clear itself on the deep side, the points of the teeth on the shallow side will strike on the inclined surface of the lips, instead of on the repose planes or circular portion of the shell. On the other hand, when it is not cut deep enough, the watch will feel the effects of thickening of the oil, etc., much more. But not more than 200° of the shell should be left standing in any case,—the extreme limits being between 185° and 200°, the best are being 196°. To test if the opening is correct, a tool is made, called the Jacot cylinder guage, having a narrow and a wide side, in the proportion that the cut cylinder should bear to the uncut. The former should go in the narrow side, just opposite to where the latter goes in the large side, allowing a trifle for polishing the lips. Those who have none can measure angles pretty closely as follows: Take a piece of thin sheet brass, and draw upon it a circle, say one-half inch or more in diameter. In a circle there are 360°. Draw a line across it, through the center, and each half of the circle has 180°. Draw a cross line, dividing the circle into four equal parts, and each quarter will be an arc of 90°, and the angle between each two adjacent lines, at the center, will be 90° or a right angle. Divide one of these arcs into six equal parts, and each will be 15°. Add one such part to 180° and you have 195°. Now drill a hole through the center of this circle, just large enough to pass the cylinder through it, and by comparing the lips with these lines from the center it will be easy to see whether the amount of shell left standing is more or less than 195°, and, if so, how much.

(309) It is impossible, in a practical article like this, to give rules and instructions for the proportional size of escape wheel and cylinder, the proper number of teeth for the wheel, and many other points,—besides, when once made, the repairer will not be called upon to alter over the watch, even if wrong. When the cylinder is too large, the frictions are greater, the vibrations smaller, and the accumulation of dirt, thickening of oil, cold, etc., cause great irregularities in the running. When the cylinder is too small, the escape wheel adapted to it must have more teeth and a larger radius, causing a decrease in the leverage and necessitating greater motive force to give proper motion, with the resulting evils. The foregoing supposes that the cylinder and wheel are adapted to each other. But if the cylinder is too small for the wheel, the points of the teeth will probably strike on the inclines of the lips, or, if set deeper, will clog. If the cylinder is too large for a correct wheel, the teeth will "drop" further from the large lip on the small one than the reverse, and perhaps will clog between the teeth. The cylinder should be free between any two teeth, and the tooth free when entirely in the cylinder, not touching the inclines or faces of the lips. If the cylinder is free between the teeth, but the tooth is not free in the cylinder as stated, the shell is probably too thick, and the cylinder must be set back, or the heels of the teeth slightly taken off. This will make the watch go, but there will always be a great loss of power from excessive "drop," etc. The correct course is to fit another cylinder with a thinner shell. The directions for changing the depthing of the escapement apply only to the Swiss style, where the cylinder rests in a movable potance, to which the balance cock is also screwed, so that it is only necessary to set the potance closer or further off. But in the English style, where the cylinder is planted in the plate, as well as the escape wheel, the depth can only be varied by changing either the cylinder or wheel as may be needed.

(310) The escapement is properly depthed when a straight line, drawn from the heel to the point of the tooth, passes through the center of the cylinder as it stands therein. Of course, if the incline of the tooth is curved outward, as is almost universal, the central point of that curve will stand a little back of the center, or deeper in. If the depthing is either greater or less than the above, the drop on the large lip increases, the watch sounds out of beat, and its performance is impaired. In testing the depth of the escapement in the depthing tool, either put one center inside the rim of the balance, between two arms (for the balance should always be riveted on with one arm opposite the center of the back part of the cylinder), or, if that cannot be done, then a center should be made for the tool, with a steel strip fastened to its end, then bent outward and around in a curve large enough for to and, then bent outward and around in a curve large enough for any expansion balance, and back, with very fine countersink in the end, exactly in line with the point of the opposite center of the tool. This strip passes around the rim of the balance and supports the upper pivot of the escape wheel.

(311) The outside or acting surfaces of the escape wheel teeth are not straight but slightly curved outward. The best form for these "impulse planes," as they are termed, is considered to be that formed by drawing an arc of a circle from the heel to the point of the teeth with the semi-diameter of the wheel as the radius of the circle. To draw it, having set the points of the dividers to a distance equal to the radius or semi-diameter of the wheel, place one leg at a point, from which as a center, the other point will describe a curve passing through both the point and the heel or highest part of the tooth. As only this incline on the outside of the tooth performs any service, the back and inside of the heel should be removed enough to prevent any possibility of its touching the large lip of the cylinder during a large vibration. Another important point to be attended to is the width of the tooth at the heel, which results from the angle which the incline forms with the base of the tooth. Evidently, the greater this angle, or the higher the incline of the tooth, the more actual and positive motion will be given to the cylinder, *i. e.*, the greater the "lift" of the wheel. By the hight of the incline is meant the distance the heel of the tooth is further from the center than the point is. This is practically ascertained while in the watch by noticing the "angle of escape," or the angular motion given to the balance by the lift of the tooth. To test the angle of escape, let the balance come to a free rest, and note the position of the banking pin, or mark it on the plate. Then very slowly push forward the wheel till the whole of one tooth has passed over either lip of the cylinder, and note the furthest position of the banking pin. The arc contained between these two positions of the pin, being doubled, will be the total angle of escape

given by that wheel. A tool is made which tests it more accurately in the depthing tool, but a description is omitted, as it is seldom needed by the ordinary watch repairer.

(312) The above is the "real angle of escape." There is another known as the "apparent angle of escape," which is measured by the arc contained between the two extreme positions of the banking-pin when the cylinder is successively impelled in *both* directions by the tooth. This angle, of course, is varied by changing the depthing of the escapement, the opening of the cylinder, etc., but the "real angle of escape" is constant, being the measure of the displacement caused by the incline of the tooth. Accordingly, we can find by it whether the acting planes of the teeth are too high, *i. e.*, too much inclined, or not enough. To measure the angle, draw a circle the size of the outside of the rim of the balance, and mark off upon it the arc made by the banking pins as described, which you wish to convert into degrees. Do this either by direct measurement with a protractor, placing its center on the center of the circle, and the line O on one mark, when the line on which the other mark comes will be the angle in degrees; or, if you have no protractor, you can divide up the arcs of the circle, as directed in section 308, and ascertain very nearly the angle of escape, and consequently the hight of the inclines of the teeth. If the inclines are too low, the watch will require a very strong mainspring, be very hard to regulate, and the vibrations will fall off as the oil becomes thick, the watch dirty, etc. If they are too high, the watch will start hard, and be liable to stop in carrying. But it is always safer to have the inclines too high than too low. What is the proper hight depends on the size of the balance, as small balances require higher planes than large ones. They also require to vibrate faster than large ones, or they cannot be regulated. The following figures are considered to give the most approved forms of teeth: Large balances should have about 40° total real angle of escape, and 35° apparent angle of escape; medium size balances, 50° real and 40° apparent; small balances, 60° real and 55° apparent angle of escape. And as to the number of vibrations, if an ordinary balance makes 18,000 vibrations per hour, small ones should make 19,000, and large ones 16,000 to 17,000, or in about that proportion. These remarks are not made with any view to the workman trying to change the inclines, if found wrong, as that is an operation very few can perform well without a suitable machine, and it is better to fit a new wheel, but merely to help him locate the errors of the escapement. And if an escape wheel has been worked at, the teeth made too short, the points rounded off, or the inclines altered to any shape whatever except a regular and symmetrical curve (311), it will seldom be worth while to bother with it, but it should be rejected at once and a perfect one put it in its place. There are other points about the cylinder escapement which it would be interesting to consider, but as they partake too much of the theoretical for these articles they are omitted. In our next we will open up the detached lever escapement.

I would here recommend that these articles should not be merely skimmed over, but read slowly and the entire meaning obtained. There is so much to be said on these subjects that the matter is condensed and explanations omitted as far as consistent with clearness. Often a single sentence contains the results of the labors, experiments and investigations of many eminent horologists and mathematicians for a long series of years, and each member of the sentence may, if fully understood, convey an important fact. The effort has been to simply state the final conclusions of the best authorities, leaving out the processes and reasonings by which they have been reached. Owing to this necessary condensation of the matter and omissions of explanations, the articles should be studied, rather than merely read, in order to obtain all the information which the writer has designed to give. Each escapement should also be considered as a whole, one part complementing and explaining another.

Electro Metallurgy.

Another formula for graining powder is:—Cream of tartar, 120 to 150 grammes; silver powder, 30 grammes; common salt, 400 grammes. Or, silver powder, 30 grammes; cream of tartar, 100 grammes; common salt, 1 kilogramme. All these substances should be as pure as possible and perfectly dry. Cream of tartar is generally dry; but common salt often needs both before and after it has been pulverized, a thorough desiccation in a porcelain or silver dish in which it is kept stirred with a glass rod or a silver spoon. The mixture of the three substances must be thorough and effected at a moderate and protracted heat, and the graining will be the coarser, as there is more salt in the mixture, and conversely, it is finer and more condensed as the proportion of cream of tartar is greater, but there is more difficulty to scratch brush.

The operation of graining is effected as follows: Spread a thin paste of one of the above mixtures with water by means of a spatula upon the watch parts held upon the cork. The cork itself should be fixed upon an earthenware dish to which a movement of rotation is imparted by the left hand. An oval brush with close bristles is held in the right hand, and rubs the watch parts in every direction, but always with a rotary motion. Add the above paste two or three times, but always with a rotary motion. The more we turn the brush and the cork the rounder is the grain, which is a good quality; and the more paste we add, the larger the grain.

Watchmakers generally require a fine grain, circular at its base, pointed at its apex, and close, that is to say, a number of juxtaposed small cones. A larger grain may sometimes have a better appearance, but this depends on the nature and size of the articles to be grained. When the desired grain is obtained, the watch parts are washed and then scratch brushed. The wire brushes employed also come from Nuremberg, and are made of brass wire as fine as hair. These wires are very stiff and springy, and will, when cut, bind and turn in every direction, and it becomes necessary to anneal them more or less upon an even fire. An intelligent worker has always three scratch brushes annealed to different degrees; one which is half soft, or half annealed for the first operation of uncovering the grain; one harder, or little annealed, for bringing up the lustre; and one very soft, or fully annealed, used before gilding for removing the erasures which may have been made by the preceeding tool, and for scratch brushing after gilding.

The scratch brushing operation, like the graining proper, must be done by striking circles and giving a rotary motion between the fingers to the tool. The cork may now and then be made to revolve. After a good brushing the grain, seen through a magnifier, should be regular, homogeneous, and with equal lustre all over. Decoctions of liquorice, saponaire, or Panama wood are employed in this operation. It frequently happens that the same watch parts are composed of copper and steel, in which case the steel requires to be preserved against the action of the cleansing acids and the graining mixture, by a composition which we call resist, by analogy with the same term employed by dyers and calico printers for similar purposes. This preparation consists in covering the pinions and other steel parts with a fatty composition, which is sufficiently hard to resist the tearing action of the bristle and wire brushes, and sufficiently insoluble in the alkalies of the gilding bath. The following is a formula of this composition or resist: Yellow wax, 60 grammes; translucent colophony, 100 grammes; red sealing wax (extra fine), 40 grammes; impalpable peroxide of iron (English polishing rouge,) 30 grammes. The colophony and sealing wax are melted in a porcelain dish upon a water bath, and the yellow wax added afterwards. When the whole is thoroughly fluid the English rouge is gradually added and stirred in the mass with a wooden or glass rod. The fire is taken away but the stirring continued until the mixture becomes solid, otherwise all the oxide of iron will fall on the bottom of the dish. The flat parts which will receive the resist are slightly heated and then covered with the above mixture, which melts and is easily spread. For covering steel pinions, which generally form a raised cylinder upon the gear, we employ a small gouge of copper or brass fixed to a wooden handle which resembles a pen holder.

The metallic part of the gouge is heated by an alcohol lamp, and a small quantity of the resist taken upon it. The composition soon melts, and by turning the tool round the steel pinion this becomes coated. Before fastening the pinion upon the cork, a small cavity has been dug in the latter where the pinion rests. The remainder of the operation is conducted in a manner similar to that used in gilding other parts as described. The scratch brush used for these pinions should be longer wire and more flexible.

Greenwich Observatory.

About two hundred years ago, England began to take a lead in the mercantile commerce of the world; her ships were daily passing across the Atlantic, and India also was beginning to attract her attention. It was therefore of the utmost importance that navigators should be enabled to find their longitude when at sea, independently of watches or clocks; and a reward was offered to any one who should discover a method by which this result might be obtained.

The plan proposed was, that the angular distance of the moon from certain stars should be calculated before hand, and published, so that, for example, it might be stated that at ten minutes and five seconds past nine on such a day, the moon should be distant from Mars forty degrees. If from a ship in the middle of the Atlantic, Mars and the moon were found to be forty degrees apart, then it would be known that the time in England was ten minutes and five seconds past nine.

Here, then, was one item ascertained, and the method was a good one; but in consequence of the want of accuracy as regarded the moon's motions, the exact positions of the stars, it could not be practically carried out.

Under these circumstances, Charles II. decided that a national observatory should be built, and an astronomer appointed; and a site was at once selected for the building. Wren, the architect, selected Greenwich Park, as the most suitable locality, because from thence vessels passing up and down the Thames might see the time-signals, and also because there was a commanding view north and south from the hill selected for the site. The observatory was completed in 1676, and Flamsteed, the chief astronomer, immediately commenced his observations, but with very imperfect instruments of his own. During thirty years, Flamsteed labored indefatigably, and formed a valuable catalogue of stars, and made a vast collection of lunar observations. He was succeeded by Halley, who carried on similar observations; and from that time to the present, Greenwich Observatory has been our head-quarters for astronomical observations.

The work carried on at Greenwich is entirely practical, and consists in forming a catalogue of stars and planets, and so watching them that every change in their movements is at once discovered. Now that this work has been performed for several years, the movements of the principal celestial bodies have been so accurately determined, that the *Nautical Almanac*—the official guide on these subjects—is published four years in advance, and thus we find that on a particular night in 1868, the moon will be at a certain angular distance from a star, and the second satellite of Jupiter will disappear at a particular instant. On the exterior wall of the observatory there is a large electric clock, which, being placed in "contact" with the various other clocks in the observatory, indicates exact Greenwich time. The face of this clock shows twenty-four hours, so that it requires that a novice should look at it twice before comparing his watch. On the left of this clock are metal bars let into the wall, each of which represents the length of a standard measure, such as a yard, foot, etc. And let us here say a few words about these standards. To the uninitiated a yard is simply three feet, and a foot is twelve inches—an inch being, we are told in our "Tables," the length of three barleycorns. Now, as the length of a barleycorn varies considerably, it requires something more definite than this to determine our national measures. Thus the question, what *is* a foot? is more difficult to answer than at first sight appears. Many years ago the French perceived the difficulty appertaining to the national standard, and they, therefore, decided that a metre should be the ten-millionth part of one-fourth of the earth's circumference—that is, ten-millionth of the distance from the equator to the Pole. But here another difficulty was encountered, because different calculators fonnd this arc of different lengths. By *law*, however, it was decided that one measurement only was correct, and so the meter was fixed at 30,794 Paris feet; though since then more accurate observations and improved instruments have shown these measured acres to have been very incorrectly ascertained, and thus the French method failed when practically tried.

The length of a seconds pendulum oscillating in a certain latitude has been our method of obtaining a standard; but this also has its weak points, so that to obtain a constant standard it is necessary to have some pattern which is unchangeable, and thus a metal has been chosen that expands or contracts but little either with heat or cold; and this, at a certain temperature, is the standard measure, and such a standard may be seen on the exterior wall of Greenwich Observatory.

On entering the doorway—which is guarded by a Greenwich pensioner, who will possibly first peep at the visitor, in order to see who the individual may be who is desirous to tread within the sacred precincts—one finds a court-yard, on the left of which are the transit-room, the computing-room, and the chronometer-room. The transit-room takes its name from the instrument therein, which is a large "transit." This consists of a large telescope, the outside of which is not unlike a heavy cannon, as it is of solid iron. The instrument is supported by trunnions, which allow the telescope to be elevated or depressed to point south or north, and, in fact, to make a complete revolution, but never to diverge from the north or south line. The magnifying power of this instrument is not very great, so that it admits plenty of light, for it is intended, not as a searcher for or for gazing at celestial objects, but for the purpose of noting the exact time at which stars and planets pass south or north of Greenwich. Upon looking through the telescope, the observer's eye is first attracted by a vertical row of what seem to be iron bars, placed at equal distances from each other. These, however, prove to be only spiders' webs, and are used for the purpose of taking the time of passage of a star over each wire, and thus to ascertain the exact instant of its being in the centre of the telescope. During even the finest and calmest nights, there is occasionally found a tremulousness in the instrument, which, as it is rigidly fixed to the walls of the building, must be due to a slight vibration in the ground itself. Thus, many a feeble earthquake unfelt by the outsider may be perceived by the astronomer by the aid of his delicate instruments.

The various stars seem to be traveling at an immense rate when seen in the field of the transit telescope, and it is really nervous work noting the exact time when each wire is passed. The experienced observer, however, not only will give the minute and second, but also the decimal of a second when the star was on the wire. The result is obtained by counting the beats of a clock the face of which is opposite the observer. Thus, if at three the star seems as much short of the wire as at four it had passed it, then 3.5 might be the instant of "transit."

At noon each day the sun's passage is observed by nearly the whole staff of observers. One individual looks through the telescope, and gives the time for each wire, while others examine a variety of micrometers in order to ascertain the fractional parts of seconds, etc., these micrometers being placed at the side of the instrument.

In the morning, the principal work consists in making what are termed the "reductions" to the observations of the previous night. These reductions are the corrections requisite for the slight instrumental inaccuracy, for the refraction of the atmosphere, and for the known constant error of the observer. When, therefore, a bright winter's night has occured, the work on the following morning is usually very heavy. At noon the sun's time of transit is taken, and at one o'clock the "ball" is dropped, by means of which the various vessels in the docks and in the Thames set their chronometers, or ascertain their rate. In addition to this, the time is sent by electricity to Deal, and one or two other seaports, in order that every vessel may be able to know the accurate time, if within sight of those places.

Not the least interesting portion of the observatory is the chronometer-room. For a very small charge, manufacturers or owners can have their chronometers rated at Greenwich, which is accomplished in the following manner:

The chronometer is placed in the chronometer-room, and compared with the large electric clock in the room, this clock being kept in order by the stars. Each day the chronometer is examined, and thus

its rate is ascertained in its then temperature. It is afterwards placed in a sort of closet warmed by gas, a condition supposed to represent the tropics, and it is there kept for a certain period, being tested each day as before. This change of temperature is found to produce very little effect on the best instruments, which, when they have passed the ordeal, are returned to the owners with their character tickded to them. Some hundred chronometers are often placed in this room; and to compare them is a science, the "expert" by a glance discovering the difference between the two instruments, whilst a novice would require to mentally add or subtract, and thus slowly to arrive at the same results.

As soon as it becomes dark enough to see stars by the aid of a telescope, one of the staff commences his observations. These are continued during the night; and a register is kept of each star, planet, comet or moon, which is "doctored" in the morning by the computers.

As all mortals are fallible, it is desirable to bring machinery into use where possible, and this has been managed in connection with astronomical observations. Instead of the computer registering by judgment the time of a star's transit over the various wires, he strikes a small indicater, which, completing the electric circuit, causes a pricker to fall and make a hole in a piece of paper that is attached to a slowly revolving barrel. Each time the star passes a wire, the pricker descends and leaves its mark; and the interval between these marks being measured by scale, the mean time of transit may be obtained.

There is usually a feeling of the sublime that comes over us when we reflect upon the vast unexplored regions of space, or contemplate the stellar world that shines upon us. The magnitude and grandeur of some of the planets in the solar system strike us with a feeling of awe and wonder, while we are puzzled at the mysteries attending comets, double stars, nebulæ, etc. No such feelings or sentiments, are allowed to enter into the constitution or mind of an observer at Greenwich. Saturn, the glorious ringed planet, with its galaxy of moons, is simply "Saturn, Right Ascension 10 hours 8 min. 12 sec., North Declination 16° 12′ 2″." Anything appertaining to the physical constitution, the probable cause of the ring, or the object of so grand an orb, does not come within the range of the observations at Greenwich, which are limited to bare matter-of-fact business work.

The southern portion of the observatory ground is devoted to the investigation of meteorological subjects, and is under the superintendence of Mr. Glaisher, who is now well known as an aerial voyager. It is here that an exact record is kept of the amount of rain that daily falls, of the direction and force of the wind, of the magnetic changes, of the temperature, amount of ozone, etc.—all matters which may, and probably will, lead us eventually to the discovery of some laws connected with the states of weather, and enable us to predict what may be expected from day to day. Whilst we are now able to calculate to a few seconds, and for years in advance, the instant when an eclipse may occur, and to explain the causes of the various planetary movements, yet we are in a sad state of ignorance as regards the cause of hurricanes, thunder-storms, continued rains and droughts; and thus we find that all the would-be prophets who from time to time spring up and oracularly announce a coming frost or fine weather or the reverse, are perpetually meeting with most signal failures, which, however, does not deter future adventurers from attempting to gain a cheap temporary renown by trying their luck at a prophecy.

The perpetual accumulation of facts at Greenwich, whether these be of an astronomical nature, or appertaining to the air we breath and its subtile changes, is a proceeding that must eventually lead us on to a correct knowledge of the laws which govern these matters, and also keep us acquainted with any variations that may be occurring in the elements that surround us.

The order and quietness necessary in such calculations as these carried on at Greenwich prevent it from being a "show" establishment, and hence visitors are not admitted except on special business. Then, however, every aid and assistance are offered to the student and inquirer; the use of books and instruments is freely given, and such information supplied as the little spare time of those belonging to the establishment enables them to afford. Thus a visit to or a period of study at Greenwich Observatory will amply repay those who wish to gain the latest and most accurate information on astronomical subjects or to practice themselves at the adjustments and use of the instruments; and to those who have not such opportunity, we offer this slight sketch.—*Chambers' Journal.*

A Few Celebrated Bells.

China has been celebrated for her bells, but the Chinese bells have all the old saucer form. In the seventeenth century four great bells were cast and erected at Nankin, the largest of which weighed, it is said, not less than 50,000 pounds, and was 12 feet in diameter at its base. The weight of the bells brought down the tower in which they were hung. At Pekin there were seven bells of enormous dimensions; one of these is described by Magillans as weighing not less than 120,000 pounds, having a hight of 12½ feet, a diameter of 13½ feet, and a circumference of 42 feet. They were used for denoting the five watches of the night, but we learn from the author of "China and the Chinese," that they are now out of repair.

Russia, among the countries of Europe, is the one most celebrated as possessing enormous bells; at Moscow in particular there are bells of most enormous size. The largest of them has been described by Dr. Clarke as a mountain of metal, and is termed by the Russians the "Tsar Kolokel," or King of Bells;" it is the largest in the world, and is said to weigh 443,772 pounds. The hight of this bell is 31 feet 4½ inches, its circumference 10 feet above the extremity of the lip is 67 feet 4 inches, its diameter is 22 feet 5½ inches, and its greatest thickness 22 inches. It is said to have been given to the Russians by the Empress Anne, and its value in money, merely as old metal, is valued at $350,000—an immense sum to lie uncirculated and wasted, for the bell has never struck a note. This monstrous mass of metal was for nearly two centuries allowed to be partially buried in the sand of the pit in which it was molded—an object of wonder to the traveler and of the deepest reverance to the natives, who visited it with pride at festivals, and were extremely jealous of its being touched or measured by strangers.

The tones of the bells of Russia are very fine; that in the tower of St. Juan's church is said to produce, when sounded, a tremulous effect which is felt all over the city.

In the scramble which took place at the Reformation, the bells of the monastries formed rich spoils for the spoilers. "They were gambled for," says Hunt, "or sold into Russia and other countries, and many of them were lost in their sea voyages, and remain to this day among the spoils of the ocean." In confirmation of this assertion, we may mention a fact given by Stow in his "Survey of London." In the ward of Farrington without, says the chronicler, was a cloister in which hung four bells, called Jesus bells, which Henry VIII took down, because he lost them in a game of dice with Sir Miles Pairidge, who wagered £100 against them with his majesty.

The following are the reported weights of some of the most celebrated bells of the world:

	Tons.	Cwt.	Qrs.	Lbs.
The great bell of Moscow	198	2	1	0
A bell in the tower of St. Juan's church (cast in 1819),	80	0	0	0
Another in the same church	57	1	1	16
Another in the same church	17	16	0	0
The great bell at Pekin	53	11	1	20
One at Nankin	22	6	1	20
One at Olmutz	17	18	0	0
One at Vienna, dated 1711	17	14	0	0
In the Cathedral, Paris, (1680) 25 ft. in diameter	17	0	0	0
One at Erfurt, Germany, finest bell metal extant	13	15	0	0
The great bell at Montreal	10	10	0	0
Great Peter (1845), at York Minster, cost £2,000	10	15	0	0
Great Tom, at Oxford	7	11	3	4
Great bell at St. Paul, (weighed originally 8 tons, 13 cwt., 3 qrs., 1 lb.	5	2	1	22
Great Tom, at Lincoln	5	8	0	0
Dunstan, at Canterbury	3	10	0	0
Another at Montreal	7	6	0	0

The two bells of Montreal were cast by the Messrs. Means, who also cast the Great Peter of York; the Great Tom of Lincoln, the Dunstan at Canterbury, and the peel of bells in the tower of the Royal Exchange, London. These last bells have lately been recast, in consequence of the works of the clock, built by Mr. Dent, not being sufficiently powerful to move the chiming apparatus in a proper manner.—*Manufacturer and Builder.*

Gold and its Uses.

Twenty karat gold does not occupy a very prominent position in the jeweler's workshop, the demand for it being so limited that it is rarely ever asked for. In consequence, it is not largely manufactured into articles of jewelry. Sometimes, however, this quality of gold is used by colored gold-workers, when different colors or shades are required in decorative designs, and when these colors cannot be produced in inferior gold. For this purpose it is very tasty and showy. Thus brown gold may be made by taking 20 parts of fine gold and 4 parts of copper; pure gold may be made by taking 20 parts of fine gold and 4 parts of silver; these ingredients must be well incorporated. In Ireland 20 karat gold is a legal standard, and has been so from the year 1784, reign of George III.; this standard was established, principally, to encourage the manufacture of watch cases and jewelry, at that time it being illegal to manufacture wares of jewelry inferior to 22 karat gold.

Eighteen karat gold is the second English standard, and of this quality all our best jewelry is made. It is largely manufactured into all kinds of personal ornaments, being an alloy rich in quality; the beauty of its color is not much altered by wear. In England this standard is used for the manufacture of watch cases, which, if of proper fineness, bears the government hall-marks. There is now no duty on the manufacture of watch cases of any quality. Mourning and wedding rings, if of 18 karat gold, or of the higher standard which we have already referred to, must pay duty upon the manufacture of 17s. per ounce, 1-6th part, as usual, being remitted for waste in finishing. It is compulsory that these articles be hall-marked, and bear the stamp of the properly authorized authorities of the town in which they are made. In Birmingham the title of the company is "The Guardians of the Standard of Wrought Plate," which has exclusive jurisdiction over all gold made into the above articles in the town of Birmingham, or within thirty miles of it. Eighteen karat gold, from the peculiar nature of its alloy, can be wrought into almost any article of exquisite beauty and delicate workmanship; if properly cast, it is both malleable and exceedingly ductile and tenacious. To this quality of gold a hardness is imparted which admirably suits it to the manufacture, and also to the wear, of articles or ornaments of jewelry of the first class. There is, perhaps, a difficulty in preparing 18 karat gold not experienced in some other alloys; this defect soon shows itself when submitted to the breaking down mill, visibly, by little cracks all over the surface of the bar of gold; when this appearance presents itself, it is by far the most economical plan to re-melt it at once, than to go on with the breaking down, for when the process of slitting is attempted to be performed, the gold will all fly into little fragments, and the probability is that some will be lost. The prevailing opinion in the trade is that this want of unity or amalgamation of the particles of the gold and alloy is due to the copper with which we desire to alloy. Our experience teaches us,—and we have tried every kind of copper, from the bean shot down to the best refined Swedish wire, for the purpose of producing 18 karat gold rather cheaper,—and we wish to state, for the benefit of the goldsmiths' trade, that we have invariably found that there is not so much in the quality of the copper as the quantity used. Formerly we used a rather large proportion of copper in order to effect a saving of about threepence per ounce, but the misfortune of which we have spoken sometimes presented itself, and, after trying all kinds of copper with no certainty of permanent success, we thought of the plan of alloying with more silver and less copper; we succeeded, and now never meet with a bar of ours exhibiting the defects after rolling just described. It is the most economical plan, when these defects show themselves, to reduce the bar to the regular 9 karat quality. It is only just to state that we always found 18 karat gold, alloyed with bean shot copper, a more difficult and harder alloy to work than when the refined wire was used. One great drawback in shot copper (which is very injurious in alloying, particularly in this quality) is, that it may contain lead or tin, and half a grain of either in an ounce of this gold will prevent it from working. This quality of gold is now always manufactured fully up to the standard fineness, and every design possible is hall-marked, and where this is not possible, the guarantee of the manufacturer is given with the article, who, if respectable, can thoroughly be depended upon. Previous to 1798 it was illegal to manufacture this quality gold; now some thousands of ounces are manufactured annually into all sorts of wares, some of which are ornamented with a variety of colors, any of which may be produced by the following methods of alloying:

COLORS OF GOLD.

Yellow gold—pure or fine gold, 24 parts.
Red gold—fine gold 18 parts, copper 6 parts.
Green gold—fine gold 18 parts, silver 6 parts.
Blue gold—fine gold 18 parts, iron 6 parts.
White gold—fine gold 12 parts, silver 12 parts.

Platinum or fine silver may be employed for white gold. Red and white gold is generally employed for flowers, green gold for leaves, while the stems or sprays may be made of yellow or fine gold. Blue gold may be used for special ornamental purposes. This latter alloy requires great practical knowledge in the preparation, as it presents many difficulties in its preparation; these are best overcome by first melting the gold and then introducing iron wire into the molten mass until the proper quantity of alloy is formed, when the crucibles must be withdrawn and the composition poured out into an ingot mould prepared for its reception. This alloy must not be quenched in water, but allowed to cool; the ingot of gold to be perfect should exhibit no signs of porosity; if it turns out of the ingot mould all right, it must be well hammered upon the edge and annealed in order to render the grain more close, and prevent it cracking at the rolling mill. This process may be wisely repeated upon the surface, and the ingot again put through the fire. The gold is then ready for the breaking-down mill, and may be safely wrought into wires or sheets of different sizes.

Fifteen karat gold is another alloy largely used in the manufacture of colored gold jewelery. This quality, to our mind, is second to none regarding works of art in jewelry, both in taste, show and durability. It can be made to present an appearance quite equal to the finest gold, and in addition is easy of manipulation; almost any article can be freely worked out of it, while the hardness which 9 parts of alloy imparts, is such, as not to prove a hindrance or a difficulty in the manufacture, but unites with it that amount of strength and durability so essential in costly articles of jewelry; these advantages make articles of this gold wear much better than when made of softer material; and they also keep their form and shape a considerable time longer. According to the provisions of the Act of 1854, fifteen karat gold can be assay mark as a guarantee of proper fineness, but it is not compulsory, unless requested by the purchaser. There is no duty on its manufacture, neither is there on the manufacture of 18 karat gold into chains, studs, lockets, charms, fancy rings, etc. Purchasers of 15 karat goods should beware of an inferior quality of gold introduced into the trade and called 15 karat, and bearing a mark something similar to the hall mark; this is not the hall mark, but the private mark of the manufacturer. The general public, however, who are conversant with the prices at which these articles are sold, will at once see that it is not done with intention of representing this quality as equal to the former, by a glance at our table of values for the different qualities. The quality of gold of which we speak generally consists of about the qualities following:

Thirteen karat gold is called common when speaking of colored golds, for the reason that is about the lowest quality that can conveniently be colored to look rich and beautiful. A slightly inferior quality (12½ karats) can be colored, but this is about the usual thing employed in all respectable colored gold houses. In Birmingham a very large quantity of gold is weekly consumed in manufactures of this quality. Some firms manufacture nothing else. It is largely made into chains, lockets, pins, studs, sleeve links, solitaires, pendants, bracelets, brooches, rings, filigree ornamentation, and almost every article we can mention has it in some part of its composition. If the reader were to take a walk down any of the principal streets in Birmingham, viz., New street, Bull street, and High street, the vast majority of articles of colored gold jewelry exhibited in the jewelers'

shops that meet the eye would be of this quality, and marked as 15 karat fine gold. The retail purchasers are, of course, in most instances ignorant of the true value of gold, and the art of alloying, and some, on the representations of the shopkeepers, who often know no better, believe they are buying full 15 karat gold of the proportion expressed in the Assay Act of 1854. It is difficult too in this enlightened day, in which the secrets of the goldsmith's craft are freely and openly expressed, to convince them of the error of their belief. Some manufacturers profess to have secrets in the art of producing good colors for their wares, and their is, no doubt, a principle in this, namely, the producing a demand for certain articles, and for special firms over all others. To understand perfectly the art of alloying gold and silver, is of very great importance, and an advantage to manufacturing goldsmiths, and it has a tendeney to produce profitable results more than anything (if the practical part is understood properly), connected with the art of the goldsmith.

Twelve karat gold is the best of the bright golds, and so called to distinguish it from colored, although any of the qualities which are described in speaking of colored gold, may be made bright by a little variation in the mixture of alloy. The demand for articles in this gold is not at present of an extensive nature, no doubt because the finish of colored gold is more costly and beautiful, for no gold inferior to twelve karat will color to present that appearance which characterizes the higher qualities. Twelve karat gold finished bright has a nice rich sparkling appearance, and when the workmanship is good, is very imposing; it is a good quality to work, being tolerably soft and ductile, also possessing good malleable qualities. The quality generally manufactured is a little under the standard fineness, and therefore cannot be hall-marked. Gem, fancy and other rings, when made of the full standard quality, bear the government stamp as a guarantee of the purity.

Ten karat gold sustains all the characteristics of the former quality, both as regards the freedom of manufacture and finish; there are no hall marks for this quality of gold, and it is very seldom manufactured fully up to the quality, unless specially asked for. A large quantity of goods is made of this quality in Birmingham.

A Treatise on Isochronism and Elasticity of Metallic Springs.

BY JAMES FERGUSON COLE.

Here it must be observed that, if the ares are wrong, a very slight bend, inward or out, will possibly be the remedy, but this must finally depend on last touches of correction. The chief cause of isochronal defect at the flat spring, when pinned outside at the full diameter, arises from the eccentric force induced by rigidity of the outer attachment in the stud; this spring, supposing it to have ten coils while in the quiescent condition, will, if the balance be moved once round on its axis in the opening direction, only then have nine coils, with a considerable enlargement of its diameter; the stud, being a fixture, obstructs the uniform expansion of the coils, causing excessive displacement, or protrusion, on the opposite side, and inducing a greater amount of tension than with a rightly isochronized spring would be due to that motion in degrees of the circle by its vibratory movement.

In the contrary, or closing direction, if one turn of motion of the balance be given, the ten coils in the spring will become eleven, inducing a less amount of tension for the degrees of motion passed over; this difference of tension in the two semi-arcs, plus and minus, may appear to balance each other by repetition, but this would only happen with vibrations of one extent

Upon this point it may be proper to examine whether the tensile force from the sprirug in its expanded condition of nine coils, being greater than the force due to the motion of balance for correct time in that semi-arc, will not re-act upon the matter of the balance and induce a greater momentum, which again, in like proportion, acts against the spring in the opposite direction, raising the tension and winding it into the contracted condition of 11 coils; and, therefore, as the momentum is greater, and the ratio of increase in the elastic resistance less under contraction of the coils, that the motion of balance in the closing semi-arc will be greater in extent, though small in amount, than the motion of balance in the opening semi-arc from the point of rest in the regular going of the watch.

If this be so, the extra motion resulting from the momentum, though constant to the end of the arc, is a decreasing force, and considered apart from the motive power, would occupy more time and be slow, while the opposite first semi-arc, for the contrary reason before stated, and going that difference shorter in distance, would occupy less time and be comparatively fast; this, however, will be of no consequence while the complete vibrations are of like extent. (See note on Inertia, No. 10, original paper.)

Now, upon reduction of the arc of vibration, each double vibration, including the two semi-arcs, with the flat spring pinned outside, the result on trial by the secondshand of the watch, as compared with clock, will be as generally found that the short ares, by the hanging position of the watch, will be slow, if the long ares, by the laying position, were previously at time, and this by reason of difference in the amount of gain or loss in the two semi-ares respectively.*

This inquiry will not alter the fact that in most instances the error is removed by the following mode of correction, though sometimes interfered with by another cause of error.

The above effects from the flat spring, if found to arise after comparative trials, would have to be corrected; it may, however, happen that the trials in some instances may give a right result. If so, nothing more is required, or, in other instances, a defective result. If there be no visible error, some other cause must have operated as a corrective, of which there are two in immediate connection with the spring —one being the flexible leverage of the collet between the inner end of the spring and the centre of motion, and where the elasticity terminates a false centre is established. This false centre operates in a degree like a common crank, the effect of which is so considerable that according to the relative positions of the inner and outer points of attachment the crank leverage of the collet will be not only the source of error but also, under other conditions, the means of correction.

This, according to my own view, constitutes what is called the isochronizing power of the whole-turn principle, so that, by letting the spring out of the stud and making it longer, the short ares will be accelerated; or, on the contrary, by taking the spring into the stud and making it shorter, the long ares will be accelerated; and between those extremes a mean is to be found. In both these cases the mean time will, of course, have to be corrected by altering the weight or diameter of the balance, either or both.

The other cause, before alluded to, is the outer coil of the spring having too much or too little play between the curb pins of the index regulator; the power of correction in this case is by simply opening or closing the pins. If a watch is going to mean time, so powerful is the influence of this principle, that if the pins are opened but so little as to be only just perceptible, the watch will lose more or less, as the length of wire from the stud to the pins is more or less, and supposing the short ares fast, opening the curb-pins will be the remedy; but this will also make the mean time slow.

To correct the mean time the index will have to be put forward; this gives a little more wire between the stud and curb-pins; both these alterations tell the same way, and will be of right effect if not overdone. Closing the pins will, of course, have a contrary effect, by making the short ares fast, and needing a reverse touch of the index for correcting the mean time; but those alterations, in both cases, will be so small as to need some care to prevent over-adjustment; and when the pins are closed the outer coil must still be perfectly at liberty, and not bound between the pins. The above particulars, if carefully attended to, have generally been found to operate effectively when other departments of the watch are right.

These facts are deduced from long observation of the power of this principle of isochronizing; one pin for the purpose was adopted by Harrison, but the origin of this principle appears to have been the cycloidal cheeks, or cheeks, applied by him at the pendulum suspension.

*The increments of both time and motion inferred under the above inquiry are fractional amounts, assumed only for argument relating to the question.

An index watch rigidly adjusted may be made to go wrong in the ares by the slightest want of care or attention in regard to this delicate point, proving that what is called isochronism, though supposed to be a natural property of the simple spring, is, in its connection with the watch, only an effect resulting from the combination of opposing forces, so adapted to each other as to produce an equilibrium; the isochronism of the chronometer is, therefore, only a compound mechanical result of the whole mechanism.

As before mentioned, the locking resistance is an additional or third cause of error, the reduction of which, in lever watches, has been my chief object in altering the pallet angles and other proportions, as given by the working rule mentioned elsewhere in these papers for lever escapements with balance arc of 27 degrees.

Having in the note at the commencement of this subject adverted to the terminal curves of the cylindrical high spring, it may be observed that the adjustment in this kind of spring, by varied form of the curve, induces a secondary power, which acts in conjunction with the crank leverage of the collet from the inner pinning to the centre of motion; the false centre, as in the former cases of the flat-spring, is not a fixed centre, the pivot and the rigid arm of the collet being in general equal to half the radius of the high spring, is much more active in tha production of eccentric force than in the flat spring, where the collet is very much smaller, and the stud of the high spring, being of the same radius as the collet, makes tho disparity of tension leverage hy the stu1 on the collet, from the collet pinning at the point of rest within the centre to the opposite half turn beyond the centre, also greater.

The mechanical tendency of these differences, considered apart from any power of the curves, would he to produce a difference of resistance, supposing the high spring pinned alternately at the whole turn and the half turn, but for another circumstauce—the perpendicular elevation of the stud above the mechanical plane of the collet; this lessens the disparity of leverage hy the difference of the perpendicular distance from the mid to the collet pinning, when on the stud side of the centre, compared with the diagonal line of distance from the stud to the collet pinning when moved round to the opposite side of the centre, and whatever may be the effect, whether much or little, the residue of error, if any, will remain to he corrected by the terminal curves, and the relation of those curves to the stud, the collet, and centre of motion.

If on the first trial of a chronometer high spring, when pinned at the whole turn, it be found slow in the short arcs of vibration, a less abrupt curvature will be required—that is to say, more wire from the body of the spring will have to be carried into the curve; and on the contrary, if fast in the short ares of vibration, a more abrupt curvature will be required, with a less amount of wire from the cylindrical body of the spring, the quantity depending upon the amount of error; more or less wire from the body is the attendant consequence of an altered curve; and by such alteration the original truth of the spring and agreement of the stud and collet will be proportionately disturbed, the final truth of the spring having to he again corrected by a suitable manipulation of the altered curve.

If the exact whole turn be made an arbitrary rule in tho adjustment, then the curves must be again more or less abrupt for that reason, and the quantity of wire in or out of the stnd must be made more or less by re-pinning; this, of course, involves a re-timing of the balance, but if the trial he made without re-pinning the spring, the altered curve alone, in some cases, may he sufficient, as there are secondary circumstances in this, as in the former instance of the flat spring, that may act in opposition or in favor of the adjustment: the first is the greater or less drop of the escape wheel on the impulse roller; the second, too strong a locking spring, or too deep a locking; and thirdly, the radial distance of the onter pinning, hy alteration of the stnd to or from the centre; for this tbe stnd is sometimes made adjustable hy a small adjusting screw through the side of the stnd, though not commonly used for correction, and as the impnlse power of the escape wheel operates on the short arcs with more effect as an accelerating force than on the long ares, any alteration of the drop would have proportionate effect on the isochronism.

In all cases the perfect truth of the high spring, as regards concentricity and upright from both points of attachment, is quite indispensable for producing a proper acting effect before repeating the trials, and, in addition to this, the perfect equilibrium of the balance and spring together, as relates to position adjustment, is of final importance. The harmony of equilibrium between the balance and spring can only be judged of by results.

The foregoing details have been gone into expressly to show the mechanical influences, particularly that of the crank leverage of the collet on the lower coil as a ground for illustrating the principle by which the isochronizing power of the curve is produced, and as no horological work has fallen under my notice explanatory of this, the following observations may not be irrelevant in a scientific point of view.

POWER OF THE ISOCHRONIZING CURVE.

The remark already made, in reference to the changing ratio of the increasing tension and diminishing force of the flat spring in the opening and closing directions, also applies to the cylindrical or high spring, as it must do to every spring of a convolute form, when acting in connection with a central axis, as in the chronometer, and all other balance time-keepers.

Suppose a cylindrical spring, applied with half a turn of wire in each curve, top and bottom, pinned at the whole turn, exactly true and upright, and, therefore, under no eccentric strain while quiescent, the immediate effect of an altered curve would be to destroy the truth. To make the truth right again, and preserve the agreement of the spring with the stud and collet, would require more or less wire in or out of the stud, as the curve may be opened or closed; if the curve be opened, giving more wire to the body, then the bend leading into the stud will be more abrupt, requiring more wire to he let out of the stud in order to restore the whole turn, and also the truth of the spring. In this case, referring only to the stud end of the spring, if the curve be continued, it will extend as a volute over more degrees of the circle, taking more wire from the body, which must be carried through the stud and be re-pinned shorter, making the curve less abrupt.

Those differences of the curve produce a more or less immediate influence on the balance, gradually through a limited extent of the vibratory are, to the neutral point, where the leverage power of the stud and collet may be supposed to change; beyond this point on both sides, as must be supposed included in a turn-and-a-quarter vibration, and within this limit, as mentioned elsewhere, the chronometer is said to differ in its rate, for the probable reason that the elastic tension, or force of the spring, is not generated by the momentum of the balance according to the same scale of progression; and if by the established axiom, referring to the whole-turn principle, the spring is lengthened to correct a loss in the short ares, and shortened to correct a gaining, the process of lengthening and shortening, if carried to half a turn in each or either direction, with a supposed respective continuance of contrary effect, would appear to stop abruptly by the meeting of two extremes at the opposite point of the circle.

Abruptness, however, cannot be, as every change of tension must arise gradually. When at the opposite point, by this mode of trial, the half-turn in such case would be indefinitely long or short in reference to the original number of coils in the spring.

The power then, by the length most probably, changes at about the quarter-turn, taking that as the neutral point, and from there gradually reversing the influence until those contrary forces, induced in part only by the changing leverage of the crank, are again in equilibrium; the power of the curve, therefore, will be in proportion to the angular motion are of degrees included within the range of the volute and the relation of that curve to the points of attachment and centre of motion of the balance.

Under these circumstances it will be reasonable to conclude that, whatever may be the amount of influence, if it be an increase of resistance by greater abutment in the opening direction, it must also, under the same conditions of the curve, imply a decrease of resistance in the closing direction, as proved, but crudely, by experiment on the weight value of the tension for the degrees of motion produced on the balance. This difference, plus or minus, as in the question of Inertia (see Note 10), while the ares of vibration are of equal extent, is productive of no effect; enlarge or diminish the arc of vibration, and then, if the ratio of increase of tension in the two directions be not the same, the long and short ares will be respectively faster or slower, in conformity with any alteration of the curve.

Trade Gossip.

A Maiden Lane firm exhibits a coat of armor labelled, "Suits for fighting the Sioux."

Austria exhibits the largest opal in the world (602 carats), and is valued at $25,000

France is proud of her new postage stamps. So is a mother proud of her new baby; and yet both lick 'em.

Mr. H. A. Robbins, of Messrs. Robbins & Appleton, arrived on the 6th inst. in the Abyssinia, after an absence of two years in Europe.

For reasons no doubt satisfactory to themselves, the Elgin National Watch Co. decline to enter their watch for competition at the Centennial.

A Vienna paper announces that an exhibition of imitations, falsifications, counterfeits, etc., is projected, and will be held in some large French city.

The African diamond mines are rapidly giving out; miners are returning discouraged, and report the diamond region thoroughly honeycombed and exhausted.

Mrs. Carr, wife of a Quebec watchmaker, hung herself with her back hair, and the Coroner's Jury rendered a verdict that the Carr was demolished by a misplaced switch.

The American Institute (63d Street and 3d Avenue) opened on the 6th instant with an unusual display of exhibits. Many Centennial exhibitors will display examples of their work.

A man in an uptown jewelry store having missed a few things from his show cases, posted a small card, which read, "The Lord helps those who help themselves, but Lord help anyone caught helping themselves here.

Burglars broke into the plated ware manufactory of Samuel H. Johnson, on the second floor of No. 38 White Street, on the evening of the 23d ultimo, and carried away goods to the value of about two thousand dollars.

A chap was arrested in Philadelphia the other day for stealing a clock. The judge told him that as he had taken another man's time to begin with, he could now take his own time to reflect upon it, and send him up for three months forthwith.

The store of F. W. Wagner, 48 Maiden Lane, was entered a few evenings since by burglars, and a quantity of optical goods stolen therefrom. The police have arrested two of the supposed thieves with some of the stolen property in their possession.

Arthur E. Lebknecker, a traveler in the employ of Messrs. Morgan & Headly, jewelers, of Philadelphia, is reported to have been robbed of a trunk containing jewelry valued at $10,000, from the baggage room of Haynes's Hotel, Springfield, Mass. Suit has been entered against the proprietors to recover the amount of the stolen goods.

In the Peruvian section of the Main Building at the Centennial is a curious bust of Grant, about one-fourth the size of life. It is the only one of the kind at the Exhibition, being composed of a core covered with woven wire of gold, silver and copper, almost as fine as wool, and drawn out, or mapped, so as very much to resemble that material. The bust rests on a column round which winds the American flag in wavy folds, and the coloring of the whole is very good.

"Dear me," exclaimed a lady, with crimson face, from which the perspiration was oozing in crystal beads, "how provokingly cool they look," pointing to a group of graceful figures, of the genuine "nothing to wear" style, that compose the musical soiree of the $30,000 Helicon Vase. "Oh, indeed!" responded her companion, giving his collar an extra lift, "would I could be made over into repousse till this scorching weather goes by."

Our readers will be interested to hear that The Adams & Shaw Co. have purchased the entire stock and plant of Reuziebauson & Co., a house originally established by J. R. Wendt & Co., about 1850, and which has, since that time, supplied the finest silverware to a select number of first class firms. This move will add great strength to The Adams & Shaw Co., whose goods are achieving a high reputation in the trade for artistic beauty and excellence of finish.

Hershel P. Hildreth, a manufacturing jeweler in Brooklyn, has at various times missed a considerable quantity of gold and was at a loss to know where it had gone. A few days since, he discovered that the thief was a friend of his, named W. C. Wilson, who was in the habit of visiting his establishment. Mr. Hildreth placed the matter in the hands of a detective, who arrested Wilson with a quantity of gold in his possession, who, on being interrogated, confessed that he had sold fifteen pennyweights of the stolen property to one Andrew Vord, a jeweler in Fulton Street, for $11.50. Vord has been arrested for purchasing stolen property; both prisoners were subsequently admitted to bail in the sum of $500 each.

The Shah of Persia has in his palace a terrestial globe, said to be solid gold. It is surrounded by circles of the same metal, and adorned with all sorts of gems. All the countries are indicated by incrustations of diamonds and precious stones of various colors.

It is mentioned as a remarkable circumstance that an old chest containing valuable silver ware and jewelry has been lying unmolested for years in a town hall in the Tyrol. That's nothing. Any one knows it would be perfectly safe to leave such a chest lying wide open in our City Hall.

Joseph Challender, an English watchmaker, has patented a new and excellent arrangement for illuminating the disc or dial of church and turret clocks, at a greatly reduced cost, and on an improved principle. The invention has been applied to some of the public clocks in Manchester with very satisfactory results.

If the young man who has just commenced to take lessons on the cornet, somewhere in Nassau Street in the immediate vicinity of this office, will only repent and abandon his unhappy design ere it is too late, he can go (at his own expense) to Servia, or the Big Horn, as correspondent of the JEWELERS' CIRCULAR forthwith.

The watch of Abdul Aziz is in Paris, being altered for the use of the new Sultan. The initials and signature on the case are being changed into those of "Monrad V., and the name of the watch, formerly "Azzie," is now "Monralie." Every time the case is opened the watch winds itself, and the face marks both French and Turkish time.

What a poetical way the ancients had of putting things. We read in their pages that "Lycurgus, King of the Edones in Thrace, refused to worship Bacchus, in consequence of which the god visited him with madness." Now, in our day, the affair would read, "Lycurgus, King, etc., refused to drink any more whiskey, and in consequence, had the delirium tremens."

Mellor, who used to be a Montreal jeweler, has discovered a new way of packing jewelry. He put his precious stones inside bars of soap, his gold chains and bracelets inside cocoanuts, and warmed a dozen geranium with earrings, nuggets, diamond rings, etc. But the wicked detective investigated, and now the estate in the hands of the assignee is a mellior-ated to the tune of $15,000.

Canterbury Cathedral, says our British contemporary, has had a narrow escape from destruction by fire through the ignition of the fumes from some benzoline used in cleaning the clock. It appears that a workman carrying a lighted lamp, crept into a rather confined space behind the dial to clean the motion-work, taking with him for that purpose some benzoline and a brush. In a few seconds an explosion occurred, which set fire to the clock-room, and so severely burnt the local clockmaker, who happened to be standing close to an open dish containing a large quantity of the fluid, as to cause his death. Evidently much greater caution than has heretofore been observed in the use of benzoline and other dangerous inflammable substances is necessary.

The favorite ornament at the Russian Court is an enameled Marguerite. Several millions were ordered of the Paris jewelers this spring by the nobility and court people. They have been worn not only by ladies, but by gentlemen, also in honor of the Princess Marguerite of Savoy, during her visit to Russia. The story of this Marguerite is thus told: In one of the Roman excavations a little gold antique bell was found, and presented to Princess Marguerite, who instantly slipped it on a black velvet and wore it around her throat as a pendant. On this gold bell of the *Scazi* was a microscopic inscription in Greek, which said, "Save thee, O lady, from evil." Now it has become the latest novelty, and the little bell of ancient Rome has been reproduced in gold by the Paris jewelers for the court ladies of Russia.

Theodore Rohrer, a watchmaker of New Castle, has invented a piece of ingenious mechanism, which is thus described: "It consists, of a set of gold studs, in one of which is a miniature watch, which keeps excellent time. The combined weight of the two studs and the watch, which are all connected together, is one ounce and a half. The face of the watch is about the size of a silver three-cent piece, and with its surroundings of gold looks much like a small compass. When the watch and studs are on a shirt front they are about two inches apart, and by turning the upper one (in the same manner that a stem-winding watch is wound) the time-piece is wound. In setting the hands the lower stud is revolved. The most remarkable thing about the time-piece is that it is not like ordinary watches, but has pendulum resembling that of a clock. The pendulum will move correctly in whatever position the watch is placed—even when it is reversed and run at the top instead of the bottom.

Proceedings of the Horological Club.

A DISTINGUISHED BODY OF WATCH AND CLOCK MAKERS.

Thirty-First Discussion.—Communicated by the Secretary.

WHICH IS THE BEST LATHE.

To the Secretary of the Horological Club:

Will some one of your honorable body be kind enough to inform me, through the JEWELERS' CIRCULAR, what lathe you consider best for a workman in a country village? Respectfully,

COUNTRY WORKMAN.

Mr. Uhrmacher said that "Country Workman" had asked a question rather difficult to answer. There were quite a number of lathes in the market, each having its good qualities, and each of which would doubtless suit some persons better than the others. It would, therefore, be impossible to give a specific answer to his question, because, which would be best for each workman would depend on the particular circumstances of each case. The ordinary Swiss lathe, using wax chucks, was the lowest in price, and a very easy running and useful tool. Next higher in cost was the regular American lathe, which used both wax and self-centering chucks. Then there were several other makes of both Swiss and American styles, more or less complete and costing according to their perfection and attachments. In lathes, like everything else, the cost was according to the quality, and the better the lathe one wanted the more he had to pay for it. If "C.W." only wanted to pay $16 to $20, he would have to take one of the Swiss style; $25 to $40 would get an American lathe, and the improved styles could be had of any price up to one or two hundred dollars. One great mistake often made by workmen was in trying to get *one* lathe for doing everything. If it was heavy enough to do the work of a Universal lathe, it would be too large and heavy for fine turning, pivoting, and such work; or, if suitable for the latter, it would be too light for the former. It was better to get one lathe for doing ordinary watch work, and a Universal lathe separate. Then each would be good, and adapted for its kind of work. Only general advice could be given on this subject. The different styles were advertised in the JEWELERS' CIRCULAR, and printed discriptive circulars could be had on application to the manufacturers. The Swiss lathes could be furnished by any tool importer in this city. Their correspondent should get all the information he could from these sources and then decide according to his wants and purse. A full description of the construction and uses of the different kinds of lathes, with their respective merits and demerits, was expected in the forthcoming articles by "Excelsior," on the lathe, which their correspondent would probably find very useful in aiding him to come to his decision.

REMOVING THE HAIR-SPRING FROM THE BALANCE STAFF.

To the Gentlemen of the Horological Club:

What is the best method of removing the hair-spring and collet from the balance-staff without injury? S. T. A. G.

Mr. McFuzee replied that he knew of no better way than to take them off with a pair of long nose diagonal cutting pliers, having the jaws run out pretty well from the handles, and at their ends no thicker than a pen-knife blade. The jaws were placed under the collet, which was lifted off by bringing them together, aided by a slight wiggling of the handles. But the ordinary cutting pliers, with thick jaws, were entirely unfit for this use. It would be better to pry the collet off with a thin knife blade, used alternately on different sides so as to raise it equally and keep it level, to avoid springing it apart and making it loose.

SUBSTITUTE FOR DIAMOND DUST.

Secretary Horological Club:

I noticed in the JEWELERS' CIRCULAR a number of months ago, an account of a patented process for so hardening glass that it will cut the hardest steel, or jewels. It was proposed to reduce this hardened glass to fine powder, and use instead of diamond dust, for grinding and polishing purposes. As it would be much cheaper, such a process would be very valuable. Has this glass dust come into the market yet? And if so, by whom is it sold. R. G.

Mr. Lapidary said that he knew nothing of any such article in the market. It was possible that glass could be hardened enough for ordinary grinding purposes, but he doubted if it could ever take the place of diamond dust. He wished it might as it would save him much expense. If R. G., or anyone else would give him the name of the patentee and the date of the patent, he would try and find out what there was of it.

TROUBLE WITH ELECTRICAL CLOCK.

Secretary Horological Club.

Can you give me instruction in regard to connection between magnet and movement in an electrical clock? I have a clock working this connection in form of a latch playing in the teeth of the third wheel, but it is not a good timekeeper. If you will let me know the amount required to obtain such instruction, I will forward the same.

J. A. BURWELL.

Mr. Electrode replied that a precise answer to Mr. Burwell's question could only be given after seeing a drawing of his apparatus, with a full statement of its operation, and in what respect it failed to perform properly. Some electrical clocks are propelled by electricity, others are regulated or controlled by another clock, and there are many different kinds of each. As nearly as he could judge from Mr. B.'s letter, the latch playing in the third wheel of his regulator opened and closed the circuit of the current which passed through conducting wires to the electric clock, which it moved by some lever attached to the armature of the magnet. The latch was probably raised by the successive teeth of the third wheel, and dropped again as each tooth passed from under it, by which means the circuit was closed and the lever moved by the magnet, this causing a forward motion of the wheels of the electric clock. If that was the case, the electric clock must keep as good time as the regulator, unless the latch apparatus occasionally failed to operate. The two conducting wires should be insulated from the clock movement, so that no current can possibly pass between them by being conducted through some part of the clock. One wire should be connected with the latch, the other with some piece which the latch or other wire should strike every time it dropped from a tooth. The ends of these wires, or the contact pieces, should be of platinum, to avoid oxidation, and should be kept scrupulously clean, or else the current might fail to pass between them even when they were in contact. The mechanical arrangement of these pieces to insure working, as also of the magnet, armature, and its lever and connecting parts, Mr. B. could make perfect himself. The battery likewise, must be kept in good working condition, and be replenished with fresh acids, etc., often enough to keep up the current required for moving the armature and its lever. The points to be attended to were to keep the battery and its connections in order, all the mechanical arrangements perfect, to see that no current could possibly pass when the circuit was meant to be broken, and that it *would* pass when the circuit was completed. This was all the instruction that could be be given under the circumstances. As to payment, no charge was ever made for any instructions within the power of the Club to give. The great object of this Association, next to the self-glorification of the members, was to give to the trade all the information they could. If the foregoing was not sufficient for Mr. B.'s purposes, more would be given on receipt of the necessary particulars, or he would be referred to some maker of electrical clocks, where he could go and see for himself.

CITY VERSUS COUNTRY WATCHMAKERS.

Secretary Horological Club,

Some time ago I cleaned a watch belonging to a lady customer of mine, whose family have had repairs done at my place for the last two or three years and have always been satisfied with the work done. Last week, the lady being in the city, called at the store where she was in the habit of dealing before I came to the village, and asked to have the watch regulated as it went a little fast. The clerk or watchmaker noticing the firm's private mark in the case, and at the same time asking her if she had had the watch repaired anywhere lately. She told him yes and at the same time where. He then said that the watch was ruined, and that the man who did the work spoiled it, that the watch no doubt was cleaned with chalk or whiting and that one of the jewels was misplaced and that the watch could never keep time

in the condition it was in and therefore prevailed upon her to leave it with him to be put in order. Now, the lady says the house is a first-class one, but she would not tell me the name or I would have sent that. I think it a great shame that city watchmakers should run down their country brothers, and as for my ability, I can give just as good references as to my work as any repairer. I have worked as journeyman in Nassau street five years, and can give the best of references. I think such storekeepers ought to be shown up, as I think the transaction was nothing more nor less than a swindle as the watch was in thorough order. By laying this before the society you will greatly oblige a brother. PIVOT.

Mr. Horologer said that he he could sympathize with his brother "Pivot," for he, in common with all workmen, had had similar experiences. But he thought that Mr. Pivot must have been uncommonly free from such annoyances or this one would not have so stirred up his soul. It was entirely a shame that watchmakers should run each other down as they do, questioning their skill, experience, and even their honesty. But he thought that city watchmakers were no more apt to do this than their country brethern. He had worked as "Jour" for a great many years in different parts of the country, and everywhere he had found workmen belittleing each other, and thus dishonoring the whole trade in the eyes of the public, instead of standing by one another and making it respectable and respected. In some places this was carried on so far that to be a watchmaker was equivalent to being a little dishonest, tricky scamp. He recollected working once in a town where he had a competitor who had originally started as a maker of "breaking plows," used for breaking up new land. He had then picked up blacksmithing in general, then gun mending, next clocks and finally he got to tinkering watches. His boast was that for fixing up breaking-plows and watches he wouldn't turn his hand over for no man." The speaker was then capable of making a watch complete in every part, in a workmanlike manner, yet he never suffered more humiliation in his life than while he was competing with this miserable puke of a tinker. After carefully examining a watch and telling the owner what it required to be put in completo order, this fellow would tell the owner that he (Mr. H.) just put that on to make a big bill; that it was his habit to get off a long lingo about what wanted doing so as to bleed his customers as much as he could. If the fellow had been the first to examine the watch, and the speaker did not tell the same things, he would say that it was because he (Mr. H.) did not understand his business, therefore he couldn't see what the trouble was and so on. All this was inexpressibly annoying, especially as there were plenty of country bumpkins to believe all that the fellow said. One of them even maintained in the speaker's presence that a man who knew enough to "pick up" a trade was the best kind of a workman. To be sure the better portion of the community could appreciate a real workman, but that did not lessen the unpleasantness of the experiences of which the above were mild samples. But he was proud to say that neither then, nor at any other time, had he stooped to run down another workman, but always made it a point to refrain from making any observations on their skill, etc., leaving the public to judge all by their work, which they will do in time, and pretty correctly. As proof of this, he had the satisfaction of running out the breaking-plow man and three others of about the same sort, in the course of the two or three years that he was there. Whether in the city or country he considered such personalities to be beneath the diguity of any high-minded workman and gentlemen, conscions of himself posscssing real skill and merit.

Mr. Chalkbrusher did not sympathize with Mr. Horologer at all. A first-class workman had no business to be in the country. It was no place for him. There was no encouragement there for him, and the stupid countrymen could not appreciate him any more than swine can appreciate pearls. If he was fool enough to go out among the heathen, he would deserve all he got. The proper place for such a man was in the city, where they knew what skill meant, and where there was work requiring such skill, good pay and lots of fun. He (Mr. C.) wouldn't work in the country any how,—and he thought every good workman ought to leave the mud sills of creation to the tender mercies of their friends, the plow-breakers and blacksmiths, and come to the city where people were civilized enough to know a first rate mechanic when they found one. That was his public opinion, privately expressed, and he didn't care who knew it, either. He was down on those infernal clodhoppers that didn't know nothing, nor nothing else, and thought they didn't deserve to have any watchmakers at all, good or bad.

The Adjuster-of-the-French-School was fundamentally astonished that any consanguineous person should, for one indentical moment he normally unconscions of the irrefragible fact that the city was as much superior to the country as old crusted Heidsick was superior to dishwater. "Why, sir," exclaimed he, "where does the quintessence of all excellence inevitably gravitate to, I would like to know? Where are the loftiest orders of minds to be found?—the sages and philosophers, horologists and prognosticators, the Horological Club and the Adjuster-of-the-French-School. Where, but in the city, can transcendental genius find congenial companionship? The roar of traffic as it courses through the arteries of trade, inspires and etherializes his intellectual connubialities and strengthens him for lofty and indigenous accomplishments. But in the rural wildernesses of the country he would languish for want of incandecent and vitalizing spiritualities, as a mouse-tailed rodent defunctuates in the infinitessimal atmosphere of an exhausted receiver. Yes, Mr. Chairman, you know how it is myself. We all know it. There is no place like the city for supereminent excellences, for ineradicable genius, and intangible perfectibilities. To say otherwise would be to utter a pygmalian prevarication,—yes, sir, it would be an anthropophological absurdity, such as no true horologizer should ever be guilty of exhooviating."

Mr. Clerkenwell deprecated such advice as the two preceding speakers had given. He thought it would be most unwise for all good workmen to rush to the city. Every place there was already crowded, filled generally by men of the highest skill and long experience, with the advantage over new comers of being acquainted, and their abilties known to the city trade. On the contrary, he thought it would be eminently sensible and wise for those who could find good openings in the country, to leave the city. Competition was less in the smaller towns, business was not done under such high pressure, there was not so much rack and strain on both body and mind, but more time for study, reflection, experimeuts, cultivation of health and social amenitis and enjoyments. The chances for making large fortunes were less there, but they were hardly worth looking after anywhere, in our line of business. As for the chances of making a good living, they were better in the country. Expenses were less, risks were less, and it was more easy for a man to live as well as his neighbors. As regards skill not being appreciated, he thought it more likely to be appreciated there, because, being rare, it would be the more conspicuous and respected, whereas, here in the city he would be swallowed up among the crowd of others as good, and perhaps better. He would have less fine work to do, but that would he no great hardship if he had common work enough. Business in the city was more dull than he had ever known it before. Wages had recently been reduced, so that the pay was not much better than in the country. On the whole, his idea was strongly in favor of the country, and he thought that every workman who had even a decent position there would do well to hang on to it.

The debate became general and somewhat warm, occupying the whole evening. Several other members spoke, denying that city watchmakers were any more accustomed to defaming their fellow workmen than those in the country, etc., etc. The foregoing report, however, includes all that would be of interest to the general reader.

PLATINUM, PALLADIUM, AND SELENIUM IN SILVER COIN.—In *Liebig's Annual* for February there is an interesting account of the extraction of metals from gold and silver coin. The silver is purified by chlyztallization as a sulphate and reduced to the metallic state by means of iron turnings. For gold, after its solution in nitro muriatic acid, it is precipitated by the ferrous chloride and melted. Fine silver, especially coin coming from an old coinage, contains about one-thousandth of gold. It also holds platinum and palladium. In the last year the assay office at Frankfort, working over some 500,000 pounds of crude silver, has obtained twelve pounds of platinum and two of palladium with a smaller quantity of selenium.

Our Centennial Report.

The extraordinary disarrangement which prevails at the Centennial Exposition prevents certainty, but we believe that the subjoined reports will be found to cover all the exhibits in the Main Building, of interest to the trade. In our next number we propose to pass over into Machinery Hall, and give our readers some idea of the most notable examples of the industries there displayed.

THE SPENCER OPTICAL MFG. CO.

The Spencer Optical Manufacturing Company, of 16 & 18 Maiden Lane, have located their exhibit at column N. 59, where they display a large and admirable selection of spectacles, eye-glasses and lenses. The progress made in this branch of industry is very remarkable, and this exhibit shows that America is fast leading the world in optical manufacture. This house manufactnre the largest selection of these goods in the world and the dealer can obtain everything he wants in that line of this one firm. The latest novelty is the applicatiou of celluloid as a material for frames for spectacles, eye-glasses, etc., and it has proved admirably adapted for that purpose as it does not corrode gold and silver, and is so light that twenty-five pairs of frames scarcely weigh an ounce. These fittings are manufactured in imitation of tortoise-shell, jet, amber and steel, and are already eagerly demanded by the trade. In conclusion we would direct the attention of our readers to the lenses, which are unequalled in clearness and finish.

NICOLE, NIELSON & CO.

One of the most interesting features of the English Department is the handsome show case of Nicole, Nielson & Co., of 14 Soho Square, London, and who are represented in this country by Messrs. Bartens & Rice, at No. 3 John street, New York, and Messrs. Robbins, Biddle & Co., 1124 Chestnut street, Philadelphia. Their exhibit is situated at Column G, 25, and consists of thirty-five watches, no two of which are alike, each representing some peculiar novelty in horological science. The specialties of the above named firm lies in sporting, calendar and hunting watches, and the quality of their work is unsurpassed. In 1862, Mr. Nicole patented the chronograph and in 1871, this house obtained credit for the split seconds which is now so much used for races and observations. A very curious watch in their Centennial Exhibit is a keyless gold double hunting split seconds chronograph, ordinary hour and minute hand on one side of watch, and chronograph and split seconds-hands on the other, which has attracted considerable attention as a novelty in this manufacture.

SUSSFELD, LORSCH & CO.

Among the many objects of interest in the French Department, of the Centennial Exhibition, few will be regarded with more attention than the exhibit of Messrs. Bardou, Fils et Cie., of 27 Rue de Paradis Poissoniere, Paris, (whose New York agents are Messrs. Sussfeld, Lorsch & Co., No. 13 Maiden Laue), which is situated on the right hand side of the aisle leading from the music stand to the door of the Art Gallery. There are displayed a choice variety of the opera glasses manufactured by this famous house, including the finest goods fitted in pearl and aluminum for dainty dames, and the more sombre binoculars used by the army and navy officers in time of war. This firm have acquired a reputation in both lines, and they have also secured the contract for the "U. S. Signal Glass," the "U. S. Navy, Marine Glass," and the "U. S. Army Signal Telescope." As inferior articles are sometimes offered under the above names we would caution the trade that none are genuine, unless marked with the trade mark of Bardon et Fils, which appears in their card in our advertising columns. Messrs. Sussfeld, Lorsch & Co., are also agents for the Holosteric barometer of Naudet et Cie., the regulator movements of Mayer-Tirset, the opera glasses of Lecoubre, the silk watch-guards of Lanary, and the improved eye-glasses of J. Hoel; and have also on hand a fine line of French clocks, mounted in marble, specially suited for general trade. We need scarcely remind our readers that Messrs. Sussfeld, Lorsch & Co., are probably the largest importers and dealers in watch-makers' materials and tools of every description, as in this department their reputation is unsurpassed. Their stock also includes optical instruments, gold and diamond scales, and of late, specialties have been added in precious stones and unset cameos.

PAILLARD ET CIE.

The exhibit of Messrs. Paillard et Cie., of St. Croix, Switzerland, whose New York agency is located at 680 Broadway, may be found in the Swiss Department near the fountain in the main aisle. There are on view three musical boxes which have never been equalled in this country. One is a cabinet in ebony, set with porcelain panels and silver bas-reliefs and finished in ormolu trimmings. This instrument is fitted with six cylinders each playing six tunes and is constructed under the patent known as "sublime harmonie," lately invented by Mr. Paillard. Hitherto the great objection to musical boxes has been that they were unable to convey the gradations of music as can be done by a living interpreter, but this invention of Mr. Paillard has overcome the difficulty by introducing three combs, tuned in unison and obtaining the various piano cresendo, diminnendo and cresendo effects by the use of one or more of them. In the same instrument we would direct the notice of our readers to the zither attachment, which stnbs the vibration of the comb and produces a *pizzicato* effect specially suited for dancing. Elsewhere the same house exhibit an "orchestra," playing eight pieces of music in which are combined the sublime harmonie" a reed organ, drum, castnets, and a cbime of bells. Concerts are giveu by the directors of this exhibit every morniug from ten to twelve and from two to six, and to judge by the attendance the public taste for the "sublime harmonie," of Messrs. Paillard et Cie. is on the increase, and they are acknowledged to hold the first place in their particular line of business.

Correspondence.

Editor Jewelers' Circular:

When a man sells a piece of real estate on credit, he is secured against any attempt of the debtor to defraud bim of his due by a mortgage, and thus, vast amounts of such property are safely disposed of. But how is it with the sale of millions upou millions of merchandise? Get all the agency reports you may, inquire of all the references possible, and the bold fact remains, that we depend solely on the debtors' honor. The past experiences of our trade in Pittsburg, St. Louis, New Orleans, Pittsfield, Mass., Pittston, Pa., etc., all go to prove the one thing, that past records of good character go for nothing, that a firm's *ability* to pay amounts to nothing if they have not the honor to pay also. We have honest struggling jewelers all over the land, and the many recent fraudulent failures show a great army of rascals also, who are choking out the honest men. Take a few cases in point that will be recognized by many victims on the Lane.

A, has a fair record for credit; by a judicious scattering of his purchases, he obtains $15,000 worth of goods He takes the goods home, confesses judgment to his mother, the whole stock is sold out to her in one lump and the son is behind the counter as usual, and the best legal talent say we creditors can do nothing as he has robbed us *"according to law."* A certain instance is too notorious and fresh to need rehearsal—in that case, a committee of some of the shrewdest men in our trade, determined to "rip the thing up" at any cost, were advised by eminent counsel, that nothing could be done, as they had been robbed *"according to law."* Take another case which we will call C: several thousand dollars in money was sent by the debtor to his sister in Europe, the rest of his stock is hid behind one of those infernal Pennsylvania judgment notes, and he smilingly invites us to take twenty-five cents. In other places in Peunsylvania are stocks of goods behind judgment notes, which the dealers, leaning over the backs of stolen horses, kindly tender us a few strands of their tails if we will return receipts in full.

Bankruptcy with concealed goods and "family claims" is another favorite legal way to rob us, and a reaction must set in soon to protect the creditor from his rascally debtor. Now, as in real estate, the title is not good until the property is paid for. So, morally, it is in merchandise, and so, legally, it ought to be. We want one law for the whole land, that shall render null and void all chattel mortgages, judgment notes, and confessed judgments, or any other transfer or sale of goods to which the grantor does not hold a title as his own individual property. A law of this kind and jail for its transgressors, would banish these rascals out of the trade into the place they belong.

UP-TOWN.

Workshop Gossip.

ACCORDING to M. Melsens, a small dose of iodide of potassium taken daily acts as a preventative to the effects of lead and mercurial poison often witnessed in those who work with those useful but dangerous metals.

THE best means for producing a black surface on brass or silver, is said to be platinum chloride, which is allowed to liquify by exposure to the air. It is best rubbed in with the ball of the thumb. After blacking, the object should be washed and polished with oil.

SCHMITZ'S ALLOY is said to be a compound of copper platinum and tungsten, melted together in a crucible, and thrown into a solution of 500 grammes of lime and 500 grammes carbonate to the cubic metre of water. The grains are collected, re-cast, and run into ingots. The alloy has the color of 18 karat gold and is inoxidizable.

FOR preserving the lustre of silver or plated ware, when not needed for actual use for a considerable time, a coating of collodion may be employed to great advantage. The articles are to be heated, and the collodion then carefully applied by means of a brush, so as to cover the surface thoroughly and uniformly. It is used most conveniently when diluted with alcohol, as for photographic purposes.

THE *Druggists' Circular* recommends the following as a liquid polish for silver plate:—3 to 4 drachms of cyanide of potassium, 8 to 10 grains of nitrate of silver, and 4 ounces of water; apply with a soft brush, wash the object thoroughly with water, dry it with a soft linen cloth, and polish it with a chamois skin. Neither whiting nor powder of any kind should be used for cleaning and polishing; they only waste or scratch the silver. In the case of solid silver, some English preparations are alterable in the solution.

HOW TO CLEAN SILVER FILIGREE WORK.—Put the article to be cleaned in a solution of cyanide of potassium. It will come out perfectly white and frosted as when new. Rinse with water, and dry by shaking in a bag of box-sawdust. Another method is to boil for a few seconds in a strong potash lye, take out and rinse in hot water, and allow to dry in hot boxwood sawdust. If the filigree has worn bright its appearance can be improved by a very slight dip in the cyanide of silver bath of the electro plater; this dulls and whitens it and gives it a very chaste appearance.

MELTING POINT OF GOLD ALLOYS.—The least addition of copper or silver lowers the temperature of the melting point considerably; 1 of copper to 23 of gold, or the so-called 23 karat gold, melts at 2,012° Fah.; 22 karat, at 2,009°; 20 karat, at 2,002°; 18 karat, 1,995°; 15 karat, at 1,992°; 12 karat, at 1,987°; 10 karat, at 1,982°; 8 karat, at 1,973°; 7 karat, at 1,960°, etc. This lowering of the melting point takes place notwithstanding copper has a higher melting point than gold, namely, about 2,372°. If the alloy is made with silver, all these melting points are considerably lower, while pure silver melts at 1,922°.

ELECTRO-PLATING WITH BISMUTH AND ANTIMONY.—Before nickel-plating had been invented, many professional electro-platers supposed that nickel could not be deposited with a battery. The plating with bismuth depends, like that with other various metals, chiefly on the proper solution. Bertrand has proved that it succeeds best with a solution of the double chloride of bismuth and ammonium, and of antimony and ammonium, which is very soluble in water, and used in the proportion of 3 per cent., or 30 grains of the salt to every two ounces of water. The use of a single element is sufficient, one of Bunsen being best. The plated object has at first a blackish tint, which however washes off, when the metal is seen to adhere firmly; brass or copper especially takes a fine polish, and has a peculiar lustre, between antimony and old silver. When a deposit is made of antimony by using the double chloride of antimony and ammonium, the result is similar, but the surface possesses the peculiar pale bluish lustre of the antimony.

PROCESS OF GILDING.—Place in a plate leaf gold, add a little honey, stir the two substances carefully together with a glass stopper, the lower end of which is very flat. Throw the resulting paste into a glass of water mixed with a little alcohol; wash it and leave it to settle. Decant the liquid and wash the deposit again. Repeat the operation until the result is a fine, pure, and brilliant powder of gold. This powder, mixed with common salt and powdered cream of tartar, and stirred up in water, serves for gilding. As another method of gilding, Bontet Mouvel gives the following:—Dissolve in aqua regia one grain of fine gold, previously rolled out very thin, in a porcelain capsule heated on the sand bath and concentrated until it is the color of ox blood. Add a pint of distilled water, hot, in which have been dissolved four grains of white cyanide of potassium. Stir with a glass rod, and filter the liquid through unsized paper. To gild with this liquid, it is heated a little above lukewarmness, and the articles to be gilt are immersed in it and supported upon a piece of very clean zinc.

GOLD SOLUTIONS.—Various salts of gold have been used for electro-depositions, among which are the hyposulphite, sulphite, iodide, bromide, terchloride, cyanide, and sulphocyanide. Finely divided gold, which is sometimes used for dissolving, may be obtained by adding a solution of protosulphate of iron to a solution of terchloride of gold, as a greenish brown precipitate occurs; this is gold in a state of minute division. Oxide of gold is obtained by adding to a solution of terchloride of gold a cold solution of caustic potash, until it ceases to produce a precipitate; or by digesting terchloride of gold with magnesia; washing the latter precipitate, first with dilute nitric acid, and then with water only. Iodide of gold is formed, either by digesting oxide of gold in hydriodic acid, or by adding a solution of iodide of potassium to a solution of terchloride of gold as long as a precipitate is produced, washing the precipitate with water; it is of a yellow color, insoluble in cold water, but freely soluble in a solution of iodide of potassium. Bromide of gold may be formed either by digesting finely divided gold, or oxide of gold, in liquid bromine contained in a stopped bottle. It is a salt of rich red color, and is soluble in water.

POLISHING WATCH WHEELS.—Put a cork in the vice, cut flat on top, place the wheel on the cork as far as the pinion will allow; take a blue stone and water, and stone the wheel flat and smooth, at the same time keep turning the wheel round with the left hand, wash it out and put in a box with some slaked powdered lime. The object of this is merely to dry it, and prevent the pinion getting stained or rusty. Then brush it out nice and clean, put another cork in the vice, cut clean and flat; pound on a stake some fine red stuff. Some workmen add a little rouge, but that is according to fancy. Take a slip of tin, about the size of a watchmaker's file, only thicker, file the end of one side flat and smooth, charge it with a little of the red stuff, and polish the wheel, keeping it turning all the time by the left hand, and don't leave off until the wheel and tin polisher are almost dry, so that you can see the polish; and, if to your satisfaction, clean it off with a piece of soft bread, and brush it out. If it has scratches on it bread them off, and clean off the tin, and charge it again with the red stuff. Cleanliness is of great importance, for if there be any grit about the red stuff, polisher, or the fingers of the workman, the work will be full of scratches.

MAKING STEEL VERY HARD.—As the hardness depends on the quickness with which it is cooled, there are better materials than water, which besides gives an unequal temper, the steam bubbles developed interrupting contact; another thing water is a bad conductor of heat, and if the bubbling and heat did not put it in motion, it would be unfit for hardening. Water with plenty of ice in it gives a harder temper; small tools may be stuck into a piece of ice, as jewelers and watchmakers insert them in a piece of sealing-wax. Oil is also used by them as being better than water, as it does not evaporate so easily. The Damask steel blades are tempered in a strong current of cold air, passing through a narrow slit; this gives a much more uniform and equal temper than water. But the most effective liquid is the only liquid metal—mercury; this being a good conductor of heat, in fact the very best liquid conductor, and the only cold one, appears to be the best liquid for hardening steel-cutting tools. The best steel, when forged into shape and hardened in mercury, will cut almost anything. We have seen articles made from ordinary steel, which have been hardened and tempered to a deep straw color, turned with comparative ease with cutting tools from good tool-steel hardened in mercury. Beware of inhaling the vapor while hardening.

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11 MAIDEN LANE, N Y.

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THE

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THE RECOGNIZED ORGAN OF THE TRADE.

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

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The Philadelphia Awards.

The agony is over, and half of the exhibitors at the Centennial are going about like the knights of the rneful countenance because every other one of them has got a medal. It is a sad commentary on humanity in general that these fortunate individuals find it impossible to be happy except by contrast with the unhappiness of everybody else. But this is the state of mind produced after all by the awards of the Centennial Exhibition, and we fear that the honorable gentlemen of Philadelphia will have to hold themselves responsible for not a little profanity and a good deal of ill-nature. The contest in the daily press, in which each of the piano and sewing machine manufacturers has proved conclusively that his medal was the highest awarded, has lent no little amusement to the gloom otherwise arising from the Centennial swards. We have at last come to Artemus Ward's famous company in which every man is a brigadier general. Aside from this matter of popular feeling, there is no doubt that the proclamation of the awards has been in many respects very badly botched. There is no little reason for criticism over the way in which these lists were made public. The commission determined to hold a great day of rejoicing, and would not wait for the judges to get ready, but fired the mine before the powder was all there. The official list was printed within one day, and seems to have had no revision whatever, but is full of blunders and contradictions of all sorts. Let us hope that this is merely the result of the present hurry, and that finally a revised list and the reports themselves may be more satisfactory. Some cases are still before the commission (not the judges), and a committee of appeal is revising a number of cases. We had intended to print, in this number, the list of awards connected with our own trade, but it is yet so imperfect that we propose to wait until it can be given completely and correctly.

It should not be forgotten, however, that some of the dissatisfaction arises from a mistaken point of view. There are no medals of superiority, as at Paris and Vienna; each medal is the highest, because there is only one class. The fact of the matter is, that it is the reports which are discriminative, and not the medal. The medal is nothing more than a certificate that there has been some kind of favorable report. How valuable the reports themselves on the individual exhibits may be, we cannot yet judge, for they do not seem to be ready, as should have been the case, with the list of awards. These reports run from the mere mention of "good quality" to an examination of two or three MS. pages, and are to be given to the public in pamphlets, one to each group, which will be published and sold. If they turn ont to be what they were intended to be, the more detailed ones will prove a valuable series of reports by experts on the best of the individual exhibits, and it is only fair in the present dissatisfaction to ask a suspension of judgment until these reports are seen. In many cases they will certainly be of great value, and the trade will gain no little information from their being published. But whether this can be said of them in general is yet in the minds of many a matter of doubt, and must be left to the reports themselves to settle.

Respectable Thievery.

It is ordinarily understood among honest men that a man has a right to the inventions of his own brain and the prodnctions of his own capital and to such benefits as accrue from them. The exceptions which prove the rule, we are sorry to say, are to be found in the jewelry trade. It is now not the exceptional but the usual thing to see any tasteful and popnlar novelty in design, originated by some one American house, captnred and multiplied by any of the trade who can lay hands on it the moment its popularity is proven; or, what is worse, they will take the idea and modify it just enongh to injure its art-effectiveness and it may be to vary the designer's work beyond the possibility of legal identification.

The worst of it is that the designs of many of our best makers are continually reproduced in plate, or in inferior gold, so that the market for their superior goods is taken away from under their feet and they have no encouragement to make further outlay in designs which are sure to be stolen as soon as they are to be seen in the shops. It is not comforting to find your new designs duplicated in a few days in Providence rolled plate; but to tell the truth it is not only in the cheaper goods and among the manufactures of this class that the evil exists. Each man is apt to tell tales of his neighbors but there are few in the trade who have not "protected" themselves against others who stole from them, by indulging in little quiet abstractions of their own. Respectable members of the trade have been seen sketching a pretty novelty in jewelry on their cuffs and the result would soon be evident from their workshops. One is reminded of the famous picture of the Tammany Ring, in which each innocent member was pointing his thumb over his shoulder at his next neighbor. We may all confess our sins in this particular.

Now this is a point on which the public feeling of the commercial community should be very rigid. The practice is in the first place a severe drawback to American art, and is immediately disastrous to the advancement of the trade, especially in competition with foreign trades. So long as we are in the habit of stealing designs we may expect to go backward instead of forward in our own work. Many of our best houses are employing to-day designers, among whom the lowest salary is not less than fifty dollars a week, but if their best efforts are to be coolly laid hands on in the way they are to-day, they will certainly feel inclined not to encourage their designers, but to discharge them. There is absolutely no commercial stimnlus under such conditions to elevate the standard of American art. This wholesale robbery of other man's brains, is doing more to deteriorate the art-character of jewelry than any other one thing.

This evil is to be corrected chiefly by a revolution of public opinion in this respect. We are promoting a more healthful feeling in other

commercial matters and are beginning to give a man to understand that if he cheats by fraudulent bankruptcy or other means, he is to be treated as a cheat and take the consequences. If the trade is to be what it should be, the same principle must be applied to this robbery of designs. It is not honorable and must not be considered so. If this tone can be fostered in the trade appeals to legislation will be much less necessary.

Nevertheless we are glad to learn that certain of our best manufacturers have determined to take all legal steps for their own protection. They propose to patent all valuable designs and to prosecute all who infringe on their rights, and further to seek additional legislation if it should be necessary to protect those rights. In all this the better part of the trade will heartily sympathise with them.

Pawnbrokers in the Trade.

The growing incursions of pawnbrokers into the regular jewelry trade is a danger which should receive prompt attention. Their opportunity comes in two directions, the habit of some of the retailers in driving away custom by exorbitant prices and the willingness of travelers to sell to pawnbrokers, who are often too ready to pay cash down.

It is scarcely necessary to point out that the competition of pawnbrokers would be a most dangerous element in the jewelry business, both in its commercial effects and in its influence on the art-character of our trade products. These men are, by the nature of their business, the most unscrupulous and grasping class in commercial life, and they are generally able to turn a penny, whether an honest one or not. The evils which we have pointed out as threatening the trade from the "cheap John" shops, are magnified tenfold when we come to consider this new difficulty. In fact the incursions of the pawnbrokers might easily change the entire current of the jewelry business and bring it to the level of pawnbroking itself. This class of men have an existing business and are in the first place ready to do business on a smaller margin than can rightly be afforded in the jewelry trade, and yet the public is not likely to save its money by their help. The extra price that the customer pays the local dealer is, as we have many times pointed out, for the surety that his character gives to the goods. The pawnbroker may buy a few of the better class of goods for bait, but so far as he buys directly, it will be for the most part cheap stuff and imitation goods, such as 10 karat chains for 14 karats, or the 12 and 14 karat rings, that are advertised by a Chicago jobber, marked 16 and 18 "to suit purchasers," or neck chains filled in with copper wire, and so on through all the varieties of petty fraud. These, with abundant misrepresentations, they will oppose to the honest goods of the regular trade and too often the public will permit itself to be fooled.

We would suggest to the retailers, especially those in St. Louis, where the pawnbrokers seem to have found a special opportunity, that they themselves can to a certain extent meet this difficulty. Many houses have driven customers away by the extravagant profits they asked and their consequent repulsion of customers. The latter are thrown back to the pawnbroker who offers them a "bargain," and in this way the trade of the regular dealers leaks away. This should be checked by asking only a fair profit on regular goods.

The other side from which the evil is to be met is that of the travelers. It is of course a great temptation to a traveler and to the house which he represents, to encourage the custom of men outside the trade who are apt to pay cash in a city where the regular retailers are not selling goods enough to give him any orders, especially when he sees that their lack of sales is partly their own fault. And yet the temptation is one to be resisted. The money of these cash buyers is often hot coals in the fingers. To cultivate this trade is to discourage the regular trade on which the foundations of prosperity must rest. If the pawnbroking and "cheap John" class are encouraged the result will be that, as they get the control, they will exert it to the utmost and always in the wrong direction. They will offer no market for fine goods, and when they get control of the market with their cheaper stuff they will dictate their own terms. From all reasons such a result is to be deplored and therefore the proper steps should be taken now.

Country Dealers and City Favors.

It is scarcely necessary to describe to the trade the class of country dealers who are in the habit of sending to the city trade pick-up orders and small, profitless repairs;—so small that they never think of sending the money, or even thanks, in return. Every jeweler knows instances of the kind where interior dealers have sent old pieces to be matched, or duplicated, or some trifling but bothersome repair to be made which requires the outlay of a day or two's running around or other troublesome work and returns no remuneration whatever.

We mention a recent instance in a which a country dealer sent to a manufacturer a peculiar stud for which he wanted a mate—a dollar job. The manufacturer courteously sent out his boy, who occupied one day and a half in hunting up the maker of the stud. The gross profit of this commercial enterprise was probably ten cents. The goods were sent by mail at an additional outlay of six cents and the letter required its three cents stamp. Net result one cent profit, or a remuneration of two-thirds of a cent a day for the boy's work. Supposing him to be paid four dollars a week, this was a loss of a round dollar. A still more marked instance was the case of a country dealer who sent in an odd earring to be matched. The piece was made at a cost to the manufacturer of a great deal of trouble, and $3.28 actual outlay. It was sent by express C. O. D., with the usual privilege, the expense of expressage taking most of the margin of profit. What did the dealer do but coolly change his mind when the goods arrived and sent back the single piece, of no earthly use to the manufacturer, without apology.

If dealers in such cases would be reasonably appreciative of the service done, or at least pay for it, the matter would not be so bad. But most of them, putting their correspondents to great trouble, will not take the little trouble on their own part to return the money. It will often be six or eight months before they will send on the few cents or dollars and sometimes, as in the transaction reported above, they overlook it altogether. We would suggest to country dealers asking such favors that they should take them as favors, and should be careful always to exercise the ordinary courtesy of sending the money with the order. A little attention to such details in business often prevents a good deal of uncomfortable friction.

Artistic Jewelry.

We this number present our readers with an admirably executed illustration, in gold and colors, of goods manufactured by the eminent house of Miller Bros., of 11 Maiden Lane, N. Y. Although this illustration is in the best style of lithographic art, yet it falls far short of doing justice to the goods represented therein. The productions of Miller Bros., which have never been approached, are so thoroughly identified with the advanced art effort in jewelry, that it is impossible to convey more than an idea of their marvellous beauty and finish in every portrayal. The reputation of the house is so well and favorably known throughout the country that it would be invidious in us to speak of them in terms of praise; we shall therefore, confine our remarks to the goods themselves. Their stock embraces a full line of the finest stone cameo, amethyst, topaz, coral and pearls, set and mounted in pins. Ear-rings, seals, lockets, medallions, sleeve buttons, studs, besides enamelled work with agate finish; masonic and other emblems. Their peculiar specialties are in initial buttons and bas-reliefs depicting birds and animals, which are perfectly marvellous in their fidelity to nature—the latter are especially worthy of attention as their graceful poise and detail are such as could only be executed by artistic genius, while their line of initial goods is among the recognized staples of the trade. We would prefer, however, that our readers should judge for themselves in the matter, for language, however eloquent, and illustrations, however carefully prepared, fail to do full justice to the works of this enterprising house. We would, therefore, refer those interested, to Messrs. Miller Bros., 11 Maiden Lane, where they will find an unsurpassed display of goods, and at prices that must tempt purchasers.

The Trade Revival.

From all directions comes the news of a revival of business. We have now the assurance that the movement was not spasmodic, for it continues, and gathers strength as it progresses. From the North, East, South and West, the same cheerful tidings come. Business is picking up in a wonderful degree all around, and even the most despondent have concluded that bottom has been reached at last. There is scarcely a paper published that has not noted this state of affairs, and for some of them the admission came with very bad grace. In Chicago business is very lively; Cincinnati is in the same comfortable condition. The *Commercial*, of that city says: "Within a few days there has been a brightening of business that is cheering to witness." From the far West comes the same news. A hearty revival has taken place all along the line and must continue. The worst has been seen and now, with a fixed financial policy, there can be no backward step.

The Progress of the English Goldsmiths.

At the beginning of the present century the art of the goldsmith in England was an insignificant one. Beyond wedding and mourning rings and red gold seals there was scarcely anything manufactured. Rundell & Bridge, the Court jewelers, no doubt made now and then a presentation snuff-box. But it was not till long after the then Prince of Wales made light of his mother's jewels by pledging what did not belong to him for £10,000, that London possessed more than one Court jeweler. Then Ludgatehill was the only place where it was supposed gold could be converted into ornament, or diamonds make up to order, or or entrusted to the workmen. Out of that magic space there were certainly a few houses which could manufacture a small service of plate, but nothing of a higher character. Amongst these firms may be mentioned Messrs. Green & Ward; Makepeace, in Searle Street; Gray in Bond Street (now Hunt & Roskell); Salter in the Strand, patronized by Lord Nelson and Lady Hamilton; Wakelin in Panton Street (now Messrs. Garrard, the Crown jewelers), Smith of Maddox Street, whose firm has entirely passed away; and Hamlet, of Syndey alley, who lost half a million of money by stock-jobbing, and finished his ill-fortune by building the Princess' Theatre. These were really salesmen of other men's goods, and for amount of business and for the taste and artistic quality of the work sold, they could not bear the slightest comparison with their brethren of the present day.

Polished gold was then the staple trade article, the coloring of gold having been only just introduced hy several French emigrants, probably about the year 1797. The process met with little immediate success and did not come into general use until after the peace of 1815, at which period French filigree work superseded polished. "Red," articles, made of what was then called "jeweler's gold," were in great request, and if the gold was better in quality than it looked, it arose from want of knowledge of the manufacturers, thus differing from their ancestors, who knov sufficient of their business to make the precious metals of a better quality than it really is. About 1820-5 the firm of De Vin, in Frith Street, was not to be surpassed in Europe for its diamond work, though the good trade in London depended on foreign workmen for the manipulation of the greater part of the improvements, and the firms of Laurea, De la Fons, Pocderin, and others, which for a while carried all before them, have now fallen into English hands. These firms rose about the same time, and those attempting to carry on their business without adopting the progressive improvements of the times sank to rise no more.

The continued distress and want of employment which existed in the gold trade from the year 1796 to 1815 had driven from it the best English workmen, and to supply their places manufacturers were compelled to employ French, Polish, Russian and Austrian emigrants. Indeed, it has been stated that at that time masters frequently advanced money to pay the debts of profligate journeymen in order to secure the talent which was often considered the accomplishment of drunkenness.

The date of the peace following Waterloo may be taken as the time at which a wider field of work opened to the English goldsmith. The taste of the time, as well as its politics, was in a state of transition. The nobility and gentry alone had hitherto been able to indulge in costly jewelry.

From filigree work the style passed into that of "stuck up," ornament. Small pieces of metal were piled one npon the other until a pattern resulted, frequently void of either taste or design, but certainly expensive and showy. All that is now changed, for at the present time a work of art in gold or silver may not be dear at twenty times its metallic valne, while a pile of meaningless ornament is generally and in most markets considered dear at any price, except perhaps in Madagascar and other semi-barbarous parts, where a golden ring in the nose—the larger the better—is considered a personal adornment.

The change which followed the fashion of "stuck up" goldsmith's work was that of the plain, solid in appearance and colored—an operation absolutely necessary since there were no small ornaments to disguise or screen the solder marks. It was then a custom that gold should not be less in quality than 16 carats. When this plain gold work was in fashion rapid strides were made in the multiplication of the forms of chains. This period was also distinguished by chain bracelets, of new patterns, unremittingly brought out by a firm in Frith Street, Soho, while the manufactnrers of Clerkenwell and Birmingham were alike doing their best to destroy a monopoly of work of a higher class.

Ahont the year 1825 it became the fashion to have gold work engraved over its entire surface. To this day that fashion has not quite vanished. And while the engraving was well done, a character which distinguished it for some years, there is no douht it was a great improvement on previous modes. But unfortunately competition threw the work into the hands of inferior men, such as gun engravers, who knew little of their art. There has been as much gold work spoilt by bad engraving as curiched by good nnder the pressure of this competition. Engraved jewelry then gave place to enamelled, which had become the fashion in Paris. The English work soon superseded the French. For if the goldsmiths of Paris do set the fashions, it is certain that the English goldsmiths improve upon them.

With the introduction of enamel work came the necessity of studying not only form, but the harmony of color.

A few years previous to the exhibition of 1851 a change in the style of work took place. Hollow wire work was introduced, and gradually the gold smiths learned to twist and turn it into most unaccountable knots and ties. Tie and not work became all the rage. It was always graceful and pretty, and was a great feature in the Exhibition. It admitted of great variety, by being either plain or enamelled, engraved or ornamented with stones; and, while light and showy, it was not very expensive.

The next change in the style of work was introduced from Rome, and slowly and steadily has the Italian style made its way to the present time, but not without improvement. When the work was first introduced, the mosaics and cameos always had the appearance of the workman having been stinted in the gold. The article, mounted or set, frequently appeared too heavy for the border, and had to be remounted to render it safe.

The use of reflected lights in jewelry is an introduction on the part of London workmen; and in this we have the first frnits of the steady advance of art in manufacture through legitimate art education. The Flemish school of painting had, and still has, its peculiarity in the introdnction and use of reflected lights, which give a charm to the work that can only be appreciated by those who have a knowledge of art. This peculiarity has been admirably adopted in jewelry by the giving of light to the center of a brooch by a piece of concave polished gold with a point of color, or gem, in the center. This effect is quite as artistic as, in the painting, the lighting of a face by the flame of a candle, while the candle itself is hiddeu from sight by the hand.

In comparing the English goldsmiths at the Exhibition of 1851 with those of the Exhibition of 1862, it is manifest that during the intervening years they had taken most rapid strides in art. In that of 1851 the London goldsmiths strove their hardest, and, we must say, fell far behind their foreign competitors. The juries, by the way, were far from being up to the mark, making the most unaccountable mistakes in giving medals to men for exhibited work, who knew nothing about it, except that they had paid for its manufacture.

The Jewelers' Association.

The members of the Jewelers' Association held their second annual meeting on the 12th ult., at their rooms, 1 Bond street. The attendance was very large, as the election of officers was announced for this occasion. At 3 P. M. the meeting was called to order by Mr. Seth W. Hale, the retiring president, who, in a few gracious words, thanked the members for the honor already done him, but declined a renomination for the principal office. The balloting was next in order, which resulted in the following unanimous designations for officers:

Mr. Jaques Guedin, of the firm of V. J. Magnin, Guedin & Co., for President; Mr. Ethel C. Hine, of the American Clock Co., for Vice-President; Mr. Frank D. Taylor, of Taylor, Olmstead & Taylor, for Treasurer.

Board of Managers.—Seth W. Hale. E. C. Hine, R. N. Peterson, Aaron Carter, Jr., Danl. F. Appleton, Edward Holbrook, Jaques Guedin, J. F. Chatellier, Ed. Todd, Geo. C. Taylor, John A. Riley, Thos. D. Pearce, Henry Randel, D. C. Wilcox, W. S. Hedges, P. Bissinger, J. Eug. Robert, A. F. Cross, Henry B. Dominick, E. F. W. Eisenmann, Thomas G. Brown, H. B. Beach, Geo. R. Colles, John D. Lyon, Isaac M. Miller, C. B. Yale, A. Spadone, and Geo. Wilcox.

The next business before the meeting was the appointment of Committees, which resulted as follows:

Executive Committee.—S. W. Hale, Chairman; Thomas G. Brown, J. F. Chatellier, Ed. Todd, Seth E. Thomas.

Finance Committee.—Daniel F. Appleton, Chairman; A. Spadone, H. B. Beach, John A. Riley, Edward Holbrook.

Committee on Membership.—L. J. Mulford, Chairman; A. K. Sloan, Henry B. Dominick, Henry D. Atwater, E. F. W. Eisenmann.

The incoming officials having been installed amid enthusiastic applause, the serious business of the meeting terminated, and the members adjourned to Delmonico's.

THE JEWELERS' BANQUET.

Many famous feasts have been served in the comfortable mansion on 14th street and Fifth Ave., where the hospitable Delmonico has for many years dispensed the good things of this world. Now the prince of the caterers has moved up-town, but the jewelers' banquet took place in the old house, and it seemed as though the last dinner served in that historic mansion should be the best. Covers for fifty were laid in the two rooms fronting on Fifth Avenue, and the table was resplendent with damask, crystal, and silver, while floral decorations perfected the *ensemble* and delighted the ocular sense of the guests. It is needless to speak of the viands, for Delmonico fully appreciated the importance of the occasion, and surpassed all his prior achievements in the culinary art. As soon as full justice had been done to the good things, eatable and drinkable, Mr. Guedin, the newly elected president, rose to his feet, and, in a few happy words, expressed his appreciation of the honor rendered to him by the Association in electing him to the office which he now occupies. He then called on Mr. Hine, who, in a speech of characteristic eloquence, set forth the aims, objects, benefits, and advantages of the Jewelers' Association, giving, by the way, some very witty and wise thrusts at the chronic compromisers who infest the trade, and whose evil schemes have, in a great measure, been frustrated through the agency of the Association. He also suggested that every effort should be made to clear the trade of these pirates, and his remarks were endorsed by all present.

Mr. Peterson followed in the same line of thought, and showed how the organization was a protection to the trade, and also to the honest men of the country, to the important interests which were united in the Jewelers' Association, and also to every retailer in the country whose object it was to earn his living and pay 100 cents on the dollar. He hoped the Association would protect honest men, and prove itself in the future, as in the past, a terror to chronic compromisers and evildoers, until the vultures of the trade were exterminated. These spirited remarks were listened to with marked attention, and were followed by ringing applause. Mr. Thomas G. Brown was next called on, and congratulated the Association on their happy selection of officers for the coming year, and expressed his belief that the result of the coming elections in November would be as satisfactory to the people of this country as the new elected officers of the Jewelers' Association were to the members of that organization. This sentiment met with the hearty approval of all Democrats and Republicans present.

Mr. Chatellier heartily indorsed the eloquent speech of Mr. Peterson, and spoke in no unstinted terms of the advantages already achieved and yet to be perfected by the Jewelers' Association. He regarded it a monument of business enterprise of which their children and their childrens' children would be proud. The president next invited Mr. Appleton to say a few words, and that gentleman, in a learned and eloquent speech, dealt with the early history of the goldsmiths' guilds of the middle ages. He told how in old times the jewelers and silversmiths were the associates of kings and princes, how societies, such as the Jewelers' Association, first were formed in Italy, and by degrees sprang up all over Europe, giving many interesting details of their history. Mr. Appleton also spoke in reference to the question of hall-marks, showing the practical impossibility of this system of test in this country, and also that it was not required when every first-class manufacturing firm had its own reputation to support, which was a far more dependable guarantee than any "hall mark" in the world. He also spoke of the prominent men who from time to time have risen to eminence from the jewelry trade, referring in this regard to Mayor Wickham.

At the request of the Chairman, Mr. Baldwin next gave some interesting reminiscences of the progress of the trade during the past half-century. He told that he remembered that about 1848 a jewelers' society was established in this city under the title of the "The Watchmakers' and Jewelers' Association," but as there was then no particular necessity for its existence it languished and died. But times have changed since then. The trade now is very different from what it was then and what was in those days superfluous has now proved absolutely indispensable. Mr. Baldwin's remarks were listened to with marked attention, for all present honored him as the Nestor of the trade.

Mr. Carter, another veteran, was then invited to address the meeting, and he also reviewed the life gone by in some interesting reminiscences of the past. He spoke of what the jewelry trade was in the days of his boyhood, and of the wonderful progress made of late years in this track of manufacturing industry. He said he believed that the day was not far distant when American jewelry would be sold in England, and that the people of the old world would remove the restriction of the "hall-mark," which prevents our goods from being valued as they deserve. He spoke of the good work already accomplished by the Association and predicted a bright future for it.

Mr. Spadone, when called upon, followed out the historical thread of Mr. Appleton's speech and also stated how favorably the work and designs of America compared with those of Europe. He spoke of the admirable work done by our leading manufacturers, specifying them by name and challenged any country to produce goods which were so thoroughly endowed with artistic spirit and finished detail.

Mr. Whitehouse (designer of the Bryant Vase) was then appropriately called on. This gentleman, in a few words, acknowledged the honor done him by the meeting, and called on Mr. Gorham as the oldest representative of the silversmith art. That gentleman, in response, made a brief, but telling speech in regard to the industry of which his house was the pioneer.

Mr. J. E. Robert was listened to with attention as he debated the Swiss and American watch industries. For the present he admitted, the Swiss manufacturers are not as prosperous as they might be, but that was a common state of affairs at this time, while he had no doubt that a new era would appear as soon as the American system of manufacture should be generally adopted. He also referred to the fact that the American Watch industry sprang from that of Switzerland and to the change in demand which now regulated the American market. Formerly the cry was for cheap, cheaper, cheapest watches for this country, but now quality not quantity was sought.

The chair then called on Mr. Geo. White, Jr., a young man but an old merchant, who has grown up with the plating trade of this country. He referred to the early history of that branch of the business when

travelers used to go out with three or four samples, and the entire sample stock of one of the largest and most prosperous manufacturing firms was displayed on a shelf in Maiden Lane, while now the same exhibition filled a large show room. He mentioned that the success of the Jewelers' Association had caused the organization of a similar society down-town, and also expressed his delight at meeting so many of his friends and associates in business.

Mr. C. C. Adams was next invited to address the Association and in a very interesting speech he told what he had seen and learned during a recent tour through Europe. He found the English manufacturers jealous of the Americans and displaying patterns which would not sell on our frontiers. There was nothing new in Paris; while in Germany, he was surprised to find Reed & Barton's goods in active and successful competition with European manufacture. He said that where the "hall-mark" system prevailed, imported goods had to be scraped, tested and then refinished, thus adding a heavy additional cost to the expense of manufacture. This was the great obstacle to American trade in silverware throughout Europe, but he had no doubt that it would ultimately be secured. He also referred to the closeness with which the English manufacturers preserved their designs, and said that it seemed as if they regarded every new idea as a great trade secret.

Other speeches, interesting, entertaining and profitable, were delivered by Messrs. Eisenmann, Cottle, Holbrook, Spence, J. A. Riley, Fred. Vors, Henry Ginnell, S. Thomas and G. R. Collis, and the reunion was terminated by Mr. E. C. Fitch, who wound up the proceedings with some very humorous and sensible remarks.

Thus terminated one of the pleasantest evenings of our editorial experience. All parted with pleasant memories and mutual congratulations

Practical Hints on Watch Repairing.

BY EXCELSIOR.—No. 19

(313) I find the subject of watch escapements opening up before me vastly more extended than was expected when I consented to take it up. Being in it, however, I shall endeavor to do it justice, and will therefore treat it more thoroughly and minutely than at first contemplated, with cuts when necessary, giving not only the ordinary practical methods of testing the mechanical correctness of the parts and adjusting them, but also rules for analyzing their action and trying their conformity to principles which lead to theoretical perfection. Some rules will be given for selecting and fitting new pieces, because that will be necessary whenever the escapement is radically wrong, and they therefore properly belong to this subject. Different ways will often be given for doing the same thing,—some good enough for ordinary examination of completed work, others more accurate but more difficult to follow, and still others for attaining as near as practicable to absolute theoretical correctness.

THE DETACHED LEVER ESCAPEMENT.

(314) First examine the hair-spring, balance, pivots, end stones, fit of the pivots in their jewel holes, etc., as directed in article No. 17, for the cylinder escapement. Make the end shakes of the balance staff, pallet arbor and escape wheel pinion to be very moderate, and alike, or nearly so. See that the table roller runs perfectly truly on the staff, both "in the flat," and particularly "in the round," or at the outside edge. If it does not, it should be made round, driving it off the staff and fitting it on an arbor, to turn off the projecting part in a lathe, then re-polishing the edge,—or a new roller should be fitted. Sometimes the roller is driven on the staff so tightly as to spring it, and when put on the arbor it runs truly. In this case, broach out the hole in the roller slightly, drive it on the staff and try again. If the balance staff itself is out of true, and cannot be trued by straightening the pivots or otherwise, the roller should be adjusted upon it at the proper hight, then cemented fast and turned true while on the staff, and its position not afterwards changed. If the roller is loose on the staff, it is better to fasten it with cement than by closing up the center hole or by pecking at the staff to flat or rough it up, as these ways are almost sure to throw the roller out of true. A good cement that dries quickly and is quite hard, is the black asphaltum varnish. Shellac dissolved in alcohol is good. Both should be used very thick, so as to dry sooner. Shellac alone can be used, melting it by heat, having first removed the hair-spring from the staff. Or the heat may be safely conveyed to the roller by the "temper drawer," without removing the hair-spring. Heat should never be applied to a compensated balance, but it is better to use one of the liquid cements. Then look along the lever and see how much room there is between the upper surface of the notch and the under surface of the roller; let the balance rest on the lower pivot and raise the lever to its highest end-shake and see if the lever and roller can touch. If so, the roller must be driven higher upon the staff till they clear, or the end-shake of the pallet arbor should be lessened. If neither can be done, the lever must be lowered on its arbor, or the notch end bent down slightly, (first drawing the temper a little, and, after bending, getting the guard-pin vertical, at least that part of it opposite the roller edge,) or the upper surface of the notch dressed off, for it must not be left so that it can touch the roller. Nor must any of the cement that fastens the ruby pin be left above the surface of the roller, as its interference in the notch would have as bad an effect as the lever and roller rubbing. The ruby pin should be clean, smooth, well polished, not chipped or scaled perfectly vertical in every direction, well fitted to the lever notch, securely fastened in its place, which should be in the center of the hollow in the edge of the roller. It must not project far enough to touch or come too near the surface of the potance, or the point of the screw which holds the foot jewel setting; and, in the double roller escapement, it must not project through the notch of the lever so far as to touch the index point, in any position of the watch.

(315) Next hold the movement edge upward, so that the balance will fall against the point of the lever as it rests against one of the banks, and get it so that you can see between the guard point and the edge of the roller as it vibrates under the impulse of the main-spring. The distance between them should be very slight, but sufficient to prevent any danger of touching. While in the above position, notice this distance when the lever hits *both* banks. Then hold the movement so that the balance falls toward the guard point when the lever rests against the other bank, and again notice both distances, as above. This will show several points. 1st, Whether the roller runs truly, as above noted. 2d, Whether, in any position of the watch, the roller can rub on the guard pin or point of the lever. 3d, Whether there is much side shake to the balance pivots. If so the distance between the guard pin and the edge of the roller will vary as the movement is held in the two positions alternately,—being least on the side toward which the balance falls. In this case, also try the distance by holding the movement so that the balance will fall *away from* the guard pin. If there is much difference, it will be apt to effect the action of the ruby pin in entering or leaving the notch of the lever, and the jewel holes should be knocked out and others put in which fit the pivots properly. In doing this, if the balance pivots are worn, rough or improperly shaped, dress them down and polish before fitting the jewels. Also try if this difference of distance is not caused by too much play in the pivots of the pallet arbor, instead of the balance staff. If so, the correction must be made there.

(316) Finally, this test will show whether the action of the escapement is uniform and steady. For if not the guard pin will clear the roller a part of the time, and at other times rub against it. This shows some irregularity in the teeth of the escape wheel,—some acting properly, while others fail to throw the lever against the banks, either from being too short or the corners rounded off, which causes them to strike on the impulse planes instead of on the locking faces, or from the front sides of the teeth not being sufficiently inclined, so that they have no "draw." These faults of the wheel will be considered hereafter. A part or all of this defect may be caused by lack of "draw" in the locking faces of the pallets, and that should be tested also, according to directions in a subsequent section.

(317) The usual method of trying the freedom of the guard pin, is to turn the balance around till the ruby pin is entirely clear of the lever, then hold it there while you move the lever back and forth with the tweezers, to see how much play the guard pin has between the bank and the roller edge. But this method may show an apparent freedom when in reality there is none. For, in case the pivots of the balance staff or pallet arbor, or both, had considerable side shake or

play in their holes, the force used in trying the lever as above may so move the parts as to prodnce an apparent play of the gnard point; whereas, under the influence of the motive power only, in actual running, there may be no freedom at all, but a more or less continnous touching of the guard point on the roller. When the pivots are closely fitted, and the lever is allowed to have considerable play between the banks and the roller, this method will show whether there is freedom or not, but it will not show the four points above mentioned. Although it has taken so long to describe, it will require but a moment's time to test by both methods.

(318) Next examine the lever; see that the pallet arbor pivots fit closely in their jewel holes. Remove the balance, let the main spring entirely down, lift the lever to its highest end-shake, and see if it falls freely when let go, also try this with dial up; try if the lever will fall freely from one bank to the other by holding the movement slightly inclined; turn dial upward and try in the same way. This is a good test except when the lever is poised, in which case the fork-end, not being any heavier than the other, will not drop as above. These tests should always be repeated when putting a movement together again. Try if the pallets and fork together are firmly fixed on their arbor; if the pallet can vary their position relatively to the fork; if the pallet jewels are fast in their places, properly placed, with sound faces and corners, well polished, with proper inclinations to their locking and lifting planes; that the arms of the right breadth for the wheel, and of equal breadth; that the space between them, from the heel of the outer or short arm to the front corner of the other, at their extreme edges will just freely take in three teeth of the escape wheel; that the teeth pass up far enough on the locking planes for safety, but no more; that the pallet arbor has a positive end shake, but only enough to insure freedom; that any part of the fork does not rub on the bottom of the sink in which it plays, nor on the under side of the lever bridge when the movement is held dial upward.

(319) See that the end shake of the escape wheel pinion is clearly perceptible but moderate; that the pivots fit their jewel holes closely; that the wheel is fast on the pinion; that when it is raised to its highest end-shake it does not rub under the anchor or outer end of the lever fork, nor under that part of the fork between the pallet arms, nor under its own bridge; that the teeth do not touch the belly of the pallets or part between the arms; if they come *very close*, a little dirt will be apt to clog and stop them, and it is well to grind off the parts nearest to the teeth with a diamond lap. A ball metal wheel with emery or coarse oil-stone dust will do the work, but more slowly. The pallets must of course be removed from the fork and arbor while grinding, and care taken not to touch the corners of the pallet jewels with the lap, or they will he ruined. And before taking the pallets off the arbor, always notice their position closely, so that they can be replaced as before, or nearly so. Otherwise you will have to adjust them in position on the fork to get the correct "escapement angle." The teeth of the escape wheel should act entirely upon the pallet jewels, at the highest point of their convexity when they are rounded up, and not upon the steel part above or below the jewels, as that is generally taken off a little so that it has a different shape and distance from the pallet center from the jewels themselves.

(320) Whether the wheel is staked concentrically upon the pinion, can be seen while the watch is running, by watching the distance that the teeth lap on the locking face of one of the pallets. If some are near the edge while others fall further from the edge, up the locking face, the wheel is either concentric or not round; if the difference is considerable, the action is not safe; and if the pallets are pitched deeply enough to have the shallow or short teeth lock safely, then those which fall further up on the pallets will work too deeply, causing greater friction, loss of impulse, etc., and perhaps stopping. The only remedy for this is to drive the wheel off the pinion, and stake it on again so as to concentric. An English escape wheel, however, may have the points of the teeth stoned off trnly in the lathe; if this makes the depthing of the escapement too shallow, an eccentric arbor must be fitted, to set the notice the distance that each tooth stands from the heel of a pallet after it has dropped therefrom, and while another tooth is locked on the other pallet. If all stand at an equal distance, the teeth are evenly spaced. Notice if the working faces or front sides of the teeth, and the driving planes on the ends of the club teeth, are smooth, well polished and shaped alike. Direction will be given hereafter for testing the inclination of the front faces of the teeth, the lift of the driving planes, etc., as also the inclinations of the parts of the pallets, and all other points which partake somewhat of the theoretical. See that the backs of the teeth clear the heels of the pallets properly, after dropping from one and while the other is in action; that the amount of "drop," or distance that the teeth fall, is equal off both pallets, and not too much; that the wheel is true "in the flat," and works on the highest part of the convexity of the pallets; that the end-shake both wheel and pallets is alike and very moderate in amount, so that they cannot vary their positions respectively to each other to any extent.

(321) Test the perfect freedom of the pivots of the wheel in their jewels, (the lever being removed,) by giving a very slight pressure to the main wheel, just sufficient to cause it to revolve very slowly, when any obstacle or sticking will be detected. Try this with both sides of the movement up. Also try it when putting the movement together, by lifting the wheel to see if it drops freely by its own weight.—doing this also, with both sides np. Try the shake or play of the wheel in the pallets, by letting a tooth come as closely as possible to the front corner of the short arm, but not over it and on the driving plane, then hold the pallets still and move the wheel back and forward, to see if it is perfectly free, without too much play. Then try as above with the tooth at the corner of the inner arm, and see if the wheel has play between the pallets. If there is no play inside, take a little off the heel or delivery edge of the short or outer arm. If the lack of play is on the outside, take enough of the discharge edge of the inner arm to give perfect freedom, but no more. These alterations are to be made with diamond laps, examining closely with the glass to see that the polish is perfectly restored and the corners smooth and sound. The size of an escape wheel should be such that three teeth will jnst go freely inside of the pallets, and the outside corners of the pallets must just go freely inside the points of five teeth,—all measurements being taken at the extreme corners of both pallets and teeth. The object is to to have the teeth acting upon the pallets as continuously as possible, without catching upon the corners. To avoid this a little play is allowed, which causes what is called the "drop," as the tooth leaves each pallet, but there should be no more than necessary to give freedom to the wheel, as all drop is so much waste motion of the wheel and loss of the motive power of the watch.

(322) Finally, the balance staff, the pallet arbor and the escape-wheel pinion should all be vertical, and parallel with each other. Any inclination either towards or from each other, will cause a difference in the depthing of the parts with every change in their end-shakes. The very common practice of twisting the bridges to one side in order to change a depthing, whether in the escapement or elsewhere, cannot be too severely condemned. Not only does it cause the above defect, by throwing the arbor out of vertical, but it changes the action of the connecting parts upon each other, besides causing the pivots to rest merely against the corners of their jewel holes, instead of having a firm and continuous bearing therein from end to end. And, if the pivots are closely fitted in their jewels, this twisting of the bridge will cause them to bind more or less in their holes, and often bend them or break them off. Even if the practice was unobjectionable, the useful effect obtained by it is generally too little to be of any account, (except between the third and center wheels of ankers and lepines,) because, although the upper ends of the arbors are moved considerably, yet, the connecting parts being generally near their other ends, are moved scarcely any as regards their depthing, as will be apparent upon reflection. Every bridge should be firm in its place, and its steady pins fitting closely in their holes so that it cannot vary its position. If the depthing of the parts is defective, there is a proper way to correct it.

(323) Having removed what may be called the merely mechanical

defects, we will now consider the escapement in a more technical light. In the detached lever escapement there are four distinct actions, viz.: the wheel and pallet, by which the rotary motion of the wheels is converted into vibratory motion of the lever; 2d, the fork and roller, by which the motive power is conveyed by the lever to give motion to the balance, through the medium of the ruby pin and roller; 3d, the banking, which keeps the parts of escapement from passing out of proper working position, 4th, the safety action, to prevent accidental external disturbances from throwing the parts out of position, or moving before the proper time. These actions are all found, and substantially the same, in the different kinds of levers. In the double-roller lever, instead of both the fork and roller action and the safety action using the same table roller, the two actions have each a separate roller, or arm. Resilient levers have some device added for preventing damage when the balance vibrates two full turns, causing the ruby pin to strike on the outside of the lever fork. What is called the rack-and-pinion lever has, instead of a notch in the end of the fork, a circular segment, on the outer edge of which teeth are cut, forming a rack; and the balance, instead of being riveted upon a staff which carries a roller and ruby pin, is staked upon a pinion, the leaves of which work into the rack. It is therefore not a variety of the detached lever, but is governed by entirely different principles in every part. Being seldom used now, directions for adjusting it are scarcely necessary, and will be omitted.

(324) The wheel and pallet action consists of a wheel called an escape wheel, the teeth of which act alternately on the two ends of a piece called the pallets, causing them to vibrate on their center, where they are carried by a staff called the pallet arbor. The ends or arms of the pallets have jewels set in them for the teeth to move upon, called pallet jewels. There are two principal forms of this action, the Swiss and the English,—the main difference between them being in the shape of the teeth, the latter having teeth with pointed ends, the former broad ones called club teeth. In the English style, the lifting is all done by the pallet faces, while in the Swiss style both the pallet and the teeth have driving planes, and the lifting is divided between them. In the wheel and pallet action there are three distinct functions; the locking, the draw, and the lifting or impulse. The tooth of the escape wheel strikes the arm of the pallet on the outside, called the locking face, and is locked or held by it, preventing any further motion, till the fork is carried by the ruby pin far enough to let the tooth pass off the locking face over the corner and on to the front face called the driving plane, because it is inclined towards the wheel so that the tooth in passing over it forces it back, till it reaches the heel or discharge edge, when it passes off, and another tooth acts upon the other arm or pallet. The amount that the driving plane is inclined (or the distance that the tooth forces it back,) is called the lift, or lifting angle of the pallets. This varies in different constructions, being from 8° to 12° but generally 10°, in modern watches of the English style. In the Swiss levers, the lift of the pallets is from 6° to 9° leaving from 4° to 6° to be accomplished by the driving planes on the teeth. The wheel and pallet action of American watches is constructed upon the Swiss model, with some slight modifications.

(325) When a tooth drops from one pallet, another locks on the other pallet, as described for the former. But there is another part besides locking performed by the locking faces. In order to draw the guard pin or guard point of the lever away from the roller, and insure against it touching, so that the balance after receiving its impulse will be entirely free from the rest of the escapement, or "detached," as the name of the escapement implies, the locking face is so formed or inclined from the teeth that it does not merely lock or stop the tooth resting against it, but is drawn towards the wheel by the tooth sliding up along the incline, till it is prevented from going further by the bankings. This function is called the "draw." If the locking face is in line with the center of the wheel when the tooth rests on it, of course there will be no draw at all. If it is inclined inward, or to the right of the wheel center, the tooth will be disposed to slip off instead of locking, and the watch will stop from the guard pin being forced against the roller. But if the face inclined outward, or to the left of the center, the tooth will be disposed to move further on it, or draw it in. If inclined too much, the draw will be so strong as to present considerable resistance to the unlocking motion of the lever by the ruby pin, and then also the watch will stop. The draw should be only sufficient to insure that it will bring the fork against the banking when the tooth falls upon the locking face, and there retain it safely locked until released by the ruby pin. The proper amount of draw is given by forming the short or left pallet (looking from the center of the wheel towards the pallets,) with an inclination of 15° from a line drawn from the wheel center through the front corner of the pallet, and the long or right pallet a similar inclination of 12° from such a line. That is, from the point where the line touches the corner of the locking and driving faces, draw another at an angle of 15° (or 12°) to the former, and this will be the proper inclination of the locking face when the front corners of the two pallets are placed at an equal distance from the center of the wheel; or, what is the same thing, when the pallets are so placed that a line drawn through their front corners is at right angles to a line between the centers of the escape wheel pinion and the pallet arbor. This will insure the balance being detached during each vibration, without offering too much resistance to the unlocking. Too much draw allows the wheel to advance perceptibly, as the pallet is drawn in by the inclined locking face. Therefore when the ruby pin comes around to perform the unlocking motion of the lever, it has to force the tooth back as far as it had advanced, before it can pass over on the driving plane; and as the whole power of the mainspring is pressing the wheel forward, it will be seen how much resistance the ruby pin has to overcome in order to effect the unlocking. A stronger main spring does but little good, for it also increases the resistance to be overcome. The proper remedy is to lessen the inclination of the locking faces. They should also be highly polished as possible, to lessen the frictional resistance. Practical methods of testing and measuring the draw, the lift, the depthing, etc., will be given in our next article.

The Revival of Greek and Etruscan Art in Jewelry.

The following interesting paper, by Signor Alessandro Castellani of Rome, was read before the American Association for the Advancement of Science, at Buffalo, August 25th.

I have asked the favor of being permitted to lay before you in a few words, the result of my researches on the subject of the art of jewelry practiced by the ancients; not only with reference to the forms which ornaments, serving as such brilliant additions to the female toilet, assumed at the periods referred to, but with reference to the no less interesting process of execution employed by the artists of those times. These processes are, unhappily, lost, with many secrets of a civilization which was the mother of our own, a noble inheritance of which barbarous ages have robbed us in the greater part. It must with humility be confessed that we see at present raising, as if by enchantment, from the forgotten cemeteries of Etruria and of Greece objects in gold of a workmanship so perfect that not only all the refinements of our civilization can neither mistake them or even explain theoretically the processes of their execution. I have not seen a single work in gold dating from a well determined Roman epoch, even including the most artistic periods, which can in any degree whatever be compared for elegance or form or skill of workmanship with the artistic productions of the Greek or Etruscan art. Without doubt the Romans had traditionally preserved certain primitive forms belonging to their models, but the imitations are in point of execution extremely inferior.

I will not speak here at the complete degradation into which the art has sunk on the fall of the Roman Empire, when the material formed the only value of the ornaments. Jewelry among the early Christians had the rude simplicity which at that time belonged to all the productions of this lost art. The transfer of the seat of the Empire to Byzantium marked a new phase in the history of jewelry. It became quickly grafted on the Arab art, and by means of this new element acquired quite a different style from that which it had derived from the artists of antiquity. Enamels, precious stones, pearls, and coarse chasings, all mounted together with an exubrance of barbaric luxury, constitute the characteristic traits of that Byzantine school. I

will not speak of what jewelry had become in the hands of the Goths and of the Lombards. We have an example in the celebrated crowns of Teledo, now placed in the museum of the Hotel de Cluny. In these crowns gold is treated as a village blacksmith would hardly at present treat tin or copper. After the close of the tenth century the art profitted by the general aspiration of the public mind just delivered from fears created by gloomy phrophecies toward a better future. We need no other proof of this than what is furnished by Theophilus and his school, and by the relics of that time which have come down to us. By insensible advances the art gradually developed itself up to the fifteenth century, when it suddenly expanded under the direction of the new Italian school, at the head of which stood Maso Finiguerra, Caradosso, Cellini, and many other eminent artists who accomplished wonders in it. But this renaissance was not, as regards jewelry, a return to classic forms. On the contrary, a new school sprang up. New requirements, new elements, and new methods were introduced: chasings, engravings, enamelings, and nielli were employed in endless variety, but neither in design nor workmanship was there any reminiscence of antiquity. The gold ornaments of Vulci, Cervitri, Chiusi, Toscanella, and of Kertch remains still buried in the mysterious tombs which held their ancient possessors. Had Cellini any knowledge of their existence, and was he willing to take them as models? From the time of Cellini the art, instead of progressing, lost much of its lustre, till it became entirely degraded in the hands of the Spaniards. I will not enter into the history of this decay of jewelry, losing every year its artistic character to become more and more in modern times a mere object of trade and of paltry speculation. Grieved at witnessing in Rome the prevalence of this deplorable refluence, my father, myself, and my younger brother believed that it might be a matter of some importance, in the midst of the universal improvement of taste, to give a purer and higher direction to the art in which we had devoted ourselves. In the year 1830 some fortunate excavations brought to light the treasures hidden beneath the soil of Etruria. Every one was struck with admiration at the beautiful ornaments discovered in the cemeteries of this mysterious country, and my father was the first to form the design of imitating some of them. Encouraged by the praise and counsel of friends of the arts, among them the Duke Michelangelo Caetani, known as possessing the purest taste and the feelings of a true artist, he revived at Rome the art of the jeweler by taking as models the most perfect examples that antiquity could furnish him, The discovery of the celebrated tomb, known as that of Regulini Galossa, at Cervetri, was an event of the highest importance in regard to our enterprise. On the Papal government expressing a wish to become possessed of the objects in gold found in this crypt, my father and I were called upon to examine them with the utmost care. We had thus an opportunity of studying the particular character of Etruscan jewelry, and holding thereby in our hands the thread which was to guide us through our researches, we set earnestly to work. The subsequent discoveries of Campanari at Tuscanella, and of the Marquis Campana, and the excavations made at Vulci with so much intelligence by our friend, Francois, by Prince Torlonia, and by Mr. Noel des Vergers, have revealed new treasures to us, and have furnished models of the most exquisite elegance. Our first object was to detect the process by which the ancients worked. We remarked that all their jewelry, except that intended for funeral ceremonies, instead of owing the raised parts to chiseling or engraving, were formed by separate pieces brought together and placed one upon the other. This it is, in my opinion, that gives it so peculiar and marked a character, derived rather from the expression, as it were, of the spontaneous idea and inspiration of the artist, than from the cold and regular execution of the workman. Its very imperfections give to the workmanship that artistic character altogether wanting in the general number of modern works, which are generally produced by punching and casting, and that charm which so constantly strikes us in the proceedings of the ancients. The first problem, then, that offered itself to our attention was the means of soldering together, with the utmost neatness and delicacy, so many pieces of extraordinary thinness. Among others, those of almost invisible grains, like little pearls, which play so important a part in the ornamentation of antique jewelry, presented difficulties nearly insurmountable. We made innumerable assays, employing all possible agents, and the most powerful dissolvents to compose proper solder. We consulted the writings of Pliny, Theophilus, and Benvenuta Cellini; we neglected no other sources of instruction with which tradition could furnish us We studied the works of Indian jewelers and those of the Moltese and Genoese, but it was only in a remote corner in the Marches at St. Angelo at Vado, a little district hidden in the recesses of the Apennines, far from every centre of civilization, that we still found in use some of the processes employed by the Etruscans. There yet exists in this region of Italy a special school of traditional jewelry somewhat similar—not certainly in taste or elegance of design, but at least in method of workmanship—to the ancient art. The beautiful peasant girls of these districts when at their wedding feasts wear necklaces and long ear-rings called "naviceller," much resembling in workmanship the antique. We procured then, from St. Angelo in Vado, a few workmen to whom we taught the art of producing Etruscan jewelry. Inheriting the patience of their forefathers, and caring nothing for those mechanical contrivances by which geometrical exactness is attained in modern jewelry, these men succeeded better than all whom we had previously employed in the imitation of that freedom of style which is the particular characteristic of the art among the ancients. In substituting arsenicates for borax as solvents, and reducing the solder to an impalpable file-dust, we obtained results of a sufficiently satisfactory nature. We profitted also by the chemical studies of my father in the coloring of gold. We dispensed, as much as possible, with the use of the punch and of the jet. Having come to the conclusion that certain works of the ancients, very delicately executed, must have been done by women, we confided to intelligent workwomen that which required the most delicacy. The result was excellent, especially in the placing and soldering of that little granulation which is carried over the face of most Etruscan jewelry. In a memoir, which I read in 1860, on antique jewelry, before the Paris Academie des Inscriptions et Belles Lettres, I made the following conclusions: "Nevertheless, we are convinced that the ancients had some special chemical process for fixing these strings of small grains of which we are ignorant; for in spite of all our efforts we have been unable to reproduce some exquisitely fine workmanship, and dispair of being able to do so, unless aided by some new scientific discoveries. We do not, however, intend to discontinue our labors, and it is, therefore, with confidence, gentlemen, that I address myself to you. If your studies of antiquity in all its branches have brought to your notice any passages in the classic authors which may put us on the track of discovering the secret of which we are in search, be so good as, in the interest of art, to point them out to us, and be assured that we shall feel grateful for your assistance." This I said sixteen years ago. I have now the satisfaction to declare to you, who so nobly represent the science of America and Europe in this congress, that the lost art of the granulated work of the Etruscans and Greeks has been at last entirely revived by us.

Gentlemen, after this communication I call your attention to some specimens of gold ornaments in granulated work which I exhibit in the Italian section of the Centennial Exhibition, that you may be able to judge yourselves of the results of our studies of the art under its ancient forms, which have been and will continue to be our models.

The members of the American Association for the Advancement of Science, with a number of friends—the party numbering over three hundred—spent August 26th at Niagara Falls and surroundings, returning in the evening, when they held an informal meeting of a private nature.

A Wonderful microscopic watch has been presented to Mme. MacMahou by the Ecole de l'Horlogerie at Besancon. It is so small that to tell the hour a glass of high magnifying power is needed. The Duc d'Aumale was present when this fairy jewel was handed to the Marshal, and related how his ancestor, Duc de Penthieve, wore watches in his vest buttons. Moved by this family souvenir to give a fillip to Besancon trade, his highness ordered a set of lilliputian chronometers for shirt and wrist studs.

Gold and its Uses.

The use of 22 carat gold as our national standard of value for the coinage is well known, but a few additional particulars will not be irrelevant to that branch of the subject we are now entering upon. Gold coins when first introduced into the currency of England by Henry III., were of fine gold, that is to say, 24 carats. Edward III. was the first English king who used gold coins of an inferior standard, in the form of six-shilling pieces, nearly equal in size to the present sovereign, and consisting of 23⅚ carats. A coin called a noble followed, worth six shillings and eight pence. Edward IV. reduced the standard to the fineness of 18 carats. The next change was made by Henry VIII., raising it to 22 carats. From this time until the time of Queen Elizabeth the currency underwent various changes of standard, but in her reign it was again fixed at 22 carats, and has so continued, with about one exception, down to the present time. All English gold coins are nominally and intrinsically worth the sums they represent. This is so when they are new, and when they leave the mint, and have not been subjected to the wear and tear of circulation. Besides the standard fineness of coins, there is also a legal weight, fixed according to the regulations of the mint. Thus in England a pound troy of the standard metal is worth £46 15s., so that were a single pound troy of standard gold taken to the mint to be coined, after forty-six sovereigns and one-half sovereign had been manufactured out of it, a portion of gold of the value of five shillings, not used up in the coins, would remain. The same quantity of standard gold will coin 44½ guineas of the value of 21s. each; hence the value of standard gold is £3 17s. 11d. per ounce.

The coining of gold is conducted with great exactness by the officers of the mint with respect to weight, and the closeness of standard to which they are compelled to work will be shown by the following extract from the first schedule of the Coinage Act, 1870.

The imperial weight in grains only is here given:

Coin.	Weight.	Remedy.
Sovereign	123.27447	0.20000
Half-sovereign	61.63723	0.10000

The remedy is the difference allowed to the deputy-master of the mint, between the standard and real weight of the manufactured coins, which in a sovereign is only one-fifth of a single grain, but to this limit he has always well confined himself, as the trial of the Pyx fully proves. This trial, which is one of the most ancient customs, the first known writ for a trial of the Pyx dating from the reign of Edward I., was held on Wednesday, July 31st, 1875, at the Goldsmiths' Hall, according to the provision of the Coinage Act, 1870. Although this is a trial of great interest and importance to the authorities at the mint, and also to the public, and to manufacturing goldsmiths in particular who are constantly melting up the coin of the realm for manufacturing and commercial purposes; nevertheless, it is a trial in which the latter take very little or no interest. To the former the verdict is of great interest, because, if favorable, the result is an honorable commendation of the officers of the mint, for the proper and faithful performance of their onerous duties during the past year, and also a perfect guarantee to the public and the goldsmiths that the large amount of additional gold coinage annually manufactured and circulated is fully up to the legal standard as to fineness and weight. The standard fineness for gold coins is 11-12ths fine gold, and 1-12th alloy, or millesimal fineness 916,666, the remedy being millesimal fineness 0.002 = one 500th of a grain. The guinea is of the same standard as the sovereign in fineness, but differs in weight, hence its value, 21s. A guinea weighs 5dwts. 9¼ grs., and a soverign 5dwts. 3⅛grs. and a fraction of a grain, of which 4dwts. 22⅛grs, and 4dwts. 17grs. respectively, is fine gold. Since the reign of George III. gnineas have not been coined for circnlatien. There is also a difference in color. Gnineas look yellow, while the modern sovereign shows a deep red tint. This denotes an alloy of silver in the former, and one of copper in the latter. Our coins are now always alloyed with copper, with the exception of those manufactnred by the colonial mint at Sidney, in Australia, which contain silver. These coins can easily be distinguished from a handful of English coins by their greenish-yellow cast, without close inspection of the impression of the die npon the coins, which is slightly different upon the obverse side, and more so npon the reverse, which has the word Australia stamped upon it.

These coins are of the same standard, in fineness, weight, and value as the English coins, and pass freely without observation among commercial men. Some persons we have heard express doubts as to the genuineness of a coin the color of the Australian sovereign, but they have been those through whose hands no large amount of coins have passed, and who are unacquainted with the variety of colors gold may be made to present to the eye; if there is any real difference between the Australian and English sovereign, as regards value, the Australian has the advantage on account of the extra silver it contains, which is more expensive than copper That beautiful characteristic deep, red color to be seen in a new English gold coin, is produced when the coin is snbmitted to the very highly polished dies of the coining press, and it comes ont perfectly bright and of a beautiful lnstre.

Previous to the reign of Charles II. all the coin of the realm was made by hand labor, by forging or hammering pieces of gold to the proper thickness required for the coins, then cutting sqnares a little larger than required for the different-sized coins, afterwards removing the corners from the squares, and rounding them to the size, and adjusting them to the weight of the money desired to be put in circulation. These round blank pieces were then placed between two hardened and tempered steel dies, containing the pattern and design of the intended coin; the upper die being well struck with a hammer, the impression was produced. This method of preparing the coin was far from perfect, in consequence of the difficulty of placing the impression of the dies exactly opposite each other, and also the uncertainty of the blow in producing a perfect impression on the blank piece of gold intended for the coin. The coining press introduced into England in the beginning of the last century, remedied a defect long experienced.

Onr present gold coins are perfection in themselves, as regards artistic design, taste, and workmanship, and as such are noted all over the world.

Twenty-two carat gold, besides being manufactured into coins, is very largely used indeed in the manufacture of wedding rings, which must be of this quality; and so fine is this branch of industry now cnt, that a wedding ring may be purchased from the manufacturer for a very little above its real value in gold, and it is by no means an nnusual thing at Mr. Aston's manufactory, when the trade is busy, to work up into wedding rings a thousand pounds' worth of gold per week. This quality of gold is very expensive to work up, consequently the working loss would be very severe in a manufactory carrying on business to the above extent; indeed, it could not possibly be estimated at less than £2,000 per annnm. Of course we mean that this amount goes into the polishing dirt, floor sweep, washing waters, etc. There is one decided advantage the wedding ring makers have over other jewelers, that the necessary—the coin—is sent with the order, which is very nice, and no doubt the manufacturers in several other branches of jewelry—not to say all—would like the same system or custom of trade established with them. Wedding ring makers have to pay a duty npon their manufacture of 17s. per ounce, 1-6th being remitted for loss in finishing, because it is compulsory that this quality should, when made into wedding rings, be hall marked, and this has to be done when the articles are in a half-finished state; therefore, for every six ounces you pay for five, etc. For this reason it is usual to melt down the coin of the realm, and for more purposes than one it is an advantage to wedding ring manufacturers, who can depend upon the quality, and also effect a saving of from fourpence to fivepence per oun-e; a gain to a large firm, not to be lost sight of in these days of keen competition. Twenty-two carat gold is also used in the manufacture of mourning rings, but to a more limited extent than above. In some instances watch cases are made of 22 carat gold, but English watch cases more commonly consist of 18 carat gold. Watch cases (English) bear the mark of the Goldsmiths' Hall, and are duty free in the manufacture.

Proceedings of the Horological Club.

A DISTINGUISHED BODY OF WATCH AND CLOCK MAKERS.

Thirty-Second Discussion.—Communicated by the Secretary.

FITTING IN A HAIR-SPRING.

Secretary Horological Club:

I see by your proceedings in the JEWELERS' CIRCULAR for September, that you give the trade any information desired, free of charge. Would you kindly state the method followed by the best workmen in fitting a hair-spring? I have heard men claim that they could put in a hair-spring and regulate it in an hour. If that can be done, I would like to know how it is done. It takes me a part of two or three days before I get one down to time. An answer would oblige.

HAIR-SPRING.

Mr. Horologer stated that directions had been given several times, already, besides the well known essay of "Excelsior" on the subject, but as Mr. H. had probably not seen them, he would once more repeat the *modus operandi*. The usual way was to select a spring of as near the proper strength as we could judge, and attach it to the balance staff, either with a little pallet of wax or by springing the central coil over the hub. Then put the pivot of the staff in its hole, so as to get the spring central, and grasp with the tweezers the coil that laid in the regulator pins. This gave the proper size of spring wanted, which was then to be tested as to time, by resting the lower pivot on some hard, smooth surface, holding the balance upright by means of the spring in the tweezers, and counting the number of vibrations it would make in exactly one minute, or even in half a minute by the regulator. If it gave very nearly the proper number, it was pinned in the watch and tried more accurately. If correct, the central coil was cut out in such a manner that, when pinned in the collet, it would lie near to but not touch it, and the spring would be central or concentric on the staff. Then carefully pin it in the stud, with the collet end of the spring in a straight line running from the centre of the balance to the stud, or nearly so. This was found to make the vibrations of the spring isochronal, in most cases. If not quite so, it could be corrected by varying the place of attachment to the stud,—taking up the spring when the long vibrations were too slow, and letting it out when they were faster than the short ones. There were other ways of making the spring isochronal, but it would require to much space to go into that point here. The above method of pinning the spring would generally secure approximately isochronal vibrations. Now time the watch accurately for one minute, by counting the vibrations of the balance, or by comparing them with those of another watch alongside giving the proper number of beats. If necessary to take up or let out the spring, the central coil should be altered to keep the two ends of the spring in the same relative position as before. When ready to regulate, set the seconds-hand at the 60, turn the balance around a little and hold it till the seconds-hand of the regulator touched its 60, and at that instant let the balance go. When the watch had run exactly one minute by its dial, rate how much the seconds-hand of the clock was before or back of its 60, and change as required, till no difference could be seen for one minute. Then set and try for fifteen minutes, and if the regulator will control it, without being moved far from the stud, the watch may be put into the case and hung up with the others. This was a general outline of the process, and the spring could be thus fitted and approximately regulated in one hour. There were different ways of timing, sometimes followed, and numerous little details to be attended to, especially in a fine watch, in order to get the spring perfect. These it would be impossible to give here. Mr. H. should get the back numbers of the CIRCULAR containing the articles of "Excelsior" on the subject, where he would find all the *minutiæ*, from making a spring up to the adjustments for isochronism and positions, with descriptions of new tools, methods, etc. They were undoubtedly the most practical and reliable article on that subject ever published, and had been officially endorsed as such by the Club. So great had been the call for them, that the publisher was long ago unable to supply the back numbers, and Mr. H. would have to borrow them of some fortunate subscriber. It was, understood, however, that they were soon to be republished in book form, when Mr. H. would do well to secure a copy. What the price was to be, he did not know, but no reasonable sum should deter any practical workman from purchasing it.

DIAMOND GRAVERS AND DRILLS.

To the Gentlemen of the Horological Club:

I have a good deal of trouble in pivoting and turning hard steel. As the diamond is so much harder than steel, it seems as if that might be used for working it. Are there any such things as diamond drills and gravers for sale? If so, please state the price and the place where they can be got, and greatly oblige. A. H.

Mr. Clerkenwell said that diamond drills could be had of most material houses, but they were only good for drilling jewels, etc. They would not do for pivoting. Diamond gravers, however, were very useful to the watchmaker for turning hard steel. They were small diamonds or pieces of diamonds, set with their natural cutting edges outward, and, if carefully used could last a great while. They were to be had of all shapes and sizes of cutting edge, of Mr. Dickinson, whose card, he believed, was in the CIRCULAR. That gentleman had given much attention to preparing diamonds for all useful purposes in the practical arts, and would doubtless furnish Mr. H. with what he desired. The price ranged from $5 to $20.

OUR TERMS FOR EXAMINING AND REPORTING ON NEW TOOLS, ETC.

Gents. of the Horological Club:

Noticing the description of Mr. Schwerter's jeweling tool in your report for August, I would inquire if you make a practice of examining new improvements in tools, etc., and giving notices of the same in your published reports? If so, what are the terms or charges? I have a valuable improvement in galvanic batteries, very useful to electro-platers and watchmakers, which I would be glad to have examined and reported on by your honorable body, if it comes within your rules or customs. Respectfully, G. R. G.

The Chairman replied, for the Club, that we would be very happy to examine and report on new tools, etc., for any one desiring our opinion. For this, no charge was ever made. But the article was referred to the member most conversant with that subject, for trial, and he generally considered it to be his perquisite, for the trouble of studying it out and giving it a thorough test. The actual result of the trial, whether favorable or otherwise, would be published as early as possible. When requested, however, no report would be made, if unfavorable. The Club had no wish to injure any one, but if any report was made it would invariably state the exact facts in the case for the guidance of the readers of the CIRCULAR. It must be understood that the Club does not engage to advertise the manufacturer's address, prices, etc., but only to report on the merits of the article. Anything further than that belongs to the advertising pages, over which the Club has no control whatever, being indebted to the well known liberality of the publisher for the gratuitous use of what space is occupied by our reports.

A GIFT TO THE TRADE OF THE FRITZ COMPENSATION BALANCE.

The following communication, from Mr. C. E. Fritz, was then read, in which he very liberally gives the free use of his improvemont in compensation balances to all who desire to apply it practically. As it has been repeatedly commended by the Club, it is unnecessary to add more respecting our high opinion of its merits. It was also specially mentioned by "Excelsior," in his articles on compensation, as one of the four improved balances which gave the best promise, which is certainly high praise, and from an excellent authority. The example set by Mr. Fritz is one worthy to be followed by others who have made improvements of value to the trade. Instead of covering it by patents and restricting its use to a few purchasers of rights, he very generously gives the benefit of it to all, without charge.

Secretary Horological Club.

Through the medium of your honorable body I hereby present to the trade the free use of my improvements in the compensation balances, as substantially embodied in the adjustable radial segment compensation balance, described and illustrated in the JEWELERS' CIRCULAR for January, February, and April, 1875; the *Watchmaker and Jeweler* for February, March, April, May June, and July, 1875; the *British Horological Journal* for January, February, March, April, May, and June, 1876, and other papers. The commendations, which this balance has received from the best sources, justify me in believing

that it has superior merit, and that by its use a wider range and more perfect adjustment can be obtained than with the ordinary balance, and at least equal to any of the improved forms yet known, while it is not difficult to construct or adjust, nor liable to get out of order. The above named papers give all particulars necessary to enable any one to understand and construct it. I should be pleased to see it widely adopted in use, and would respectfully request manufacturers or others who apply it, to designate it as the Fritz balance, in all competitions, reports, etc., that its performance may be distinguished from that of others. Any communications concerning it may be addressed to me in care of the JEWELERS' CIRCULAR. C. F. FRITZ.

COLE'S TREATISE ON ISOCHRONISM.

Mr. Isochronal alluded to the former remarks of Mr. Regulator upon Cole's Treatise on isochronism, published in the *British Horological Journal*. Many workmen had thought them rather severe, especially as its publication was not then completed. It had since been brought to a close, but not a single new fact had been developed by it. If Mr. Cole really possessed any knowledge on the subject beyond that known to all good workmen, as was supposed, and indeed, advertised before his treatise appeared, he had been very careful to keep it to himself. The speaker considered that the strictures of Mr. R. had proved to be well founded, and he now made bold to intimate further, that Mr. Cole's much vaunted superior knowledge was purely imaginary, as was shown by the manner of its treatment. So long as he was merely remodeling other men's ideas and well known facts, he was all right, but as soon as he struck on t beyond that he was all at sea. As for his theories, they were fanciful and far-fetched, say nothing about their bearing on the subject, or their value and novelty. He thought that Mr. Cole should now either "step down and out," or else proceed forthwith to furnish the trade with a stock of fresh information which had been promised them in his name. We, in this country, had not contributed to the fund paid to Mr. Cole, and therefore had no legal claim upon him, or any other except the promise to the public. But a promise among men of honor, considered as binding as any pecuniary obligation could be. The speaker then referred to the practical articles of "Excelsior" on the balance spring and the different adjustments required in watches and chronometers recently published in the JEWELERS' CIRCULAR, as being far more valuable, and giving more information, both new and standard, than the essay of Mr. Cole or any other yet brought out on that subject. In this opinion he was sustained by the best workmen in this city, who expressed great disappointment at the manner in which Mr. Cole's treatise had turned out, after having been led to expect something extraordinary.

TRADE SECRETS AND TRADE HUMBUGS.

To the Secretary of the Horological Club:

Having no faith in trade secrets, and desiring to expose humbugery and be of some benefit to honest men, I present your honorable body the enclosed proposition. JOHN H. DAVIS.

The Secretary then read the enclosed circular to the Club. It was issued by a Mr. A. Styles, who stated that he had just arrived from Geneva, Switzerland, where he had secured rights to three trade secrets, very valuable, etc., viz.: "How to lengthen the guard-point of the lever, without hammering the point, soldering on a piece, or stretch the lever;" "How to pivot without drilling;" "The process of reducing watch glasses without use of a grindstone, etc. By this new process, glasses can be reduced to the required size, and fitted into the bezle almost in an instant. *No more* a general assortment of running numbers needed, odd numbers and surplus stock of watch glasses on hand can be used up—no loss of time—glasses can be reduced and fitted almost as quick as to have the proper size on hand—warranted to make a nice, smooth job." Price fifty cents each, or the three for one dollar.

Mr. Uhrmacher agreed with Mr. Davis, that trade secrets, as a rule, were merely trade humbugs. Probably all of these "secrets" were known to any good workman. The lengthening of the lever was done by cutting down just behind the guard point with a screw-head file, and then prying forward the thin slice thus separated. If it broke off at the bottom, a piece could he soldered on in its place, or the stump filed down, a hole drilled through the fork, and a pin put in after the English or American lever style. The pivoting, without drilling, was probably by a method recently patented, for manufacturing pivots on short sockets. These sockets were to be fitted over the stump of the staff or pinion. The method itself was entirely worthless, practically, and besides that, no one could use it without paying the patentee. The fitting of watch glasses was probably by dressing them down with diamond files while held and turned in the lathe. This was quickly done, but every workman knew that glasses dressed down were never so strong and durable as those with the natural edge on. Every one of these secrets was well known and practically worthless, and it was no better than a swindle to take money from green workmen for them. It was for their benefit that he had been thus minute in his remarks. And he would say that if a watchmaker wished information on any point connected with the trade, let him apply to this honorable body and save his money. All communications should be addressed to the Secretary of Horological Club, care of the JEWELERS CIRCULAR. Mr. Davis has the thanks of the Club for his spirit and promptness, and it was hoped that all other watchmakers would be equally ready to denounce such cases of imposition as came to their knowledge. The race of trade-secret swindlers would then soon become extinct, as they would find no victims, except among those who do not take the trade paper, and consequently do not keep posted on the improvements of the day, and the new tricks and traps of the rognes.

LETTING DOWN ENGLISH LEVER MAIN SPRINGS.—NOTICE TO OUR READERS.

Mr. F. W. Hunt sent in a letter correcting the reply to the above question, which was given a few months ago. The letter is omitted, as it would be but a repetition of that answer. Mr. McFuzee replied to Mr. Hunt, that he had given the answer referred to by that gentleman, and the method of letting down the spring described in his letter was identically the same as originally stated in that answer, as Mr. H. would discover by turning back to it. He would, however, thank that gentleman for his good intentions, and hoped that he or any other reader of these reports who could rectify any erroneous advice therein, or could give better ways, would kindly do so. Should any one differ with the opinions expressed on any subject, he is not only welcome, but is invited to send in his views, always observing brevity as far as possible. So, also, if any one is able to add further information on any subject discussed, or any other of interest to the trade, the Club will be very happy to hear from him. Next to the self-glorification of the members, the great object of this association is to give valuable information to all the trade who ask for it, and in this laudable endeavor they merit and seek the co-operation of their brethren who are so fortunate as to possess superior knowledge. For their reward, they will have the satisfaction of knowing that they have secured immortality, for their names will be embalmed in the JEWELERS' CIRCULAR, and handed down to future generations of watchmakers, surrounded with a halo of glory arising from their connection with this wonderful and beneficient institution, the Horological Club; while we, ourselves, the grand panjandrums and sanhedrians of the concern, modestly and disinterestedly remain in obscurity, hidden under technical *pseudonyms*, forever unappreciated, unpraised, and unknown.

At this stage of the proceedings, a number of the members were compelled to retire, on account of the cold, the Council Chamber not having been provided with conveniences for warming it so early in the season, and the Club then adjourned, leaving several communications to stand over till next month. This was a great disappointment to the Adjuster-of-the-French-School, who had just taken the floor to give vent to his views on matters and things. As his ideas are always peculiarly original and interesting, their unfortunate suppression is a sad loss to the world. May the fates be more propitious next time!

ENAMELING ON BRASS AND GERMAN SILVER.—The adhesion of enamel to brass and German silver, it is said, may be most perfectly effected by first engraving or pressing the design to be enameled into the alloy, and then coating the whole object, or only the depressed design, galvanically with copper. The enamel can be fused upon this surface as usual, and may then be bronzed, or silvered, or treated in any usual way.

A Treatise on Isochronism and Elasticity of Metallic Springs.

BY JAMES FERGUSON COLE.

The curves already mentioned are to be regarded as contracted from the cylindrical body of the spring in the most regularly gradnated volute form; but as the cnrve admits of being as easily made irregular it may be observed, as an extreme case, that if the wire from the true circle be bent at an angle by a sharp curvature, and then carried straight into the point of attachment at either the stnd or collet end, the knee thus formed in the wire would become a distinct fulcrum and new center of motion, operation in some degree as an extension of the crank leverage of the collet.

By so abrupt a bend the action of the spring would be much distorted, as the coil at that point could neither expand or contract sufficiently; it would, therefore, increase the action on the opposite side, with corresponding effect on the long and short arcs of vibration, like the abutment of the common stud in the first-mentioned case of the flat spring.

In now adverting to the flat spring, I will add, before concluding this subject, that isochronism, by the whole turn in connection with flat springs, where the d ameter is unalterably fixed, occasions, as said before, an increased difficulty and expense in the springing, timing and adjustment.

My only motive for repeating this is to show the advantage which attaches to the over-coil principle of isochronism, and to recommend the more general adoption of this latter mode of springing.

Upon the altered position of the stnd, planted nearer to the center of motion, a question arises as to whether the general effect of a shortened radius of the stud, with an over coil spring apparently offering less abrupt resistance to the balance than the longer radius of common stud, with a flat spring pinned at the full diameter of the spring, and that, therefore, a greater extent of vibratory motion might possibly be produced by the same power when going to time under like circumstances in all respects, excepting the change in the radius of the stud, I have been induced to make the following experiments.

To a lever watch, with a balance weighing 14 grains, I applied a tempered flat spring with 11 coils, with one coil turned over to suit a stud at the half radius of the flat spring; this watch on trial, in the laying position, when going to time, occasionally struck the bankings, the main-spring power being set up for the purpose a little in excess; this over coil spring was removed, and another tempered spring applied, with only eight coils, pinned outside to a common stud in the usual way, and brought to time with the balance of 14 grains nnaltered, the result in motion being a barely perceptible reduction, the balance still continning to strike the bankings slightly.

After this, the common stud at the long radius was removed, and the same short spring of eight coils adapted, with an over coil, to suit the first stud at the first radius, and the watch again brought to time with the same balance of 14 grains unaltered, the result in motion still being a barely noticeable difference, as in the former trial of this short spring, when pinned outside at the long radius. From this it appears that, while the balance weight and diameter remains the same the elastic force of the spring governing the balance at time in all cases can only produce like effect in regard to the extent of vibratory motion.

The evidence of those results sufficiently satisfies the above inquiry, proving by practical demonstration on the same watch, that the over coil mode of springing may be adopted with a certainty of the same extent of vibration being produced as with the common flat spring, and with any convenient number of coils, the difference in effect in the different applications being so small as to be of no important consequence in practice.

In another instance, a tempered flat spring having 18 coils, with an over coil pinned to a stud of extreme short radius, going to time, and vibrating a turn-and-a-half, was removed from the watch, and another spring of much less diameter, finer wire, and only 10 coils, was applied with an over coil pinned to the same short stnd, and same collet; the result in motion of the balance was, in this case also, found apparently the same as with the thicker long spring in the previous trial, with the balance at time as before.

Those experiments and results lead to the conclusion that springs of any convenient number of coils, or difference of length, will answer equally well, and may be made isochronous; it is, however, of no advantage to employ more than 12 coils for the balance-spring when in connection with the chronometer, duplex, detached lever, or any other escapement of the class called limitary, signifying such as will not admit of two full revolutions of the balance without striking the bankings, or over-running or repeating the impulse; both these faults of over-action are found so seriously detrimental to the otherwise uniform time keeping, that every care should be taken in order to prevent such liability to casual error.

The number of coils nsually applied to marine chronometers averages about 11, for the cylindrical high spring; the number may, however, be more or less, with a suitable difference of length and also strength or thickness of wire for the determinate time, provided at the terminal curves and radial extension of the stud and collet are made equal to the half radius of the particular spring employed; cylindrical springs, with a less number of coils, require a greater exertion of the curve to render them isochronons, and at the same time true in action; long springs, on the contrsry, requiring a less extension and greater abruptness of the curve, as the general figure of the long spring is subject to less distortion of form.

ON THE FORM OF PENDULUM SPRING WIRE.—REFERENCE NO. 5.

By the fact that a given length of perfectly round steel wire, set straight, is of eqnal strength when deflected through a given arc in any direction, and that flatted wire and flat springs of every description bend more easily as they are thinner as compared with their width so the strength of wire for balance-springs will be various for the same weight of wire per foot of length, for various widths, according to the sectional area or relative width and thickness of the wire.

A spring made of very thin and broad wire would not have its elastic force or resistance generated so rapidly as it would be in the case of a thicker wire of the same weight per foot of length; first, for the reason that a greater number of thicknesses of the wire would be contained in that length, which wire, representing a longer lever in proportion to the thickness, would be less resisted; and, secondly, as the thickness is diminished by flatting, the width is increased, and also the length to some small extent, but in increasing the width it should be particularly observed that the greater strength has been given to the wire edgewise, in which direction it does not act, and, therefore, would not resist so much in the flatted direction, in proportion to the increased width of the wire or spring, as will be understood.

This view, I think, may be admitted, as in a wire of any certain dimension there is a certain amount of resistance at any specific arc of flexure, the sum or value of which, if divided, or made capable of resistance in a transverse or other direction, or to gain equal advantage both ways.

To illustrate this practically, take four equal lengths of snitable wire or watch main-spring steel, set flat by heat, in a perfectly straight condition, each piece three inches long, and riveting two of the pieces face to face with a few small rivets, these pieces together representing one of donble strength and thickness.

The other two pieces fix edge to edge by a firm clamp, at the root ends, so that the free ends may be connected together by attaching a movable clamp weight, these two pieces representing together the broad thin wire, the clamp weight being now allowed to act by its own gravity, will deflect the two springs through a certain arc of motion downward from the horizontal quiescent point, this point being marked, remove the clamp weight, and repeat the experiment with the prepared thick spring, attaching the same weight, and the greater resistance of the narrow wire thus represented will be shown by the less deflection, in this case, from the point of rest, though the solid contents be alike in both cases.

Tales of the Trade.

No. 2.—An Extensive Customer.

The other day he and she came down Broadway from the Fifth Avenue Hotel. He was a good looking specimen of the young men that make a country, and she was a bright-eyed girl with the freshness of country life in every look and action. Both were evidently well off, and as evidently unused to the necessities of wealth. I noticed him first in the parlor of the hotel, where he was struggling for dear life with a bran-new pair of dog skin gloves. He handled them as if they were top boots, and finally attained peace when half of the palm of the left hand dissolved partnership with the rest of the concern. Then he sat still, and brushed his hat until she arrived.

She had an old lady, that looked like her mother, along. She pranced up to the glass and clapped her hands behind her back, just under. neath where the waist of her dress was, gave her Gainsboro' hat a vicious yank to make it set according to her idea of style, and went for her gloves, which were a sombre shade of green. The mother sat down and admired the rising generation.

At last the fixins were complete, and the pair started off for a promenade. The old mother rather spoiled the effect of their departure by opening the parlor window as they swept past, and remarking, in a tone which made its mark above the rattle of the street:

"You be keerful of Cynthy, David; don't eat too much neither, and be right back for supper at six."

At first she hung on his arm like a basket of flowers on a gardener's elbow, but it seemed as though folks took particular attention of them (which, indeed, was in a measure the case), and when he lit up a very large cigar of very curious quality, she took a good hold of her flounces with one hand and swung her parasol with the other. He robbed the world of the enjoyment of his yellow gloves and burried hands, etc., in his great coat pocket.

That promenade down Broadway was not as nice as he and she had anticipated. The crowd got in their way, and when they stopped at the windows rude young men would stop too, or ruder urchins ask foolish questions about the Centennial. Matters came to a climax at the corner of 17th street. There is always a crowd at this point, and to-day there was a jam. She was elbowed and pushed about, and he was jostled off the pavement and almost run over by a passing carriage. So when they reached the other side, and a small boy, who asked for a penny and didn't get one, remarked: "Yah—yah cintinials; go home, meanies," she was to be pardoned when she swung her parasol pretty hard his way and mashed the carved handle against the iron railings. Perhaps she was looking for a quiet place to cry when she caught sight of the comparative emptiness of the park in Union Square, and off she started for the dear familiar shade of the trees and the home-like twitter of the birds. They walked down a little way and then sat down.

For awhile the conversation was brisk and indignant, then after awhile the talk died away, and a long pause followed. He began tearing his glove to pieces, and she wriggled that wretched parasol until the ribs squealed. Then he began to talk and she had to listen. He said a good deal and she said a little, possibly because he gave her no chance. At last she turned square around and the next thing was a case of assault and battery, or what would have been if the victim had not been a party to the offense. The old constable was astonished for a moment, but such incidents were not entirely unknown to his experience—after dark—and he understood the situation at a glance. Meanwhile he and she had also realized their situation; she jumped up, clapped her hands behind, as before, and marched off with a blushing countenance, and he rose to his feet five times the man he was before. He looked over the way to where a huge pile of brown stone rises, and suggested to she:

"That's Tiff'ny's, we'll go right over and get one."

"Seems you're awful spry; let's see mother?"

"No; you come right along. That's Tiff'ny's." And over they went and in they went.

He looked one way and she looked another. His gaze was fixed by the massive plate and hers was repelled by the nude bronzes. She went to twitch his coat and get hold of a young exquisite with wire-waxed monstaches, while he put out his hand to lay hold of her and embraced a young society lady. Mutual complications ensued, and he and she wished they were home again, when one of the members of the firm came up, and in quick quiet tones, asked what he could do for them. She blushed again, and he stammered out:

"I'd like to see some kind of rings, sir."

The thoughtful old gentleman led them where the choicest jewels flash in settings of splendor, but he and she did not want diamonds or rubies. There were rings with posies and mottoes, but he and she were strangers to such fancies. She looked at the beauties lovingly, but he was bent on business.

"Now, you look here, sir. These is all right, but this lady and me—we agoing—"

Then the old salesman understood it all, and he handed out a tray of plain gold wedding rings.

"That's the thing, Cynthy, good and chunky and solid, knocks an X, I guess. Got any bigger? Let's see how it suits."

The old salesman smilod as he looked at the couple, but a gontle mist grew dim over his eyes as he looked at the young couple, brave, innocent and loving. He waited until they were suited and then after they had started homewards returned to the office.

"Where have you been so long?"

"Serving an extensive customer," was the reply, as the old man leaned back in his chair and thought of the times that had been and the days that were dead, of the young lives that were soon to be joined together, and of the future in store for them.

Our Centenial Report.

HENRY TROEMNER.

Mr. H. Troemner, of 710 Market street, Philadelphia, exhibits two cases of scales and balances which are not to be equaled in the exhibition. The wares of this house have achieved a national reputation for perfection and accuracy, and the display which has been made at the Centennial Exhibition explains how it is that Mr. Troemner is so widely and well known. Among the features of his exhibit are included two analytical balances with a capacity of 200 grammes, but which are sensible to 1-20th of a milligramme. One of these has been secured by Professor Wayne, of Cincinnati, while the other has been purchased by August Koenig, of Frankfort, Germany. There are also several jewelers' and diamond balances, besides other scales, finished in fine marble and plate, which are as handsome as parlor ornaments. Henry Troemner need never be afraid his goods will be weighed in the balance and found wanting.

MESSRS. PAILLARD & CO.

In the notice of the exhibit of Messrs. Paillard & Co., which appeared in a former issue of the Jewelers' Circular, we omitted to refer to the large orchestra in the Swiss department, in which are incorporated some novel and important improvements. It is fitted with sublime harmonic, and also with a set of reeds, and by a very ingenious arrangement the uncoiling of the springs, which gives the motive power, is made to exert its influence in different directions, thus setting two distinct mechanisms and fly-wheels in motion, one of which works the bellows of the reed attachment, while the other regulates the cylinder of the sublime harmonic. Hitherto it has been impossible to run these two distinct movements under the direction of the one fly-wheel, as in order to obtain the requisite force of wind for the reeds it was necessary to make the comb-cylinder revolve so fast as to injure the rendering of the tune. Now, however, since this ingenious duplex utilization of motive power by Mr. Paillard, a perfect accord in time and tune is secured. The instrument to which we have referred is valued at $2,600.

THE PHILADELPHIA WATCH CO.

The exhibit of the Philadelphia Watch Co. is situated at column N, 55, is one of the most tasteful and best displayed in the exhibition. The exhibition case is one of the finest in the building, and has been decorated with special ornaments and designs appropriate to the centennial year. In this patriotic display, the Philadelphia Watch Co. are not excelled by any other exhibitors. Samples of the extended line of goods manufactured by this firm are arranged upon a skeleton frame of silvered wire placed over a mirror, so that the display is doubled in effect. There are several movements of various patterns, including keyless and eight-day watches, in another part of the case a very fine marine chronometer, fitted with Paulus' Patent Escapement. We would also direct the attention of visitors to the new style traveling clocks, with vertical escapement, which are elsewhere displayed in this exhibit. We would also refer with approbation to the beautiful *niello* work in which some of the watch cases of this firm are finished, and which almost equals the triumphs of mediæval Florence. Taken all in all the display of the Philadelphia Watch Co. is one of which the firm may he proud, for in every part of it good taste, attentive care, and perfect finish are evidenced.

H. F. BARROWS & CO.

The exhibit of Messrs. H. F. Barrows & Co., 177 Broadway, located at N, 43, Main Building, comprises one of the finest display of stock plated goods at this exhibition. Their case of ebony and gold is very handsomely lined with red white and blue silk, and a pyramid in the centre, with mirrors at the back, makes their exhibit particularly attractive. This firm, which has been in active business since 1853 makes a line of goods second to none in style and quality. Their patent chain bracelet, which has had a very large sale, is made in a variety of styles, and with trimmings identical with the finest gold patterns. Their display of neck chains and lockets is very handsome, and comprises all sizes from the delicate Geneva style to the largest cables. The trimmings on their lockets are largely of real stones, cameos, and carved coral and comprise some very neat patterns, which in design and finish cannot he surpassed. The display of necklaces and vest chains is unique in taste and splendor, and an extraordinary finish has been attained in some goods in red gold, to which our attention was specially attracted. There are also a choice assortment of neat styles of sleeve buttons and shawl pins in Roman gold, which fascinate by their beauty, and we are not surprised to learn that this admirable display has attracted considerable attention, both from the public and those belonging to the goldsmiths' guild.

THE WESTON DYNAMO-ELECTRIC MACHINE.

Every day and every hour shows some step taken in advance by science to facilitate the labors of the world. Among the many processes which have sprung into existence during the past half century, few, if any, have resulted in grander triumph than those consequent upon the discoveries of galvanism. The battery called by his name is at work all over the world, speeding the wondrous electric force hither and thither to do the work of mankind, but now the battery is to he superseded by the Weston Dynamo-Electric Machine, which supplies a constant and easily-regulated force without any of the inconveniences of the ordinary battery. In the Weston machine electricity is generated by the revolution of magnets passing a series of fixed magnets. A current is thus induced, which can be modified in force by regulating the rapidity of the revolutions. The machine is specially suited for electroplating, with nickel, gold, silver, copper, etc. It is very simple, easy to manage, requiring scarcely any attention, and but little power to run it, and is very compact and durable. It is, moreover, automatic, the current adjusting itself to the surface of work exposed. The conversion of motion into electricity and its use for the electro deposition of metals is of great importance, since it avoids the use of expensive materials, loss of time, and the deleterious fumes arising from the use of hatteries, the use of mercury being especially objectionable to jewelers and gold platers. A large number are already in successful operation. A medium sized machine, such as is sold for $150, capable of running 200 gallons of nickel solution, and also a large one can he seen in operation at the west end of Corliss Engine Avenue, B, 78, Machinery Hall, Philadelphia.

WM. GIBSON, THE BELFAST JEWELER.

Sometimes on the track the excited throng sees a horse, hitherto unknown to them, clearing the rack and boldly challenging long established favorites as they sweep on to the goal. So it sometimes is in the contest of business that a man, heretofore unrecognized, suddenly swings into the front rank by sheer force of ability and enterprise. This is what Mr. Wm. Gibson, the jeweler of Belfast, Ireland, has done at the Centennial Exhibition. The town he claims as his base of operations may not be large, but it is prosperous, its citizens have made the linen industry, and Mr. Gibson has now given it a reputation for fine work in gold and gems. His show-case, which is very handsome is appropriately decorated with national and civic emblems, while the contents are of exceptional beauty. He exhibits a full line of fine goods, and his designs should be studied hy the trade as examples of delicate taste, superadded to careful thought and unstinted expenditure. A peculiar feature of his work is its modesty. You examine and admire an article thoroughly, without thought of its mere intrinsic value, and then of a sudden you find that you have met with that true art which enobles the noblest materials. His goods have got what is known as the "art soul" in them, and this gives them a rare value to those who care for such treasures. He has a varied assortment of goods on exhibition, ranging from a superb necklace in emeralds and diamonds, which is in exquisite taste, and valued at $20,000, down to little sets in carved hog oak, finished with specks of chased gold, while a special exhibit is made of carved oak statuettes, candelahra, snuff boxes, and other articles for decoration and household use. We heartily commend all our friends to take a good look at Mr. Gibson's exhibit, that is if the crowd will permit them. The trade will then see new designs and also find much to admire in elgegant contrast, in color and disposition of form.

THE TIME GLOBE.

Mr. L. P. Juvet, of Glenn's Falls, N. Y., exhibits at the Centennial a novelty in horological manufacture, which has been examined by all scientists with interest, and honored with unqualified praise from all skilled in horology. The time globe, as this invention is happily designated, is a horological apparatus by which the hour at any given place is designated, and also the corresponding time anywhere and everywhere on the face of the earth. It consists of a terrestrial globe, encircled at the equator by a zone dial, inscribed with the twenty-four hours of the day and the fractions thereof, while an ordinary clock dial encircles the north pole. The zone dial is stationary, while the terrestrial globe revolves on its axis once in twenty-four hours, exactly as the earth does. To set the apparatus in operation for any locality, the hands of the clock dial are removed and replaced in position so as to accord with the time indicated by the longitude of that place on the zone dial at the equator. Care must he taken to set the globe in proper siderial position hy the compass, and also that the proper hour of day or night is designated hy the zone dial indicates the actual time of day or night, as the case may be. This is easily determined by letting sunshine fall on the globe, and seeing which part is in light and which in shadow. Then set the hands of the clock dial to the actual time of the location, and the terrestrial globe revolves on its axis so that the longitude of the location is opposite the same instant on the zone dial. Now the time globe is set, and a glance at the zone dial shows the time opposite every meridian of longitude, and consequently of every place on the surface of the earth. The hands of the clock dial revolve to the right, while the globe revolves to the left, consequently the relative difference in designation of time is maintained, and every meridian of longitude points out its mean time on the zone dial so long as the movement is regulated and kept in proper working order. The movement, which is self-winding in the terrestrial globe, is made of two plates, in the centre of which stands the main spring and harrel, with its arbor extending through the globe as the south pole, outside of the meridian ring, where its end is provided with a knot or thumb piece by means of which the clock is moved up. The

shaft of the first wheel extends through the plate and receives a triple wheel intended to transfer to the minute, hour, and globe wheels their proper motions. The axis of these wheels is secured to the upper plate of the works by a flange with pins and screws, extends through the globe at the north pole to the meridian ring, where it is firmly secured by a set screw, and forms with the arbor of the axis upon which the globe revolves.

SETH THOMAS CLOCK COMPANY.

The clock built by the Seth Thomas Clock Company, of Thomaston, Conn., and forwarded by them to the Centennial Exposition, is calculated to run eight days with one winding, and to strike the hours and quarter hours on a very heavy bell or two bells. It is similar to that made for Independence Hall, Philadelphia, both having the same strike and time train. They differ in this: the Centennial Exposition clock has the necessary alterations and attachments to constitute what is called a quarter strike, while the one for Independence Hall strikes the hours only, on a 13,000 pound bell. The frame is of cast iron, the two main strike wheels are 41 inches in diameter, made of bronze, the main time wheel is two feet in diameter. The movement is also fitted with a patent arrangement for turning on and off the gas at the proper times. The shafts are all of steel and run upon hell metal boxes. The Dennison double three-legged gravity escapement is placed in full view on the front of their arched or upright frame, having a one-foot escape wheel, with two-feet pallets or gravity arms made of bronze, as are all the wheels of the strike and time train. The two second zinc and steel compensation pendulum rod carries a cast iron ball of 500 pounds, the rod and ball weighing nearly 700 pounds. There are 1,200 pieces in all. The frame is 10 feet long and four feet wide, and the clock stands about eight feet high. The weight of the movement is abou. 7,000 pounds. This mammoth movement runs twenty-six dials, two five feet, and twenty-four three feet in diameter, the latter having connection through an electro wire, giving the time throughout Machinery Hall, and also one dial on the outside and at the front end of Machinery Hall building connected directly with the movement.

An Open Letter to the Centennial Judges.

GENTLEMEN. For five long and weary months I have labored, watched and waited, for your report on my "Improved Great American Sap Bucket," which has just been rendered. Day in and day out for twenty weeks have I rung the changes on my sap bucket in the presence of thousands of visitors, and to their entire satisfaction.

I did not conceal the fact from you that I had presented each member of the Commission with one of my buckets, not as a bribe, but that they might the sooner comprehend the difference between my "Improved Buckets" and the miserable imitations of them which are being exhibited by my neighbors from Troughville and elsewhere, and which I feared would be foisted upon the American people unless the Centennial Judges should put the indelible stamp of their disapprobation upon the miserable counterfeits.

You are also well aware (for I told you so), that the Emperor Dom Pedro, and each member of his suite left the Centennial grounds with one of my buckets on their arms, and I took particular pains to inform you that Don Carlos ordered a thousand of my buckets, to be used in his great sap bush near Paris.

Now then I put it to you—does it stand to reason that they would be such sap-heads as to order my buckets by the thousand, unless they were the best buckets which have been produced since the fall of man? I put it to you as judges, as men, as citizens, of this or any other country. One of the chief claims for merit in my buckets is that it makes no difference whether you carry sap, whiskey, vinegar, plantation bitters or water in them, they never lose the flavor originally intended, and which has made them famous, and when, therefore, I received your award and diploma last Thursday night and read that "the Centennial Commissioners award a diploma and two medals to the great American Sap Bucket Co." I at once telegraphed home that we had carried off ALL the honors as we certainly expected and deserved to do "by a large majority." Imagine my astonishment then, when the next morning in reading the notices of your performance, I found that the old pail company of Stateville came out with a grand flourish and claim to have received the first prize also—they having received two diplomas and a medal, and in big capital letters they print the following extract from your official report:

"*For greatest carrying capacity, with precision and durability of mechanism, also novel disposition of the hoops and construction and bracing of the staves.*"

And they go on blowing about six of their so-called patents and improvements which they imagine have made their pails as famous as my buckets.

I must confess, gentlemen, that I read their advertisement with feelings not saturated with those recommended in the Gospels, but when, in addition to this, in another column of the same paper, I read that you had also awarded the same prize to the "Spileville Covered Sap-pail Company," a concern known in all our region as a fraud, a delusion, and a snare, I was mad gentlemen, very mad, and just listen to their claim which you allowed.

"*For purity of tone, and sap retaining qualities, pliant and easy adjustableness to the neck yoke, and back-ache saving qualities to the sap-gatherer*"—why gentlemen I I explained to each one of you that all their blowing about the back-ache saving qualities of their miserable six-quart pails was hosh and nonsense, and I showed you plainly that in a given amount of sap there was certain to be produced as much back-ache by a pail as by a bucket. Then why should you for one moment have listened to their foolish and silly claim? But I have not done yet, gentlemen, I told your committee that the Basswood Soft Soldered Bucket Co. made the poorest bucket or pail of any company in the world, and in the face of this information, gratuitously given to you, you have seen fit to award them "two medals of merit, two diplomas of honor, and one grand complimentary medal *for sap holding qualities, with novel anti-slop-over and non-spilling arrangements, with automatic extractor, which, together with double bottom and patent self-adjustable cover, thereby protecting the sap from the ravages of the grasshoppers and the attack of the potato bugs.*"

Why gentlemen, when I facetiously said to you that my bucket was proof against grasshoppers and potato bugs, I little thought that you would treasure up the idea and use it as a reason for giving a premium to another company, and may I venture to ask how it could be possible for none of your honorable body to recollect that sap comes in March and grasshoppers in July? Why would it not have been better gentlemen to have placed the medals in one huge pile, call all the exhibitors in, and invite them to help themselves, and let the value of the medal consist in the string that tie them. As the case now stands, it reminds me of a private school, in which, in order to win the good will of patrons prizes are distributed to all the pupils, and thus the fond parents on examination day are gratified by seeing their children rewarded for every variety of excellence: those who have done well in scholarship get a reward of merit for their brightness; the dunces are praised for application and good behavior and those who have been unruly get medals for politeness. No doubt, gentlemen, you have been actuated by the laudable desire to please everybody, but your efforts have been in vain, the Centennial bird of liberty with drooping plumage looks down upon your action with mingled feelings of pity and disgust, he hides his devoted head under his wing. Gentlemen, do likewise. Yours complisiningly,

TIMOTHEUS TUBBS.

CORALS IN PERU.—Prof. A. Agassiz has just furnished some remarkable data in regard to the coral limestone found at Tilibichi, in Peru, at an elevation of 3,000 feet above the level of the sea. Prof. Agassiz advances the idea that the Pacific, within comparatively recent times, extended through gaps in the coast range and made an internal sea, which must have stood at a height of not less than 2,900 feet, and that this sea must have played an important part in the deposition of the salt and nitrate beds in Peru. The assumption that a sea must have existed here receives greater weight when M. Agassiz produces eight species of *Atherchestes* (amphipod crustaceans), certainly a salt water genus, in Lake Titicaca, which is at a height of some 12,500 feet.

Trade Cossip.

In ornaments silver abounds.

Russian belts, studded with silver nails, are a novelty.

A revival of business is noticeable in the police courts.

Link buttons are again fashionable in place of sleeve-studs.

The most fashionable ear-rings are arrows of small diamonds.

One of the young ladies at the American Watch Co. Centennial exhibit, has been seriously ill with typhoid fever.

The Philadelphia Exhibition is to close on November 10, the day originally chosen, the managers having decided not to extend it.

Abraham Rice, a small jobber of cheap jewelry, who had an office at 438½ Broadway, was found floating in the North River on the morning of the 18th ult.

Mr. G. J. Sturdy, a Providence jeweler, died very suddenly on board the steamer Richard Borden on the 16th inst. while returning from Philadelphia.

The man who wins a Centennial prize and don't advertise is as bad as the man who buys a $10,000 oil painting, and then presents it to a Blind Asylum.

The Centennial Committee of Award have been lavish of their honors. "Here you are now, gentlemen," as the candy boy says, "a prize in every packago."

Miss Clock, a young lady of striking beauty, was recently married in Connecticut to a young jeweler from the west. The festivities were wound up at a late hour.

Custom house officers recently seized $20,000 worth of jewelry from the wife of an absconding German jeweler, named Goldschmidt, who some time ago fled to this conntry.

Centennial visitors represent a great variety of opinions as to the Big Show, but upon this point they all agree, to wit: That it isn't the worm that knaweth in secret as the flea.

New sleeve-studs represent a calendar, with the date of the month and the name of the saint for the day. On one of the blank spaces is the name of the wearer, and in the other that of the donor.

After a close study of the Centennial awards we have come to the irresistable conclusion that every piano exhibited was the best, every sewing machine the best, and every safe the best ever made.

Mr. Walters, proprietor of the *London Times*, recently paid a visit to the American Watch Co.'s Factory at Waltham, Mass., and was there shown the entire process of American watchmaking by machinery.

It was a rare sight to see two New York policemen engaged in close conversation over a collection of Sandwich Island fishing tackle at the Centennial. One of them privately advanced the opinion that a finer set of burglar's tools he had never laid eyes on.

The tidal wave of financial distress has reached the region in which the Garden of Eden is supposed to have been located, and is acknowledged to have had a wholesome effect in diverting the people's thoughts from the untimely fall of Adam.

It is thought that the dying Cardinal Antonelli will leave 20,000,000 francs, besides objects of art to the extent of a further 1,000,000. He possesses one of the finest collections of precious stones in Europe: diamonds of purest water, emeralds unexcelled, and pearls and torquoises of great size. He has several nephews, but it is asserted that much of his wealth will be given to the Pope.

A successful burglary was perpetrated on the afternoon of Sunday, the 1st inst., at the jewelry store of Franklin Horton, No. 42 Fulton street ,resulting in the disappearance of the whole stock, with the exception of some plated ware. The amount of goods stolen amounts to $18,000 or $20,000. Great sympathy is expressed for Mr. Horton, who loses his entire fortune by this robbery.

H. E. Cooke, of the firm of Williams, Cooke & Klein, to Miss Annie Leonard. They were young and they were 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 they were united in the happy bonds of wedlock at Black Earth, Wis., Sept. 19th, 1876. No cards.

The carbonized skeletons of two men have lately been unearthed at Pompeii. Among the things found near by were eight rings, six pieces of gold, two large armlets, each ornamented with thirteen pairs of half globes, and three hundred and twenty-two pieces of silver money. It is thought they were thieves burned by the falling mud from the volcano, while making off with the spoils of houses ransacked during the confusion.

A couple of New York theives entered the establishment of Messrs. Savage, Lyman & Co., Montreal, and while one of the scoundrels engaged the attention of the salesman, the other attempted to make off with a box of diamonds, but before he had proceeded far acciden tally dropped them, and while coolly stopping to pick them up, was pounced upon by one of the employes of the house. Both the scamps were arrested and lodged in jail, but subsequently succeeded in making their escape.

Mr. Columbus Ewell, of Wellsville, N. Y., complains that a watchmaker calling himself Eugene Schmidtlin, lately left his employ taking with him the following named goods: One silver hunting stem winder, Droz & Perret, No. 25766; one open-faced gold English lever, W. Robinson, Liverpool, No. 33963; one open-faced gold English lever, No. 7259; two ladies' gold cases; one E. Howard gold hunting, No. 7925—engraved on back "F. C. or W. C. Farnum;" one heavy silver hunting Waltham watch, No. 446565, and one silver hunting Home, Boston, Mass., No. 478531. Schmidtlin is a German, thirty-five years of age, about five feet four inches high, light hair and moustache. Has a marked habit of chewing moustache on right side. Eyes light. Some teeth gone on upper jaw, right side. Has heart disease. Wears glasses when at work. Any information touching identity of property or thief will be thankfully received and liberally rewarded.

Several days ago John Cummerford, a Connecticut jeweler, came to New York with the intention of buying some jewelry. He brought with him about $2,000, and invested $1,000 in jewelry, which he gave to a friend to take care of. He then went on a spree for two or three days, and was arrested and taken before Justice Flammer, at the Essex Market Police Court. When asked by the justice how much money he had when he left Connecticut, he replied $2,000. "How much have you left?" asked the judge. The prisoner (shutting one eye), said, "That's my business." "All right," said the judge, "I had no business to ask you that question, but I shall fine you $10 for being drunk." As the prisoner was going down stairs he turned to the judge and said, "Judge, what right have you to fine me $10?" The judge comically replied, "That's my business." A few hours latter the judge learned that Cummerford had only $6 left, so he remitted the fine and allowed the prisoner to go on his way rejoicing.

We are glad to note enterprise everywhere, especially in our own trade, and the firm of J. E. Cauldwell & Co., of Philadelphia, already widely known as eminent jewelers, have certainly made proof of their enterprise in purchasing the entire prize exhibit of the American Waltham Watch Co., which has attracted so many delighted visitors at the Centennial. The case, as many of our readers know, whether they have visited the Centennial Exposition directly, or only by the aid of the JEWELERS' CIRCULAR, contains over two thousand movements, cased in a superb variety of gold and silver cases, representing a very large sum of money. The action of Messrs. Cauldwell & Co., suggests the general confidence felt in the stability of the Waltham movement, and the practical assurance that dealers have against loss by any sudden cutting of prices, or the deterioration of these movements in public esteem. The protection which the Waltham Co., has afforded to the trade inspires thorough confidence, and rightly merits such particular recognition as this.

EXAMPLES OF CORAL IMPORTED FROM THE CELEBRATED HOUSE OF
LUIGI CASALTA, NAPLES, ITALY.
BY VICTOR BISHOP & CO., NEW YORK.

The Jewelers' Circular & Horological Review.

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THE

Jewelers' Circular & Horological Review,

THE RECOGNIZED ORGAN OF THE TRADE.

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

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

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Striking Bottom.

"The bottom is out" say the faint-hearted. On the other hand, "We have struck bottom," say the business men who look ahead into the future. The real danger to the country a year ago was, that we should go on in our careless fashion of giving credit, and paying salaries to dishonesty, until there was no moral stamina left in the commercial community to rebuild on. Happily, the reaction has come before it was too late, and one of the really assuring features of the present revival of trade is the revulsion of public opinion from the loose methods of credit and compromise recently in vogue. We are glad to see that dealers have at last come to the conclusion that the only possible safe-guard against dishonest bankruptcy is to exercise greater care in investigating the character and ability of parties asking for credit. It has been the disgrace of the jewelry business that in no other industry has credit been so cheap, and so wilfully abused. It has been a notorious scandal in the trade, that men whose methods of doing business could mean nothing else than fraud upon their creditors, were practically as good in the market as men who had been tested and not found wanting, for a generation past. There seemed to be no premium at all upon honesty, and dishonesty was fast getting business into its own hands. Happily the universe is not so constructed that this thing can go on forever, and the frightful crashes of the last year or so have opened the eyes of the leaders of the trade to the real significance of their almost criminal carelessness. Their consciences have at last been touched, if it has been partly through their pockets.

The new views, or rather, we should say, the old views, about credit are to be attributed, in no small degree, to the excellent influence of the two associations which have recently done so much towards strengthening trade feeling, and promoting true business principles. The consultation, through them, of the best men in the trade, *backing* instead of fighting each other, has produced its natural good results. They have generally agreed that the rascals are to be given the go-by hereafter, and followed up to the bitter end for their past sins, and they are determined that honesty shall again have fair play. We have no doubt that this new tone will meet the approval of every honest dealer in the trade. Character, promptness, and strict commercial integrity will again count for something, and the men who do not possess these essential requisites must stand aside and give place to those who do. The men who have abused the credit hitherto given to them, will find that in future dealings they will be probed relentlessly, and that, unless they make up their minds to deserve credit, they may make up their minds, on the other hand, not to get it.

At last dealers begin to realize that it is not the amount of goods they sell, but the amount of goods they get the money for, that means prosperity. When the end of the year comes, and the merchant has to look his books in the face, they tell their own story. The new policy is a wise one, as the JEWELERS' CIRCULAR has said plainly more than once; indeed, we believe we are justified in thinking that through the association, and in its influence directly upon the trade, the JEWELERS' CIRCULAR may fairly take some credit to itself for the new infusion of stalwart principle into the commercial dealings of our trade. We cannot say that we have taken this step unselfishly, for the welfare of the CIRCULAR is bound up in the welfare of the trade, and we have never for an instant doubted that the protection of honest trade throughout the country, and the punishment of dishonest trade, has been vitally necessary for the protection of the larger houses with whom our dealings are more direct.

The experience of a great many of our manufacturers has convinced them that the present bankruptcy law, like any bankruptcy law, is, to a considerable extent, a delusion and a snare. It cannot make honest men out of dishonest ones, and it must too frequently afford an opportunity for dishonest men to take advantage of legal technicalities, and screen themselves from the consequences of their false dealings. But there is always a remedy against bad laws of this sort—not to give the laws a chance to operate. The only safety of merchants, as they have now come to see, is to exercise a proper precaution at the time of the incurring of the debt, and secure themselves at the outset against the possibilities of fraud. It is better for merchants to mourn over goods on their shelves than to mourn after them on other people's shelves. We have reason to hope that we have seen the worst of the dull times; the present revival may be looked upon as the first indication of a growing prosperity, if business men will be careful that their business is conducted hereafter on those principles which only can ensure a business prosperity. There is a splendid future for the trade not far off, provided the trade earns it. But, gentlemen, the new tone must not be spasmodic; eternal vigilance will be found the price of prosperity, and prosperity will only come as honest men come by their own.

The Exhibition Awards.

We had intended to give in our last, and again in this number, the full and correct list of awards at the Centennial Exhibition in the jewelry and kindred trades. We have made every endeavor to obtain these lists in satisfactory shape, and, so far as they were in shape at all, have been successful. The entire official list of awards up to date in the several groups with which the JEWELER'S CIRCULAR is connected is in our hands, but the list is as yet neither complete nor correct, and we have decided to postpone the publication until the December issue, when the reports, in the case of those who desire it, can be printed in connection with the awards, and when the list of the latter is in its final shape.

It is yet possible that the list of awards will be extended by the action of the Committee of Appeals, which has so far had before it about a thousand applications. This Committee, which is not of judges but of members of the Commission, takes cognizance, it

should be understood, only of those cases in which exhibits had been originally entered for competition, hnt had in some way been overlooked by the respective judges. Whenever it is found, on reference to the note-hooks of the judges, that the appellant's exhibit has been considered, it is thrown at once ont of the jnrisdiction of the Committee of Appeals. If it is found, on the contrary, that the exhibit has not been examined, the Committee makes or orders an examination, and in the case of merit makes an award,—not over the signatures of the judges, of course, but over those of its own members. It is possible that there may be a half-dozen or a dozen additional awards from this source to be added to the jewelry and kindred lists; and the reports of the judges, which may be expected within the month, must be awaited for the full completion of the result.

The Commission has continued, since onr last, the remarkable vacillation which has characterized all its treatment of the award question. The protest against the signature of the reports hy the general officers instead of the special expert judges, has been so general that the Commission has receded from its action, and the awards will be furnished with the signature of the examining judge and the endorsement of his fellow-members of the group. This will give them, of course, much more value than if they were signed simply hy the general officers of the Commission, who have no personal responsibility in the matter, although their value in the popular judgment has been largely impaired by the way in which they have already been bandied from one to the other.

The system should have properly been left entirely in the hands of the Bureau of Awards, as was at first planned. In that case, although the number of awards has been too large, there would have been much more satisfaction, and the reports would have been in the hands of exhibitors, and officially in print for the public benefit, before this. Any good executive, like Prof. Walker, could easily have compassed this desirable end. As it stands now, the exhibitors have only been able to obtain reports from "powers behind the throne," and we could cite cases where leading houses who have been nnable to obtain their reports in the proper, straightforward and official way, have felt themselves justified in paying the necessary sum to lobbyists who undertook to furnish and did furnish them within twelve hours. We had entered, on behalf of the trade, a request from the JEWELERS' CIRCULAR for proofs of the reports which are already in type, of Group 13, the chief jewelry group. But this reasonable request was denied, in accordance with the general abstructionist policy of the Commission, hy Prof. Campbell, its Secretary.

As it stands, those medalists who do not care to pay money for that which they should have for nothing must await the official publication, in pamphlet form, of the reports of Group 13 and the others. That of Group 13, being already in type, may be expected within a few weeks. The reports run, as stated, from a few lines to several pages, but probably do not average more than ten or a dozen lines in print. Some of them, however, are exceedingly valuable monographs, particularly those, we learn, of Sir William Thompson, upon instruments of precision and research, many of which come into connection with our own trade. By the ruling of the Commission individual exhibitors are entitled to their reports in the order of their application; but, as two thousand and more applications are now on file in the Director-General's office, there is not much consolation in this announcement. The thing has been badly botched by the Commission, and their action in this particular is a decided blot upon what has otherwise been so great and remarkable a success.

Fair Play.

We regret to note a tendency among silver-plate manufacturers in especial to "make business," as they put it, during these dull times, by going outside the legitimate trade for orders. We hear constantly of cases of retailers in the interior who have been offering reasonable terms on contract bids for hotels, steamboats, or other large buyers, being "cut under" by the manufacturers themselves, who have in many cases taken the order for less money than the price at which the retailer himself could buy the goods from them. The tendency is a growing one and so dangerous that the manufacturers should consider at once what will be its final result.

This experiment, we do not hesitate to say, is directly in opposition to all business principles. It has been tried in other trades and its results have always been disastrous. Wherever the character of the business is such that it must depend largely upon the facilities of distribution, that is, upon the character, stability and enterprise of a scattered retail trade, there is only one policy for manufacturers,—that is to encourage retailers and to refrain from competing with their own customers.

It is of conrse a temptation for a manufacturing house to take a large retail order, and if that be necessary to get it, to give away to the parties ordering, the discount they would allow to the retailer and sometimes more. But the giving of better discounts outside than inside the trade is a breach of faith and really dishonorable. The giving of any kind of discount to retail buyers is at least unwise. Retailers who, with their capital and enterprise, are supporting manufacturing houses by disposing of their goods, naturally feel that they have a right to bid for local contracts undisturbed by the manufacturers from whom they buy goods. With such houses of course they cannot compete. When the manufacturers with their great capital undertake to cut the throats of the retailers, the latter have no chance; and that manufacturer who neglects the interest of his business household in this way is already sowing the seeds of bankruptcy, first for his retail dealers, and ultimately, perhaps, for himself.

Railroad Tyranny.

Jewelers must travel, and, when on their journeys, must take with them valuable samples of goods; but if the New York Central and Lake Shore companies are to have their way, a speedy end will be put to the entire trade. The employees of the Vanderbilt lines refuse to take baggage until, by compulsion, the owner has signed a "release," and, in a case which recently came under our notice, they wanted to charge a travelling jeweler about $100. for carrying 100 pounds of extra baggage from Buffalo to Chicago. They offered to cut their rate down to $12.80 if he would value the extra baggage at $250; in the end the traveller had to do so, signing the valuation "under protest." Now, this action is high-handed and unrighteous tyranny, exercised by a corporation over the individual. The Vanderbilts have not a shadow of law or equity to authorize them in so doing; but it is no easy matter for the person aggrieved to take arms against the railroad. The question should be made the subject of discussion by the Jewelers' Association, and that powerful and wealthy organization should teach the Vanderbilts that even railroad kings cannot impose on the public with impunity. We do not pretend to point out the ultimate course to be adopted, for that lies in the province of a first class lawyer, and no other advice would be worth the paper it was written upon; but, in the interest of the trade, immediate steps should be taken to remedy this evil which, if not forthwith checked, may increase to be an incurable evil.

Time to Stop.

Burglary, we may mildly suggest, is getting to be rather too profitable a business,—a little more profitable, in fact, than that of regular dealers in the jewelry line. The bold robberies of jewelry stores in the last few months have amounted to an enormous sum; in fact, we figure that over $100,000 worth of goods have been stolen in New York alone within three months. These figures tell their own story, and are by no means creditable to the Metropolitan police. There is "something rotten in the state of Denmark," and it is about time, if the police cannot do better than this, that the trade should know why. It might, in fact, form a very proper subject of consideration at the Trade Association meetings, and the police authorities should be communicated with to see if something cannot be done. The recoveries out of this $100,000 worth have amounted to a hundred or so dollars' worth of opera glasses, which is of itself a disgrace to our

police. Of course it behooves the trade, also, to take every possible precaution against such robberies. While, in the presence of such successful boldness, the police may rightly be called to account, it should yet be remembered that gold goods are extremely difficult to trace, because the wise burglar—and most of them are wise in their generation—knows enough to put them straight into his melting pot. For this reason it is better to "lock the barn door before the horse is stolen," and take every possible precaution against that very unpleasant experience of leaving a good stock of goods over-night and finding it completely "cleaned out" in the morning. Let the trade do its best to prevent the police having such cases to work up; but then let them insist that the cases are to be worked up relentlessly and successfully.

Canadian Reciprocity.

The Canadian Government has directed that duty is to be paid by commercial travelers upon all samples taken into the Dominion, such payments to be final and not to be refunded when the goods are retaken out of the country. This is a step which will practically put an end to the American drummer in Canada, at least so far as regards the industries interested in this periodical. But though the prospect is not pleasant for manufacturers, they cannot complain, since this course of action on the part of the Canadian Government is the necessary reply to the system of prohibitive tariff on imported goods which prevails in the United States. So long as our manufacturers are protected from alien competition by a high rate of import duty, they cannot grumble if they are taxed when offering their wares in foreign markets. They must take the one benefit with the other burden, and make the best of it. In the end all measures of private patronage and protective tariffs enure to evil for the fostered industries; the world is big enough for everybody, and those fare best who work the best. We do not speak of bygone times, but of the present, and looking at the events of the past year, and considering what has been learned since the 10th of May concerning the status of the United States as a nation, we say: shake off the leading-strings of protection, let our good work stand on its own merits, and we shall right soon be content with the place which we shall have won honorably and fairly. Meanwhile, we must be content when, with the same measure that we have meted, it is measured to us again.

"Busybodies."

There are in this world a certain class of people whose mission will never be fully accomplished until they become disembodied spirits when they can have a finger in every pie and yet never spoil any of the pastry. Meanwhile their hand is in every man's business, and mischief inevitably follows their meddling. If a customer brings them his watch to be mended, they must needs catechise him as to when and how he bought it, concluding with a gratuitous offer to supply a far better article at one half the price. As to whether the performance of the busybody fulfills the promise is another matter; but meanwhile his object is attained, for he has sown the seeds of discontent. The busybody is always ready to point out the mote in his brother's eye, or, the shortcomings in his equipment. "Why don't you do this or that?" "I'm sure I wouldn't stand it" are staple goods in trade of their stock, and they are always ready to dispense these small unmercies without the slightest provocation. If people could only be allowed to settle their differences without the intervention of sympathising or unsympathising busybodies, the world of trade would move a great deal easier. When he tries to catch a pig he gets hold of the wrong end, and his authentio reports are founded in fact, but in inverse proportion to the truth. He says that all centennial sales are sham, and has received special information that the transactions in watches were got up to mislead the trade. He has the evidence somewhere or other, but all he dare vouchsafe is a mysterious shake of the head and reticent closing of his lips. Would to goodness he would always keep them so. Another peculiarity of the busybody is his propensity to scandalous conversation. He hears of the shadow of a story and it grows to groundless confirmation as he cogitates thereon. Then his heart swelleth with the self grown secret, and he seeks some congenial friend to whom he can reveal his awful tale. And so the story rolls along like a growing snowball, until, at last, perchance some honest firm is ruined by the lack of confidence created alone by the mischievous propensities of the busybody. Beware of him! he is at first a pleasant companion, for he knows, or pretends to know, many things, but his friendship is a hollow sham; and he tells you stories that he may learn, wherewith to fabricate spicy anecdotes for the delectation of your friends. Think over the circle of your acquaintances, and whomsoever you mark as a "busybody," beware of him, and let him pass from among those with whom you interchange the conversational currency of life.

Etruscan Jewelry.

Of late years the so-called Etruscan method of ornamenting plain gold surfaces with grains, balls or lines of twisted wire, has become favorite and fashionable. For centuries the process of attaching the decorations was unknown, and it seemed as though the jewelry found in Northern Italy was never to be reproduced. Little by little the lost art was rediscovered, and now our modern workmen have far improved, both in delicacy and finish, on the efforts of their pagan predecessors. But this Etruscan jewelry is peculiar in that it cannot be made by machinery. The design must be built up bit by bit—here a grain of gold and there a graduated series of twisted wires in curves; the die-stamp is out of the question, and only the careful eye and patient hand can be used in this manufacture. We have seen many and choice examples of this Etruscan work, but none which will compare with that exemplified in a necklace and pendant lately made by Messrs. Chatellier & Spence, of 652 Broadway. The necklace is composed of elaborate pendants of luxuriant yet chasto ornamentation, while the largest, or locket pendant, is a marvel of the goldsmith's handicraft. We cannot attempt to describe the intricacies of the designs, for that is impossible; but no words are too strong to express the perfection of balance and delicacy of finish which distinguish these rich and excellent works. In this, as in all other things, American industry has proved how bravely she can excel the old world on her own ground. We demand the best obtainable and we must have it. Hence the existence of specialties like those now treasured by Messrs. Chatellier & Spence as their latest triumph, which have been admired by most of the trade and are already known to all by honorable comment.

Coral Jewelry.

In the current number of the JEWELERS' CIRCULAR we present our readers with an admirable illustration of an exquisite coral set from the eminent house of Victor Bishop & Co., a firm recognized as the pioneer in this line of jewelry. Beauty of material and finish of workmanship have ever distinguished the goods of this house, and nowhere else can be found finer instances of that exquisite translucency which is considered the chief and rarest excellence of coral. The necklace, of which we present an illustration, is composed of carved Cupids, each cut from a single piece of pink coral connected with medallions carved with Cherub heads. The pin or pendant is made from a piece of coral of unusually large size; the centor piece, representing a beautiful head of Diana, while on the sides are heads of hunting dogs, set in a border of graceful foliage; three pendants complete this unique ornament. The earrings display the features of the nymphs of the goddesses also encircled with chaste decorations. The entire set is a rare treasure of art, and displays in a marked degree, the taste and artistic perception of the gentleman who is now at the head of this house. We need scarcely remind our readers that Messrs. Victor Bishop & Co. offer an unexcelled selection of fine cameos, pearls and other precious stones.

The Middletown Plate Co., whose attractive display at the Centennial was so much admired, has acheived a high reputation for the artistic designs and careful finish of their wares. Those who admired this display will not be surprised to learn that the competition for its possession was quite animated. In the end the entire exhibit was secured by Messrs. Robbins, Biddle & Co., the well known jewelers, of Philadelphia, who have shown that they appreciate a good line of goods and are quick to seize upon it. This is the first instance of the purchase of an entire exhibit in this line at the Centennial, and we congratulate both parties on their bargain.

The Horological Movement in Germany.

Editor of The Jewelers' Circular, DEAR SIR:—I think it a duty to the readers of the CIRCULAR, and to your countrymen in general, who, on every occasion, show so much sympathy to our national development, to acquaint you with the lively movement which has within a year sprung up in our trade. Having read, in the May issue of the CIRCULAR, that the trade in your country is also suffering under similar difficulties as ours, I think it may be useful and interesting to give you a statement of what has been and is still going on here.

With the beginning of this year a horological journal has made its start. It was not the first attempt in this direction, several journals for the same purpose having appeared and failed after a short struggle and deserved their fate, since they proved merely speculations of publishers who fancied it a very easy thing to get a man without the slightest knowledge of our art to write on horological matters or to translate articles from foreign journals without even a revision by a thorough horologist. This journal appears at Nuremburg, Prussia, near Leipsig, and has honestly endeavored to meet all the wants of our trade. It is issued twice a month, and from October 1st once a week. It has had the unexpected success of getting 3,500 subscribers until now, which number is still increasing. The journal has been the principle means of convoking a Horological Congress at Harzburg, a beautifully situated little place in the Harz Mountains. This Congress met on the 4th, 5th and 6th of September; it was attended by about 240 members, and treated the following questions:

1. Which are the principal causes of the progressing decline of our art, and what ways may be suggested for an effective raising of the same within the limits of the existing laws?

2. Why is it necessary to establish a union of practical horologists, and how ought it to be done?

3. Would it be advisable to establish a general German Union of our trade, or might it prove preferable to organize a union of the local societies?

4. Is it practicable to establish a German Horological School at Glashutte?

5. Which method may be proposed and universally accepted for the transactions with manufacturing wholesale dealers.

6. What advantages may be expected from co-operation in purchasing watches and materials?

7. Would it seem advisable to get up regular supporting funds with our trade societies?

8. Is the general introduction of testimonials for workmanship practicable, and would it be advantageous?

9. Is it useful to introduce voluntary examinations of apprentices, with testimonials of equal form and tenor for the whole German Union?

10. Why should it be avoided to estimate the prices of watches for the public?

The first meeting was held on September 3d, and it was occupied by a hearty welcome to the assistants, and by the necessary organisatory proceedings. The President of the Watchmakers' Union of Berlin, Mr. Rheinhold Packel, was elected President of the Congress; the writer of these lines and Mr. Schwepenhauser, of Frankfort-on-Main, were elected Vice-Presidents. After this preliminary meeting a solemn dinner united the members, and numerous toasts, and not less than nine songs of earnest and humoristic contents, each of them the product of watchmakers' brains, cheered up the meal. A walk in the beautiful environs of Harzburg concluded the day.

The next morning at 10 o'clock the session was opened and the 1st point of the programme was put to discussion which took a very lively course, after which it was unanimously resolved that the organization of local and provincial societies in our trade, with a central directory, was the most efficient way to raise the moral and material position of the German horologist.

By this resolution the second and third questions were already taken up and several of the members had prepared a memorandum with regulations for the provincial and central societies, and this proposal was accepted in principle, so that there will be about sixty provincial unions, corresponding, as much as possible, with the districts of public administration, and one Central Directory to be conferred upon one of these Unions. For the next period the Directory is to be with the Berlin Union.

The 4th question was introduced by a report of the writer of this communication, bearing on the existing horological schools of Switzerland and France, and their prosperity and development, and on the fundamental views to be proposed for attaining success in this undertaking. After some discussion these suggestions were accepted and the speaker was entrusted with the mission of introducing the project to the Government of the Kingdom of Saxony, and of taking all the necessary measures required in continual accordance with the Central Committee at Berlin. Here the meeting adjourned after six hours close work. The evening was dedicated to trips into the beautiful environs of Harzburg, and to the examinations of the various exhibitions of tools, horological novelties and literature.

The next day the proceedings were opened at 10 o'clock, and the 8th point of the programme came to be treated. This, as I understand from some of the recent issues of the CIRCULAR, has been the object of the discussions in the trade of your country. The practice of many wholesale dealers of selling to the public at large at wholesale prices has caused heavy damages to the honest retailers, and also to those wholesale firms who adhere to more respectable principles. Many instances of very unfair proceedings were brought before the meeting, and a resolution, running as follows, was carried unanimously: "The transactions with manufacturers and wholesale dealers who carry on a retail business at the same time ought to be stopped as much as possible." It is intended to publish in the *Journal* a list of those wholesale firms who promise to act according to these principles.

With respect to the 6th point, those Unions who have some experience in keeping co-operative stores of watches and clock materials pronounce them very useful and worthy of general introduction, especially because they produce a friendly and sociable intercourse among watchmakers of the same place or district. The same resolution was adopted regarding the following question (7th.)

The 8th point of the programme requires a word of explanation to your readers. Formerly every workman had to carry with him a book when travelling in Germany; it took the place of a passport and had to be presented to the police in each town he passed through to be signed. This same book served for the purpose of receiving testimonials of skill and good conduct from each employer where the man had worked, together with the time he had stayed there. There were rather severe regulations and penalties for the purpose of having the books always complete and in good order. With the introduction of freer legislation in an industrial direction, these books were abolished; but since that time the conviction has become stronger that there are many obstacles in receiving men in a watchmaker's or jeweler's shop without any means of establishing their identity and without the slightest reference as to their ability and character. Therefore the meeting resolved to introduce testimonials of a certain form and tenor for travelling workman. These, of course, could not be enforced by any law, but a man without any testimonial would be suspected.

The 9th question needs a similar explanation: under the old legislation the guild of each trade was surrounded with legal difficulties and would never allow an apprentice to be left off before his ability was proved satisfactorily, by a piece of his own workmanship. At the same time no workman could establish a business of his own before he had been travelling six years for his improvement, and before his practical ability was satisfactorily proved by his making a repeater watch, under close survey, in shop of a master of the trade. These regulations are abolished, but it has been felt for many a year that something must be done to raise the average requirements of our young men, by the introduction of facultative examinations of passed apprentices, with diplomas for those who go through it honorably, was acknowledged as the best way to stimulate the young men to energy, and to reward his merit.

A short discussion on the 10th point led to a resolution that giving estimates about the price of watches should be avoided in future by all members of the Union. Thus the whole programme had been gone through, and the proceedings were closed on the third day at 10 o'clock.

These days will live in the memory of all who were present. They have brought many old friends and shop-mates together, and they have brought many men in personal contact who had hitherto sympathized with each other at a distance. All the discussions were carried on with remarkable order, and in the spirit of friendly co-operation—not the slightest disharmony has disturbed the general good impression. The evenings were devoted to conversation, and like Germans everywhere, we had the charm of our beautiful four part songs to heighten our pleasure.

Should these communications be of interest to your readers, I shall be pleased to keep you informed about all further measures to be taken in the matter.

GLASHUTTE, SAXONY. M. GROSSMANN.

APPLETON'S ART JOURNAL. BY PERMISSION.

"THE CENTURY VASE."

It has been the aim and object of every leading manufacturing firm in this country to signalize and mark the Centennial year by some supreme effort of industrial art. This specially applies to the honorable brotherhood of workers in silver, and each and every house offers for criticism and admiration some magnificent trophy of the achievements of skilled labor. In such a display one of the first firms to be looked for is the Gorham Company, for this house ranks as the patriarch of the trade, and one is not astonished to find that it is represented at the Centennial by a masterpiece which is unsurpassed in purity of material, in felicity of design and in excellence of finish. The idea of "The Century Vase," is to present a combined symbolism of the past and present of this country, and in this lofty and ambitious intend Messrs. George Wilkinson and Thomas J. Pairpoint have succeeded wondrous well. The work may be divided into the base with plinth and the vase proper, the former embodying the history of time past, the latter the full fruition of the present day. Following the design from the base upwards we first observe two figures of armed Indian and Pioneer while on either side there stretches away a coping richly ornamented with wild game and fruits on one side and agricultural products on the other. This border encircles the entire and is symbolical of those early days when civilization had as yet scarcely acquired a footing on this continent. Thence there rises an easy sweep of silver to a solid slab of granite emblematic of the security of government, around which are displayed the thirty-eight stars of the United States, thirteen of which, representative of the original colonies, occupy the place of honor along the front of the slab. On the left hand side Bellona with angry torch in hand bounds on the cruel dogs of civil war amid the debris of the battle ground while on the right the lion led by gentle children among music and flowers, denotes the return of peace and security. These groups are worthy of special attention for each is of admirable spirit. In the centre, the outcome of events, rises the calm solid plinth set on either side with massive bison heads and decorated with two medallions in *bas-relief*, one depicing the Genius of Philosophy presenting a portrait of Franklin superintending the operations of the printing press, while in front the Angel of Fame bears aloft the portrait of Washington to eternal glory. From the summit of the plinth the shank of the vase rises until the two panels of the body are reached. One represents Genius ready to record the progress made in literature, science, music, painting, sculpture and architecture, while on the reverse is indicated the advancement in commerce, agriculture, mining and manufactures. The summit of the vase is occupied by a statuette group representing America, inviting and welcoming all nations to unite in the celebration of the Centennial year, while around the central figure stand representatives of Europe, Asia and Africa, each bringing in their contributions to the Exhibition. It is impossible to give our readers a correct idea of the many excellencies and beauties of "The Century Vase." by a mere description, but we have no doubt that many have seen and admired it during their stay at Philadelphia. There can be no question but that it is one of the leading features of the Exhibition and will still be so when, after the lapse of another hundred years, it will be again set forth by the Gorham Company in 1976.

The Rare and Precious Metals.

Platinum.—Although this metal, from its peculiar physical properties, is available for numerous purposes in the arts and manufactures, it does not yield many colored combinations, and on account of its expense is seldom employed by artists.

Platinum was first discovered in 1741, and is now found in Brazil, Peru, the Uralean mountains, and in small quantities in the sands of the Rhine. The oxides of platinum are of a black or gray character, but by the addition of the alkaline and earthy salts to solutions of platinum, we form triple compounds, which are generally of a yellow or buff color. Some peculiar platinum yellow was introduced to the artists, but though very permanent, it was not superior to other pigments, and the chromate of cadmium now supplies its place. A very fine and peculiar yellow is made from platinum in the following manner: Take a solution of the chloride of platinum and add a sufficient quantity of lime water to render the solution perfectly neutral, and then in the dark give a slight excess of lime to the mixture; place the solution in a clear glass bottle in the sunshine, and gradually a yellow powder will be precipitated, the quantity varying with the amount of light to which the solution is exposed. This color is unchangeable under the influence of either the light or heat of the atmosphere.

A gray, used in ornamenting porcelain, is prepared as follows: Mix together one part of powdered platinum with three parts of minium, one of sand and one of borax.

All the metals which ordinarily accompany platinum possess similar excellent qualities, and fine useful colors are made from palladium and ruthenium.

The mode in which finely divided platinum is prepared, is by decomposing the ammonia-chloride at a red heat; the residue is a very porous and hut slightly coherent sponge. To make it still finer, some sea-salt is mixed with the yellow salt, the first being afterward washed out with boiling water. In this state the metal is of a fine black, and is of the utmost permanency. The lustre of platinum is obtained by mixing with a concentrated solution of the metal some essential oil of lavender; this solution is washed over the porcelain, which is then exposed to a strong heat in a muffle, when it soon acquires a fine metallic lustre, which admits of being heavily burdened. The French vases, which are platinized by a process similar to that above described, are of considerable beauty, and have the advantage of the mere silvered ones by remaining untarnished for years.

Glass is platinized by precipitating the metal directly from its solution upon the surface. An alcoholic solution of chloride of platinum is evaporated to dryness, then the dry mass is redissolved, again evaporated, and thus continued until no longer any metal is precipitated by a solution of sal-ammoniac, it being in fact converted into an organic compound of acetile and chloride of platinum. When glass is coated with a solution of this substance and held in the flame of a spirit lamp, the platinum is revived as a brilliant metallic mirror, over the surface 4 parts of dry chloride of platinum, 4 of alcohol, and 5 of the essential oil of lavender is the mixture employed both on glass and hard porcelain.

Iridium.—This is one of the metals commonly found with platinum, and which possesses many chemical and physical properties in common with platinum, palladium, osmium and rhodium. The oxide of iridium is used in painting in vitreous colors; the metal is of a very fine gray, but its oxide produces a black far superior to any of the mineral blacks known. The advantage is that it is not decomposed at a cherry heat, at a white heat, however, the oxide of iridium loses its oxygen, and if placed in contact with any hydrogen, or hydrocarbon, the mass detonates with violence. It forms, with rhodium, what is known as the native alloy, which, being remarkable for its hardness, is sometimes used to form the bearings of delicate philosophical instruments. Its alloy with osmium is used for making the points of the so-called diamond-pointed gold pens, as we have mentioned on a former occasion.

Palladium.—This metal is of great value in preventing silver from tarnishing. When from 15 to 25 per cent of palladium is united with silver, the compound metal may be exposed to any of those chemical agents which blacken silver, without effect. In this way any metal may be protected, and thus palladium will be of great value in many departments of manufacture.

Rhodium.—Some of the salts of rhodium are of a most beautiful red. A silicate of the oxide of rhodium is used to give to glass a fine ruby red, which is as beautiful as that imparted by gold.

Uranium.—The oxide of uranium, when pure, produces a beautiful delicate yellow; but it often contains oxide of iron, and this gives a greenish hue to the glass, which, however, is not unpleasant. Uranium is generally obtained from a mineral called *pitchblende*, which is a mixture, in uncertain proportions, of the oxide of uranium, of galena, and of iron pyrites, and the sulphuret and carbonate of copper. Having procured a solution of the nitrate of uranium, the oxide is precipitated as a yellow powder by ammonia, and after being well washed with soft water, it is in a state of purity.

Vanadium.—This metal was first discovered in the slags of the reducing furnaces of Tabery, in London, and still more in a peculiar lead ore; it is of a silvery lustre. Its oxide is occasionally used in giving a green color to glass.

Cadmium, which was discovered in some ores of zinc, in 1817, yields an oxide and sulphide of an extremely beautiful orange yellow, of great permanenoy.

Tungsten.—This metal, which is of an iron gray color, exists largely in nature, in combination with lime and with iron. In the tin and copper mines of Cornwall, England, it is sometimes found intermixed in such quantities with the tin ores, as to have formerly reduced their market value, owing to the difficulty of separating the tungsten by any process of smelting; later a method was discovered by which the tungsten was separated with great advantage from the tin ores, and consequently large quantities of the tungstate of soda, and the oxide of tungsten (a pale yellow powder), was formed.

Artificial Pearls.

This is undoubtedly an age of shams, and there is abundant room for the fierce denunciation of the venerable Carlyle in this regard. From the commonest articles of domestic use to the most prized and precious wares all are liable to sophistication and to the insidious attention of imitators. In the imitation of precious stones Paris is far ahead of all competitors, and such skill and ingenuity is brought to bear on this industry that it is difficult even for experts to discriminate between the Parisian shams and the real thing. This is particularly the case with pearls, the imitations of which are lined with fish scales and wax. The scales of the roach and dace are chiefly employed for this purpose, and they have to be stripped from the fish while living, or the glistening hue so much admired in the real pearl will not be imitated. These Paris pearls have been of late years so perfected that the Romas pearl has to a great extent been superseded. The setting is always of real gold and the fashion of the newest kind. Other precious stones are also successfully imitated, and the whole process of transforming a few grains of dirty, heavy-looking sand into diamonds of sparkling hue is constantly going on. The sand thus employed, and upon which the whole art depends, is found in the forests of Fontainebleau: it appears to possess some peculiar qualities of adaptation to this purpose. The coloring matter for imitating emeralds, rubies, and sapphires is entirely mineral, and has been brought to high perfection.

Historical Chronometer and other Instruments.—Among the timekeepers exhibited at the Kensington Museum is one which was twice carried by Capt. Cook. This same timepiece was again used by Capt. Bligh, in 1787, and when the crew of the Bounty mutinied it was carried to Pitcairn's Island. In 1806 it was sold by Adams to an American who touched there. He sold it in Chili, when in 1840 it was purchased by Sir Thomas Herbert in Valparaiso, taken by him to China, and brought back to England in 1843. Among astronomical instruments may be cited two of Galileo's telescopes, the one with which he discovered the satellites of Jupiter in 1610, and the smaller one with which he first saw the spots on the sun. Tycho Brahe's quadrant is also on exhibition, and the oldest European instrument in the collection is an astrolabe made at Barcelona in 1345. Not the less interesting is an instrument used by Sir Francis Drake in his voyage around the world in 1577. By its aid Drake could tell the sun's altitude, the ebb and flow of the tides, the hour of the day (if the sun was visible), and it contained a compass, a perpetual calendar, and a table of latitudes, and as it was made from Drake's designs, it bears witness to his ingenuity.

Practical Hints on Watch Repairing

By Excelsior.—No. 20.

EXAMINING AND ADJUSTING THE DETACHED LEVER ESCAPEMENT. THE WHEEL AND PALLET ACTION.—CONTINUED.

(326) To test the "draw," when the balance is in its place, and the watch wound, move the balance around till the ruby pin is entirely clear from the notch of the fork, and hold it there with the forefinger, then press the guard pin against the roller. If it remains there, the draw is deficient. But if it returns of itself to its former position, with the fork resting against the banking pin, the draw is sufficient. Watch the wheel closely while making this test, and if any recoil or backward motion of the tooth can be seen when the fork is moved, it shows that the locking faces are too much inclined and the draw too strong. If, when the guard pin is pressed against the roller, it remains there because the tooth has passed over the corner on to the driving plane of the pallet, the roller is too small, or tho lever fork too short, or the guard pin bent back, providing the pitching of the pallets is correct. To test the draw when the balance is removed, push the guard pin forward from the outside, and the fork should be drawn back against the banking by the tooth. The strength of the draw is shown by the promptness and vigor with which it returns to the banking. The distance that the fork moves before it begins to fly across, shows the amount of locking, or the distance the tooth passes upon the locking face. In many watches, on testing them in this way, the fork can be moved nearly one half of the distance between the banking pins, before the tooth leaves the locking face and passes on the driving plane. This not only is a waste of motion, but it increases the resistance to the unlocking, by the recoil of the escape wheel, and the friction on the pallet, and also lessens the angle or space during which the impulse is given to the balance, all evils to be avoided.

(327) To lessen the draw is somewhat difficult to do. If we grind off the locking faces, so as to give them less inclination, we shall thereby narrow up the driving planes to the same extent that we have taken off the locking face. If we warm the pallets and move the jewels in their cement, to change the inclination of the locking faces in that way, we shall also lessen the lift, by changing the inclination of the driving planes at the same time. The least objectionable way, when practicable, is to lessen the locking angle, or distance that the teeth pass up the locking faces, by bringing the banking pins closer together; but the locking must always be left deep enough to insure safety. The benefit of this operation does not come from changing the inclination of the locking faces, but merely by lessening the distance during which the pallets are subject to their excessive resistance.

(328) To increase the draw, we have to grind the locking faces so that they will have more inclination. This is practicable, but difficult, especially with the long arm. If we change the jewels in their cement we also increase the lift or inclination of the driving planes. And setting the bankings apart to increase the locking angle, would increase the draw on the long arm, but lessen it on the short arm, and even the advantage gained on the long arm would be counter-balanced by the excessive locking angle, with its useless motion and friction. Some workmen seriously propose to bend the pallets at their center, to give the arms more or less inclination. But this, if practicable, would be the worst kind of botch work, for it would bring the arms nearer together, or further apart, and thus make the pallets too small or too large for the wheel, while it would increase the draw on one arm and diminish it on the other, and entirely destroy the correctness of the lifting angle on both arms, and lastly it would alter the pitching, and make the pallets unsuitable for the center distance of the wheel and pallets.

(329) The correctness of the center distance of the escape wheel and pallet arbor, or distance between the centers of their two pivot holes, in the watch, may be tested by first marking say ten times that distance on a straight line, which is then called the "line of centers." In figure 13, *ab* represents that line. The only object of increasing the measurements is to make the drawing on a larger scale, and more distinct. Then with one point of the dividers at the mark *a*, corresponding

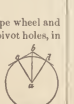

Fig. 13.

to the escape wheel pivot, draw a circle ten times the size of the wheel at the extreme points of the teeth. From the other mark, *b*, draw lines which just touch the circumference of this circle, one on each side of the line of centers. Then draw lines from the two points *c* and *d*, where the circle is thus touched, to the center *a*. Now measure the angle between these two lines, *ac* and *ad* with the protractor. If the wheel has fifteen teeth, this angle should be 60°, or 30° on each side of the line of centers, *ab*. If the angle is more than 60° the center distance is too great for the size of the escape wheel used, and *vice versa;* and pallets of suitable size for the wheel would not work properly, according to the theory of the escapement, although the pallets could be adjusted, by setting up or back, to make the depth of the lockings correct. This test can be varied slightly to show what the center distance should be. From the points *c* and *d*, where the lines *bc* and *bd* just touch the circle, draw two lines at right angles to those lines, and the distance from the crossing of these latter lines to the point *b*, divided by ten, will be the correct center distance for that wheel. If the crossing is just at the point *a*, then the pitching is correct in the watch. The depth of the pitching is practically shown by the distance that the teeth pass on to the locking faces of the pallets.

(330) To test the pitching, or depth that the pallets work into the wheel, when the balance is removed and the watch wound, take hold of the guard pin with the tweezers, and very slowly move the fork from the banking till the tooth drops off the pallet, then hold it perfectly still. If the tooth which has fallen on the other pallet, hit it upon the locking face, far enough up to be safely locked, yet near the edge or corner, that pallet is properly pitched. But if it did not strike the locking face at all, but fell upon the impulse plane, that pallet is pitched too shallow. If it fell upon the locking face, but further up than barely enough to lock, it is pitched too deep. Then let the tooth drop from this pallet, and another on the other, and test the pitching of that in the same way, using the eyeglass constantly. A pallet which is found a little too shallow when tested in this way, may often operate very passably in the watch, by being moved from one side to the other so rapidly when running, that, before the tooth reaches it, it has gone far enough across to lock it properly. Nevertheless, it is not right, nor always safe. To test this point, instead of holding the guard pin as above, so that it cannot go any further than it is moved by the tweezers, simply push it forward from the outside, till the tooth passes from the locking face on the driving plane,—letting it fly across by itself. If the opposite pallet locks, it may answer. But if the tooth strikes that pallet without locking,—the pallet *returning* to the same side it started from, before locking,—*the other pallet* is pitched too shallow, and lets the teeth off too soon. If both pallets are too shallow, the fork will play from side to side, perhaps several times before stopping, till, finding a tooth projecting further, than the rest, it will lock. All this is supposing that the driving planes have correct inclinations, both on the pallets, and, in the club tooth wheels on the teeth also. These points will be fully considered hereafter.

(331) Where the pitching is too shallow, besides the lockings being defective and unsafe, as above, there will be more "drop" on the outside or short arm than from that on to the inner or long arm. To remedy this, the pallets can be moved up towards the wheel; the pallet jewels can be moved further out in the arms, or, in an English lever watch, a pallet arbor can be fitted in, having its pivots out of center so as to throw the pallets forward. Some workmen put in a larger escape wheel, and grind off the back or discharge edge of the outer pallet to make the drop equal on both pallets. But this method is defective, because, although it secures a safe locking, it makes too much drop on *both* pallets.

(332) When the pitching is too deep, then, besides the locking being too deep, causing excessive friction and resistance to the unlocking by the ruby pin, and also increasing the distance that the fork must vibrate to effect the unlocking, there will be too much drop from the outer arm on to the inner arm, and too little from that to the outer arm. The remedies are to move the pallets back on the arbor; grind off the impulse faces and thus shorten the arms; when practicable

move the pallet jewels back; and, in the English lever, fit an eccentric pallet arbor, as above, except that in this case the eccentricity is caused to set the pallets back from the wheel. Some workmen put in a smaller escape wheel, and grind off the discharge edge of the long arm, but, as in the reverse case, although this corrects the locking and makes the drops equal, it makes both drops too great. The correct remedy is to remove the cause of the fault, *i. e.*, correct the pitching of the wheel and pallets. Whenever the lockings are correct, but the drops are not equal, or are both too great, the pallets are defective, and should be replaced unless this fault can be removed.

(333) The usual way to select new pallets, is to place a broach or tapered wire through the center hole of the old one, making proper allowance if they had been set up or back on the arbor, and try your stock by placing each one on the broach, alongside of the old one, till you find one that is apparently the same, and which will just freely admit three teeth of the wheel inside of the pallets, and just fill five teeth at their points, with the outer corners of the pallets. Then try the pallets and wheel in the depthing tool, the points of which have been previously set to the proper center distance. In buying pallets, those with short arms should be selected. Pallets which seem to be just right for the wheel, except that they work into it a little too deeply, from the arms being a little too long, are very hard to fit properly, and generally it cannot be done. It will not do to grind off the driving faces of the arms, for when that is done the two arms will be wider apart and will no longer fit the wheel. They must be set back on the pallet arbor, till their real center of motion will coincide with the center distance in the watch. If you have none that fits the wheel, select one that is a little too small for the wheel and which also has the arms a little too long. Then grind back the arms, which will at the same time make the depthing more shallow and the arms further apart, so that it will then fit the wheel. In thus grinding off the driving planes, (which, only, are taken off,) their inclination or angles must be kept exactly the same as they were before—unless they were not correct, in which case the grinding should be so conducted as to form them into the proper angle. After getting it correct for the wheel, if the pitching is a little too deep or too shallow, alter that by setting them up or back on the arbor. When pallets fit very nearly correctly, rather than grind off either the locking or driving faces, which requires considerable labor and skill to do properly, the jewels are sometimes moved in the pallets, so as to perform fairly. But this cannot be called good work. Moving "exposed" pallet jewels is worse yet, for they generally can only be moved endwise, in their slots, and whether they are pushed inward or outward the locking and driving angles are not changed,—the only effect being to change the depthing and make the pallets closer or further apart, *i. e.*, smaller or larger than before.

(334) The pitching, draw and locking being correct, the lift remains to be examined. The amount of lift, or distance that the pallets are moved by the wheel, depends on the angle or inclination of the driving planes of the pallets, and their breadth. The exact angles, etc., will be treated hereafter. In general terms we may say that they are usually such as will give a lift of 10° in English levers. In the Swiss levers, the angle depends on how much of the lift is accomplished by the teeth, which is generally 4°, leaving 6° to be effected by the pallet faces. The breadth of the pallets, or of their jewels, is one-half the distance between two teeth, deducting a small amount for play, or "drop," to give freedom to the teeth in passing. This allowance for drop is 3° for each pallet, in English levers, and 2° in the Swiss, measured from the center of the escape wheel. The drop is greater in the English style because the shape of the tooth is such that there is more danger of the heel of the pallet touching the back side of the tooth before the other pallet has fully escaped. But the club tooth is hollowed out on the back, and allows closer working of the teeth in the pallets. In a wheel with fifteen teeth, the distance between two teeth is 24°, half of which is 12°, and deducting 3° for drop, leaves 9° as the breadth of the arms of an English pallet. With a Swiss wheel we allow 4° for breadth of the tooth, which leaves 20° between two teeth; taking half of this, and deducting 2° for drop, gives 8° for the breadth of the arms of the pallets of the Swiss levers. In addition to the motion of the pallets due to the lift, they have a further motion to the amount that the teeth pass on the locking faces, or that the pallets work into the wheel. This is intended to be about 1½°, measured from the center of motion of the pallets, so that each pallet moves, in all, 11½° from its rest against the bankings till the drop of the tooth from it.

(335) The lift can be measured either in the watch, or in the depthing tool. In the former case, cut a slightly concave curve in the edge of a piece of paper, and hold it so that the guard point will rub along this edge. Make a fine mark on it to indicate the beginning of the lift, and place this mark just opposite the guard pin at the instant that the tooth passes from the locking on to the driving plane of the pallet. Then slowly move the fork along till the tooth drops off the pallet, and mark that position of the guard point. Next set the dividers from the center of the pallet arbor to the guard point, and draw a curve with the points so set, which will represent the track of the guard point. Transfer to this curve the distance between the two marks made on the paper, and measure the angle between them with the protractor. The other pallet can be tested in the same way, and the lift should be equal on each. The distance that the guard point moves, from the banking pin till the tooth passes off the locking face, shows the depth of the locking, and can be measured the same as the lift.

(336.) To measure the lift in the depthing tool, set its points to the proper center distance, by the pivot holes, and insert the escape wheel and lever in their correct working position, either staked upon their pinion and arbor or not, as the case may be. Set the tool centers pretty tightly to hold the pieces as they may be placed. On one of the centers holding the lever, slip a metal semi-circle, graduated in degrees, mounted truly and centrally on a socket, say one quarter inch long, fitted closely to the tool center and also sawed longitudinally through the middle for two-thirds of its length, so as to be spring-tight on the center. The number of degrees which the guard point passes over, when moved as before described, will be shown by the graduated sector, which should be set close to it. These methods give the actual lift, or pallet angle, irrespective of the angles which the driving planes make with the pallet centre, which will be considered hereafter.

(337.) The lifting angle of the pallets can also be measured directly, but not so accurately, by setting them between the tool centers carrying the sector, which should be placed in contact with the pallets (the wheel being omitted in this method), and noting the angle between the lines which touch the front and rear corners of the pallet being tested. This angle is the lift due to the inclination of the driving plane, whatever that may be, and its accuracy will depend largely on the care taken to look across the corners of the pallet perpendicularly to the plane or face of the sector. In the Swiss style, the lift due to the tooth alone can be ascertained by deducting the lift of the pallet, thus found, from the total lift of both wheel and pallet, as shown by one of the two previous methods (335,) (336). Or it may be found directly, either in the watch or in the depthing tool, by noting the angle through which the guard point passes from the time the front corner of the tooth touches the front corner of the driving plane till the back corner of the tooth reaches the same spot. The rest of the lift, during the passage of the back corner of the tooth across the face of the pallet, is that due to the driving plane. In all cases where a certain result is produced by the action of two or more pieces, and one is found apparently defective, try the other to see if the defect is not made up there. If the lift of either pallet or tooth, in the Swiss lever, is not according to the rules given, test the other also, to see if that is not correspondingly large or small, so that both together produce the correct result. If pallets are found too wide, see if the teeth are not correspondingly too narrow, and *vice versa;* and so with all other faults.

(338.) The usual way of selecting a new wheel for given pallets, is to find one three teeth of which fit inside of the pallets, and five teeth on the outside, as already described. Then set the points of the depthing tool to the correct distance, and try the wheel and pal-

lets in it, when their operation should be as stated in the sections on pitching, (330 to 332). If the depthing appears to be shallow, the wheel is small and should be rejected. Even in the brass wheels of English levers, the teeth should never be "swedged out" or lengthened, nor bent more backwards, to make them project out further. If the wheel is too large, turning it down will not answer, for then the points of the teeth will he closer together and the wheel will no longer fit the pallets. When no wheel can be found which fits the pallets correctly, select one which is both a little too large and at the same time has the points of the teeth a little too far apart to fit the pallets. Then turn it down a little till the teeth fit properly, and if the depthing is still too close, set the pallets back a little. If it is a club-tooth wheel, select one as near right as you can find, preferably a little too large rather than too small, then set the pallets up or back as needed. There is but little excuse for not being able to fit in a wheel properly, for in all well made wheels of a certain size, with the right number of teeth, the teeth will always be the same distance apart, and must therefore fit the pallets—provided *they* are correct. But pallets are scarcely ever alike (except the American); there are almost endless variations in the details of their forms, which renders it harder to fit them in than a wheel, which only needs to be of the right size. There are exceptions to this remark, in the case of club-tooth wheels, which are sometimes made with incorrect angles to the driving planes, on the ends of the teeth, and the teeth themselves may be too broad or narrow. These and other points will be further treated in our next article, after first considering the proper angles for the different parts of the pallets and the escape wheel.

[The reader is requested to kindly make due allowance for occasional errors in these articles, arising from the proof not being revised by the author. There were several in the last article, which considerably changed the meaning, but I think the intended expressions must have been apparent to the thoughtful reader].

The Manufacture of Gem Stones.

What boxwood is to the wood engraver—the means without which his finest art would be impossible—that chalcedony is to the engraver of gems. Hard without brittleness, susceptible of a fine and enduring able polish, tinted by Nature with heautiful and at times strongly contrasted hues, or capable of taking on such color at the hand of man, it has been from the earliest period of art, not only the favorite medium but the only possible medium of the gem engraver's most striking effects. In its simplest state, chalcedony is an unattractive white stone, nearly transparent, and chiefly used for making spear heads and arrow tips, or their more modern representatives, gun flints. Sometimes it has a striped or banded appearance, due to alteration of more or less translucent layers, ranging in color from whey white to the white of skim milk, still not very serviceable for gems or jewelry. When stained by metalic oxides, however, chiefly those of iron, it raises to the dignity of gem stone, sard, cornelian, chrysoprase, &c., when uniformly tinted brown, yellow, red, or green—as agate, onyx, sardonyx, &c., when the colors lay in bands or strata, or are separated by bands of white. The natural formation of these flowers of the mineral world is recorded in their substance. Though commonly found in lavas and other igneous rocks, or in the *debris* remaining from their disintergration, gem stones are substantially an aqueous product, and require the agency of fire simply to develope their fine colors, a step in their production more the work of art than of nature. At high temperatures, especially under pressure, silica, the basis of all these stones, is dissolved to a limited extent by water, and thrown down in a more or less crystalline form when the pressure falls or the temperature falls or the pressure is lowerod. Illustrations of this process may be seen on a grand scale in the hot springs of the Yellowstone country and elsewhere in the great West, where immense masses of siliceous sand and rock, sometimes chalcedonic, have been brought up from the heated depths by the flowing or spouting water, and deposite1 around the orifices of the springs. When water similarly impregnated with silica finds passage through rocks containing cavities, gradually filling them from circumference to center, the variable rate of deposit showing in concentric rings or hands of more or less opacity. Frequently the supply of silica-bearing water appears to have been permanately cut off, leaving a chrystallized druse or geode; and occasionally the cavity remains filled with water hermetically enclosed, forced in, possibly under pressure and unable to escape, when, by some geologic change the pressure has been removed. In case the siliceous water is also charged with iron, nickel, or other metal, the stone may be more or less impregnated with the foreign material, according to the degree of its chrystallization, the more amorphous layers naturally taking the most and consequently developing the deepest color when subjected by nature or art to the action of heat, sunlight, or other agent of chemical change. Or after the deposition of the stone, the enclosing rock may be washed by chalybeate or other mineral waters supplying the coloring matter necessary to convert the unattractive gray chalcedony into the highly-prized sard, cornelian, onyx, or other gem stone. It is in these latter processes that art steps in to complete or improve upon the work of nature, either by developing the latent color of naturally impregnated stones, or, going further back, by supplying the coloring material also. Probably the majority of gem stones thus owe part, if not all, their beauty of color to art, as well as their beauty of engraving and finish. The simplest process is the developement or heightening of dull or latent color hy the action of heat. The celebrated cornelians of India, for example, are largely produced from dull brown stones by a native process of roasting in a matrix of camel's or cow's dung, which prevents the stones from being too lightly or too rapidly heated. A temperature to char wood is enough, the effect being like that observed in the burning of bricks; the brown oxide of iron is changed to red oxide, and the color of the stone is correspondingly improved. At Oberstein, the great manufacturing place of gem stones in Germany, carefully-regulated ovens are employed for the same purpose. Similarly treated lumps of unimpregnated chalcedony are converted into white cornelian, the texture of the translucent stone being sufficiently disturbed by the heat to make it opaque. The snow-white bands of onyx, to which we owe the art of the cameo engraver, are almost always artificially produced in this way, the heat which improves the color of the darker layers, serving to develop the white ones at the same time. But art, as we have said, goes a step further back, and introduces as well as develops the colors of these stones, sometimes producing effects which nature is unable to rival. In all cases the staining process involves, first, the introduction of a substance capable of producing color on precipitation, by heat or chemical action; second, the precipitation of the color. As the stone is too finely grained to absorb any colored solution, the coloring liquid must itself be colorless. To convert grey chalcedony into cornelian, the stone is soaked in a solution of pernitrate of iron, roughly made by dissolving old nails in dilute nitric acid; then the colorless pernitrate is changed into red peroxide of iron by roasting, the resulting color being faint or dark according to the amount of the solution absorbed. The more translucent the stone, the longer the period of steeping required; and when layers of unequal translucency exist, unequally colored bands result, giving sardonyx or cornelian onyx instead of simple sard or cornelian. Black onyx,—that is, black stones crossed by bands of pure white,—are always artificial. The coloring matter is carbon, introduced in a colorless solution and blackened by fire or sulphuric acid. By the Oriental and most ancient method, the stones are first boiled in honey or oil, sometimes for weeks, then heated to a temperature which chars the vegetable matter in the pores of the stone, producing black or brown according to the amount absorbed. This method produces the finest and most permanent black; but as the heating is liable to check or crack the stones and so destroy them, the western practice is to darken the carbon by the action of sulphuric acid. Inasmuch as the Oriental black resists the action of the nitric acid, while that produced by sulphuric acid is readily "drawn" therefrom,—that is, reduced to the iron mould tint of natural sardonyx,—it has heretofore been regarded as a natural color. Billing has discovered, however, that it is merely a question of time in soaking, a sufficiently-protracted bath in nitric acid drawing the Oriental as well as the Western black color. He has found also that any stone made pale by nitric acid, if properly heated, will recover its color by the charring of the carbon remaining in its pores, and that the color so produced will resist nitric acid as well as the best Oriental black, which in fact it is. The yellowish brown, orange and lemon tints of sards are artificially producible by methods the same in principle as those already described, the last being developed by the action of hydrochloric acid on nearly transparent stones slightly impregnated by nature with oxide of iron, the other two by the protracted soaking of the stone in the neutral solution of pernitrate of iron, afterwards exposing them to the action of sunlight.

Proceedings of the Horological Club.

A DISTINGUISHED BODY OF WATCH AND CLOCK MAKERS.

Thirty-Third Discussion.—Communicated by the Secretary.

VOIGT'S AMERICAN CHRONOMETER ESCAPEMENT.

Mr. F. H. Voigt, of Buffalo, N. Y., had sent in a description, with drawings, of his improved chronometer escapement, which was referred to Mr. Isochronal for examination. That gentleman now reported that he was very favorably impressed with Mr. Voigt's invention. It was extremely simple and easily understood, and seemed likely to be free from the faults of the ordinary constructions. As claimed, the movement will start with a vibration of the balance of only 5°, which is certainly a great improvement, and substantially removes the liability of stopping by external disturbances. The friction is also reduced so much that it would apparently be unnecessary to oil the escapement except on the pivots. He should consider the circular disengaging spring preferable to the straight form shown in figure 1, but would suggest that there should be a guide pin in the roller to prevent its end projecting too far and working too deeply on the unlocking jewel, *I*, which, on the return vibration of the balance, would stop it instantly. But very likely this was provided for in the actual construction of the escapement although not shown in the drawings. Altogether the speaker thought very highly of the general plan, and would recommend Mr. Voigt to publish the description and drawings in the JEWELERS' CIRCULAR, where its simplicity and effectiveness would at once strike the careful reader. The Club wished to offer every encouragement to those who were not satisfied to plod along in the beaten tracks but sought to improve upon even the constructions acknowledged to be the best. It was to them that we must look for whatever advances were made. He would assure all inventors of real improvements in our line that they would be cordially welcome to address us, and the Club would willingly examine and report upon their merits.

WATCHMAKERS' WARRANTEE.

To the Secretary of the Horological Club:

I wish to bring before your honorable body a topic which, I think, has at some time or other closely touched every member of the trade, viz:—that of warranting watches. I will give a few sample cases to illustrate:

1st. Suppose a watchmaker puts in a new mainspring and warrants it for six months or a year, as his custom may be. Within that time it breaks, and the recoil also breaks the center pinion, or knocks several teeth out of the main or center wheel. Now is the watchmaker bound to make the watch good again? Or is he only bound to put in a new spring and can charge for the other repairs? How long should a mainspring or a case lifting spring be warranted,—a year, six months or not at all?

2d. Suppose he puts in a mainspring, it breaks within the time for which it was warranted, and he puts in another free of charge. *That* also breaks within the original time of the warrantee. Is he bound to put in third spring, and a fourth, and so on, as many as may break within the stated time?

3d. Suppose he cleans a watch and warrants it to run and keep good time for a year. Soon after it is delivered to the customer the mainspring breaks. Does that come under the warrantee?

4th. Suppose he cleans a watch and hangs it up to regulate, but before the customer takes it the mainspring or the case spring breaks. Is he bound to put a new one in for nothing?

5th. Suppose a watch is left to have a glass, or some other trivial repairs, but is in good running order. The mainspring breaks while he has it in his shop, and does other damage besides. Is he bound to make the watch as good as it was when left with him, for the 25 cents he gets for the glass? Shall he deliver it in the used-up condition, or fix it and charge for it?

6th. Suppose he cleans and warrants a watch. The owner carries it in the same pocket with his loose tobacco or other filth, and gets it full within a few weeks. Is he bound to take it apart and brush it out, on the warrantee that it shall "run a year?" Or shall he charge for his trouble?

7th. Suppose he puts a watch in order, and the owner is a man who gets pretty well elevated two days out of three, and four nights out of five, besides Sundays, holidays, and whenever he don't feel very well, must he warrant it to be proof against all the thumps, twistings, neglect and abuse that it will be subject to? I could give any number of other instances, but the above is sufficient to show the idea of the thing. If he "won't warrant his work," he won't get the jobs, and if he does, he often has a hard row to hoe. It appears to me that this warranting business is something that ought to be abandoned. No other mechanic is expected to do anything of the sort. If a carriage maker sews up the dash-board, he is not held responsible for the hind axletree breaking within a year. If a carpenter makes a window or a front door for your house, he is not blamed for your roof leaking, or the cellar stairs giving away and breaking your mother-in-law's neck. Why then should a watchmaker be held responsible for anything more than he does, or for the performance of parts that he, perhaps, has never seen? I think this subject ought to be ventilated, and that the trade should refuse to do anything more than is reasonable and proper in this direction. The decision of your honorable body would have great weight, and I hope you will undertake to regulate the matter for us.

G. W. A.

Mr. Uhrmacher said this was one of the subjects that was to have been considered in the National Convention of Watchmakers, which unfortunately failed to come off. The evil Mr. A. complained of was a great one, and arose chiefly from over anxiousness to get work, which led to submitting to the demands of customers, and promising more than was reasonable. But it was almost useless for isolated workmen to try to narrow up the hounds, as they might merely drive the work away to their competitors. Action should be general, if not universal He thought that, in a matter so important to every watchmaker, it would be better to let the trade present their views upon the evil, and the best remedy for it. After getting all the new ideas we could, our way out of the trouble would perhaps be plain, but at present it is difficult to say what should be done. The subject was accordingly held in reserve till the next meeting in order to hear from the trade.

ELECTRIC CLOCKS.

Secretary Horological Club:

Will you please inform me through the JEWELERS' CIRCULAR, where it is most suitable for a clock to make a (say) electric attachment to its pendulum. Is there anything harder than glass that does not lead the electric current?

SUBSCRIBER.

Mr. Electrode replied as follows: There are two general plans, which have the electric connection through or upon the pendulum. By the first, electricity keeps the pendulum in motion, and the pendulum drives the clock train. By the second, electricity keeps the pendulum in motion, but the clock train is driven either by separate batteries, magnets and currents, whose circuits are opened and closed by the pendulum; or, by weights, in the usual manner.

In the former the pendulum ball is attracted alternately in each direction, by bar magnets placed at the sides. The pendulum bob is composed of a hollow coil of wire, so arranged that as it vibrates in either direction, the poles of the magnets on that side enter the hollow in the coil. The crutch that supports the pendulum rod carries pallets of a peculiar kind which *drive* an escape wheel, and that moves the rest of the train. A wire runs down one side of the pendulum rod, to and forms the coil spoken of, then up the other side of the rod. At the top of the rod suitable contact pieces are arranged on the frame which sustains the pendulum, and the crutch which carries the rod, so that as it swings to either side contact is made on that side. About one-third of the distance from the center of oscillation of the bob to the point of suspension, the rod carries a slide which makes contact with pieces arrange on either side, so that it breaks and completes the circuit, and reverses the direction of the current at each vibration. When the current passes in one direction, the coils of the bob are attracted by the south poles of the magnets one side, and repelled by the north poles of the opposite magnets. The current is then reversed by the slide, and the poles of the coils changed, when the south poles of the magnet then repel the coils and the north poles attract them, by which means the pendulum is kept in motion from side to side.

The other plan is for clocks with remontoir escapement, and the electricity acts by raising a small weight on the end of a lever, which, falling against the pendulum rod makes up for its loss by the resistance of the air, etc., and keeps it in motion. In this plan, the electricity only passes through the short suspension spring which supports the rod, to a contact piece on the crutch, which completes the circuit by contact

with another insulated piece attached to the clock frame or the frame which supports the pendulum. The pendulum is therefore an independent mechanism kept in motion by the dropping of these weights against it, which are then raised again by the current, magnets, etc., —and it is not necessarily connected with the clock, nor in the same room or building. It may even control a number of clocks by means of wires running to them, through which the current passes as the circuit is completed by the oscillations of the pendnlum. As the weight of the balls is always the same, no matter what the strength of the current may he, we have an unvarying amount of impelling force applied to the pendulum, and, if fitted with a compensated mercurial bob, it is capable of extreme accuracy of time keeping. In this form, the "electric attachment to the pendulum" is made very near the point of suspension. Or, if "Subscriber," meant, by that, the place where the weight• pressed against the rod, it should be as near as convenient to its upper end.

Mr. Electrode observed that he did not know whether the foregoing would meet their inquirer's wants, as bis letter was so indefinite that he could not tell exactly what information was desired. Correspondents should send particulars enough to show us what they wish to know, otherwise it was impossible to give more than a general reply. Earthenware, glass and porcelain are the most common insulators, and he knew of no harder non-conducting substances, except some of the precious stones.

EASY FLOWING BLACK ENAMEL.

Secretary Horological Club.

Would some member of your Club be kind enough to let me know how to make an easy-flowing black enamel? AUG.

Mr. Muffle said that he prepared his black enamel by taking, of red lead, 16 parts; powdered flint glass, 16 parts; powdered flints, 4 parts calcined horax, 3 parts; by weight. Fuse in a Hessian crucible for twelve to twenty hours,—the longer the better, then pour it out into water, and reduce to powder in a buscuit ware mortar. This is the basis, or paste, from which enamels of all colors could be made by adding proper coloring ingredients. For a black, mix 3 parts peroxide of manganese, and 1 part of saffre; add this to the above paste till sufficient depth of color is obtained. If not fusible enough, for our correspondent's purposes, add more of the glass to make it flow more readily. This is the very best hard enamel, such as used for ornamental and decorated work. Perhaps our correspondent did not want anything quite so good. A common black enamel for jewelry may be made by taking 1 part of silver; 5 of copper; 7 of lead; 5 of muriate of ammonia; melt together, pour into a crucible, and add 36 parts of pulverized sulphur, covering the crucible immediately to prevent the sulphur taking fire. Calcine in a smelting fire till sulphnrous fumes cease to he emitted, which may be several hours, then let cool and pound the mass into coarse powder. When wanted for use, make up the necessary quantity into a paste with a solution of muriate of ammonia in water, place on the article to be enameled, and hold over the alcohol lamp till it melts and flows, when it may be filed, stoned and polished down.

THE LENGTH OF MAINSPRINGS.

To the Gentlemen of the Horological Club:

What is the proper amount of mainspring to place in a given barrel so as to obtain the greatest number of revolutions that the spring is capable of giving in a barrel of that size? Every watchmaker knows that in putting in a new mainspring, if he leaves the spring too long so as to fill the barrel too much, or if he makes it too short, the number of turns the spring will give the barrel will be less than if the proper proportion had been reached. What this proportion should be I propose to demonstrate mathematically.

Let R=inside radius of the barrel.

H=radius of the hub of the barrel arbor, together with the small portion of spring that never uncoils from it, and

h=thickness of spring.

Let X=distance across the coils of spring as they lay in the barrel unwound.

Y=distance across the coils when fully wound, and

U=number of revolutions.

Then $\frac{1}{2}$=number of coils in the barrel when run down, and $\frac{1}{2}$ number of coils when wound.

Neglecting the terminal curves, which are so small when compared with the whole length, as not to materially affect the result, we have the the equation,

$$\frac{1}{2}-\frac{1}{2}u. \quad . \quad . \quad . \quad . \quad . \quad . \quad (1.)$$

As the area covered by the spring is the same whetber wound or unwound we have

$$R^2-(R-x)^2=(h+y)^2-h^2.$$

Finding the value of y in the second equation and substituting it in the first,

$$\frac{\int 2\ Rx-x^2+h^2-h}{a}-\frac{x}{a}=u$$

Freeing from the constant a, and differentiating,

$$\frac{du}{dx}=\frac{2R-2x}{2\int 2\ Rx-x^2+h^2}-1$$

Making the differential coefficient equal to zero and reducing, we obtain the value of x when u is a maximnm:—

$$x=R-\frac{\int h^2+R^2}{2}$$

Making $h=\frac{1}{4}R$, which is correct for many watches, and reducing we find that $x=.258\ R$.

Hence, the length of spring must be such that, when placed in the barrel, the ring of spring will be a little more than one-quarter of half the inside diameter of the barrel, or a little more than one-eighth of the diameter.

In applying this rule to practice, the graduated scale on the end of the Denison mainspring gauge can be found to measure the diameter of the barrel, and the distance across the coils. No variation of this rule need to he made on account of thickness of spring; but, where the arbor has is smaller than one-third of the barrel, a little more spring will be required.

By substituting the value of x in the second equation, and then finding the value of y, it can be demonstrated that, when the spring is the proper length, the coils will cover one-half the available area of the barrel.

J. M. ARNOLD.

Mr. Horologer was pleased to see gentlemen of such scientific attainments as Mr. Arnold evidently possessed, devoting them to the solution of practical problems in horology. That was a field in which there yet remained many vexed questions to be investigated and settled, some of them of great moment, not only to our own trade, but to all the correlated sciences, such as navigation, surveying, astronomy, mathematics generally, etc., as well as the many kindred mechanical trades. There was a proper scientific treatment and solution for every doubtful point we meet in the pursuit of our daily employments, if we would only look at them in that light. Whenever we study out any such point, we should put the process into such a shape as to make it apply to all similar cases, and we have then solved a scientific problem, and formulated a rule which may be valuable to us and others. The faculty of generalization, or discerning the *general principles* which lie back of and control the particular phenomenon we are studying, was one which should be more cultivated, and in that way its possession made the mechanic a philosopher. The workman who merely accumulated practical methods of doing the various things, was a mere mechanic still. But if he comprehended those principles of all these methods, he became a man of scientific attainments, and deserved the name of horologist. And if he possessed the true scientific spirit he would not selfishly keep his discoveries to himself, but would hasten to lay them before his fellow artisans, that all might be benefitted thereby, and the craft itself he elevated by the enlightenment of its members. He considered that there was no better medium for reaching the great body of our trade, than the Horological Club, and we should always be glad to hear from Mr. Arnold and any others who should follow the course above outlined. Since its organization, the Club had had the pleasure of bringing out many valuable inventions, making a record of which we might well feel proud, and which we hope will be but the beginning of a long career of usefulness and honorable service in the cause of science.

Mr. Chalkbrusher disapproved of all this rigmarole about science and things. There was no need of it and no use of it. His way of fitting a mainspring was to get one of the right breadth, try the stiffness in the fingers to get her like the old one, break her off to about the right length, punch a hole in her, jab her in and try her. If she didn't give turns enough, haul her out and jerk off a piece, then try her again. Anybody with half an eye could get her right the second time trying, if not the first. Science be blowed! All he wanted was a good eye and some practice, and he wouldn't give a pinch of chalk

for all the science they could fetch on. He had heard of fellows that had so much science they couldn't rest, but slobbered it all over everything they came across. But he never heard that they amounted to anything very dreadful. He didn't want any of it on his plate anyhow.

The Adjuster-of-the-French-School was radically mortified and humiliated to hear the gentleman speak so disrespectfully of science. As a devout and devoted follower of science he felt obligated to rush to the rescue. This world, without science, would be but a promiscuous conglomeration of fugilateral molecules. The transcendental scintillations of the loftiest genius of man was only the approximated elimination of some fact in science. The torrefied ebullitions of aculastic eloquence are simply the consummation of antagonistic vortexes of scientific influences. There was science in everything—in fact it was, so to speak, the code of laws which governed the universe. He believed in science—delighted in it—reveled in it. His devotion to it had led him to his great discovery of the adjustment of watches in the supramundane position—a discovery not appreciated as yet, but which was undoubtedly fated to revolutionize the world, and introduce a new era and a more intellectual order of manhood upon this degenerated planet. He loved science as he loved his father and mother and the rest of his friends and relations. His natural modesty dictated majestic silence, but his veneration for the truth prevailed, and compelled him to promulgate that whoever had no reverence for science had no science in his soul, and was fit for stratagems, and spoils, and treasons most foul, or any other man.

Mr. Chalkrusher here called the speaker to order, and a debate ensued between them which was more personal than scientific, until, at last, words failed to express their feelings. The belligerents were then escorted home and put to bed by delegations of members, and left in charge of their respective spouses, thus abruptly terminating the proceedings. Some moral reflections upon—well, science—are omitted. Space is valuable, but moralizing is cheap, and each reader can do that for himself at a safe distance from the scene of action.

N. B. It may be proper to state here that there has been a special meeting of the club held, since the last regular session, to take appropriate action on the death of Mr. Henry J. N. Smith. This gentleman was the founder of the Horological Club, and well known to all reading watchmakers in this country, being a frequent contributor to the trade journals. He was the author of "Reminiscences of an Apprentice," and many other sketches and articles under the *nomme de plume* of "Clyde," which gave evidence of the possession of not only an intimate knowledge of the trade, but a genial spirit, and a keen sense of humor. And so, another good worker has gone to his long, long rest. Peace to his ashes!

Gilding Watch Parts.

When, after gilding, the resist is to be removed, we plunge the parts into warm oil, or into tepid benzine or turpentine, then into a very hot soap water or alkaline solution, and lastly into fresh water. Scratch brushing and drying in warm sawdust of white wood terminates the operation. The holes of the pinions are cleaned and polished with small pieces of very soft white wood, the friction of which is sufficient to restore the primitive lustre. The gilding of those parts composed of copper and steel requires the greatest care, since the slightest rust destroys their future usefulness. Should some gold have become deposited upon the steel, it should be removed by rubbing with a piece of wood and an impalpable pumice dust, tin putty, or English rouge. After the series of preparations which we have described, we at last come to the gilding, which may be effected by some of the processes already mentioned. Hot baths must not of course be employed where resists are used; but some of the following have been used with very good effect: Four grammes of finely laminated gold are heated to destroy all organic substance, and then dissolved in a glass flask, with six grammes of pure nitric acid, and twelve grammes of hydrochloric acid. When the gold is all dissolved and the excess of acid evaporated, leaving in the flask a nearly syrupy dark red liquid; the whole is then removed from the fire and allowed to cool. Then dissolve the chloride of gold in fifty or sixty grammes of distilled water and pour into a large glass vessel, after which dilute with about one half litre of distilled water and pour into the liquor a certain excess of pure ammonia, which will precipitate the gold in the state of a yellow powder of ammoniuret of gold or fulminate of gold, which is highly detonating when dry. The quantity of ammonia is ascertained only by adding a new quantity to a clear solution it produces no precipitate. The clear liquor is decanted and kept among the saved waste. Collect the settled powder upon a filter, previously wetted with distilled water, and there wash with distilled water until all ammoniacal smell has disappeared. The filter and its contents are afterwards put into a glass or porcelain vessel, with one litre of distilled water and twelve grammes of pure cyanide of potassium which rapidly dissolves the gold and leaves the filter. This mixture is then filtered anew, boiled for fifteen or twenty minutes, filtered again and left to cool. This bath is excellent for gilding the most delicate watch parts, under the influence of an electric current regulated to suit the services to be gilt.

These baths, since every gilder should possess several of them of various degrees of exhaustion, are generally kept in glass or porcelain vessels with a flat bottom, and holding from four to five litres within a depth of ten to twelve centimetres. The articles to be gilt are suspended to metallic holders, connected with the zinc pole of a battery, and of a shape appropriate to the nature and form of the watch parts. One or several platinum wires are used for anodes and are placed in the centre or at the sides of the bath. The battery most generally employed by gilders of watch parts is composed of three, four or five small Daniell's elements. This battery we will describe further on. Those batteries with balloons, on account of their constancy, should be preferred. The Smee battery, and especially those of Bunson, Grove, and Archereau should be discarded on account of their intensity, which may result in too rapid deposits. These batteries are also wanting in constancy, and their production of acid fumes is objectionable in work-rooms where there are many articles of steel. The slower the deposit of gold is made the finer and more adherent it is. When the operator deems the coating sufficient, the articles are washed clean in clear water and fixed again on cork plate in order to admit of the final scratch-brushing with a decoction of liquorice, of the bark of Panama wood, horse chestnut or of Egyptian saponaria. We will next speak of the battery to be used in these gilding operations. On account of the constant and lasting currents, the Daniell's battery has been considered the best for gilding watch parts. This battery is deficient in amount of intensity, but is especially adapted to those deposits which are slow and must be thick and of uniform texture. A very good advantage of this battery is that it will work without acids and therefore the production of gases and smells is not to be dreaded. It can be used in a private apartment without inconvenience, thus making a fine battery for a person's private experiments. This battery is not much used in silver plating, as there is required a battery of much greater intensity, which can also be arranged for quantity; and in this case there is used a Smee battery and now, in more modern times, electricity is furnished by electro-magnetic machines driven by steam or water power.

Some of the newspapers are astonished at a horse's pulling the plug out of the hunghole of a barrel for the purpose of slaking his thirst. It's extraordinary. Now, if the horse had pulled the barrel out of the hunghole and slaked his thirst with the plug, or if the barrel had pulled the hunghole out of the horse and slaked its thirst with the plug, or if the barrel had pulled the hunghole out of the plug and slaked its thirst with the horse, or if the plug had pulled the horse out of the barrel and slaked its thirst with the hunghole, or if the hunghole had pulled the thirst out of the horse and slaked the plug with the barrel, or if the barrel had pulled the horse out of the hunghole and plugged its thirst with the slake, it might be worth while to make a fuss about it.

A Treatise on Isochronism and Elasticity of Metallic Springs.

BY JAMES FERGUSON COLE.

Considering again the balance-spring in its application to the watch it will be evident that a spring of broader and thinner wire than the original spring, though of the same weight as a spring, could not control the ba'ance with the same effect, the vibrations would be too slow and would require shortening to bring the watch to time. It is also probable that if two springs of equal width, with the same number of coils, but a different thickness, were brought alike to time, changing one spring for the other, with the same balance and conditions unaltered, that the thin short spring would contain the same number of thicknesses in its entire length, as the number of thicknesses contained in the longer and thicker spring of the same width, and hence, probably, like results under comparison between the two; in this way showing a principle of mechanical leverage arising from matter of the spring itself.

All convolute springs admit of only a certain extent of vibratory action, within which they will act properly without being distorted, or thrown out of truth by setting from the strain; this range will be more or less, according to the length of wire and number of coils; and with a view to permanent well going, I think it desirable the number of coils should not much exceed what is necessary for allowing an equable and true extension and contraction of the spring, dependent on the admissable extent of vibratory motion.

Two or more coils should be carried into the over arrangement, but this can only be done when there is no index, and where the pinning of the stud is much nearer to the center. With the flat spring, and a double over coil, the acting effect and timing result, in most instances, is entirely satisfactory when well and carefully applied.

TAPERED SPRINGS.—REFERENCE NO. 6.

All the observations, up to this point, relate exclusively to springs made of parellel drawn wire, in contradistinction to springs made from tempered wire. Tapered springs, according to their good effect for isochrouizing, "as reported by the late Thomas Earnshaw," doubtless could not, under so competent a judge, have been otherwise than satisfactory to him; the process of making taper springs is, I consider, dependent on a reduction of parellel wire by the meertain means of hand operation, which is slow, and, being more costly, such springs are now but rarely adopted. There is also room for doubt as to permanent soundness at the inner end, where the wire is thinner.

The immediate effect of a tempered spring is a diminished action of the outer coils, and consequent reduction of the eccentric resistance or abutting influence of the common stud, which abutment ordinarily produces gaining in the long arcs.

With a flat tapered spring of 12 coils, the tendency would be to lose in the short arcs, under like circumstances as regards the stud and collet, the amount of error depending on the degree of tempering; in both cases the results are the same, thought differently stated.

These remarks on tapered springs are made chiefly to explain the influence of tapering; this principle, though of no value in connection with a properly proportioned detached lever escapement, which performs well with a spring of parellel wire, tempered and properly applied, is on the other hand of some value where a greater amount of vibration of the balance is admisible, as in resident lever and double rotary escapements; it, however, is found in both these cases that flat springs, when made of parellel wire, tempered and properly applied with double over coils, have always answered in an entirely satisfactory manner, showing that tapering may be dispensed with.

In speaking again upon the resistance of convolute springs, wound into tention hy a circular axis, great scope is allowed for error by the differences of circumstances under which experimental trials are made; a moment's reflection on the varying lever power of the stud and collet is enough to confirm this doubt, and there appears no way in which the progressional elastic resistance of a simple spring, apart from collet leverage on the inner and outer coil, can have any mechanical solution, otherwise than by supposing the two attachments of the spring made at the exact mechanical centre of motion, and thereby destroying the effective leverage of the stud and collet; this, though quite practicable as an experimental mode of springing, cannot be entertained under the present conditions of a vibratory balance and spring, by reason that, without the corrective influence of the stud and collet, there would be no means, other than a still greater motive power, for accelerating the short arcs, and, therefore, in that case without the collet no isochronism, as any additional length of wire would be overruled by the extra strength required for governing a balance at time, for any determined rate.

COLLET LEVERAGE.—REFERENCE NO. 7.

At this stage of inquiry it appears necessary to explain on what principle the stud and collet leverage can have a corrective power; on this a few words of explanation will be as much as can be given on so obscure a subject.

Crank leverage, then, may be supposed to operate most effectively when the terminal points of attachment are equally placed on the centre line between the balance axis and the stud, as in that situation it probably would have more mechanical determination than when in any other part of the circle, by reason that both attachments are then on the centre line, and both on the same side of the axis, the point of greatest mechanical advantage for accelerating short arcs.

These facts appear strong, if not sufficient, arguments in support of the whole turn principle of springing. On the other hand, suppose the two attachments at the stud and collet, made on opposite sides of the axis, the elastic force of the spring could not then act with the same full advantage, as some small loss would in this case arise from the intermediate pivot friction.

Again, suppose a spring let out at the stud one-eighth of a turn without regard to time of vibration, then move the collet to set the watch in beat, in this stage the acting effect would be right, as before letting out at the stud, but in this condition there would be a possible inequality of strain on the two sides of the centre line; the spring would therefore appear out of harmony with the stud, which, when pinned at the exact whole turn as at first, would be again at time, and and in the right mechanical point of fixture for uniform action and for isochronous effect, as generally found in practice.

In connection with some escapements constructed hy me, in which the vibratory motion is unlimited, I have used flat springs made of parallel wire with 20 coils, giving entirely satisfactory results, the mean vibration of balance being *two complete turns*; under so large an arc of vibration the tensional capability of the spring would be quite as much exerted, and therefore it is found that a long and thick spring with so many coils and with proportionately extended vibration, will he equally determinate in time-keeping effect, as the shorter spring under ordinary circumstances of a less extended arc of vibration.

I nave already stated a case in which a chronometer was found on trial to give a slow result in the short arcs, and was made perfectly right by simply an increase of motive power; a stronger main-spring gave more motion, but by reason of extra force the short arc, at first slow, was accelerated without any interference with the balance or spring exactly at time in the long arcs. This mode of amendment has been found to answer well in so many instances that, if the full vibration will allow extension, I never hesitate to change the main-spring for a stronger one, and seldom find it fail. These facts go to show that by whatever means isochronism may be effected, whether by altered length or otherwise, if the motive power be lessened, the short arc will be *most* affected, and therefore the isochronism will be lost; any one can try this and find the same result; if right in one case, it ought to be so in another, if the mechanical conditions are right; regarding this there must be no want of care.

There is no principle without its limit; if, therefore, any specific length of spring be supposed effectual for giving equality of time to unequal arcs of vibration, it does not show by any rule or argument how that effect is produced, as the common consequence of letting out wire from the stud, though an evident increase of length, which makes the vibration slower on both long and short arcs alike, that if the balance is reduced either in diameter or weight, for restoring mean

time, the only conclusion is, that no change of relation has occurred between the lessened resistance of the spring, and reduced weight or diameter of the balance. The case then stands as before, except in one particular, the larger proportional weight of active matter in the spring by the added quantity of wire let out from the stud, as compared with the less amount of active matter in the balance, which exemplifies nothing but the showing that there is no manifest principle for governing a defect of isochronism; it therefore appears that an isochronous result can only be effected by recourse to some extraneous mechanical influence, by a change of motive power or form of the curves, and not by any available power inherent in the spring itself. The difficulty is not a fault of primary principle, but is only a concomitant associated evil, and any attempt to rectify by touching the right condition of a naturally pure elasticity is but an indication of false judgment or insufficient reasoning.

REFERENCE NO. 10.

Having made the above remarks, I must also mention a chronometer by the late M. Breguet, which was submitted to me for inspection. It was of the usual two-day chronometer size, having four weak mainsprings and four going barrels gearing into the center pinion. The movement was a two-tier arrangement with the train wheels and escapement in the upper part of the frame. The escapement was a detached one, but what merits particular notice was the balance-spring, which, while at rest, appeared cylindrical, but when in action it expanded outwardly to a barrelled shape, like the form of a cask, but inwardly, on the return vibration, the spring contracted from end to end, assuming a geometrical figure of contrary form This peculiarity of action arose from being much reduced at the middle coils by extreme tapering from the two fixed ends; these were so strong as to show no visible flexure, and consequently admitted of no terminal curves for adjustment as in ordinary cylindrical springs. As I had no opportunity by trials. I am unable to say anything regarding the isochronal properties of this spring.

Regarding the relative length of a spring as a means or principle of isochronising, I take for evidence, on the contrary, the well-known general instances observable in the varied lengths of all simple sonorous springs, as those of the musical box or of the harmonium; in both cases it is clear that in the wide range of various tone, produced through an extent of five or six octaves, the lengths of the springs differ from half an inch or less for the higher tones observable in musical boxes, to four inches of length for the deeper tones of the harmonium, and in all cases of such extreme differences of both length, and also rate of vibration, the same unquestionably perfect isochronism is found to exist, as the pure result of a free state of action, independently of all secondary interference, with the sonorous effect arising from the operation of a natural law which governs the tone.

The Progress of the English Goldsmiths.

For example, to Morel, of Burlington-street and Paris, the most thorough artist who exhibited as a gold manufacturer, was given the council medal, while the jury in operation gave the same honor and reward to a shopkeeper who never manufactured an ounce of gold or silver in his life. Again, a prize medal was awarded to Mr. J. Angell, of the Strand, for his enameled silver, while the artist who executed and exhibited work of his own did not so much as obtain an honorable mention. In fact, such a feeling of dissatisfaction did the distribution of medals create in the year 1851, that in that of 1862 only one practical London goldsmith, one London engraver, and one enameler, exhibited cases of their work. The jury, the leading men of whom were shopkeepers, gave one of the three a medal, and the other two not so much as an honorable mention, although their work was excellent. But in the Exhibition of Paris (1855), it must be confessed, the awards were more justly distributed.

In considering this question there cannot be any doubt that more merit is due to the artist and manufacturer than to those who merely pay for art manufactures after they are produced, and exhibit them as their own by virtue of their purchase. This system has been the great mistake in our exhibitions. Art is not to be buttoned up in a pocket, nor can it ever be. Let us add, the manufacturer who exhibits matchless work and suppresses the name of the workman, injures himself as well as the artist, for he discourages the latter by his injustice, and this discouragement may result in a laxity of purpose in his work, for which the manufacturer ultimately suffers. Here is an example: In one of the goldsmiths' cases was to be found a number of matchless engraved crystals, taking the shape of truly beautiful horses, dogs, portraits, game and foliage, colored to nature. There was but one artist in London who could do this kind of work, and that man, who introduced a new art feature in jewelry, was barred from the honor due to him (which was not small) because the silversmith who purchased his works exhibited them in his own name and ignored that of the artist.

In the course of the steady progress of the gold and silversmith, it cannot be too loudly urged that art is sensitive as well as cosmopolitan. Hurt it, and this latter characteristic crops up. Under fair conditions it will make its home in the best market. Rome, for instance, appreciates sculpture and sculptors, and these are wedded to that city, where their material is found, and better and cheaper there than elsewhere. Thence the Roman sculptors find their market all over the world, while the goldworkers of Rome find a market for their genius in the great metropolis. The inference is clear; art being cosmopolitan and sensitive, when ill-treated in one place it encamps in another, and the result is artistic depreciation where art is unjustly treated.

The rapid strides of the goldsmith's art in England arise from the natural causes of demand and supply. The one has become exigent, and the second has risen immeasurably in quality.

The educated eye, accustomed to what is graceful in form and harmonious in color, rejects those articles in jewelry which are devoid of taste, and as the art education of the purchaser improves, so must the taste of the manufacturer follow, and the result is to the benefit of both. Dr. Dresser, who is no small authority on applied art, declares justly that one of the highest enjoyments of the human mind is to contemplate that which is pure and beautiful, and that the higher the mind is cultivated in art and nature the greater is the amount of enjoyment of the individual.

When we come to consider the silver work of the interval between the Exhibitions, it must readily be admitted that great improvement has been effected. The repousse table presented by the people of Birmingham to the Princess of Wales is of a higher standard of art than any piece of work exhibited in 1851. Its conception is as poetical as its form is pure; and with the greatest respect for the talent of Vecte, whose artistic labors in silver for so many years has been unsurpassed, we can congratulate the trade on the fact that the finest piece of work exhibited in the Exhibition of 1862 came from Birmingham.

In reviewing the progress of art in relation to gold and silver work, we fearlessly say that in no corresponding period of modern times has art made such rapid progress, and furthermore that the schools of art have already done much towards the improvement of gold and silver manufactures.

In considering the influence of art education on the prosperity of the goldsmith and jeweler, it must be taken into consideration that art-knowledge in the purchaser is of the greatest importance to the manufacturer and the seller, so that it is useless to introduce high art into the jewelry for the million, at least at present, although some progress has been made in this respect.

The study of drawing and painting by the higher classes has been one great cause of improvement in gold manufacture. There are many ladies who make a good drawing of what they require the jeweler to execute for them. A jewel given to Miss Nightingale was designed by the late Prince Consort, and although in itself but a trifle, it was conceived in a feeling of true art. Such instances are not rare, and they are likely, in the future, to have a more beneficial influence upon art manufactures.

Workshop Gossip.

Brass, copper, bronze and similar metals, can be quickly silvered without a battery, by rubbing them with a solution of chloride of silver (prepared by precipitation with common salt), in hyposnlphite of soda.

Molding Ivory.—Take 3 onnces of spirits of niter and 15 of spring water; soak the ivory in this about a week; it may be colored any desired hne with alcohol stains. It is then to be molded or worked to the desired shape, and hardened by wrapping it in white paper and covering it for 24 hours in decrepitated common salt.

Bronze Ornaments.—First varnish the work to be bronzed, and allow it to dry until it is "tacky;" then lay on the pattern (which should be cut in good foolscap paper,) and apply the bronze (dry) by means of a small velvet cushion; allow the coat to become thoroughly dry, and then varnish again.

Golden Varnish.—Pulverize 1 drachm of saffron and ½ a drachm of dragon's blood, and put them into 1 pint of spirits of wine. Add 2 ounces of gum shellac and 2 drachms of Soccotrine aloes. Dissolve the whole by gentle heat. Yellow-painted work, varnished with this mixture, will appear almost equal to gold.

A preserving lacquer for brass or bronze, which gives a beautiful gilding to the articles, is prepared simply by dissolving in 332 parts of rectified spirit 16 parts of shellac, 4 parts of dragon's blood, and 1 part tumeric root. The metal to be lacquered is warmed, and the varnish applied by means of a sponge. As the liquid is a spirit solution it is necessary, of course, to keep it in a well-stoppered bottle.

A gold lacqueer, closely resembling the real Chinese article, is made by first melting to a perfectly fluid mixture 2 parts copal and 1 part shellac. To this add 2 parts good boiled oil. Remove the vessel from the fire, and gradually mix in 10 parts oil of turpentine. To give color, add a solution of gum guttæ in turpentine for yellow, or of dragon's blood for red, a sufficient quantity of coloring material being used to give the desired shade.

Nickel-Plating Bath.—Pfuzenet employs a bath composed of 87.5 grammes of sulphate of nickel, 20 grains of sulphate of ammonia, 17.5 grains of citric acid dissolved in 2 liters of water. Another recipe much used in France, is formed of a solution of 4 parts of nitrate of nickel in 4 of liquid ammonia and 150 of water, in which 50 parts of sulphate of soda have been dissolved. With a moderate current the operation is completed in a few minutes. When the film of nickel is of sufficient thickness, the objects are withdrawn from the bath and dried with sawdust.

New Important Alloys.—Several new alloys have been invented; one of them, similar to German silver, contains no nickel, but manganese instead. It consists of 72½ per cent. of copper, 16½ of nanganese, 8½ of zinc, and 2½ of iron. This alloy is malleable, does not change when immersed in water for forty days, takes the silver plating well, but is a little yellowish. The inventors of these alloys are Beirman, and Clodius, of Hanover, who also produce alloys of tungsten, manganese in various proportions, phosphor copper, chromic copper, and metallic chromiums. We believe this information to be of some value to many classes of metal workers, for the benefit of whom we hasten to communicate it.

A solution of chloride of copper will show the difference between gilding for which gold has been used and gilding with alloys of inferior metals. If the gilding is imitation gold, a touch of solution gives a black mark, copper separating out through the zinc in the yellow metal, with pnre metal no discoloration occurs. The test can only be effected with a solution of chloride of gold or nitrate of silver, the first of which gives a brown spot and the second a grey or black spot; neither, of course, has any effect on gold. Common gold goods of 14 karat gold do not change their color with nitrate of silver. Leaf gold is tested by being shaken up in a closed bottle with sulphur chloride. Beaten gold shows no alteration, while "metal" leaves grow gradually black.

Egg spoons get tarnished by the sulphur in the egg uniting with the silver. This tarnish is a sulphuret of silver, and may be removed by rubbing with wet salt or ammonia.

Professor J. Lawreuce Smith has recently invented a new compensating pendulum, in which he avails himself of the great expansibility of ebonite, which, between 38° and 152° Fah., approaches that of mercury. The pendulnm rod is of steel, with an adjusting screw at the lower end; and a round rod of vulcanite, with a hole in the center, is passed on to the steel rod, fitting it loosely, and being held in place by the adjusting screw. The bob of the pendulum consists of a heavy piece of brass, with a hole throngh the center large enough to admit the vulcanite, over which it passes, and, by a properly arranged stop, rests on the end of the vulcanite furthest from the lower end of the pendulum, so that any expansion of the vulcanite elevates the brass bob, thus compensating for the downward expansion of the steel rod and brass bob. Professor Smith says that four months' use of this pendulum on an astronomiveI clock has given very satisfactory results. It can be adapted, at a cost of 20 cents, to the ordinary mantelpiece clock, the pendulum of which nsually beats in half-seconds.

Coloring Gold by aid of Bromine.—Wagner suggested, on account of its simplicity, the substitntion of treatment with diluted aqua regia for the usual process for imparting the tiut of pure gold to articles of jewelry. On trial it was fonnd not to answer on account of the impossibility of removing, by mechanical means, a small amount of chloride of silver formed on the surface, and dissolving it off by ammonia or hyposulphite of soda also proved unsatisfactory. He found bromine, however, an excellent means for the preparation of a gold color, with the addition to its aqueous solution of some bromide capable of dissolving bromide of silver (and also the bromide of copper probably formed at the same time). Bromides of calcium, barium and magnesium were found especially adapted to the purpose. He recommended, therefore, a solution of 15 grains of bromine and 375 grains of bromide of calcium (or 450 grains of bromide of potassium) in about 34 fluid ounces of water. The articles to be colored should be moved about in this for three to five minutes, and rinsed with pure water on removal from it. In case of alloys of gold and silver, rinsing with a solution of hyposulphite of soda is advisable, to remove possible traces of bromide of silver remaining in the depressions. The silver is recovered from the exhausted bath as bromide of silver by dilution with ten times its volume of water; and the gold by the addition of sulphate of iron, after the last traces of free bromine are removed by means of sulphurous acid.

How to Produce a fine high color on Gold Jewelry.—Boil 8 ozs. saltpeter, 4 ozs. alum, and 4 ozs. common salt together, in a porcelain or other fireproof vessel (not metallic), in barely sufficient water to dissolve them; add 9 ozs. strong muriatic acid to this solution, and filter. This quantity will be sufficient for coloring 4 ozs. of work at a time, and should be kept in a well-stoppered glass bottle when not in use. Another recipe is: Boil 10½ ozs. saltpeter and 5½ ozs. common salt together, in a porcelain dish, in a quantity of soft water barely sufficient to dissolve them, add ½ oz. nitrate of silver (lunar caustic) and 9½ ozs. muriatic acid; filter. This quantity will be sufficient for coloring 4 ozs. of work at a time, and should be kept in a well-stoppered glass bottle when not in use. To color with either of the foregoing mixtures, anneal the work twice, and boil it, each time after annealing, in a pickle consisting of 8 parts water and 1 part sulphuric acid. Then pour a sufficient quantity of the coloring mixture into a porcelain dish, and heat it to about 150° Fah. Hold the work in this for about two minutes, then take it out and rinse it in clean water. If not sufficiently colored to suit, repeat the process until the desired color is obtained. Another and more common method among jewelers is to make a kind of paste, consisting of 2 parts saltpeter and 1 part each of alum, sulphate of zinc, common salt, and a little water. These ingredients are well mixed in a mortar, and the articles to be colored are covered with the paste, laid upon an iron plate, and heated over a clear fire nearly to a black heat. They are then suddenly plunged into cold water and well washed. This insures a beautiful high color.

Trade Gossip.

Brooches, worn at the throat, have been revived.

John Bliss & Co.'s chronometer on Wall street is the standard time for over 4,000 watches.

A Philadelphia jeweler has been detected substituting imitation diamonds for real ones left him for setting.

A bronze statue of Hans Christian Oersted, the discoverer of electro-magnetism, has been erected in Copenhagen.

Ear-drops will he worn of medium length, as the long pendants would interfere seriously with the lace neck-ruffles.

C. M. Power's jewelry store in Canastota, N. Y., was damaged by fire on the 15th ult. Loss estimated at $1,000; no insurance.

The stock of Charles Hyde, jeweler, of Tarrytown, was slightly injured hy fire on the morning of the 10th inst.

Stein & Brother, jewelers, of No. 66 Nassau street, have suspended in consequence of the robhery of their entire stock of watches and jewelry.

An art store in Fifth avenue exhibits a hird of Paradise carved from wood, and painted so lifelike that the illusion is with difficulty dispelled.

Richard Keeping, who keeps a jewelry store at 1601 Broadway, has heen victimized by two confidence scoundrels out of three gold watches valued at $400.

Robert A. Knight, employed as errand hoy in the store of J. F. Horton, jeweler, of No. 25 John street, has been arrested for systematically stealing from his employer.

The direetor of the Mint has fixed the purchasing rate of silver at the Mints and Assay Office in New York at 116 cents per ounce fine. This rate will he continued until further notice.

Mr. Dorrance has retired from the firm of Smillie, Dorrance & Edge. The business will be continued under the firm name of Smillie & Edge. Our good friend Dorrance has our heartiest wishes for his speedy restoration to health.

The Middletown Plate Co.'s exhibit at the Centennial was one of the chief attractions in that department, and the goods there contained were universally admired hy everyhody. Style, finish and decoration were executed with remarkahle care and artistie excellence.

A novelty in finger-rings—and an entire novelty, at that—will shortly he offered to the trade by Messrs. H. Muhr's Sons, who have secured the U. S. patent for the "Bellezza" style. At an early date we purpose to present our readers with an illustration of this new and curious style.

D. Lazarus, who keeps a pawnshop in Notre Dame street, Montreal, was recently robbed of diamonds, watches, jewelry, etc., valued at $20,000. The police succeeded in arresting one of the thieves, who confessed that he, with two others, had stolen the goods. His accomplices are said to he in this city.

John M. Hall, Jr., who has heen in charge of the exhibit of Messrs. Starr & Marcus, at the Centennial, was instantly killed on Tuesday, the 30th ult., while attempting to jump from a train in motion. Mr. Hall was in the prime of youthful manhood, and the centre of an extended circle of friends hy whom his sudden taking-off will be deeply felt.

A foreign gentleman who will take home medals for each of the several houses which he represents, is in very good humor about it. Especially is he pleased with one of the prizes for an excellent article of blacking. The packages exhibited are very showy and attractive, and display exeellent taste in the printing of fancy wrappers and other devices to gain the attention of spectators. But the best of it is, says our fortunate friend, that none of the packages had any blacking in them.

One of the Australasian papers vouches for the following story, which it thinks too good not to be handed down to posterity:—

"A certain chief, a man of intelligence, and punctual in monetary matters with his pakeha neighbors, was lately a sufferer to the extent of some £30 or £40 by a man going through the court. In relating the affair to some natives he was visiting, he told them that he had lost his money by a man becoming 'packarapu.' This word rather staggered the aboriginals, who immediately demanded an explauation. It was given as follows: 'A pakeha who wants to become a "packarapu" goes into husiness, and gets lots of goods and does not pay for them. He then gets all the money he can together, say £2,000, and puts it away where no one can get it, all except £5. With this he goes to the judge of the Supreme Court, and tells him that he wants to become 'packarapu.' The judge says he is very sorry, but of course it cannot he helped, and he calls all the lawyers together, likewise all the men to whom the 'packarapu' owes money, and he says 'This man is "packarapu," but he wishes to give all he has got, and so he has asked me to divide this (the £5) among you all.' The judge thereupon gives £4 to the lawyers, and £1 to the other men, and the 'packarapu' goes home."

The Attorney-General of Pennsylvania, in deciding that gold and silver watches worn upon the person are to he considered as wearing apparel, and not to he subject to taxation, has created quite a stir among watch carriers, as anything looking to the lightening of the hurden of taxation naturally does. It seems that it is only gold lever or other gold watches of equal value that are subject to the tax of $1; the tax on inferior gold and silver lever watches being seventy-five cents, and upon every other description of watches of the value of $20 or upward, fifty cents; and in ascertaining this value of "$20," the original cost, or the value put upon it hy the owner from association, hy reason of its having been worn hy some esteemed friend or relative, are not to he the tests, but the present market value, as may he determined hy the price each particular watch would command at the hands of the dealer. This important decision of the Attorney-General, if accepted as conclusive, will very materially lessen the amount heretofore realized from watches, and yet it is known to have worked most unequally, hundreds and thousands of the less conscientious not making returns where they should, and many, supposing themselves included, returning when not required to do so under the law.

A Quaint Old Bill.

The following curious account for restoring a chapel is engraved, in French, on a watch case to he seen in the Swiss department at the Centennial:—

A painter had heen employed to repair a number of pictures in a convent; he did it, and presented his bill in full for 59 francs and 11 centimes to the curate, who refused to pay it, saying that the committe would require a full detail. The painter produced it as follows: "Corrected and revised the Ten Commandments, 5 francs and 12 centimes; embellished and renewed Pontius Pilate, and put a new ribbon in his bonnet, 3 francs 6 centimes; put a new tail on the rooster of St. Peter, and mended his comb, 3 francs 20 centimes; replumed and gilded the left wing of the Guardian Angel, 4 francs 17 centimes; washed the servant of the High Priest, and put carmine on his cheeks, 5 francs 12 centimes; renewed Heaven, adjusted two stars, gilded the Sun and renewed the Moon, 7 francs 14 centimes; re-animated the Flames of Purgatory, and restored some souls, 6 francs 6 centimes; revived the Flames of Hell, put a new tail on the Devil, mended his left hoof, and did several jobs for the Damned, 4 francs 10 centimes; put new spatter dishes on the Son of Tobias, and dressing on his back, 2 francs; cleaned the ears of Balaam's Ass, and shod him, 3 francs 7 centimes; put ear-rings in the ears of Sarah, 2 francs 3 centimes; rehordered the robe of Herod, and re-adjusted his wig, 4 francs 4 centimes; put a new stone in David's sling, enlarged the head of Goliah, and extended his legs, 3 francs 2 centimes; decorated Noah's Ark, 3 francs; mended the shirt of the Prodigal Son, and cleaned the pigs, 4 francs 9 centimes. Total, 59 francs 11 centimes."

EXAMPLES OF CORAL IMPORTED FROM THE CELEBRATED HOUSE OF
LUIGI CASALTA, NAPLES, ITALY.
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THE

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Our New Volume.

With the January number our first volume in the new shape will close, and with that of February, the second will open. The change of shape decided upon, after much questioning a year ago, has proven very satisfactory to the trade, and in the main to ourselves; although it has entailed a considerable increase of expenditure, which has reduced the profits proportionately. We would ask our readers to take a glance over the volume, nearly completed, and ask themselves if any other trade journal has been able to supply such a variety and quantity of valuable matter, at anything like the price we ask. Besides this, the volume will contain no less than ten full-page plates in color, giving the latest novelties in jewelry, watch cases, etc., some of which have been prepared entirely at our expense, and at a very great outlay of money. Taking the increased cost of the journal into consideration, we have thought it, after much consideration, only fair that we should hereafter ask the price of $2.00, instead of $1.25 This will still be about half the price at which any corresponding journal of its size and elegance is furnished, and we believe the trade will agree that it is not fair that we should, in improving the journal, suffer a decrease of profit. The old price nowhere near paid for the mere mechanical cost of the journal, and the new price will scarcely more than cover it. We shall be greatly disappointed if the trade does not feel that we have proved the worth of THE JEWELERS' CIRCULAR to be $2.00, and we shall certainly spare no endeavors to make it worth, next year, more than it has been heretofore.

The Year 1876: A Retrospect.

The year 1876 has not fulfilled the expectations of those who looked forward to it as the first of a new period of busy prosperity and wholesome activity in the trade; and yet, when we take into consideration the universal depression of business and the unparalleled distrust which, with many merchants, marked the advent of the year just closing, we cannot but think that the interests we represent may feel reasonably satisfied with the results of the past year. Those who have expected too much have certainly been disappointed; but those who put their standard of expectation but reasonably high, have found themselves not without some consolation. It is to be remembered that we have been for some years on the down track, under that reaction from the over-prosperity after the war that must inevitably follow such periods. The new-year of 1875 brought with it, maskedly, the commercial distemper which affected the whole nation.

Hard times were felt everywhere and want, open or concealed, met us with sad frequency. For reasons which the political economists will not yet understand, the whole world seemed to sympathize with this tone of the commercial community. There was a general uncertainty and stagnation on the other side, which reacted in its turn upon our own commercial state; while at home the unsettled state of public affairs, and the distrust engendered by official corruption at Washington, created a general gloom and despondency from which it must take a long time to recover. Previous years had left to 1876 a legacy of bad debts, depreciated securities, and a scarcity of money; and real estate, which always is the last thing to respond to the rise or fall of commerce at large, lost its convertible character and dropped also to the bottom. These calamities were like a canker-worm in the heart of commerce.

The Centennial Exposition, which it was thought would stimulate trade no little, seems to have had rather the contrary effect, at least the effect of diverting people from their ordinary purchasing. Neither New York nor Philadelphia has felt to any marked extent the influence of the visitors who were supposed to be coming with money in their purses; and we must be content to find the fruits of the Centennial in the improvement in our industrial art that will come from our useful comparisons. The year has also no more failures in the jewelry trade than any since the Chicago fire, and yet we may say that there have been fewer failures than we had reason to expect at the outset. Under the conditions in which trade found itself at the opening of the year, and has since been carried on, it is a wonder that more houses have not gone to the bottom.

The considerable proportion of rascally failures has not been an encouraging feature of the year, and we are sorry to say also that many of these have been disgracefully compromised in a manner that reflects little credit on our commercial honor and integrity. It is proverbial that drowning men will catch at a straw and in dull times there is always the temptation to the business man who does not look very far ahead, to make the best terms he can with bankrupting debtors, and then to sell to them again the moment they get upon their feet. In this way the creditor-merchants are the direct cause of many of these failures, through their weak policy of selling to the delinquents, under the delusive idea that they are financially stronger after bankruptcy, and therefore safe parties to sell to for a time. This is as uncommercial as it is illogical, and disastrous to honest business principles. A man fails by his inability to meet the credit already extended to him, and it is a great mistake in most cases, to attempt to save him by giving additional extension of credit, which only makes the quantity of his debts greater, and gives no more satisfaction to his creditors. This mistaken policy is only putting off the day of judgment, making it worse for the creditors, and giving the debtor no better chance. Partly as a result of these compromises, and the offering of bankrupt stocks, but largely for other reasons, there have been frequent cutting-under in prices of various commodities during the year; another trick of the trade which has had a decided unfortu-

nate influence upon business. A competition by the manufacturer for the retailer's customers is not wholesome, and is pretty sure to lead, in the long run, to this cutting of prices; but it has also crept up in the jobbing, and even, to some extent, in the retailing stores. But wherever goods are sold below cost and a reasonable profit, it is disastrous to the trade and does no good to the community. A considerable excitement was created during the year by the cutting in prices of watches, but this was promptly met by the Waltham Company, they extending rebates to jobbers and retailers, so that the influence was not so bad as it might have been.

Business men are very apt, in dull times like these, to leave their business, one may almost say, to brood over the troubles from which they can see no relief; and many merchants have been particularly "blue" in this way this year, over the practical workings of the bankruptcy law. There is now a general agreement among the commercial associations that the result of this law has been very disappointing, and that most debtors have been able to stow away goods either in their wives' names, or under some other hocus pocus. Under this state of mind they have too easily allowed themselves to be influenced by the advocates of compromise and this accounts to a considerable extent for the difficulty we complained of above. The result has been of course that they have given out, and they are the common enemy of the whole trade. It is to be hoped that the new year will bring with it such changes in the bankruptcy law as will prevent dishonest bankrupts from dissipating their property altogether. But, after all, no bankruptcy law can do for the merchant what he can do for himself. If he will put his credits on the proper foundation, and be careful not to allow time to men who are not worthy, there would be less likelihood of difficulty later. It is encouraging to learn that credits are, as a rule, better under control than in former years. This is no doubt owing largely to the influence of the trade associations, and the more searching investigations adopted by many of our best firms. Yet we are sorry to say there is still great laxity in this matter of the strict business morals so necessary to success.

Those members of the trade who have pushed sales as in former years, find that they have sold all the goods they wanted to, and more too; but when they have come to ask for their money, the result has not been so satisfactory, and the present prospect of their making a fortune from large sales in 1876 is, to say the least, doubtful. It is wise to carry into 1877 a cautiousness both as to credit and large sales. We have seen during the year, to be sure, numerous little spurts in business, which have certainly been encouraging, and enlivened for a time. But as a rule they did not last as long as we had hoped; and now, when the jewelry trade is looking for a fair holiday business, our hopes are again dashed by the great uncertainty of the political situation. The old year closes in Europe with no less distressing complications there, although its misfortunes are likely to turn into strokes of good luck for us. Take it all in all, we may fairly say that, everything considered, the jewelry houses that have held their own during the past year, may very fairly be satisfied; for many merchants and dealers in far more staple articles have had to go under and stop business altogether.

And now the question is for 1877. Let us all pray that no unhappy political complications may interfere with the possible prosperity of the coming year, and let us hope also that the year may prove a link in the chain toward better times. This is what we have been hoping for many years, and the year has not come yet; but it must come sooner or later, and everybody believes we have touched bottom this year. Next year, without the Centennial excitement, and the disturbance of a Presidential election, and after the worst of the hard times, should at least show some improvement; and if our own trade will be careful to act on the strictest principles of business integrity and wisdom, it is likely to have a reasonably fair chance in the year on which we are soon to enter.

Sweet Confidence Misplaced.

Now and then there comes a moment in life when we are tempted to believe that there is some innocence left in this weary, wicked world. Such a blissful instance arrived to us this morning, when we perused a postal card directed to a manufacturing firm in this city. The postal card was not clean; its corners were dog's-eared and dilapidated, as though the sender had treasured it long in his bosom before entrusting it to the custody of the postmaster. Well might he hesitate ere he gave to the world so rare a treasure, so absolute an evidence of his faith in the goodness of mankind! But we waste time in thus bandying words; let the gem be its own expositor. We copy it to the letter, as near as we can:—

Harrisonville. Ufergs Co, Ohio Oct 20

Sir we are dellers & are gowing to purches larg stalk of (*chains* Gents) & if you will send By Expres asortmt for selection & kuts we will favor you with cash Order at wonce Send by Adms Express Pommercy Ufergs Co Ohi

D. F. Casey & Co.

The spectacle which was presented in our office subject to the perusal of the original of the above was affecting. We—including the entire staff—smiled blandly and sweetly as we wondered over its many beauties. We thought of D. F. Casey & Co. away in the western wilds of Ohio putting their trust in the goodness of human nature, and asking a trustful world for "asortmt for selection & kuts." D. F. Casey & Co. must be prompt business men, for they add with emphasis, "order at wonce," and we admire their enterprise. But the consignee of this postal phenomen was a cool and calculating man of business; he looked not at the æsthetic side of the question, nor considered the reliant spirit of Casey & Co.; he sought out as to their credit, and with that sordid non-existency not even as good as their orthography, he let D. F. Casey & Co. severely alone. And now the firm sit, day after day, in their wild western home longing for the "larg stalk" that doth not come, and lamenting the expenditure required for the sending of that trustful and trust-seeking postal card. Our smiles fade away, and in the place thereof we drop a tender tear in sympathy with those who have cast themselves upon the bosom of the universe to find that it is hollow, hollow, hollow!

The Remedy for Railroad Tyranny.

It would seem as though the railroad tyrants had got their hands upon the throat of the jewelry and silverware industries, and were resolved to put an end to all traveling enterprise in those lines. The policy which has been adopted is suicidal to the welfare of the railroads, but meanwhile is destructive to the oppressed trades. Of late many houses have suffered heavy losses by the mysterious disappearance of sample trunks while in the custody of railway officials; and, as the companies have whittled down their common law responsibility, by inequitable legislation, the manufacturers in jewelry, silverware and watches can only look at each other in silent dismay as one of the most important branches of their business is crushed out of existence. If proper precaution was taken by the companies of the property entrusted to their care, then there would be no need for special legislation in their interests; but the fact is that the companies are careless, and then exert their power to cure their neglect by unjust enactments, conceived and executed by their purchased instruments. The citizens of the United States are ground down by the corporations of the country, and especially by ill-doing and tyrannous railroad companies. Unless something is done the manufacturing firms *must* cease to send out travelers, for the risks of the road are so heavy that no one will dare to face them. It is impossible to pay the extra premium demanded when the value of sample trunks is declared, and even if it were paid, what assurance has the insurer that his claim will not be fought out to the end in the courts, and then goodness only knows what or when will be the end of it. The question of the hour is, "What are you going to do about it?" We answer, meet the issue required, and fight corporations by combination. Let those whose interest it is to secure safe carriage for their goods organize an insurance company which shall guarantee the value of sample trunks. Let the risks be graduated, and let care be taken in their acceptance. Then there will be a fair prospect of improved business with reduced expenses. Moreover, "in union there strength," and such an insurance company, powerful and well backed with brains and capital, would be in a position to restrain further railroad encroachments and to remedy existing evils.

Editorial Jottings.

We hear that some of the retailers in the trade have brought themselves under threatening embarassment, by taking advantage of the recent low prices of real estate to look up part of their capital in that direction. This does not seem so unwise, at first sight, but pretty soon there comes a time when the retailer has to pay his bills, and finds he needs all the money he can get together; and now he finds that his real estate purchase was one of those dear bargains that a man repents of severely. The truth of it is that a man who is in business needs his capital first for that business, and he should not go outside to look up capital in other things, until he is quite sure he has made enough of a fortune to run his store on his baiance. This is a fundamental principle of business, and disregarding it, a great many people have come to grief before this.

Our readers will be amused, and not seriously grieved, over the neat way in which one of the gentry now preying upon the craft, was lately caught, as described in another column. The CIRCULAR was after him, it seems, though he didn't think about that; this detective function of trade journalism is certainly curious. But the journal now circulates so widely throughout the entire trade that there is small chance for the escape of any one who has committed fraud or robbery, and who must still keep himself among the trade. The example of the firms which tracked up the man, should be followed by other houses who have like opportunities hereafter; for each case of a robber caught makes it more safe for the trade in general, and therefore for every member of it. We are glad to know the fellow is in jail, and trust no sentimentality will prevent his having the full benefit of the law. There have been too many of these things.

A certain event, known to some of our readers, has revived in the minds of many the question as to guaranteeing the standard of the precious metals when manufactured. We are in receipt of some lately compiled authorities setting forth the various regulations adopted throughout the civilized world, and also discussing the practical effect of such legislation as the English "Hall Mark" as compared with the unrestricted manufacture which prevails in this country. The subject is one of great importance and is not to be taken up for disscussion without much thought and careful consideration. In our next number we propose to commence a series of articles upon this matter, and, meanwhile, invite those of our readers who are in possession of papers, documents, books or information relative thereto, to communicate with us, forwarding, at the same time, their views and opinions, so that from the wisdom and experience of the multitude we may be able to evolve the ultimate advantage of all.

A very strange accident took place on Sunday, Nov. 26th, which resulted in the destruction of the baggage car on the Boston train which left the Baltimore & Potomac Depot, in Baltimore early that morning. When the train arrived at Washington, from the South, a very large quantity of express matter was transferred to the car containing the baggage of the passengers, and among this express matter was some loosely packed cotton which was placed near to the stove and presently began to moulder and burn. The express men had scarcely noticed this before the cotton burst into flames which spread so rapidly that only a small portion of the baggage was saved. The burning car was switched off onto a siding where it was allowed to blaze away, so that the remaining contents were destroyed, including a trunk belonging to W. B. Howe, of the firm of Carter, Howkins & Sloan, of New York, who was returning from an extended business trip through the South and West. His trunk was in the baggage car but he was not informed of the accident until it was too late to take any steps to save it. Mr. Howe at once notified his firm, and Mr. Sloan immediately hastened to the scene of the disaster. By his directions the ashes and debris were collected and assayed out. The contents of the trunk were valued at $20,000 or $25,000, and, up to the present, about 1,500 dwts. of gold and some silver have been recovered.

We print elsewhere a list of the Awards at the Centennial, which is complete up to the present date, but which will probably be followed by a supplementary list to be published by the Commission on Appeals. It will be seen by reference to this list that our Swiss friends have been universally successful in carrying off the honors in horology. This is not to be wondered at when the quantity and quality of their goods are taken into consideration. Two only of the American companies exhibited goods, viz.: the Waltham and the Elgin. What the former have done can best be judged by reference to the official record, where it will be seen that they have received no less than four distinct awards for various points of excellence. This was the only American company who had pluck enough to enter their goods for competition with the best foreign makers, and the perfection and reliability of their movements astonished the judges and experts. The tests were very severe, which, without doubt, deterred other exhibitors from competing; and the watches which sustained an ordeal so thorough and searching, are deserving of the highest praise. The very excellent article by John Bliss, Esq., which appears in this number, conveys a great deal of information on this subject, and, inasmuch as his firm is the representative chronometer makers of this country, his statement will be read with interest by the whole trade.

Tales of the Trade.

No. 3.—THE FIRST PURCHASE.

Both of them meant business as they swept into the stately emporium of the Gorham Manufacturing Company in Union Square. His air bespoke the man who has a good balance at his bankers, and her carriage showed the woman who meant to spend it. It was very evident that they came to purchase as well as to inspect, that they were such customers as gladden the hearts of storekeepers. No time was wasted, for without delay he started in as the salesman came up—

"Come, Nellie, What do you want to look at first?"

"I've wanted a swinging ice-pitcher all my life, ever since I came home from school, and almost drowned myself trying to tip the big one at home"

That was soon supplied, with goblets all around a cunning little goblin sitting on top.

"Pitch-her in the basket," he remarked, "and what is the next article?"

"I s'pose we'll want some spoons, won't we?"

The salesman put some on the counter and turned away.

"I don't want to be extravagant, Nellie.—Now ain't you spoons on me?"

She shook her head with a very eloquent nod.

"And ain't I spoons on you?"

"Hope so," was her emphatic response.

"Then if we are both spoons, we don't want any other spoon at all, do we, eh, Nellie?"

Her answer was unspoken when the salesman returned and remarked.

"I would not entirely recommend that article, maam, the plating will wear off in time, but here is a pattern we warrant to wear."

She blushed and he hemmed, and the spoons were accepted.

"Next, little woman."

"Knives, Charley, knives."

"Well, you know, Nellie, they say that the giving a knife is the cutting of love. I'm not superstitious, oh, no, but if your mother could be brought to look at knives as an appropriate present.—No, thank you, not at present.—No knives, thank you."

"Forks then?"

"Oh, forks are all right. I'll fork out for them with pleasure. What next?"

"A Cruet Stand."

"That's so. Oil, vinegar, pepper, and mustard. Symbolical elements of matrimony, I read somewhere, all very good when properly mixed up. Sort of salad dressing to give a flavor to life. Let's have one with a bell on top. You have always been in that line, and when you are married shall have one all to yourself."

"Now, I want a te' set."

"Providence will probably send us several tea and coffee pots and a choice variety of cake baskets, as wedding presents. Better wait awhile, Nellie."

"But sugar basins and milk ewers. I know I never gave any of them to anybody. They would be useful."

"All right. Get good big ones so that we can have all the milk of human kindness and the sweets of life at our disposal."

And so they went on until a pretty fair sampling of the wares had been completed. They were at the door when her glance fell upon a tiny set of table equipment. The glib salesman was ready in a minute.

"For a little child, madam. The very newest style. Apostle pattern, madam, with St. John on the knife handle and St. Matthew on the spoon."

She blushed and he smiled.

"Not to-day, sir,—not to-day. You see times are hard; but next year perhaps we will look in and see about that little set."

But I do verily believe that she would have traded off all her purchases for the contents of that little morocco casket.

Practical Hints on Watch Repairing

By Excelsior.—No. 21.

THE DETACHED LEVER ESCAPEMENT.

(339) The selection of a new wheel or pallets which shall be theoretically correct in form and action, is a job that few watchmakers can perform properly. Even when guided by the old ones, and having selected new which appear to be exactly like them, when tried in the watch they may not answer at all,—sometimes the wheel will be unable to pass, and in other cases it will scarcely touch the pallets. But when we are guided by some knowledge of the principles which control their action and determine their form, it is easy to select pallets adapted to the wheel, or a wheel adapted to the pallets. Without going very deeply into the theory of this escapement, I will at present merely give brief directions for making correct drawings of the different parts, which will serve to show what is wanted. To do this we should have a horn protractor, clear and properly cut, and a pair of parallel dividers with pump center, often called pump dividers. It is possible to get along with merely the ordinary dividers or compasses, and mark off the angles as in section (308), but the above tools do not cost much and are much better.

(340) The workman also needs a short and easy lesson in Geometry, which is a branch that every aspiring watchmaker should study. It will be found exceedingly useful to the student of horology, and by no means so dry and uninteresting as is generally supposed. Any one who has a love for nicety and exactness will be sure to like it, provided he does not overdo the thing and undertake to learn it all as fast as he can read it. Suppose the following cases: 1st. Having a straight line, we want to draw another line that will meet it perpendicularly at a certain place. Let *b c*, Fig. 14, be the line, and we want to draw another, perpendicular to it, from the point *a*. We set the legs of the dividers to any convenient distance apart, place one point on *a*, and with the other mark the curves *b* and *c*, across the line. Then set one point at the crossings *b* and *c*, and draw the two curves at *d*. Finally, draw a line from the crossing of these curves to *a*, and the problem is solved.

Fig. 14

2d. We have in Fig. 15, two points, *b* and *c*, on a straight line, and we want to draw another line to cross it perpendicularly exactly midway between those points. Set the dividers to any convenient distance, and draw, from *b* and *c*, curves at *d* and *e*, then draw a line from the crossing of these curves at *d* to that at *e*, and we have what we wanted. This is also the method used to halve or bisect a line. Hereafter, when we say "draw a line perpendicular to" etc., etc., it will be understood that it is to be done as above, although the curves, etc., are omitted in the cuts. An "angle" is the inclination of one line to another, and is expressed by three letters, the middle letter being the one at the crossing or junction of the lines. Thus, the angle *b a d*, Fig. 14, is the angle between the lines *b a* and *a d*, at *a*. When lines are perpendicular to each other, as in this case, the angle is a right angle, or 90°; if the angle included between two lines is more than 90°, it is called an obtuse angle; if less, an acute angle.

Fig. 15

(341) We will take the ordinary style of detached lever escapement, the wheel having fifteen teeth, the pallets taking in three teeth, the lift 16°, etc., as thus far supposed. The distance between the centers of the escape wheel and the lever is fixed, being generally jeweled, is unalterable. Now suppose we want to select new pallets. We draw a circle *x*, Fig. 16, the size of the wheel at the extreme points of the teeth. From its center, draw a line *a b*, and mark on it the distance between centers, which will be, say, *a c*. Then with the protractor mark off 30° on the circle, on each side of the line *a b*, and draw lines *a d* and *a e*, to those points. Now our pallets, if in the Swiss style, should measure, from the front corner of the short arm to the front corner of the long arm, the same distance as from *d* across to *e*; the distance from the front corner of the short arm to the center of motion (or center of the arbor hole) of the pallets should equal *d c*, and the distance from the front corner of the long arm to the center of motion must equal *e c*. The pallets may be measured with the pump dividers, placing the pump center in the arbor hole, and holding the dividers vertically or perpendicularly to the plane of the pallets as they lie on the bench, and the needle point just at the corners. If the pallet jewels are not perfectly flat, but rounded out in the middle, all mensurements, etc., must be made from the highest point of their convexity. If the pallets, (whether new or those already in the watch,) do not measure as above, they are not right for that wheel and center distance, and, if much different, should be rejected.

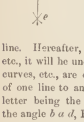

Fig. 16

(342) To draw the pallets and mark their center of motion, measure the distance between the front corners and mark it on a straight line, as *d e*, on the horizontal line in Fig. 16. Then measure from one front corner to the center of the arbor hole in the manner before described, (341,) project the pump center to the same distance as the other, and, holding the dividers vertically, set one point at *d*, and mark a curve at *c*, with the other. Then measure from the other front corner, as above, and from *e* make another curve at *c*. Where these curves cross, at *c*, will be the exact center of the pallet hole. The distance from the center of the hole should he the same to *both* of the front corners. If not, the pallets are defective. To draw the pallets as above described, when they are fastened on their arbor, set the female-center end of the pump on the lower pivot, and hold the dividers in line with the arbor while measuring to the front corners. Then reverse the ends of the pump, and mark the curve with its pointed end, as already described.

(343) To find the size of a wheel suitable for given pallets, draw a straight horizontal line, lay the pallets on it so that the front corners just touch it, and mark the exact distance between them, as *d e*, in Fig. 16. Also mark their center of motion, *c*; or measure and draw as directed in section (341). Now draw a line perpendicular to *d e*, and through its center, (340). This will be the line *b a*, on which we mark the center distance as measured in the watch, measuring from *c*, and the point *a* will represent the escape wheel pivot hole. From *a*, as a center, draw a circle passing through the points *d* and *e*, and you have the size of wheel for that pallets and center distance, provided the pallets themselves are correct for the center distance. To test that point, lay off the distance between the front corners on a straight line, as *e d*, in Fig. 17, then measure from the center of motion to the front corner of one of the arms, and, with the dividers thus set, find the center of motion, *b*, as directed in section (341). From *b*, draw a straight line perpendicular to *e d*, and passing through its center. On this line mark the center distance *b a*. Draw lines from *a* to the points *e* and *d*. Measure the angle between *a e* and *a d*, which will be 60°, if the pallets are correct.

Fig. 17

(344) Finally, we can test whether the escapement is properly pitched for the wheel and pallets, that is, whether the center distance is correct. Fig. 16, will serve to illustrate. Draw the circle *x*, say ten times the size of the wheel, and from *a* draw a line *a b*. Mark off 30° on each side of *a b*, and draw the lines *a d* and *a e*. Then, from the points where the lines cross the circle, draw the line *d c* perpendicular to *a d*, and the line *e c* perpendicular to *a e*, and where these lines cross, at *c*, is the proper place for the center of motion of pallets suited to that wheel. Now, if the center distance as measured in the watch, and multiplied by ten, or measured ten times on the line *a b*, reaches from *a* to *c*, as already drawn, then the escapement is correctly pitched. But if, for instance, the center distance thus measured should reach from *a* to *b*, there is some error of construction in the escapement. If the pallets are adapted to the wheel, then either the wheel is too small, or the pallets are not set deeply enough into the wheel. If the pitching is too shallow, the pallets should be set up towards the wheel, on the arbor. But if the pitching is correct, the wheel is small and the pallets have arms too long for a good action. This can be remedied by grinding back the arms and putting in a larger wheel, or by put-

ting in both wheel and pallets properly adapted to each other and to the center distance, according to the rules already given. These illustrations are for the Swiss style only, but the workman can readily modify the process slightly so as to apply to the English lever, after noting the differences between it and the Swiss, in the following sections.

(345) We will now make a more complete drawing of the wheel and pallet action, giving the proper size and inclination of the different parts, but omitting the extra curves and lines used in laying them out. In Fig. 18, the circle x represents the size of the escape wheel at the extreme points of its teeth, with its center at a. The line of centers is $a\ L$, $a\ d$ is the center distance, d being the center of motion of the pallets shown in dotted lines. $A\ b$ and $a\ c$ are two lines 60° apart, and 30° on each side of $a\ L$, touching the front corners of the two arms of the pallets. To draw the locking faces, we lay the center of the protractor over the point b, where the line $a\ b$ strikes the circle, and, at an angle of 15° from $b\ b'$, we draw the line $b\ e$, which is the proper inclination for the locking face of the short arm. In the same way we draw line $c\ f$, at an angle of 12° from $c\ c'$, which gives the locking face for the long arm. To draw the driving plane of the short arm, we place the center of the protractor at b, and line 0 over d, and draw line $b\ g$ at an angle of 20° from $b\ d$, which is the proper inclination for Swiss pallets. For the driving plane of the long arm, set the center of the protractor over c, and line 0 over d, and draw $c\ h$ at angle of 150° from $c\ d$, or, what is the same thing, at an angle of 60° from $c\ a$, or 30° from $c\ w$, the continuation of the line $d\ c$. To get the breadth of the driving planes, measure 8° on the circle x, then measure that distance on $b\ g$ from b, and from c on $c\ h$, and you have the back corners of the two pallets. The back sides of the pallets are generally parallel with the locking faces: when there is any difference the arms are a trifle narrower at their ends than near the helly or middle portion of the pallets. The shape of the helly is not material, provided it he such that it must safely clear the wheel teeth in all positions.

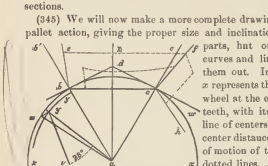
Fig. 18

(346) English pallets are drawn somewhat differently. Instead of the whole of the driving faces being below the lines $d\ b$ and $d\ c$, as in the Swiss style, where the 6° of lift of the pallets is below those lines, leaving 4° still further lift to be given hy the teeth,—the whole lift is here given by the pallets and is distributed 4½° above those lines and 6½° below them; or, practically, 4° above, and 6° below, measured from d. Having drawn our Fig. 19, as before, till we have found the pallet center d; we then from d lay off lines to m, m, 4½° above $d\ b$ and $d\ c$, and to n, n, 5½° below. These lines, 10° apart, indicate the total lift of the pallets. Where the lines $d\ m$ cross lines $a\ b'$ and $a\ c'$ are the places for the front corners of the two pallets. Connect these points hy the line $m\ m$. Where the line $d\ n$ crosses $m\ m$ is the heel or discharge edge of the short arm. Place the center of the protractor at the front corner of the long arm, and draw line $m\ o$ at an angle of 111° from $m\ m$, which gives the proper inclination for the driving plane. Where $m\ o$ crosses $d\ n$ is the heel of the long arm. The locking faces are drawn as before. Another way to draw the breadth of the arms is to circumscribe each between two circular curves, drawn from the pallet center d. One of these curves is drawn through the points b and c, the other through marks on the circle x, 9° to the right of those points, measured from the center a; or, for Swiss pallets, those curves are 8° to the right of b and c. These curves merely indicate the places of the front and back corners of the driving planes, not their breadth. But the actual breadth of the arms is greater, and that of the driving planes is still more, from their not being formed at right angles across the arms, but obliquely. The breadth of the driving planes, measured on the circle of the wheel in which they work, should he about 9° for Swiss pallets, and 11° for English. The breadth of English pallets may also be measured directly, as mentioned for the Swiss, hy taking 110° from the front corners on the lines $m\ m$ and $m\ o$.

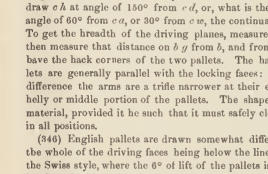
Fig. 19

(347) To draw the club tooth of a Swiss or American escape wheel, first mark off the circle into fifteen equal parts, corresponding to the number of teeth, and draw lines from the center a to each point. Then draw other radial lines to z, 4° back of each such line, and the breadth of the teeth is included between these lines. To draw the inclination of the driving planes on their ends, mark on the line $a\ b$, and inside of the circle x, the point y, 4° below b, measured from the pallet center d. As the teeth are all formed alike, this 4° is marked for all hy drawing a circle from the center a, passing through the point y. The driving plane of each tooth is drawn from z to y, in each of these four-sided spaces. To draw the front face of the tooth, place the center of the protractor at y, the front corner of the tooth, and draw the line $y\ v$, 28° from the line $y\ a$. Different makers give from 26° to 30° backward slant to the teeth, but 28° is considered sufficient with properly formed pallets,—the object being that only the *points* or front corners of the teeth shall touch the locking faces. In the Swiss lever wheel, the points of the teeth reach to the circle x, and the 28° is of course marked from those points. The backs of the teeth are not important, but should be such that they do not touch the pallets, and yet are not cut away so much as to make them weak. Their shape is a matter of taste with the makers. We have now drawn all the working parts of the wheel and pallet action, as the best authorities have determined that they should he, and if any part in the watch does not correspond with these angles and measurements, it is by so much defective. The student will do well to make these drawings on a large scale, several inches in diameter, so as to be perfectly clear, and also to facilitate the laying out of the angles, etc.

Pebble Jewelry.

For many years past the "pebble jewelry" made in Scotland has been much in demand. The style has been copied by manufacturers south of the Tweed, and materials of inferior quality have been employed, so that the Scotch makers have been prevented from reaping the full benefit of this branch of their trade. In Edinhrgh great attention has been paid to the manufacture of pebble jewelry, and a degree of excellence has been attained which it would he found almost impossible to surpass. Some of the early work in pebhles was very coarse and inartistic; the stones were roughly cut, and arranged without regard to shades of color; but now the utmost care is taken in the cutting and arranging of the pebhles, and beautiful effects are thereby produced.

Articles of an ornate character, such as hrooches, bracelets, covered with filigree work, or inlaid with pebhles, require great nicety of manipulation, and the number of parts which go to compose some of them is immense. Pebhle bracelets, of a finely worked geometrical pattern, are made in which there are no fewer than 160 pieces of stone. In making an article which is to be inlaid with pebbles, such as a brooch, the jeweler forms a back or foundation, to which a plate pierced with apertures for the pebhles is fixed, a convenient space being left between the two plates. At this stage the work is passed to the lapidary, who cuts and fixes the pebbles. The stones are first cut with a revolving disc of iron charged with diamond dust and oil, and roughly shaped with a pair of pincers. Each piece is then taken in succession and attached to a "cement stick"—a small piece of wood with a quantity of strong cement on one end. Held in that way the stone is ground to the required shape on a revolving disc of lead charged with emory and water. When all the pieces are brought to the shape of the apertures designed for them they are set in shellac. The outer surface has up to this time been left rough, hut, after the cement has hardened, the lapidary takes the hrooch in his hand and manipulates it on the grinding disc until the stone is reduced to the level of the metal which surrounds it. The surface is next polished on a disc of tin charged with rotten stone and water, and the brooch is returned to the jeweler. Usually pebble hrooches have in the center a "cairngorm," or what is supposed to he one. The 'cairngorms' are not "set" until the work on the other parts of the brooch is all but completed. The exposed surface of the metal on the face of the hrooch is usually relieved hy engraved scroll work. Enameled jewelry has recently come into fashion, to some extent, and fine specimens have been produced, the Runic patterns especially being very pretty.

Proceedings of the Horological Club.

A DISTINGUISHED BODY OF WATCH AND CLOCK MAKERS.

Thirty-Fourth Discussion.—Communicated by the Secretary.

WATCHMAKERS' WARRANTEES AGAIN.

Secretary Horological Club:

In relation to the warranting of work by watchmakers, I hold that they should not give any formal warrantee at all, on anything, but let their reputation as honorable men be the customer's surety that the work had been properly done. If he put in a mainspring, or a case-spring, and it broke soon after, he could make such allowance on the next one as might seem proper under the circumstances. If he cleaned a watch, and it stopped soon, from something getting in it, he ought to have pay for his time in getting it out again. The owner should be willing to pay for his own fault or carelessness. If he put a watch in order, he could say to the customer that it was now in perfect running order, and with good usage would continue to run and keep good time for a year or two, unless it got injured, or something in it, and wanted cleaning or repairing. If it should stop shortly after, he would examine it, and in case the fault was his,—some of his work had given out, or he had neglected some point, he should do it for nothing; but if it was the owner's fault, or not the fault of the workman, the owner should pay for it. That would be just for all parties. To demand a formal warrantee is an imputation upon the jeweler's honor. And even when given, the customer is really no better off, than if he had simply relied upon the dealer's honorable disposition. If the latter is disposed to be tricky, he will manage to gouge the customer all the same, whether he has a warrantee or not,—so of what use is it? It appears to me that, as the value of a warrantee depends entirely on the dealer's honesty, he should stand on his honor, and dispense with warrantees, as delusive and valueless. If people had not confidence enough in a dealer for that, they ought not to deal with him. Then a man's reputation would be of some value to him. But as long as people think a "warrantee" will make them safe, the trickster stands as good a chance with the public as the honorable man. That warrantees should be done away with, is the opinion of W. H. B.

Mr. Horologer observed that he thought W. H. B. went to the other extreme on this question, in proposing to abolish warrantees altogether. There was much truth and justice in what he said, but it would be very hard to get the public "broke in" to any such sweeping change, and in the meantime whoever promised warrantees most liberally would profit most by it. Again, if the public thought there was such a wonderful potency in a "warrantee," why not make proper use of that advantage, instead of throwing it away, or even fighting against it? But he would reserve further remarks. It was desirable to hear from the the trade more generally before coming to any conclusion. No doubt there were a great many who, from both reflection and experience, had elaborated plans for overcoming these difficulties, and he hoped they would send in their views, in time for the next meeting, and the subject would be more fully discussed.

INQUIRIES OF "EXCELSIOR.—REPLY.

Mr. Ira D. Stocking had sent in to the Editor of the CIRCULAR some inquiries upon points he wished "Excelsior" would explain, about certain difficulties with the lever escapement. "Excelsior" had written to the Editor, (who had handed it down to the Secretary of the Club for publication,) that the inquiries of Mr. Stocking would be met when the subjects spoken of were treated, and would assure him and all others that no apology for addressing him was needed, but on the contrary he was glad to have particular difficulties pointed out and brought to his attention. He endeavored to think of all important points, but they were so numerous that he was liable to overlook some. On the other hand, it was impossible to treat every separate trouble in detail, as there would be no end to it. He would give as specific directions as possible, and readers must use some judgment and thought themselves, to apply the general principles to all the little variations of circumstances.

A FEW WORDS TO JEWELERS.

To the Gentlemen of the Horological Club:

The time has come when jewelers and dealers who employ watchmakers, need the services of more skillful workmen than were formerly required, when inferior grades of English and Swiss watches were the best in use. Fine watches require to be cleaned and repaired by workmen who know something more than to merely brush a plate and whittle peg-wood. The fact is, too many employers are ignorant of the requirements of a really skillful workman. True, as salesmen they learn to talk glibly of "Breguet hairsprings, isochronism, and adjusted to position," but know comparatively very little of these matters; and are as unable to judge of a workman's ability to make or restore such adjustment, as they are incompetent to do it themselves. This will explain why we so often hear owners of fine watches complain, "I do not know how or why it is, but I have never been able to get my watch to run as close as when I first got it." The secret lies in the fact that some of the fine adjustments have been injured or destroyed, and the *practical* watchmaker with a five inch focus eye-glass could see the *broken*; if it had been a good one, he could also see and repair it, probably, in a creditable manner; but the subtletie of isochronism concealed in the elbow of a Breguet spring are a sealed book to his kin. So *all adjustments* might be destroyed and he know nothing about it; because they are not tangible to sight or touch, but only reveal themselves to certain tests, which he never applies. The ignorance and obstinacy, (making itself manifest in malice and enmity,) existing in the minds of a large majority of so-called practical watchmakers, can only be cured by discrimination and action on the part of employers. That this ignorance exists, can easily be proven to any one who will take the trouble to investigate; for example, one firm in this city, (rating as first-class,) employing six watchmakers, (and all select first-class men, as their employer told me,) when interrogated as to their experience in the rates of fine watches, agreed in extolling the performance of a watch sold by the firm, which in a period of two months, varied but two seconds, or one second each month. On investigation, the watch proved to be nothing but a *fair* Swiss with plain gold balance, and flat hairspring. On talking individually with the workmen, but two had ever put in a Breguet balance spring, (and probably they had let pass dozens which were worthless,) and that one man, when asked if he adjusted his springs, replied tartly, "I do not know what you mean by adjustment, but the spring was true and flat, and worked free between the regulator pins, and the watch had a splendid motion, and I brought it right down to time by the seconds." This was said as though the last clause settled the matter. Now, if the writer had obtained employment in that concern, he would have had just six enemies. These workmen would never have sought to elevate themselves to a higher standard of skill, but would use all their efforts to get rid of a man who by extra application, study and *practice*, was able to do what they could not do, or even comprehend. The term practical watchmaker is one of very loose signification, and should be met with the questions, how practical?—Can you file?—Can you drill?—Can you brush?—Can you *soft-solder?* There is a great deal more required. A man must have practical ideas of the *principles* involved in a fine watch, and the mechanical skill to *make* or repair any part lost or broken, and the part replaced or repaired just as good and more than unlike as originally, and also be able to restore any adjustment either of heat and cold, or isochronism. What I insist on is, that employers will look to this, (which is for their interest as well as the skilled workmen,) and apply a just and rigid discrimination between the really skillful man, and the inferior workman, and let the pay be proportionate. This is no more than justice to all parties. The skillful man spends more of his time to learn; and the man owning a watch worth three or four hundred dollars must (and should) expect to pay more for its care and correction than a man who owns one costing only twenty-five.

INTERN.

Mr. Isochronal said it was too much as "Detent" complained. Employers did not discriminate enough between the really good workman and the mere mechanic, so that the former often got discouraged at being classed on a par with any regular bull head and ignoramus who could palaver and blow. One great trouble was that employers themselves knew no more and often actually less about the business than their workmen, and therefore were not competent to discriminate justly. They judge by what little they know. A large share of them think that if a man is a good lathe hand or finisher, he is all right. But he had known men who could make and finish up new pieces unexceptionably, with a perfect polish, and very rapidly, but who had not the least idea about the principles of a watch, and who could not find out what made one stop, to save their lives. The really good and thorough workman is often passed by for another reason:—because he takes time enough to get a thing right,—and the employer often prefers some one who will rush off the work faster. It was some slight satisfaction to know that, in the long run, employers suffered as severely for their error as the workmen. For the public would sooner or later find out a shirk shop, and avoid it. But, supposing that an employer really wants to discriminate, it is not so easy as might he

supposed. The subject is surrounded with difficulties, and about all that can be done is to convince employers that their true interest lies in securing the best workmen, even at a little higher wages.

CONE ROUNDERS FOR FORMING WHEEL TEETH.

Gents. of the Horological Club:

Please state where the cone rounders can be had, or if they are in market yet. They are for rounding up wheel teeth. You mentioned that they were at the Centennial Exhibition. I would like to get them, because I think they are far superior to the ordinary rounding-up tool; for the former, if properly made, I think would remove any irregularity in the teeth, and vary the pitch of the teeth to suit the pinion, while the latter will do neither. J. WHITESMITH.

Mr. Uhrmacher said that he did not know that the cone rounders were for sale in this country, but they could of course be imported to order by many of the New York houses. He believed that Mr. Moritz Grossmann, of Glashutte, Saxony, was an agent for them. Mr. Whitesmith was in error in saying that we had mentioned them as being at the Centennial. The articles mentioned were Ingold's fraises, or cutters—something very different. They also cut the teeth, while cones only round them after they are cut. The former were unexceptionable in their operation, giving the true epicycloidal form to the teeth, but there must be a separate cutter for every size of tooth, which made a fair assortment very expensive. The cone rounders were claimed to include all the ordinary sizes with five cones, costing only about $10. But as to their operation he could say nothing, never having seen them work. If they were equal to the claims, they were very valuable, and should be introduced into this country by somebody at once, as there would certainly be a large sale for them. If any readers of these reports had used them in watch work, he hoped they would send in an account of their experience and conclusions; or, the Club would examine and report on them, if sent in for that purpose.

TRADE SECRETS AND TRADE HUMBUGS AGAIN.

Secretary Horological Club.

I saw in the JEWELERS' CIRCULAR three receipts for $1, one for how to lengthen the guard point, &c., one how to pivot without drilling, one cutting or fitting watch glasses, these three for $1. You will find inclosed P. O. order for the same. Send by return mail.

A. J.

These receipts are from John H. Davis or Mr. A. Styles, who had just returned from Geneva, Switzerland, who had secured the rights of these three receipts.

Mr. McFuzee, who had exposed these same "trade secrets" in the October reports, denouncing them in plain words as a humbug and swindle, expressed his astonishment that any man who could read should be able to peruse that exposure and then write such a letter as the above. He had described in detail how each was done, and pronounced the "secrets," each and all, practically worthless; yet this man was ready to pay his dollar for them. No wonder the trade-secret swindlers flourished, when even among watchmakers such simpletons could be found. It would almost seem as if they *ought* to be swindled. But probably we ought rather to be glad that there was such a desire to learn manifested throughout the trade, and to protect the simple from the impostors who sought to make their dishonest profit out of that desire. He would say again that, as a rule, trade secrets were generally trade humbugs. Learners should be very cautious how they pay out their money for getting instructions outside the regular channels. Let them read carefully the trade journals, particularly the JEWELERS' CIRCULAR, with such articles as those by "Excelsior," and many others, and they would get more reliable information, and more of it, than all the trade secret dealers could furnish, and at a mere fraction of the cost.

The Adjuster-of-the-French-School pronounced Mr. McFuzee's remarks entirely out of order, scandalous, exasperating, and intolerable. If Mr. A. J. desired to accumulate expanded and valuable information, direct from head-quarters, thus saving all intermediate profits and insuring the genuine article, why he had an inalienable right to do so, and no man should say unto him, "Why do ye so?" Instead of deprecating his course, he declared that A. J. was pursuing the only proper course. Information that was worth having, was worth paying for, and could not be obtained without adequate compensation. Mr. A. J. was evidently willing to obliterate an equivalent for what he had, and his enterprise and liberality deserved commendation instead of reprobation. As evidence of sympathy and friendship, the speaker intimated that, as a particular favor, he would disclose his great secret of the adjustment of watches in the supermundane position. Any watch adjusted according to this method would run five years without stopping, and not vary to exceed two seconds a year. This was something that every high-minded workmen should understand. It would infallibly double his business every three months, besides making him a gentleman and christian, and a leading member of society. If it did not operate exactly as represented, he would agree to furnish another secret for the same price and say no more about it. Warranted to stand acid and not to cut in the eye, or the money refunded. Beware of counterfeits!

Price only $22.50; richly worth a thousand to any person of good moral character and industrious habits. In fact, there's millions in it. To be had only of the originator, inventor, discoverer, and elaborator. Address the Adjuster-of-the-French-School, care of THE JEWELERS' CIRCULAR. The gentleman was about to promulgate his views on trade secrets in general, when the Chair unfortunately thought proper to adjourn.

Correspondence.

Editor of The Jewelers' Circular:

Will some good, friendly reader of the CIRCULAR inform me as to how I can clean Etruscan gold jewelry, or, in other words, how I can restore its brightness and color, and oblige, A READER.

Editor Jewelers' Circular:

An article in last number mentions the impositions practiced on the New York dealers by country merchants. What is a poor country jeweler to do when he wants to match a stud or sleeve button for a customer, and don't know who made the goods, but send to his best friend? Some enterprising "old reliable," who is out of business and wants something to do, will confer a benefit on the whole trade, and make a good small business, by establishing a distributing, receiving and shipping office, where all small orders and packages can be sent, distributed to the different manufacturers, dealers, etc., and when done, bring together again and ship in one package, say every week. If this can be done it will relieve the necessity of our imposing our little errands upon our kind friends, beside expediting business and saving expenses. Write it up a little if the "notion is worth putting."

H., R. & Co., CHICAGO.

To the Editor of the Jewelers' Circular:

DEAR SIR:—Your notice of my loss, and description of thief, has been the means of catching the gentleman.

Your paper was received by Mr. Landis, of Coatesville, Pa., on Sunday. He wrote me next day that had he got the CIRCULAR one day sooner, he could have caught the thief, as he left there the night before. The next day after I got Mr. Landis' letter, I received one from a firm in Lancaster, Pa., that they had him in jail. I sent an officer for him; he made no defence, pleaded guilty, and is now in jail awaiting trial. He had disposed of all the watches and best tools; one watch he had pawned at Albany, and had the ticket. He said he sold the Howard movement, No. 7925, one American silver hunter Home movement, No. 478531, with a gold chain attached, one silver hunting stem-winder Drop & Perret, No. 25766, and claims he sold the Howard case at another place (I don't believe it); he said he sold the above to a dealer in old gold and silver, near the corner of Chatham and Chamber streets, New York. The fellow said he was never followed so sharply before. He said he didn't think of *that Journal.*

COLUMBUS EWELL.

WELLSVILLE, Nov. 20th, 1876.

Diamonds and Precious Stones.

The art of making diamonds has been almost as eagerly sought as that of producing gold. The problems are not, however, the same in principle, since to make a diamond is simply to crystallize carbon or charcoal; while in producing gold the alchemists attempted to change the very nature of bodies, and to make gold of all things. Modern chemistry having burnt the diamond, and discovered that the product of its combustion is the same as that obtained by the burning of charcoal, we would suppose that some peculiar compound of charcoal might be found which, submitted to such process as would allow the carbon to separate slowly in a condition of perfect stillness, would produce regular crystalline forms. It is thus that sugar, salt, and alum are deposited when the water which held them in solution is evaporated very slowly and in perfect stillness. Looking at it in this light, there is a curious substance which renders the experiment of diamond-making a hopeful matter. It is not generally known that in combining sulphur and carbon a colorless liquid is produced resembling water, and containing really nothing but sulphur and carbon. If by some process the sulphur could be got rid of, either wholly or partially, we might expect to see the carbon deposited in the crystalline state. So far, this hope has failed. Many other plans have also failed, so that at this day the crystallization of charcoal is by most persons a thing despaired of. Despretz, a member of the Institute, was, however, of a different opinion. By means of the voltaic battery he has obtained on a thread of platina, small crystalline depositions, which, by their form and hardness, seem to be really embryonic diamonds. These crystals, or rather, let us say, these particles of diamond dust, have been used in polishing hard stones, in the same manner as ordinary diamond powder. The scientific question is then solved. But this ingenious and sagacious academician did not stop here. He organized, as we may say, hundreds of preparations to facilitate the precipitation and aid crystallization of charcoal under the influence of electricity, an agent which in the researches of man is the obedient servant of his will. These interesting facts lead us to indulge the hope that persevering and sagacious labor will be rewarded by success in the crystallization of carbon, and the manufacture of the diamond. Although this result might not be advantageous to commerce, it would be so to science. Nowhere does nature show us the diamond in the locality where it has been formed; it is now obtained only from ground which has changed its place, so that we get no more light on the primitive conditions of its crystallization, a circumstance which seems to confirm the views of Despretz, which is, that in Brazil, side by side with the diamond, there occurs a curious substance as hard as the diamond which is called by the Portuguese *carbonado*, and in the trade at Paris, *carbon*. Speaking of the mines of Brazil, Tennant says of it:—

"There is found here a considerable quantity of a black substance of the same specific gravity as the diamond, laminated, or rather composed of a succession of laminella, generally broken into separate fragments. It is too imperfectly crystallized to be cut, though it possesses in places the brilliance of the diamond, and can be reduced to powder, for the polishing of other stones. Its name, *carbonado*, is due to its having an appearance resembling charcoal. May not this be the same substance as that artificially obtained by Despretz? In the age of Louis XIV., it was thought that it was quite possible to increase the size of diamonds by placing them in certain solutions, just as a piece of salt may be increased in size by placing it in a solution of the same substance. Despretz has, doubtless, considered the property that a crystal possesses of attracting and regularly arranging around itself, particles of matter analogous to its own. At present this is the whole scientific condition of the subject. Let us wait for future developments."

Several years ago the premature announcement of the artificial production of diamonds agitated all Paris. Baron Thenard, however, by an experimental examination, reassured the many merchants and families who had been alarmed on account of the threatened depreciation of their fortunes, based on the value of this queen of gems. Since that time the number of diamonds has increased in France, and is every day increasing, even more rapidly than in England, and now represents an immense capital. According to the remark of Achard, there is no article which, being resold, suffers so little loss, so little depreciation, while, at the same time, it is always in demand. It may almost be considered a circulating medium for high values. Furthermore, in the actual state of physics and chemistry, nothing warrants the fear that the artificial will ever compete with the natural product. The case is analogous to the well-known production of gold pieces made by M. Sage, from gold extracted from the ashes of certain burnt vegetable substances, a beautiful scientific result, but by no means lucrative, since every piece of 20 francs cost 125 francs in the making. In like manner, we may say that if the process were known, the artificial gem would cost more than its worth.

The other precious stones have been designated "colored gems." In fact, their principle merit is the beauty of color and play of light which distinguishes them, but to this we may add hardness, which insures their preservation, and which is one of the most important qualities that a precious stone can possess. Pliny says, that in gems we see all the majesty of nature united in a small space, and that in no other of her works does she present anything more admirable. According to him, the first one who wore a precious stone was Titan Prometheus. Released from his bonds and impressed by some ideal sentiment, he inserted in a piece of his chain a fragment of the rock to which he had been fastened, and thus formed a ring, which he ever after wore in memory of his misfortunes. Is there not some allegorical sense in this story of the construction of the first ring? What leads us to this supposition is the mysterious personage himself who is made the wearer. This grand personage, Prometheus, the benefactor of man, who gave him fire, stolen from the gods, has always been venerated in antiquity for his opposition to the imperious domination of Jupiter.

The ancients included also, under the name of gems, stones engraven either in relief or in intaglio, and in this form of art they have left us the most admirable productions that the imagination can conceive. Here, as in sculpture, the moderns have neither surpassed nor even attained to the perfection of the works of antiquity. Engraven stones, which were used as seals, are now the most precious and valuable of relics, while they afford us definite mineralogical ideas as to the various kinds of ornamental stones known from the earliest period of history. Stones of color do not probably, at the present day, represent more than one-tenth of the total value of gems, while diamonds may be estimated as 90 per cent. This was different among the ancients. With them the diamond was hardly known as an ornamental jewel, because it was uncut, and did not exhibit those vivid colors which now place it in the highest rank among precious stones. Furthermore, our system of lighting lamps, gas, or candles, throws upon all objects tints very unfavorable to the natural color of gems. Thus the garnet, turquoise, amethyst, and even the opal, lose much of their lustre in these artificial lights. When a colored stone is placed in the path of the solar spectrum, its color will vary with the portion of the spectrum which falls upon it; and two stones of the same color, but of a different nature, will exhibit different effects. Thus a paste, placed beside a fine colored stone, betrays its worthlessness. A simpler method of testing stones is to look at them through a bit of glass colored red, yellow, blue, or green. Every stone will exhibit under this test properties peculiar to itself, and by which its nature may be recognized.

Since we have spoken of paste, we would remark that in spite of the high price of fine stones, there are fewer false ones used than at first we should be inclined to believe. Paste, colored or not, is only a very fine glass overcharged with lead and enamel, analogous to the best quality of cut-glass for table service. In the early times of its substitution for precious stones, it was cut very carefully; now it has become common and cheap, and inferior in workmanship. Besides, national riches augmenting from day to day, and the insufficiency of paste for beauty and duration becoming more apparent, a greater expense for something of imperishable value is preferred to a less price paid for what is really an article of no permanent worth. We are long past the time when the Dutchess of Berri, arriving in France, received

for her bridal ornaments only paste, and when, in order to make the Duke of Wellington a present in diamonds of less a million francs in value, the Paris trade was obliged to borrow from the civil list a certain number guaranteeing their restitution in kind.

Before speaking further of colored stones, a question presents itself—Can science explain the coloring of these gems? There are, I suppose, few persons who do not know that the white light which reaches us from the sun and other heavenly bodies can be decomposed into a number of colored rays. Thus, when the light of the sun passes through a triangular prism, it is bent, and will trace on a white card placed opposite to it an irridescent band, in which Newton has marked seven colors, according to some idea of analogy with the seven notes of a musical octave; an idea which is, after all, without foundation, since every prism gives its own peculiar band. The idea was by no means new.

The Greeks and Romans entertained it, and Nero, who, in dying, pitied the world for losing so great an artist as himself, has sung it in verse. A child blowing a soap bubble produces colors as splendid. In a word, every thin plate of any transparent substance whatever, becomes colored under a white light. Striated surfaces also offer effects not less brilliant; so that, to clothe certain insects more vividly, nature has grooved the tissue that envelopes them. The globules of clouds between us and the moon produce also, with white light, the most vivid colors; and, above all, in beauty, the *iris*, or rainbow, which the sun paints in a thousand colors in the drops of the falling shower, is the transcendent effect of decomposed light. Nature, always, with a palette, so to speak, charged only with white, knows the art of spreading all over her pictures the magic glow of the most brilliant coloring; but we have not exhausted all the resources of this coloring, the secret of which is the light itself. How shall we explain the whiteness of the snow which covers our planet at either pole, and on the summits of the loftiest mountains? How account for the perpetual greenness of countries covered with plants and trees, the blue of the vast aerial sea which envelopes the earth, or the color of the great ocean which rests on its surface? Here science is in default. The cause of the color proper to bodies is only half perceived; and we can still say that which Huygens said at the end of the seventeenth century: "In spite of the labors of Newton, no one has yet fully discovered the cause of the colors of bodies." We must then admire, without penetrating their secret, the unparalleled red of the oriental ruby, the pure yellow of the topaz, the unmingled greenness of the emerald, the soft blue of the sapphire, and the rich violet of the amethyst. This is not the only thing the discovery of which we shall leave to posterity.

Gold and Its Uses.

TO RECOVER GOLD FROM THE WASTE WATERS OF THE JEWELER.

There are various methods practiced by jewelers, for the recovery of gold from their waste waters, &c., a few of which it is necessary to say a few words about. The old plan of dealing with the waste waters was very unsatisfactory in a pecuniary sense. A moderate-sized tub was employed, into which liquid substances of every kind in the manufactory were put. This tub was fitted with a tap about one-third from the bottom, under which was placed a circular framework of wood, with a rather closely fabricated piece of felt or flannel, attached loosely to the rim, so as to form a cavity in the centre for the reception of the liquid, as it issued from the tap above. The liquid, after filtering through this apparatus, was allowed to run away, no more notice being taken of it whatever. Now, this liquid carried off a considerable portion of gold with it, which shall presently be shown. But we will first proceed to narrate some improvements effected, or rather presumed improvements. The following is one of several which found much favor at the time when jewelers began to pay *special* attention to the economy of their establishments, with the view of reducing the working loss to the lowest extent possible compatible with safe working; and which formerly was excessive in proportion to the quantity of manufactured articles and their weight. Several large tubs were provided, dissimilar in size, and placed in a row, each succeeding one being smaller than the preceding. In each of these tubs was fitted a tap, which could be turned on when circumstances permitted, or at the will of the person in charge of them. First of all the water would be conveyed by leaden piping from the several workshops connected with the manufactory, into the largest tub. When this had become full, the tap would be turned on, and all surplus water carried over into the next, and so on, until the last in the row of tubs was reached, and in which a piping was properly secured, which conveyed the whole of the liquid, after its passage through the row of tubs, into a large tank of deal sawdust, as a final security to the whole process, the latter being usually placed in the yard, or some out building of the premises, where the manufacture is carried on. It was supposed that the whole of the gold would be recovered by the above means, on the ground that the water's passage through the tubs would be so checked, and its flow so slow, that the small particles of gold would all sink to the bottom, and thus be eventually saved. Unfortunately such was not the case. In the jewelers' pickles and waste waters there are minute divisions of gold which no amount of filtering, or passing through a series of tubs of stagnant water, can possibly recover, unless some chemical ingredient be added to the liquid, which has the power of reducing the gold to the metallic state; for it should be understood that the dissolved gold (and there is a considerable quantity in these waste waters) passes through the filter as freely as the liquid itself. Therefore, unless this is acted upon chemically, no hope can be raised of its ultimate recovery by the jeweler.

The best method of all for collecting the gold from these waters, is to provide three large tubs of different sizes, and place them in a row, into the largest, or first tub, is put the exhausted pickling solutions, the water in which the workpeople wash their hands, the water in which the work is washed out, the coloring salts, and rinsing waters, and the swilling waters of every description; into this tub is fitted a tap, level with the top of the second, and one in the second, level with the top of the third, to allow the liquid to run from one tub to the others in rotation. A quantity of protosulphate of iron is dissolved in boiling water, and added occasionally to each of the three tubs, more especially the largest, which is the receptacle proper for all used-up liquids. The protosulphate of iron precipitates the dissolved gold held in solution to the metallic state, and so clears and purifies the solution, that, by the time it leaves the last tub, every particle of gold will be precipitated, and the water appear perfectly clear; so clear, in fact, that it cannot be distinguished from clean spring water. The sediment at the bottom of the tubs, after the clear water has been withdrawn from them, which is best done with a siphon, may be well mixed with deal sawdust, in order to dry up the liquid remaining, and afterwards well burned and sieved as fine as possible. Instead of taps being employed for the conveyance of the water into the various tubs, which are liable to become corroded and destroyed by the different agents in the liquid, stout glass siphons may be successfully used, and will be more economical. It is a very good plan, when these siphons are used, to alloy the water, after coming from the last tub, to run upon a filter placed upon a canebottomed sieve, the very clearest water then only being allowed to run away; by such a method the sediment in the tubs is in no danger of being disturbed. The sediment may, instead of being mixed with the sawdust, be poured upon one of these filters, and the moisture gradually withdrawn; the substance remaining is well dried, and afterwards reduced to powder. If the protosulphate of iron is added regularly, and at the proper times, such precautions as subsequent filtering will not be necessary, for every particle of gold will be precipitated in a manner so truly effective, that further attention will not be required. The gold may be collected into a button by the means already described, using sandiver as one of the principal refining agents. It may be put into the ordinary floor-sweep if preferred, or kept separate and a trial taken for the refiners; the latter plan is by far the best where a large manufacturing trade is being done. Oxalic acid will also precipitate gold from its solution, but it is considerably dearer than the salt of iron we have recommended. If it is desired to precipitate gold in solution without the addition of another metal to the solution, then oxalic acid may be used with advantage.

JEWELERS' SWEEP.

Jewelers' sweep constitntes the whole of the sweepings from the floors of the workshops in the manufactory, which should, in well regulated places, be swept twice a day, the refuse preserved and carefully sorted every morning, with the view of gathering the small particles of gold visible to the naked eye, and which have been dropped dnring the work of the day. After the dirt has been carefully sorted, and the gold of this kind removed, the sweeping be well burned, and as much of the organic matter destroyed as possible, then well pounded in a large cast-iron mortar, and preserved for the refiner. The latter plan may be dispensed with if found inconvenient, in the working department of the establishment, the whole refuse being sent, at stated periods, to a grinding mill moving by steam power, when, by the means afforded, a large quantity of sweep may be redneed to powder in a very short time. It should, of conrse, be previously well burned to facilitate the action of the rollers upon the material. The old melting pots of every description, and the burnt cinders and ashes from the furnace and muffles, should be preserved with the sweep; in fact, everything at all worth preserving should be taken care of and sold to the refiner. For well looking after the losses occasioned by production, constitutes the greater part of suecess in the manufacture of goldsmiths' work.

And now, in conclusion, we desire to say the information afforded in connection with this interesting branch of industry is thoroughly practical, and highly trustworthy in a commercial sense; and we trust the trade will be generally benefitted by coming into possession of some valuable advice, acquired only by many years of close study and personal attention, practically devoted to the subject.

The Watch with a Fly on it.

Mr. Lawrence Jerome is likely to recover his Rhinebeck Jurgensen watch with the fly painted on its dial. Mr. Jerome lost this watch with the fly on it on the evening of the 12th nlt. He was walking homeward down the Fifth avenue, and the watch with a fly on it was concealed in his pocket. As Mr. Jerome approached Nineteenth street a target procession passed up the avenue. There were torches and banners, drummers and fifers, and crowds of people in the ranks and on the sidewalks. The watch with a fly on it nestled cosily in its owner's pocket, and marked time for the procession. Suddenly a small boy with a bullet head dashed headforemost into the regions behind Mr. Jerome's waistcoat, and startled the insect on the dial of the timekeeper so that it flew away and took the watch with it. The boy with the bullet head had been on the watch, and in an instant the watch was on him. Mr. Jerome cried "Watch! watch!" and heeded not the bullet-headed boy's appeal for "time." So the boy with the bullet head ran along Fifth avenue until he came to some new sewer pipes, which were soon to be laid under the road. While Mr. Jerome stumbled over these, and ruined a forty-two dollar flannel suit, the boy with the bullet head ran through one of the pipes, stopping at the further end to look at the Rhinebeck Jurgensen with the fly on the dial. He saw that it was time to go home.

Mr. Jerome described the watch, the fly, the flannel suit, and the boy, to the police, saying that altogether they cost him about $642. For several days New York was a disagreeable place to live in, the police became so watchful and "fly." They took in all the bullet-headed boys and target processions in the streets. They inspected "the flies" in all the theatres to see if there was a Rhinebeck Jurgensen concealed about them, and wherever men were at work laying mains in the street, the police piped them off.

A few evenings after, the police arrested a young man who described himself as John Schaffer, of 105 Sheriff Street. They heard that he sold a Rhinebeck Jurgensen, with a fly on it, to Nathan J. Israels, of 105 Division Street. Then Detective O'Connor arrested a bullet-headed little boy named Frank Cross. "Who stole Lawrence Jerome's Rhinebeck Jurgensen watch?" Detective Keally asked.

"Please, sir," replied Frank Cross, "I cannot tell a lie. I did it with my little bullet head."

"How did you come to do it?" the detective asked.

"I caught it on the fly," the bullet-headed boy replied.

In court, the boy said he passed the watch to Schaffer, and ran as hard as he could, so that Mr. Jerome followed him, while Schaffer kept the time of the race. Schaffer gave bim three dollars for it, with a promise of two more if it proved to be gold.

Mr. Jerome groaned. "Why, even the fly was gold," said he.

Schaffer said he sold the watch to Israels for $80.

"So help me gracious," cried Israels, "I nefer seen a vatch mit a vly bainted on it. Vatch you dink I am—a diet?"

The bullet-headed boy, Schaffer, and Israels, were locked up for trial. Mr. Jerome says he hopes the watch is locked up also, because he "don't like to leave that fly loose."

Vulcan.

When Jupiter, in a moment of impatience, kicked his son, Vulcan, down from Olympus, the latter struck a very eccentric orbit; it took him nine days to come from heaven to earth through a cloudless sky He broke his leg in the fall, and there was not enough wind left in him to fill the lungs of a good-sized mosquito. His conduct while here on earth was very little to his credit, and we are somewhat surprised, at this late day, to find so much interest manifested as to his present whereabouts. He is, however, chiefly interesting to men as the husband of Venus, and to women as the father of Cupidon. He was not happy in his domestic relations. Mrs. Vulcan was of rather a lively turn of mind. Mars was a frequent visitor at the house. They had a desperate flirtation together, which finally resulted in a terrible scandal, brought about through certain revelations made by Phœbus. It caused at the time great excitement on Mount Olympus, was a sort of a Beecher-Tilton affair, and has been handed down from the fabulous ages as a solemn warning to all men who put their trust in beautiful blondes. Now, we could readily understand that astronomers, philosophers, and poets might earnestly seek to interview Vulcan with the hope of getting at a true version of her alleged eccentricities, pointing out the follies of her past life, and giving her some good, wholesome advice; but that they should search the sun's disk for that lame old reprobate, her husband, is beyond comprehension. A very distinguished astronomer tells of the many unsuccessful searches which have been made for Vulcan, and winds up by giving the following concise and lucid advice to those who may desire to watch the sun's disk with the hope of discovering his whereabouts.

The time between Lescarbault's observations in 1859 and that of Lummis in 1862, must be divided into such a number of synodic revolutions, that some other number of synodic revolutions previous to 1859 would carry us back to Sidebotham's observations in 1849. These two intervals must be commensurable, and the synodic revolution must be a common factor. It may not be the largest common factor, and probably is not the smallest common factor, so that there are several possible orbits, which would satisfy these three observations. Then we must consider the interval between the observations of Fritsch in 1802 and of Decuppis in 1839, which must be divided into a whole of equal synodic revolutions.

Just so. Could anything be clearer? Should any policeman feel desirous of making a search for Vulcan, the following description of his personal appearance when last seen may possibly be of use:

His breast was hairy, his forehead was blackened with smoke, he held a hammer in his right arm raised in the air ready to strike, he was covered with sweat. He had on a beard of some months' growth, a small round cap on the top of his head, and no other clothing. He limps in walking, and is lame of the right leg.

BRAZILIAN GEMS.—Brazil is rich in mineral treasures, and yields, in in ever diminishing qualities, diamonds excelling those of South Africa in purity and water. These stones, with others, are found in the provinces of Minas Geraes and Bahia, as well as in those of Matto Grosso, St. Paulo, and in Parana. Emeralds, rubies, sapphires, topazes, aqua marinas, turmalina, black, blue, and green (so-called Brazilian) emeralds, exist in the provinces of the empire, principally in that of Minas Geraes, where "zirconite" is found, as well as other gems. Of the quartz kind, crystal rock of the purest kind is exported from Minas Geraes, Goyas, St. Paulo, and Parana, as well as amethysts. The onyx, the opal, the cornaline, and jasper stones, are abundant in Minas Geraes, Goyaz, and St. Paulo. In Rio Grande do Sul the onyx and agate are already an important branch of trade.

Celluloid.

One discovery or invention is usually the ancestor of another. The invention of gun-cotton by Shoenbein, in 1840, who treated cotton fiber with nitric acid, was soon followed by that of collodion, which is nothing but a solution of gun-cotton in a mixture of æther and alcohol. This collodion is a varnish, and when dried in lumps forms a solid substance, which has been called celluloid, is very tenacious and strong, and can be mixed with various substances, as coloring matters, etc., and has become an important material for many manufacturing purposes: in its pure state it is translucent, but may be made opaque, while all possible shades of color can be given to it. It is impervious to damp, is not effected by exposure, and the different pigments being thoroughly incorporated into the substance, the colors do not fade. Although, so hard that a ball of the material two inches in diameter is capable of resisting several blows of a sledge-hammer, heat reduces it to a plastic condition, in which state it can be readily molded.

This substance is evidently adapted for a variety of purposes; it constitutes an excellent substitute for ivory—a product which is every day becoming dearer by expanding demand and failing supplies. It can be produced in color equal to the real material, while it takes a better polish, and the color does not deteriorate with age. Genuine ivory is a substance of a somewhat deceptive character, as the worker in it is often reminded to his cost, and the artificial article is superior to the real; as its substance is of course uniform throughout, it does not crack, while it can be slit, which admits of its being used in a much greater variety of goods. Celluloid ivory can be sold forty per cent cheaper than the ivory of commerce, so that it may supersede the latter, to a great extent. Seeing the vast variety of articles made in ivory at the present day, and having regard to its enhanced cost, it must be conceded that the discovery of a satisfactory substitute is very opportune. For the cutlery manufacturers of Sheffield this substance has a peculiar interest, and for the last ten years we have had in use table-knives with white celluloid handles, far superior and more lasting than handles of the best ivory; billiard-ball makers, brush manufacturers, and the trades concerned in the production of fancy articles, will be equally interested in a material so well suited to their special requirements. In the manufacture of pencil and pencil-holders celluloid has already been turned largely to account.

Tortoise-shell is another scarce and dear product, of which a close imitation is produced in celluloid. To specify one branch of manufacture—combs—there is here alone great scope for the employment of celluloid-tortoise-shell, and the flexibility of the material well adapts it to this purpose.

The manufacturers of jewelry and articles of adornment opens up a very extensive field for the utilization of celluloid. Coral is imitated so perfectly as to deceive even those practically acquainted with that natural production and its working into *objets de luxe*. The exact shade of color is reproduced in the imitation material, and its translucency makes detection more difficult than it would otherwise be. It is readily manipulated, and for this reason the production of imitation coral ornaments with this material, is, at the present day, a profitable branch of industry. Another considerable branch of the jewelry trade which seems to invite the employment of celluloid, is that which produces vulcanite and jet goods. In the former, the India-rubber, which forms the manipulative material, is combined with a large proportion of sulphur; but this addition, though necessary, is a disadvantage, for the sulphur evaporates, and, combining with the gold of the mountings, soon tarnishes them. Black goods only can be made from the rubber compound, as the sulphur destroys every delicate pigment, and even the black of vulcanite when exposed to the light soon fades, first becoming a dingy green, then a brown. But celluloid embraces the whole range of colors, and by employing it in the manufacture of jewelry, a variety of results are attainable. Vulcanized rubber is now largely employed in the fabrication of various articles, as opera-glasses, knife-handles, combs, inkstands, etc., but whatever can be made from it can be made from celluloid, and at an appreciably less cost. From these considerations we opine that there is a considerable future in store for that material. We have indicated only a few branches of industry which present a profitable field of employment. The uses to which so accomodating a substance can be put, are certainly not limited, and in this country the consumption is already very large, among other purposes it having been widely adopted in the manufacture of dental plates, in lieu of hard rubber.

A Solar Chronometer.

A most ingenious and useful invention has recently been patented by Marshall Wheeler, of Grand Rapids, Mich. This invention is a solar chronometer by which can be determined a true meridian, the correct time, the variation of the magnetic needle, the latitude and longitude of any place on the earth's surface, the sun's altitude, and, after being one set will give the sun's declination ever after. It is an instrument so simple in construction, that a child ten years of age can be taught to adjust and learn its perfect use in twenty minutes' time.

The instrument is a spherical semi-circle, the inner surface of which is graduated to degrees of declination from west to east, and to hours and minutes from south to north. Upon the outer edge or flange of that part of the semi-circle representing the north is a dial, upon which are figures representing hour and minutes, which correspond with the north and south graduating lines. Across the top of the semi-circle is a metalic plate in the middle of which is a small circular revolving plate containing an aperture the size of a pin hole through which the sun can shine and cast its image down upon the graduated lines on the inner surface of the semi-circle.

This semi-circle or section of a globe is hung upon a light frame on right of which is a stationary graduated arc. In this arc is a vernier which is attached to the axle upon which the semi-circle swings and by means of which the latitude of any place may be determined. This frame is furnished with two spirit levels and rests upon a spindle which enters the base of the instrument. The base rests upon three adjusting screws with which the instrument is leveled.

To use the instrument, the sun's declination is first ascertained from an almanac; about five minutes before 12 M., the instrument is leveled and the semi-circle turned up so that the image of the sun will strike the twelve o'clock line where the given declination line crosses it; then as the sun's image travels east and south the instrument is turned on its spindle and the semi-circle lowered until twelve o'clock, when the image will cease falling southward and appear to stand still. This will ascertain the latitude of the place by referring to the graduated arc on the side of the instrument.

The time of day is taken by setting the semi-circle to the latitude you are in and turning the instrument until the sun's image strikes the given declination of the day, the moment that point is reached correct solar time is given and of necessity a true meridian obtained.

The altitude of the sun is obtained by turning the instrument on its spindle and raising the semi-circle until the sun's image is brought upon the crossing of the 12 o'clock and equatorial line, which is the middle of all graduations. The altitude will then be found on the graduated arc on the side of the instrument by inspection. Longitude is obtained on the instrument by the use of prepared tables. The instrument which we inspected was designed for use on land, but can be used as well at sea by adding the gimbal attachment, which will give it a constant position and equilibrium. This instrument so simplifies nautical engineering that the ship's cook can define his exact locality as quickly and easily as can the most ancient and experienced mariner. It can be used to correct and rate a ship's chronometer, and will at all times give the variations of the magnetic needle, which so often deceives the oldest and ablest seafaring men. Observations are made with this instrument instantaneously, without resorting to the usual mathematical calculations and proofs, which often entail great delay, therefore making it invaluable to astronomers, navigators, engineers, scientific schools, jewelers, or others who may require a true meridian, the latitude, longitude, altitude, or correct solar time at any hour during the day.

We have received from several of our subscribers a circular with reference to the supplementary drawing of the "unclaimed prizes" in the Topeka, Kansas and Laramie City, Wyoming Territory lotteries. According to these seductive documents, the fortunate recipient is entitled to a gold watch and chain valued at $200, which will be sent forthwith, on receipt of $20 cash, by Messrs. Russell & Co., No. 37 Bond Street, N. Y. We cannot advise our readers to enter into this little speculation, for those who have done so have already proved the sad truth of the old adage "That a fool and his money are soon parted." Such lottery schemes as this is have been exposed again and again, but still somehow or other they turn up in a new place and captivate new victims. Let such "unclaimed prizes" as these remain unclaimed.

A Treatise on Isochronism and Elasticity of Metallic Springs.

BY JAMES FERGUSON COLE.

REFERENCE NO. 11.

The tono, therefore, and its niformity, is the only indication to be found of a natural isochronism in simple metallic springs through all the varied extents of vibration from the highest to the lowest scale of tones producible, and this by reason that the specific length needful for any required rate of vibration follows the same law which would also govern the isochronism of the balance-spring, provided in this case the spring be not under the secondary influence of friction, or other impediments, to its perfect freedom of action.

The want of this necessary freedom is manifest, as shown by the reduced extent of motion when any vibratory balance is subjected to a change from the horizontal or laying position to the vertical or hanging position; in the first case, the weight of matter forming the balance is supported by only one pivot end at a minimum of friction, while in the second case both pivots are supported on their full dia. meter of side bearings by the jeweled pivot holes, and thus creating an obstructive friction which reduces the vibratory motion one-fifth part of its full extent of action. This loss of motion operates in two ways, firstly, by reducing the balance momentum, and, secondly, by a reduced speed, a proportionate loss on tme of short arcs, and hence the chief cause of isochronal defect, which necessitates a critical adjustment; whereas, on tho contrary, supposing the arc of vibration (without a remontoire) constant at one extent, the isochronism, in all probability, would be naturally perfect.

For the detrimental influence on time-keeping, from secondary interferences, I am hopeful to find a remedy that eventually might obviate or lessen the hitherto troublesome, and sometimes unsatisfactory, application of valuable time, devoted to trials and corrections over and over again, whereas, under the right condition of a rudimentary principle, the above impediments to progress would possibly be removed, and more effective and conclusive results arrived at.

I now refer back to a remark, stating how an apparent error of position may be mistaken for an error of isochronism, by reason that the conjoint result admits of no separate trial; I therefore add a few other observations in reference to trials of position, supposing in the outset, that the balance has been carefully poised.

As relating to errors of position on trials of the watch vertically, I have in various instances been at the pains of poising the lever and pallets exactly, but the good effect of this I have never found manifest at any time; extreme nicety on this point would not, in every case, operate alike well, and in regard to poise of the balance, a defect of poise in the lever may sometimes operate correctively, or otherwise increase the error of position, dependently on the casual agreement of equilibrium between the two.

For this reason, no rule for correction can apply; such niceties are too fine for calculation, and cannot be dealt with beneficially as a principle of adjustment.

If a balance is carefully tested for equilibrium, and on trial in the watch, if a small error of position is found, the touch of a timing screw, according to judgment, may either reduce the error, or make it worse, as the case may be, and when it so happens the wrong effect of such increased error is the only indication for judging where the fault lies, and what other screw can be touched more favorably for correction.

REFERENCE NO. 12.

Some observations on the comparative effects resulting from quick and slow trains as governing the rate of vibration of any balance of a specific weight and diameter. This can only be determined by the motion produced by any suitable degree of motive power applied; the amount of power must here be regarded as indefinite; the required relation of force to resistance for the motion producible, in any first instance, is only ascertainable by experimental trial and result. This, according to the rate of vibration desired for any specific train, must depend on the proportions determinable either by a mature judgment, or otherwise by experimental trial, but as the few observations to follow this must also rest on the indefinite, nothing can otherwise be said in any case regarding the sum of motive power, the weight of balance, or its diameter.

Having premised thus much, I can only offer a few remarks based on my own experience and judgment, and a comparatively few words will suffice for this. Various experimental trials, and various rates of vibration, I have adopted with the view to ascertaining the amount of motion best suited for stationary balance time-keepers, but more especially as portable chronometers and watches for pocket use.

In the course of those inquiries, practical results have shown that when the rate of vibration is that of quarter seconds, it answers well as it is known to do for marine chronometers; there is for these, however, a necessity of very careful handling as a needful precaution against disturbing the vibrations of so heavy a balance, as the comparatively slow rate of vibration demands, and this care is well understood to be as necessary in the daily process of winding the chronometer, as it is under porterage from place to place, and showing that the rate of four vibrations per second of time has been proved to be better adapted to nautical use than a quicker or slower tiain than 14,400 per hour.

REFERENCE NO. 13.

In my own practice I have made one chronometer to vibrate at the rate of half-seconds. It was constructed with a double rotary detached escapement for showing dead centre seconds on a dial three and a half inches diameter; it had a compensation balance of the eight-day marine chronometer size and weight, and the extent of vibratory motion, under this arrangement, was over two and a half turns; this chronometer, adapted for use on a library table, has performed well for the last four years without any complaint from the time of its first delivery for use.

The half-seconds train just mentioned is the simplest plan for showing dead centre seconds, as in this case, with a chronometer escapement, the impulse is given only at the full seconds interval, and though answering so well as a stationary time-keeper, it would not be at all suitable as a chronometer for pocket use; the half-seconds rate of vibration being subject to disturbance from casualties of external agitation. From this, and also from much earlier experience, I have found that the customary train of 18,000 vibrations per hour, which gives five vibrations per second of time, is the preferable rate for general good performance for pocket chronometers, and also for well-constructed lever watches.

REFERENCE NO. 14.

For a specific scientific purpose, I have in one instance adopted a doubly quick train, as a carefully constructed movement, with lever escapement, giving 10 vibrations per second, but, by reason of so rapid a rate, the balance motion was proportionately restricted, this extremely quick rate not allowing sufficient time for a larger traverse of the balance; it, however, answered well for its purpose.

Now, supposing a definite motive power applied for propelling these various balances at time, in each case of those extremely varied rates of vibration, the same power (in the case of dead seconds) would be given out in the full amount due to one second of time; in the half-seconds, the sum of force would be equally divided; in the next case of the marine chronometer rate, the same power would be expended as four-fourths, equal to one; in the 18,000 train, as five-fifths, and in the doubled rate of vibration by ten-tenths, also equal to one; and these differences may possibly admit of being carried to a still higher point with right effect, under properly arranged proportions of the respective balances and springs. All principles have a limit, and in this case perfect freedom is the important condition needful to the final result.

In conclusion of Paper No. 12, as affording the chief matter of this essay, I can only add that isochronism, as the subject now stands, is connected with various impediments to the perfectly free motion of a vibratory balance and spring; such freedom may be supposed to exist only on condition that some efficient plan or principle could be found for the extinction of pivot friction, and thus relieving the balance

from the operation of its own weight, which evidently is the chief cause of the isochronal defect, and also its consequent need of isochronal adjustment; under such a condition, the spring and balance would possibly give results naturally in favor of uniform time-keeping, but this can only be known with certainty by careful trials for experimental proof.

As regards the detrimental operation of friction on the resulting effects of time-keeping mechanism there can only be one conclusive view taken, as demonstrated by my own experimental tests; I may not have carried observations on the frictional question so far, but that my original papers on the subject of isochronism contain various remarks of like bearing, and on examination of my former views I still entertain the same opinions. I, therefore, could see no reason for modifying in any manner what I at first conceived to be true in relation to frictional influence, I consequently consider that the details here given are fully confirmative of the statements made in other parts of this essay.

Notwithstanding these remarks, the structural system and principles of watches and chronometers now in general use is so well established as to leave the customary modes of timing and adjustment to be followed as heretofore, without barely the probability of any discovery being made of a perfectly frictionless principle.

I must here admit that I have been at some considerable pains in the endeavor to achieve this desirable object, which, through various interruptions, remains for the present in abeyance, but may be resumed.

ON THE MANUFACTURE OF CHRONOMETER AND WATCH BALANCE SPRINGS.

The first step as relating to my own long-established mode of operation will be to describe the tools necessary to the process of manufacturing such springs, and firstly for the cylindrical.

As a provision against the greater expansion of a brass block when used in the process of hardening a cylindrical spring, and by contraction of that metal when chilled, leaving the hard steel spring slack on a metal block, I prefer to use a grooved block of soft steel, for the reason that the spring and block, being both steel, will expand and contract alike under heat and cold, and preserve the spring in perfect contact with the block, and therefore ensuring its truth.

Having an engine as a screw-cutting lathe for cutting square-bottomed metal finishing-blocks, the process of making a helical or cylindrical spring from wire is as follows:—

First, take a prepared block of soft steel, well examined as to soundness, and of sufficient length for holding the wire intended for the spring, allowing a few extra turns as waste, with length enough of block for four flat steel binding screws for fixing the wire. The soft steel block to be drilled through as a prepared cylinder, and bored open to one-half of its outside diameter, as if too solid it may not cool so readily; the inside opening must now fit a suitably true turning arbor on which the soft steel block is to be turned quite true, and also made to fit well on a chuck arbor of the screw-cutting lathe. The lathe arbor has a winch handle at the reverse end of the chuck arbor for cutting on the soft steel cylinder a square-bottomed groove through the whole length as a helix, the groove to be cut barely deep enough to hold two courses of spring wire when wound one over the other, the inner course for the spring proper, the outer course as a protecting cover wire.

This done, remove the steel cylinder from the turning arbor, and drill four holes of suitable size for the four binding screws—two holes at one end oppositely, and two holes at the other end in like manner, but square across in relation to the first two holes; all four holes are to be broached and tapped to suit the four flat binding screws; and after clearing the burrs, put the steel cylinder again on the turning arbor, and finish the groove by a short-haired brush charged with fine emery and oil.

The tapped ends of the four binding screws must now be shortened, so that when the heads are screwed home to the helical groove the shortened ends must be quite clear of the turning arbor. After this, remove the four screws, clear the tap holes, and also the helical groove by a clean, dry brush; and after cleaning the large arbor hole, the screw-cut steel cylinder must be again twisted firm on to the winch-winding arbor of the lathe. This is now the time for trying the wire to see if it is properly free in the groove; and if so, one of the four screws must be put half way into the left hand furthermost hole for binding on, one end of a yard length of clean wire to the grooved steel block, and chucking the winch-handle by a set screw or otherwise, so that the first turn of wire shall not run off or break. Next to this attach a four-pound weight to the lower end of the wire, suiting the weight to the strength, and then fix the lathe firm in the vice so as to incline outwardly for letting the wire and weight clear for leading freely into the groove without riding on the edges. After this the wire may be carefully wound on to the full extent of the groove, so as to allow the end of the final coil to be fixed by the second binding screw, and with a half turn carried round under the head of screw for security of fixing. At this point the weight must be upheld, and the top end of the wire nipped off. The remaining length of wire is now to be fixed by the third binding screw at the outer left-hand end of the groove, and as before to be wound on with the weight attached, this wire filling the full extent of the groove as a cover to protect the spring already on. Again fix the winch-handle, and fix the cover wire by the fourth screw, and nip off the surplus as done with.

The winding operation completed, carefully remove the filled block from the winding arbor, and now the soft steel block and spring it ready for hardening. To do this take a suitably small-sized crucible, a blacklead one with a cover to fit inside, putting ivory black as animal charcoal at bottom for the prepared block and spring to bear upon; afterwards fill the crucible with as much more charcoal as it will hold when pressed lightly down with the cover, as if too tight it may not drop out readily when inverted; a clear coke fire must be prepared, and a round of stout binding wire as a holder must be securely fixed to the crucible now ready for the fire.

After the crucible is in the fire, and at a similarly red heat, invert it over a vessel of water, and, if carefully managed, the block and the spring ought to be properly hardened, which the touch of a file on a screw will prove. After this, any water adhering to the work must be slowly evaporated, and, when quite dry and hot, dip into oil, and with a large enough length of steel to let the block free on the heated wire, hold all in the flame of a spirit lamp until the oil gives off a sign of smoke, or if a screw is brightened, and shows straw color, the temper will be right for removal of the spring and cover wire from the block, ready for polishing.

Now take out the four binding screws, and a few careful strokes of the emery brush will loosen the cover wire, and the spring may be got easily off the steel block, and by two thin slips of soft wood and sharp stuff, holding one slip in the vice, the edges of the spring can be polished; the inside and outside are done so readily as to need no remark. The same operation repeated with dry stuff and a clean brush will prepare the spring for bluing. To do this a straight rod of iron wire of size to pass free through a grooved metal block fitted and cut with helical groove to suit the steel one, and finished with the dry brush it must run free over the rod, which must be reduced at the end, and tapped for an iron nut as a stop for the metal block.

The rod, 18 inches long, must be driven into a wood file handle for heating in the fire after the block and polished spring are put tight, clipping together, the metal block and spring, let on to the rod, must lay against the handle, with nut screwed on for security, after this the nut end can be heated to pale red, and the block set forward to the hot end until nearly blue, then drop it back to the cold end of the rod; the remaining heat of the block will bring up the final blue color completing the spring.

WINDING-TOOL FOR FLAT SPRINGS.

The tools employed in the manufacture of flat spiral springs are, perhaps, much like others for the same purpose, but differing chiefly in the form of the central winding arbor, as will be described.

Trade Cossip.

The business men to the politicians—"A plague on both your houses."

Rubies and diamonds are the fashionable jewels with Parisians at this moment.

Sets of floral jewelry are made up to suit the garniture of flowers worn on evening dresses.

All the American astronomers of the last century must have been Whigs. We don't observ-a-tory on the list.

A Newark genius appropriately named Edge has patented a new "finger-nail trimmer." It ought to sell among the women folks like the very old scratch.

The *porte bonheur* bracelet, though still in favor, has a rival in the *Semaine*, a bracelet formed by seven linked gold rings and a plain clasp on which is engraved a monogram.

Hy. Knickinson, jeweler, at East New York, was recently robbed of about $600 worth of jewelry. The thieves are trying to find a policeman, but have not succeeded so far.

Some amethysts which were inserted in the marble pulpit, designed by Sir Gilbert Scott, in Durham Cathedral, England, are missing. They have been apparently removed by a knife.

A fire broke out on Sunday, the 19th ult., in the cellar of the store 13 John Street, occupied by J. S. Johnson, dealer in electro-plated ware; damage estimated at $3,500, fully insured.

The trustees of the British Museum have purchased for the sum of £2,000 an antique bronze statuette, rather more than half the size of life, representing a bearded Bacchante dancing.

Western speculators are buying up silver bullion in large quantities, both in this country and in Europe, and by having it made into coin at the mints, they are realizing handsome profits for their enterprise.

According to a German analyst, the composition of an old bronze weapon, supposed to be about 2,000 years old, has been ascertained to be ninety parts copper and ten parts tin, proving that tin was known to the ancients.

The Corliss engine fly-wheel made 2,355,300 revolutions during the Exhibition. The wheel is thirty feet in diameter, and any one point on its periphery travelled during the period stated 40,147 miles, or a little over 260 miles each day.

A number of the Turks who sold Holy Land curiosities at the Centennial bazaars have been thrown out of employment by the close of the Exhibition; and "Begora," they say, "we waz fools for not houldin' on till our jobs on the gravel trains."

Lazarus, the Montreal Pawnbroker, who was recently robbed of a large amount of watches and jewelry, has recovered some of the stolen property, but in such a condition as to render it almost valueless. Marechal, one of the captured thieves, succeeded in making his escape and is now said to be in this city.

Messrs. Mulford, Hale & Cottle, of No. 1 Bond Street, have moved from their snug little quarters in the third story to a large and more comodous salesroom on the ground floor of the same building adjoining that occupied by the Gorham Manufacturing Co. Messrs. Mulford, Hale & Cottle have fitted their new business abode up with every requisite which good taste and so nd judgment could suggest, and with due regard for the convenience of their numerous friends and customers.

The wealth of the late Cardinal Antonelli is generally reckoned at from fifteen to twenty millions, without speaking of his collection of ancient and valuable objects, which represent at least a million and a half. The late Cardinal possessed one of the finest assortments of precious stones which exist in Europe; diamonds of all forms and of the purest water, incomparable emeralds, pearls, and torquoises of unknown size—a veritable Oriental treasnre. Then, unique pieces of rock crystal, some fine pictnres, the richest lace, and admirable tissnes of the best periods.

Messrs. Reed & Barton have now on exhibition at their store, No. 686 Broadway, an exquisite tea set, consisting of six pieces. The material employed is heavy-plated silverware, oxidized and elaborately decorated with *repousse* chasing, inside gilt. This set has an interesting history It was manufactnred by Reed & Barton, and formed part of their exhibit at the Centennial Exposition; there it was seen and admired by the members of the Japanese Commission, who purchased it for presentation to the Emperor of Japan. The *repousse* work was executed by machinery. The introduction of this great improvement is due to the above-named firm, all such work on hollow ware having been done previously by hand.

William McKenzie, a West India negro, has been sentenced to five years imprisonment, at Sing Sing, for stealing a trunk containing jewelry valued at $22,000, from Marcus Englander, of No. 262 E. Seventy-sixth street. The trunk was placed on board of a railroad train at Saratoga on the 15th of September and stolen from the baggage car. Detective Dunn, who was placed in charge of the case, traced McKenzie from his residence, No. 211½ Thompson Street, to Philadelpia, Baltimore, and Washington, and there arrested him and brought him back. In his possession was found about $200 worth of the stolen property. Sergeant Kealy, of the detective force. has already recovered $3,000 of the property, and expects to find the rest in a day or two.

There seems to be a muddle so far as the medals are concerned. In the early days of the Exhibition the Commission got a celebrated diecentter in the city to make a design for a medal, which he did, and said that it would cost them $2,000 to have the dies for the medal made according to that design. The price seemed to be too high, they became seized with an economical fit, and they engaged another party in Boston, who made a design for which he furnished the dies for $600. This latter was accepted, and the dies were made and forwarded to the Commission. It was a "white elephant." On being tried it was found necessary to go through so many heatings before the medal came up perfect that the cost would average $17.50, and the time consumed would make it at least four years under the most favorable circumstances.

The trustees of the Metropolitan Musenm of Art are greatly elated over General Cesnola's latest discoveries of relics in the Island of Cyprus, and are making an urgent appeal for $40,000 to complete their purchase in competition with an offer from the British Museum. Under the Temple of Kurium, not far from the ancient City of Paphos, General Cesnola discovered what were undoubtedly the treasure vaults of the temple. In them he found over 15,000 objects in gold, silver, gems, bronze, alabaster, and terra cotta. As a whole or in detail these objects, especially the ornaments in gold and the mounted gems, are unequaled in interest by those composing the collection of the great museums in Europe, which have been made up from single pieces found at intervals in various localities in Italy and Greece. The Kurium collection is supposed to date at least 650 years before Christ. [Since the above was in type, we learn that the money has been subscribed.]

When the King asked Archimedes if he could find out whether the jewelers had, in making the crown, kept back some of the gold, and supplied its weight with some other metal, the philosopher was put to thinking and experimenting, and one day he exclaimed, with excited energy, "*Eureka! Eureka!*" ("I have found it! I have found it!") What had he found out? He had discovered that any solid body put into a vessel of water, displaces its own bulk of water; and, therefore, if the sides of the vessel are high enough to prevent its running over, the water will rise to a certain height. He now got one ball of gold and one of silver, each weighing exactly the same as the crown. Of course the balls were not the same size, because silver is lighter than gold, and so it takes more of it to make the same weight. He first put the gold into a basin of water, and marked on the side the height to which the water rose. Next, taking out the gold, he put in the silver ball, which, though it weighed the same, yet, being larger, made the water rise higher; and this height he also marked. Lastly, he took out the silver ball and put in the crown. Now, if the crown had been pure gold, the water would have risen only up to the mark of the gold ball; but it rose higher, and stood between the gold and silver mark, showing that silver had been mixed with it, making it more bulky. This was the first attempt to measure the specific gravity of different substances.

The Centennial Awards.

The following is the list of Awards made up to date, by the Centennial Commissioners in those industries which are represented by this journal. A supplementary list is under the consideration of the Committee of Appeals, which will be published as soon as received by us.

UNITED STATES.

17 Adams, Shaw & Co., Providence, R. I., Silver Plate
24 Adams, J. S. & Co., Providence, R. I., Tortoise Shell Goods, Jewelry.
31 Aikin, Lambert & Co., New York, Gold Pens, Cases, &c.
44 Alexander, Isaac, Improved Frames for Eye-Glasses.
3 American Watch Co., Waltham, Mass., Watch-Making Machinery.
4 American Watch Co., Waltham, Mass., a System of Watch-Making.
338 American Watch Co., Waltham, Mass., Watches.
269 American Optical Co., South Bridge, Mass., Spectacle and Eye-Glass Frames.
283 Ansonia Brass & Copper Co., New York, Clocks.
64 Arbeit & Pancoast Manufacturing Co., New York City, Gas Fixtures.
2 Barrows, H. F. & Co., New York City, Gold Plated Goods.
19 Bedlichmer, Isaac, Philadelphia, Gold Work.
40 Black, L. & Co., Philadelphia, Spectacle and Eye-Glass Frames.
42 Bliss, John & Cn., New York, Taffrail Log.
354 Bliss, John & Co., New York, Marine Chronometers and Transits.
282 Bonet, Louis, New York, Cameos.
22 Cottier, C. & Sons, New York, Lapidary Work.
14 Dennison & Co., New York, Jewelers' Boxes, Tags, Labels, &c.
1 Derby Silver Co., Derby, Conn., Plated on German Silver Table Ware.
22 Diamond, Jacob, Pittsburgh, Pa., Lenses and Eye-Glasses.
30 Fairchild, L. W. & Co., New York, Gold Pens, Pencils, &c.
281 Fasoldt, Charles, Albany, N. Y., Astronomical Tower Clock.
28 Foley, John, New York, Gold Pens, Pencils, &c.
10 For.enbach & Sons, Carlstadt, N. J. Silver Watch Cases.
5 Gorham Manufacturing Co., Providence, R. I., Silver Ware.
8 Gorham Manufacturing Co., Providence, R. I., The Century Vase, in Solid Silver.
280 Gorham & Co., Providence, R. I., Repousse Work in Silver.
Gorham Manufacturing Co., Providence, Plated Ware.
274 Grotjaegicsser, John L., Philadelphia, Pa., Astronomical Clock.
297 Gurley, W. & L. E. Troy, N. Y., Transits, Levels, Compasses, &c.
293 Hall, A. & Co., Baltimore, Md., Electric Clocks, Bells, Indicators, Burglar Alarms, Tower Clocks.
21 Hamilton Hunt, Providence, R. I., Rolled Plate Vest Chains.
32 Hawkes, Geo. F., New York, Fountain Pen & Holder.
273 Hietel Brox. & Geisler, Philadelphia, Pa., Improvement in Lever Watches.
15 Hilditch, Milo, Northboro, Mass., Torpedo Shell Goods.
29 Holland, John, Cincinnati, O., Gold Pens.
3 Holmes, Booth & Hayden, Waterbury, Conn., Silver Plated Goods.
282 Ithaca Calendar Clock Co., Ithaca, N. Y., Clocks.
Jackson, S. C. N. Y., Jewelry and Silver Ware, Cases, Trays, &c.
71 Kerr, N. M. & Co., Philadelphia, Pa., Paper Boxes and Jewelers' Findings.
7 Kidder, P. L., Philadelphia, Pa., Solid Silver Table and Hollow Ware.
37 Mabie, Todd & Co., New York, Gold Pens, Pencils, &c.
29
28 Manning, Bowman & Co., West Meriden, Conn., Nickel Plated Ware.
35 Manning, Bowman & Co., West Meriden, Conn., Tea and Coffee Pots, and Urns.
153 Meriden Britannia Co., West Meriden, Conn., Silver Plated Goods.
26 Meyer, John C., New Orleans, La., Jewelry and Gold Work.
270 Miller & Kripe, Philadelphia, Pa., Medallion in relief.—Bronze
4 Mitchell, Vance & Co., New York City, Bronze, Marble, Zinc, and Imitation of Bronze.
12 Mix, Geo. I. & Co., Yalesville, Conn., Iron and Britannia Spoons, Silver Plated Water Coolers, &c.
Morrison, A. B., Portland Me., Gold and Silver Solution.
25 Neher, Charles, Philadelphia, Pa., Hair Ornaments.
5 Paulus, E., Philadelphia, Pa., Watches and Clocks.
16 Pequignot, C. & A., Philadelphia, Pa., Gold Watch Cases.
18 Potter, Wm. K., Providence, R. I., Tortoise Shell Jewelry and Ornaments.
9 Prentice, James, New York, Surveying and Leveling Instruments.
13 Reed & Barton, Taunton, Mass., Silver Plated Goods
14 Reed & Barton, Taunton, Mass., a large Nickel Plated Vase.
1 Riggs & Brother, Philadelphia, Pa., Taffrail Log.
12 Robbins & Appleton, New York, Gold and Silver Watch Cases.
20 Simons, Opdyke & Co., Philadelphia, Pa., Gold and Silver Work.
20 Spencer Optical Manufacturing Co., New York, Spectacles and Eye-Glasses.
10 Spoiller, Louis H., Doylestown, Pa., Clocks.
3 Stark, John, Waltham, Mass., Watchmakers' Tools.
271 Seth Thomas Clock Co., Thomaston, Conn., Tower Clocks and Clocks for Commerce.
9 Tiffany & Co., New York, Jewelry and Jeweled Watches.
11 Tiffany & Co., New York, Silver Work.
238 Tiffany & Co., New York City, Silver inlaid with Niello and Copper.
281 Tiffany & Co., New York, Repousse Work in Silver and Iron.
280 Troemner, Henry, Philadelphia, Pa., Scales and Balances. 2 awards.
75 Wilson, T. A., Reading, Pa., Spectacles and Eye-Glasses.

FRANCE.

37 Audy, Mme. Vve., Paris, Jewelry, Pearls.
180 Bardon fils and Co., Paris, Opera Glasses, Field Glasses, Telescopes, etc.
35 Beugnet and Co., Paris, Watches and Clocks.
257 Bonieurs, Paris, Clocks with Singing Birds, and Cages with Singing Birds.
42 Boucheron, Palais Royale, Paris, Jewelry.
41 Cleray, E., Paris, Jewelry.
29 Cravet, Bouche, Paris, Ornamental Clocks.
177 Christofle and Co., Paris, Silver Statuettes.
40 Cornu, Eugene and Co., Paris, Bronzes.
166 Cornu, Eugene and Co., Paris, Decorative Bronzes.
152 Collective Exhibition arranged by M. Teil, Paris, Jewelry.
351 Darlot, Paris, Photographic Apparatus, Opera Glasses.
201 Deleuil, Jean Henry, Paris, Instruments of Precision and Research.
252 Derogy, Paris, Photographic Lenses, Achromatic Spectacles.
260 Dodin, Mannuy, Artistic Enamels.
253 Dubosque, T., Paris, Spectroscopes, Saccharimeters, Heliostats, Polarization Apparatus.
178 Farcot, E., Paris, Clocks.
254 Feil, Charles, Paris, Optical Glass, Crown and Flint.
37 Fornet, Bourg (Ain) Jewelry.
36 Fonchard, Ernest, Paris, Jewelry.
39 Goudy J. B., and Co., Pontallier Doubs, Watches.
38 Guyot and Migneaux, Paris, Jewelry.
180 Hass, B. Jr., and Co., Paris, Watches.
184 Hangard, Paris, Watch, Clock and Chronometer Springs
291 Heller, Florent Antoine, Paris, Repousse in Silver, Engraved Medals.
249 Hoel, J., Paris, Spectacles and Eye-Glasses.
165 Kaffel Freres, Paris, Decorative Bronze Work.
247 Lacombe, Paris, Opera Glasses with Round or Oval Glasses.
389 Le Cointe, Aime Joachin Leon, Paris, Bronze Vase.
248 Lemaire, A., Paris, Opera Glasses, Marine Glasses, Hand Telescopes.
256 Lunetiers, Societe des, Paris, Spectacles, Eye-Glasses, Lenses, Mathematical Instruments.
167 Lusse Bros., Paris Decorative Bronzes.
44 Louis Marchand, Paris, Bronzes.
28 Louis Martin, Paris, Bronzes.
193 Mansion, Miss Elise, Paris, Enamels.
176 Meue, Pierre Jules, Paris, Sculpture,—Bronze.
175 Meurice, Prosper, Paris, Statuettes of Animals in Silver.
260 Most, Eugene, Bevigny, Watch Springs.
39 Morel, A., Paris, Decorative Clocks.
33 Murat, Paris, Jewelry, Gold Plated.
194 Nozan, Lami De, Paris, Enamels.
31 Perrot, Henry, Paris, Bronzes.
43 Philippe, Emile, Paris, Jewelry.
195 Pottier, A., Paris, Enamels.
32 Rodanet, H. H., Paris, Decorative Clocks.
355 Rodavet, A. H., Paris, Marine Chronometers.
181 Rosset, E., Paris, Mysterious Clocks.
34 Sauzay & Rock, Paris, Bronzes
264 Secretan, Successor to Levebours & Secretan, Paris, Astronomical Telescopes
196 Soyer, Paul, Paris, Enamels.
39 Susse Freres, Paris, Repousse in Bronze.
45 Susse Brothers, Paris, Bronzes.
261 Tissot, Mayet, Murez de Jura, Regulator and Calendar Clocks.

GREAT BRITAIN.

47 Aitchison, James, Edinburgh, Scotch Pebble Jewelry, &c.
237 Chance Bros. & Co., Birmingham, England, Optical Glass.
46 Coggin, Jeremiah, Dublin, Ireland, Bog Oak Jewelry, Walking Canes, &c.
347 Dent, M. F., London, England, Chronometers and Clocks.
51 Elkinton & Co., Birmingham, England, Enameled Work.
52 Elkinton & Co., Birmingham, England, Electroplated Ware.
53 Elkinton & Co., Birmingham, England, Artistic Metal Work.
362 Elkinton & Co., Birmingham and London, England, Inlaid Work in Metal.
415 Elkinton & Co., England, Bas Reliefs in Metal, Electrotypes, Repousse Work.
349 Frodsham Chas. & Co., London, England, Chronometers, Clocks, & Watches.
50 Gibson, William, Belfast, Ireland, Jewelry.
350 Kuhlberg, V., London, England, Chronometers and Watches.
352 Mercer, Thomas, London, England, Marine Chronometers.
348 Nicole Nielsen, London, England, Watches
345 Poole, James & Co., London, England, Chronometers and Watches.
300 Poynter, G., England, Cartoons for Mosaics.
351 Sewell, J., Liverpool, Great Britain, Chronometers and Watches.

SWITZERLAND.

169 Aubert, freres, Savagnier, Main Springs for Watches
107 Audemars, Louis, Brassus, Watches and Chronometers.
Amblet & Poncet, Geneva, Watch Jewels.
166 Bachni, freres, Bienne, Steel and Gold Balance Wheels for Watches.
137 Badollet, John Moses & Co., Geneva, Watches.
Balani, freres, Bienne, Main Springs.
105 Bertie, Edward, Geneva, Watch Springs.
168 Borel & Courvoisier, Neuchatel, Watches and Pocket Chronometers.
104 Besancet Blanc, Eug., Travers, Collection of Finished Watch Jewels, and Parts of Escapement.
186 Bremond, B. A., Geneva, Musical Boxes.
Borel, L., Couvet, Tools.
135 Breting freres, Locle, Pocket Chronometers.
101 Corcelle, J. & Co., Geneva, Watch Dials.
133 Du Bois, Edward Favre, Locle, Engraving of Watch Cases.
134 Ekegren, H. P., Geneva, Watches and Chronometers.
132 Frankfeld, Louis, Geneva, Watches.
131 Francillon, Ernest & Co., Longines, Watches.
153 Grandjean, Henry, Locle, Chronometers and Watches.
130 Gyse, Fred., Aaran, Drawing Instruments.
140 Gay, J., Geneva, Jewelry.
129 Herman & Pfister, Berne, Philosophical Instruments.
126 Hipp, M., Neuchatel Chronographic Apparatus.
154 Hipp, Neuchatel, Electric Clock, Regulator, and Sympathetic Clocks.
118 Huguenin, A. & Sons, Locle, Watches and Clock Escapement.
Humbert, E., Locle, Watch Decoutions.
119 Ingold, P. F., Chaux-de-Fonds, Pinions or Cutters for Wheels of Watches.
138 Jacques Adank & Co., St. Croix, Musical Boxes.
Jean, J. Jewelry.
139 Jacot, freres, Locle, Watches and Pocket Chronometers.
121 Jeanjaquet, Charles, Neuchatel, Main Springs for Watches and Lithographic Pens.
123 Karrer & Co., Teufenthal, Musical Boxes.
122 Karrer, S., Teufenthal, Musical Boxes.
120 Klein, E., Geneva, Main Springs for Watches.
111 Matile, H. L., Locle, Pocket Chronometers and Watches.
112 Martin, Charles & Co., Geneva, Watches, &c.
Mark, Secret J., Geneva, Files.
113 Meylan, Charles H., au Sauliat, Improvement in Chronograph Watches.

114 Montandon Gentil Luiz, E., Geneva, Balance Springs for Watches.
115 Nardin, James, Locle, Watches and Pocket Chronometers.
130 Paillard, C. & Co., St. Croix, Musical Boxes.
125 Patek, Philippe & Co., Geneva, Watches and Parts of Watches.
142 Peiti, Pierre & Bryaza, Geneva, Jewelry.
36 Petitpierre, Louis Bozet, Couret Neuchatel, Tools and Instruments for Watch-Making.
116 Perret, David fils, Neuchatel, Watches.
117 Perrenoud, Aime, Geneva, Balance Springs for Watches.
141 Portales, Ernst Humbert, Watch Cases.
128 Rauss, Ami, Geneva, Watch Dials.
127 Rigtrup, R. S., Locle, Improvement in Watches.
132 Schmidt, T. B. Bitterlin, Locle, Jewels for Watches.
126 Tagleib, Carl, Zurich, Watches.
35 Vautier, Sl. & fils, Carouge, Tools for Watchmakers and Jewelers.
Vaucher, L., Peseux, Watch Oils.

GERMANY.

108 Bissinger, C. Söhne, Hanau, Gold Jewelry.
115 Backes, G. F., Hanau, Gold Jewelry.
226 Becker, G., Freiburg, Silesia, Clocks.
128 Becker, Fritz, Pforzheim, Gold Jewelry.
116 Bier, A. Voltz, Hanau, Gold Jewelry.
117 Binder, Wilhelm, Gmünd, Silver Ware.
124 Bizer, Gebrüder, Pforzheim, Gold Jewelry.
114 Diagelden, Gebrüder, Hanau, Gold Jewelry.
122 Erhard & Söhne, Gmünd, Galvanoplastic Jewel Caskets.
130 Felsing, Conrad, Berlin, Reproductions in Bronze.
98 Gabler, Gebrüder, Scharndorf, Silver Thimbles.
127 Geisel & Hartung, Hanau, Gold Jewelry.
123 Gerwig, August, Pforzheim, Gold Jewelry.
203 Hadank & Son, Hayerswerda, Turret Clock and Bell.
104 Hanter, Gustav, Gmünd, Silver Jewelry.
131 Heidegger, Wilhelm & Co., Pforzheim, Gold Jewelry.
110 Hertel, C. & Son, Hanau, Gold Jewelry.
136 Humbert & Heylaadt, Berlin, Silver Ware.
118 Keller, H., Pforzheim, Gold Jewelry.
111 King, John Martin, Hanau, Enamel Paintings and Gold Jewelry.
135 Koch & Bergfeld, Bremen, Silver Ware.
109 Kraul & Bier, Hanau and Oberstein, Stones & Cameos.
191 Kollektiv Ausstellung Schwarzwälder Uhrmacher, Clocks.
120 Lay, Edward, Pforzheim, Lockets, &c.
105 Picaer & Co., Stuttgart, Gold Jewelry.
134 Ritter, A. & Co., Esslingen, Silver Plated Ware.
112 Scheibl, C. W., Hanau, Etruscan Jewelry.
119 Schoefeld, Ernst, Jr., Hanau, Gold Jewelry.
122 Schwindt, G. & Co., Pforzheim, Gold Jewelry.
99 Soergel & Stallmeyer, Schuttinau, Silver Thimbles.
106 Steinhener & Co., Hanau, Gold Jewelry.
308 Tielenbrunner, George, Munich, Citherns, (Zitherns.)
192 Voigtländer & Son, Brunswick, Photographic Lenses, Opera and Marine Binocula rs, Telescopes.
107 Weishaupt, C. M. Söhne, Hanau, Gold Jewelry.
133 Wild & Co., Pforzheim, Mourning Jewelry.
126 Witzemann, Pforzheim, Chains.
113 Zenner, Hugo, Hanau and Berlin, Gold Jewelry.
108 Zieher, Ottmar, Gmünd, Gold Jewelry.

ITALY.

69 Asclone, Giovanne a figlio, Torre del Greco, Coral Jewelry.
72 Bellezzo, Nicolo A., Rome, Jewelry.
74 Boucianelli, Giovanni & Son, Jewelry, Mosaics, &c.
69 Bocchetti, Ilo, Rome, Bronzes of Art.
105 Capanaini, Guiseppe, Rome, Cameos.
80 Castellani, Alessandro, Naples, Reproduction of Antique Jewelry.
Castellani, Alessandro, Rome, Objects of Antique Art.
119 Fratelli, De Poli, Vitorio (Treviso), Bell in Silver Bronze.
75 Forti, Emilio, Genoa, Silver Ware.
109 Gallandi, L. A., Rome, Mosaics
70 Geraldini, Etore, Rome, Mosaic Stones, Cameos, &c.
66 Gloziozza, Giberitni & Co. Naples, Corals.
68 Labrioia, Mariano, Naples, Tortoise Shell Ornaments.
73 Melillo, Jacinto, Naples, Etruscan and Greek Etruscan Jewelry and Corals.
108 Orlandini, Leopoldo, Florence, Florentine Mosaics
104 Pascoli (Francatiz Santa Maria, Dealers,) Rome, Cameos.
83 Pope, The, Roman Mosaics.
106 Rocchegiani, C., Rome, Mosaics (Rom.)
71 Salvo, C. & Sons, Genoa, Silver Ware.
112 Scapini, Giovanni, Florence, Mosaics (Florentine.)
110 Scarselli, Niecols, Florence, Florentiac Mosaic.

RUSSIA.

59 Adler, V. A., Moscow, Jewelry.
62 Chopin, Felix, St. Petersburg, Bronzes.
383 Chopin, Felix, St. Petersburg, Repousse in Silver.
65 Hesrich & Woerfel, St. Petersburg, Ornamental Stone Work, Malachite, &c.
56 Ivanhof, N. St. Petersburg, Silver Ware and Gilded Utensils.
60 Kblebnikof, John, Moscow, Silver Ware.
61 Krumbugel, Otto, Moscow, Jewelry.
58 Owtchinnikof, P., Moscow, Silver Ware.
55 Postnikof, Andrew, Moscow, Silver Ware.
54 Semenof, A., Moscow, Silver Ware.
63 Stange, Nicholas, St. Petersburg, Bronze Works.
57 Tehitchelef, John, Moscow, Jewelry.
64 Surikof, Valentine, St. Petersburg, Silver Ware.
382 Szszkof, Moscow and St. Petersburg, Repousse in Silver.

AUSTRIA.

90 Balzani & Teifel, Vienna, Gold Jewelry.
97 Bergman, Franz, Goblonz, Imitation Gems.
92 Goldschmidt, Michael & Sos, Bobemia, Prague, Garnet Jewelry.
93 Kersch, M., Prague, Garnet Jewelry.
140 Kiendl, Antos, Vienna, Citherns (Zithern).
94 Markowitsch & Scheid, Vienna, Jewelry.
95 Neuslsadtl, M. H., Prague, Jewelry.
145 Ploasl, S., Vienna, Optical Instruments.
144 Waldstein, S., Vienna, Opera Glasses.
96 Zusche, Joseph, Vienna, Porcelain and Enamel Painting.
349 Zsche, Josef, Porcelains and Enamels

JAPAN.

143 Chiokito, Suzuki, Tokio, Bronzes.
148 Chiuso, Hiraoka, Tokio, Bronzes.
144 Genroker, Mizemi, Kanazara Kaga, Bronzes.
149 Koji, Yamakarra, Kanazara Kaga, Bronzes.
147 Loyenon, Momose, Tokio, Bronzes.
146 Soschiebi, Kasamori, Takaoka Eschis, Bronzes.
150 Takusai, Houma, Sado Island, Broazes.
145 Zsche, Josef, Porcelains and Enamels

CHINA.

Ho-Kan-Chia, Bronzes.
138 Ho A Chiag, Silver Ware.
Hu Kwang-Yuan, Hongchow, Bronzes.
139 Lee Ching, Canton, Gold Filigree Work.

SPAIN.

77 Auriticia, Compaahia, Portugal, Oporto, Silver Tea Service.
80 Cerquinho, Fraacisco Ang. vas, Portugal, Oporto, Silver and Gold Filigree Work.
79 Lobao & Ferreira, Portugal, Oporto, Silver and Gold Filigree Work.
76 Lolsaga, P. Spain, Island Work, Incrustations, &c.
78 Mortinho, Luiz Pinto, Portugal, Lisbon, Silver Candelabras, Lakstands, &c.
341 Zuloaga, Placido, Spain, Madrid, Island Work in Metals.

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82 Forstrup, J., Christiania, Silver Work.
95 Jarlsberg, F. Wedel, Ships' Log.
81 Lie, P. A., Christiania, Silver Ware.
83 Olsen, Theodore, Bergen, Silver Ornaments.

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420 Watson & Co., Bombay, Hammered Work in Silver, and Wood Carvings.

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BRAZIL.

88 Valentine, M. G., Rio de Janeiro, Ornaments for Personal Wear.

HUNGARY.

91 Goldschmidt, Louis A., Dubnik, Opals.

"What's this, mister?" said a curious countryman, who was wandering through a Boston jeweler's store, and as he spoke he rang a statue of Mercury with his horny knuckles.

"That," said the attendant, "is Mercury," and he passed on to wait upon a customer.

The ruralist gazed for a moment, with open mouth, at the bronze representation of the messenger of the gods, and then beckoned to a companion at the other end of the store, to whom he said:—

"Jim, what do you suppose that ere figger is?"

"I dunno," responded Jim, in turn giving it a resounding rap, "brunze, hain't it?"

"No," said the other, "tain't; it's quicksilver."

"Wha-a-t! the stuff they put into thermometers? Waal, I'm durned! What'll they do next?"

And after another long look the couple moved on impressed with the wonders of art.

The Jewelers' Circular & Horological Review.

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THE

Jewelers' Circular & Horological Review,

THE RECOGNIZED ORGAN OF THE TRADE.

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

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Close of this Volume.

The SEVENTH VOLUME *of this journal ends with the current number. Those of our readers whose term of subscription expires with this issue and who have been notified by circular, will confer a favor by responding as promptly as possible, as all subscriptions terminating with this volume will be discontinued hereafter. We trust that all our subscribers will not only renew, but that they may find it convenient to induce their friends to become subscribers. We shall in the future, as in the past, give our readers full measure in return for their $2 subscription.*

Better Times.

The old year has passed away and a new one has begun. The twelve months, now numbered and filed in closed ledgers, have not been very much to boast of, but we have good hopes that better things are in store in the future. We have fostered the belief that hard pan had been reached over and over again, only to prove a deeper depth to our financial misery. Latterly, however, matters mended and when the first tidings came that the presidential election was decided, trade of every description took a decided bound, which proved that the revival of business had commenced. Had it not been for the political uncertainty which has prevailed, there is not a question but that such revival would have been lasting and increasing from day to day. The present condition of affairs may be terminated any hour, and must come to an end ere long when the long delayed, but surely coming, revival of business will be felt in every part of the country. There are many encouraging features of the past year which deserve to be considered. The effect of the Centennial has been for good and its work is not of transient duration. We have learned many things from our visitors, and they have learned that the youngest in the family of nations is not far from being the most advanced in the liberal and industrial sciences. In the South, manufacturing enterprises have advanced, and in Georgia have been conducted with success. If politicians will permit affairs to take their natural course, renewed prosperity will again revive the commercial industries of this part of the country, and give fresh life to trade. The West we have always with us and there is no sign of diminution in her mighty storehouses of grain and gold. Altogether we may take heart and hope manfully for better times, now near at hand, but let us all be cautious in our credits and so avoid one of the great causes of financial distress.

Manufacturing Jewelers at the Centennial.

There is no use in shutting our eyes to the fact that the manufacturing jewelers of America were not properly represented at the Centennial. The reason was complicated and yet easily understood. The retailers desired to make a good show and so receive honors while the manufacturers felt a delicacy about entering into competition with their customers. Consequently they stayed away, and as the judges very properly decided that retailers would not be allowed to compete for honors on goods manufactured by other firms, the consequence was that the American industry did not get a fair show. Next time our manufacturing jewelers will know better.

But enough has been learned to show us that our manufacturers rank among the first in the world. The English Exhibition was creditable in the extreme, but the French weak and unequal. Much of their work was so tawdry, flashy and cheap that its only market in this country would have been on the Indian frontier, and even there we question whether it would have taken. The Russian work was clever but monotonous, and the beholder soon sickened of such tricks as the damask napkins in frosted silver. The Italian manufactures were tasteful and refined but lacking in solidity, and no work approached the American in point of finished excellence. Such firms as Durand & Co., Chatellier & Spence, and others that we could mention far excel even the finest European exhibitors, nor is this to be wondered at, for the better class of American society demand the very best article attainable at any price. Fashion is supreme here and new styles are in course of continual production. Sometimes an idea is adopted from Europe, but it is always improved upon by the American manufacturer. Already new patterns are appearing which are to be traced to the influence of the Centennial. This much at least is evident, that we have nothing to learn from the old world, and it is more than probable that, had our manufacturers manifested that interest which they should have done, the European exhibitors would have been thrown in the shade. How much better for the trade, and how much more honorable for the reputation of the country would it have been, had the manufacturing jewelers combined to show the world what American art and industry has accomplished.

Weeding Out.

There is in this world a class of people who, finding themselves therein, have concluded that it owes them a living, and having so decided, have gone on to make the manufacturing jewelers do duty for the world in general. Let us take a good look at some of these typical individuals; we shall recognize old friends.

First and foremost comes the jolly good fellow who is always hard up and yet manages to get credit. His capital mainly consists in exuberant spirits and he turns lusty laughter into ready cash every day of his life. He always has a good story or a capital joke at the tip of his tongue, and before you have remembered where it was you read it in print, he has blustered out of the office leaving an accepted order for goods which he hopes to pay for at some future date,—kind Providence so permitting. When asked to settle he pays up all he can on old scores and very jollily regrets that he can't wipe out the whole indebtedness, but promises to send the first money he gets hold of. What can you do? He is such a jolly good fellow to weed out.

Next comes the pious incompetent who conducts prayer-meetings and runs Sunday-schools with a view to the main chance, and sends a scrip-

tural quotation in part payment of a protested note. This kind of Christian is always severely respectable until he is found out, and even then he has a knack of being sinned against, which is incomprehensible to his honest creditors. He is too good for the jewelry business, but is good enough to weed out.

Next comes the enterprising individual who sells under cost. He goes into business with the sole hope of making money out of his creditors. At first he meets his obligations promptly until a kind of credit is established for him and then goes in for a big haul, offers it below cost and advises his creditors that he is open to an amicable settlement of their claims and generously offers 25 cents as a basis of negotiation. Such men succeed in demoralizing trade in general and do infinite harm to honest dealers who cannot compete with fraudulent, systematic slaughtering of the market. Weed him out.

We are all acquainted with the modern Midas, the man who eats his stock. He started in business with a little capital and a large stock of good intentions. He has a horse and wagon to support and has not the remotest idea of making expenses come within his income. Consequently he devours his stock, and in course of time invites his creditors to come and see him. Be sure and weed him out.

Then there is the man who makes large purchases on his own credit, and after some legal juggling with a convenient father-in-law and a complaisant spouse, fixes things so that his better half owns all the stock, and when the sheriff pays a visit he finds that the master of the house is only a clerk in his wife's store. The goods are put out of the reach of the creditors while she and he smile pleasantly and retail at greatly reduced rates. Weed them out.

Then there is the luckless, incapable ne'er-do-weel who is always getting set on his feet, but somehow will persistently topple over. He is always coming to grief, and preys upon the sympathy of those who pity him. He pays when he has got any money, but he has so little and so many to divide it among that there is hardly enough to go round. Finally some hard-hearted creditor snaps his stock and the rest of the creditors can whistle for what is coming to them. Weed him out tenderly, but firmly.

But the most dangerous animal, is the chronic compromiser.—We have paid considerable attention to this gentleman during the past year, and intend to continue our kind attentions towards him. By this time the trade should be familiar with his ear-marks for they have felt the effects of his acquaintanceship. We have done our duty in the matter, and we trust that the trade will do theirs and weed him out.

Timely Warning.

The tribute of honor rendered to the American watch, has astonished our European competitors and proved one of the most satisfactory results of the Centennial Exhibition. The perfection achieved by the mechanical genius of this country enables our manufacturers to turn out movements in great quantity, and at low price; but this very facility and cheapness of manufacture is tending towards evil, for indications at present lead careful observers to fear that the market will ere long be overstocked with movements, low in price, but intrinsically worthless. Competition is the life of trade, but there is a point when it becomes ruinous to all concerned, and we fear that this will he reached before long should the present policy be persisted in. Thanks to hard times, there has been a great demand for cheap movements, and a supply has accordingly been provided. The retail trade has declared that low figures were all that could be afforded, and as a natural consequence a low grade of goods has been manufactured, in great measure to the exclusion of finished and adjusted work, such as that which bore away the palm of honor at Philadelphia.

We would remind our readers that in unduly pandering to this demand for cheap goods they are ruining the legitimate and honorable industry of the country, and are in fact perpetrating a trade suicide. Improvement and advance should be the aim of all manufacturing enterprises, but when underselling is the object it can only be attained by a corresponding deterioration in quality. Of late, cheap and nasty grades of goods have been turned out in profusion, and even the leading firms have been obliged to send forth movements which are only fit for lottery swindles, or, to be put in sham cases and advertised as "the best imitation gold watch in the market for trading purposes." If the companies now making these abortions persist in flooding the country with such goods, and creditable retailers yield to the temptation of offering them to their customers, irreparable injury will be done to the reputation of the American makers and the market for first-class work will be ruined. It takes time and patience to make a name, but credit is very easily destroyed when purchasers find themselves deceived. When a man pays a fair price for what he believes to be a good article and subsequently finds that he has been duped into the ownership of a parcel of unreliable trash he is not likely to purchase again in the same market.

All manufactured articles can be cheapened in production so far and no further, but watch movements are specially complex and demand the expenditure of capital and labor in no stinted measure. Cut down on material and work and the value of the article is destroyed. A good watch cannot be made at a nominal figure, for whatever machinery may do, it can never supply the place of that human intelligence required to fit together the component parts of a watch.

Moreover, when people buy cheap wares they cease to buy those of good quality; consequently the standard steadily deteriorates and shoddy prevails. Meanwhile the accomplished workman finds that his services are not required, the manufacturer sees his expensive machinery rust in idleness, and the end of the year shows twice as many watches sold, while the receipts are very considerably decreased. Quantity not quality becomes the object of the hour and matters move on from bad to worse. The Swiss makers have already proved by sad experience how ruinous is the excessive production of cheap and nasty movements and we would warn their American competitors against marring the prospects of business in this country by a repetition of the same shortsighted folly. We are glad to see that the Horological Club is taking this matter up and we hope that they will use their best efforts to discourage it.

Losses on the Road.

We have to report another mysterious disappearance of a valuable sample trunk belonging to the well-known firm of Dodd & Hedges. The circumstances are as follows: On the 4th instant, Mr. Geo. A. Laurence, the traveling salesman for this house, arrived at Detroit in the course of his regular business. He had with him a trunk containing sample goods, including necklaces, lockets, rings, cameos, and other jewelry, amounting in value to the sum of $15,000. Having concluded his business in Detroit, Mr. Laurence expressed his trunk by the Lake Shore & Michigan Southern R. R., and had it checked for Chicago. He arrived safely at the city of the lakes, but when he presented his check to the baggage-master, a dilapidated valise of no earthly value to anyone was handed out and that was all the satisfaction obtainable. The checks had been changed and the valuable trunk had been carried off by some swindler. Since then nothing has been learned concerning its contents, although every effort has been made to discover where they have been disposed.

This is third loss which the trade has met with during the past two months, viz: Messrs. Carter, Howkins & Sloan; Sexton & Cole, and Dodd & Hedges. In the first, but $750 has been realized out of a trunk valued at $25,000, showing that it had been tampered with either before or after the accident. In the next case, the owners were not so lucky, as nothing whatever was recovered, and in the case of Dodd & Hedges, the firm can either fight the railroad company, or charge the amount to profit and loss, and the latter will prove the wisest. It would appear that the companies hold the trade in the hollow of their hands, and that they are in no way responsible for the carelessness of their employees. The question is, how are we to remedy the present condition of affairs?

A clever friend of ours has a photograph attached to his trunk and relies upon his face to secure the rendering of his baggage to its rightful owner; but a plan of far more practical benefit would he for some established insurance company to issue policies providing against such

risks. Such an organization would also be able to combat and punish the carelessness of railroad officials by meeting one corporation with the might of another. It is useless for an individual to attempt to fight a railroad, but a well organized insurance company would be no despicable champion for the rights of the traveling public. Let our readers think of it before they, too, find themselves minus a valuable sample trunk.

A Bank whereon the Pink Coral Grows.

There are times and reasons when the rural editor falls short in his supply of facts and when the make-up of his paper shows woful blanks. Then he rushes to his desk and proceeds to make news, which varies according to the season of the year. In the Spring his fancy turns to animal extremities and the great sea serpent lately seen in an inland lake. With the Summer heat come rich and rare fruits of prodigious dimensions. The mellow Fall produces ears of corn and pumpkins such as the eye of man never saw before, while the frosts of Winter drive the wretched editor to foreign fields and pastures new, and from distant lands he raises some strange story.

We have had diamonds discovered and gold mines invented in the back lots of "popular citizens," silver has had a fair show and the baser metals have not been neglected. But now the ingenious editor has surpassed himself, and the ghost of Annanias must writhe as he bears away in Hades of the latest fib. Here it is in a concentrated condition:—

"It was on Nov. 7th, on the voyage of the *Gettysburg* from Fayal to Gibraltar, in latitude 36.30, longitude 11.28, that the vessel was found to be anchored on an immense coral bank. From the partial knowledge obtained, the bank is reported of immense extent, and the material of rich, delicate, pink shades. The discovery has created much interest at Gibraltar. It is believed that there are "millions in it," and the locality having been buoyed, the *Gettysburg*, when refitted, will return to it and make a complete investigation."

This is a nice story told by the marines of the good ship *Gettysburg* but we expect that our readers will take it with a good deal of salt water, if they take it at all. We wish the Gibraltese luck of their millions, when they get them, and meanwhile would not advise any of our readers to speculate on the buoyed bank of coral in lat. 36.30, long. 11.28. Deposits made in that bank will prove permanent investments.

Japanese Bronzes.

The Heathen Chinee came out in all his might at the Centennial, and the Japanese made a most effective display. Special attention was directed to their bronze and ivory wares, and ever since the shutters were put up at Philadelphia the whole country has been flooded with goods which are, or pretend to be, of the like description. These Jap bronzes have become fashionable, but we do not believe that their influence upon the art future of this country is for good. Can anyone look at these extraordinary monstrosities, exaggerated caricatures of brutalized humanity as they are, and pretend that there is any pleasure or profit in their possession. They may be marvels of mechanical industry, but they are destitute of that artistic spirit which we find and admire in the antique. The taste for classic bronzes and statuary marks an advanced and advancing condition of a prosperous civilization, while the fancy for such heathenish abortions as Chinese and Japanese idols is evidence of the morbid appetites which mark the decadence of progress. Moreover, who knows how many of these ancient bronzes came from Brumagam, and who knows the wiles of the habitants of far Cathay? Exquisite ivory carvings have turned out to be made of a composition of pressed rice, which will dissolve in hot water, and so it is more than probable that the so-called silver bronzes, such as are now sold as the treasures of Yeddo temples, are in reality English pot metal of a very secondary quality. Beware of Jap bronzes; for the present they may be in spurious fashion, but never will they be things of beauty or joys forever.

Editorial Jottings.

We are glad to learn that Mr Peterson, of the well-known house of Baldwin, Sexton & Peterson, has effected arrangements with the Liverpool, London & Globe In. Co., whereby risks against fire can be secured on trunks of sample goods while on the road. At present, policies will be issued only to members of the Jewelers' Association, or such firms as may be introduced thereby. This, in a measure, will relieve the anxiety of our merchants who are compelled to trust their goods to the care of irresponsible railroad officials.

We regret very much that, owing to an unforseen delay, "Practical Hints," the complete treatise by EXCELSIOR, cannot be published until early in February. Some one has said that of making books there is no end, but our experience teaches that of trouble in making a book there is no termination. As it is we are urged on by EXCELSIOR on one side and the subscribers for his book at the other, and yet the printers will not come up to time. However, the sheets are nearly ready, and will shortly be in the hands of the binder, and when "Practical Hints" does arrive at a practical existence the purchasers will find that all delays will be forgotten in admiration of its excellencies.

We have received many letters from our friends, who, in renewing their subscriptions at the new rate, express their satisfaction in so doing. We are greatly encouraged by this evidence of the general good feeling of the trade, showing that our readers appreciate the efforts which we have made to supply a really useful and instructive jornal, and understand the reasons which bave obliged us to increase the price of subscription. In the futnre, as in the past, our aim shall be to provide the very best articles and information obtainable. Now, that our hands are strengthened, our readers may expect more, and it will not be through any fault of ours if their anticipations are not fulfilled.

Prompt pay is the key to all success in business. There are times in the history of every trader when he finds it inconvenient to meet his bills promptly, and in such case we find the man who knows his credit to be good becoming lukewarm, forgetting that his creditors are calculating upon him to meet some pressing obligation. The result is that he disappoints them, and thus, after one or two obligations of the same, even the man whose credit is first class can soon impair it, and sometimes to a degree that makes it hard for him to recuperate. Now let us take the man of moderate (say fair) credit. He knows under such circumstances that his credit is scrupulously watched; and if his bills begin to lapse, he is at once notified of it, and informed that unless past bills are paid no more goods can be procured. With such a contingency facing him, bo sees it is to his interest to meet his payments promptly, and is on the high road to success. Prompt pay does two important things—it inspires confidence in the seller, putting the buyer upon a first-class basis, and it insures the prompt shipment of goods. It is a good thing to do, and should be the main rule of every man in the jewelry trade.

Messrs. Traitel Bros., manufacturing jewelers, of No. 170 Broadway, New York, have suffered a heavy loss by a recent robbery which took place at their factory, 123 Railroad avenue, Jersey City. The following is a list of the goods stolen, which we publish in full, so that all our readers may be on their guard, and in the hope that, as has already resulted on other occasions, the thieves may be discovered through this means:

17¼ doz. stone figure cameos; 43 stone head cameos, large, (47 medium, 45 small,) 18 stone head cameos, oval and oblong, extra large; 1 doz. stone cameo lockets, oblong in shape, to hold 2 pictures; 2 doz. onyx and bloodstones, oblong in shape; 20 fancy gents' lockets, 12kt. gold, without stones; 1¼ gross small gold diamond settings; 134 gold frames and boxes for cameo heads; 311 gold boxes for figure heads; 50 gold frames for small oval onyx stones; 49 gold rings without stones—children's rings, for stones; 50 gold pieces, tops—settings on for children's rings; 12 gold frames for stones; 12 do 4 stone tops, settings for children's rings; 680 dwts. 10 and 12 karat gold, in ingots and wire; 15 dwts. pure gold; 43 gold rings, complete, with the exception of stones, for figure cameos, with 10 cramps; 23 rings, sardonyx, with microscopic views on side, of the Centennial; 27 rings, gold without stones, with cramp settings for amethyst stones; 36 small gold cameo rings, plain setting, with fancy flowered bands; 12 gold fancy swings for lockets. A lot of sardonyx stones.

Practical Hints on Watch Repairing.

By Excelsior.—No. 22.

THE DETACHED LEVER ESCAPEMENT.

(348) Having once drawn the various working parts, as already directed, and knowing the proper angles for the different portions, the workman can easily make a guide or sizer and avoid the labor of drawing them for each case. This sizer should have circles of different sizes drawn around the same center, each one having its center distance marked on a scale at the side, which will serve as a gauge by which to select pallets or wheels, either one from the other. Fig. 20

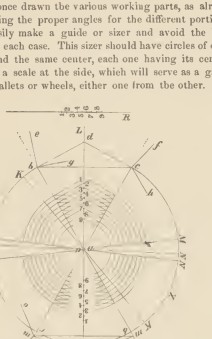


Fig. 20.

shows such a sizer, drawn on a large scale, to make the idea clearer to the reader; but, for use, the circles at the center are drawn to represent the actual sizes of escape wheels, and as close together as they can be and have each one perfectly clear and distinct. All the lines should be deep but fine. The whole should be first carefully and correctly drawn on a separate piece of metal, and, when done, transfer the necessary lines and measurements to the piece designed for the sizer, omitting everything not needed for use, to avoid a multiplicity and confusion of lines and marks. After drawing each circle, before altering the dividers draw a like circle on the sizer. Then having found the pallet center as in section (344) for each circle, you have the proper center distance for that size of wheel. These center distances are then to be accurately transferred to the lines $a\ L$, and R, on the sizer, and numbered to correspond with the circles to which they belong. At each such point on the lines $a\ L$, , a fine hole can be drilled through the plate with a pivot drill, to facilitate the testing of the center of motion of pallets, when laid on the sizer, as otherwise the mark could not be seen at the bottom of the arbor hole.

(349) The upper half of Fig. 20 is for the Swiss or American style, the lower half for the English lever. The circles should be numbered along the line $a\ L$, say the even numbers along one side, the odd ones along the other. In the space included between the lines $a\ b$ and $a\ c$ at the top of the figure, the circles should be omitted, in order to have no unnecessary lines and secure clearness. From the junction of lines $a\ b$ and $a\ c$ with each circle, draw the lines to the pallet center for that circle, which of course represents that size of wheel, and from a to each pallet center represents the proper center distance for that size of wheel and corresponding pallets. To draw these lines easily and save measuring, drawing perpendiculars, etc., for each one, make a thin metal square, one side of which you lay along $a\ b$, and by the other draw a line to $a\ L$, lightly but accurately. Do the same from line $a\ c$. Do not extend these lines beyond $a\ L$, but only to it. Also draw a horizontal line between the same junctions, for each circle, omitting the central one-half, for clearness, as only those parts near the junctions are necessary for measurements. Along one side of the sizer, draw a line R, on which you lay off the exact center distances corresponding to each circle, with its number as on the other part of the sizer.

(350) On the large outside circle, which in practice may be one inch in diameter, you lay off the necessary lines for testing the locking and driving planes, which are found as directed in the last article. I would observe here that, by a mistake of the engraver, Figs. 18 and 19 were not cut according to the drawings furnished him, nor according to the directions given in the text. In Fig. 18, the line $b\ g$ was omitted. This should be drawn from the point b, at an angle of 20° from $b\ d$, or 70° from $b\ a$, which gives the driving plane of the short arm, for Swiss pallets. In Fig. 19, the driving plane of the long arm should have been shown from m to the crossing of $d\ n$ and $m\ o$, whereas, in the figure, it is drawn from c to the line $d\ n$, which is materially different. If the reader will make his own drawings, according to the directions, he will have them correct. On the sizer, at the top, you lay off the lines $b\ c$, $b\ d$, $b\ c$, $b\ g$, $c\ d$, $c\ f$, $c\ h$, omitting the other lines shown in Fig. 18, as not necessary for use. At the bottom, for English pallets, lay off lines $m\ c$, $m\ d$, $m\ m$, and for the long arm, $m\ d$, $m\ f$, $m\ v$.

(351) On the lower half of Fig. 20, which is for the English lever, you draw the inner circles, but omit the central one-half of the arc, between lines $a\ b$ and $a\ c$. Also draw horizontal lines (omitting their central one-half) from the junction of each alternate circle with the lines $a\ b$ and $a\ c$. These lines are not for use in laying the front corners of the pallets on, but merely for convenient guides in getting the pallets in correct position for testing, for which purpose the above or even a less number of lines is sufficient. Lastly, mark the center distances, the same as on the other half of the circles, measured from a on line $a\ L$. From a draw line $a\ K$, 11° from $a\ b$. The distance between $a\ b$ and $a\ K$ on each circle, gives the breadth of the pallet arms for that circle, or size of wheel. For the Swiss or American pallets, the line $a\ K$, in the upper half of Fig. 20, should be 9° from $a\ b$. For testing the angles of the escape wheel, we draw on the right hand side, at N, two radial lines, 4° apart, measured on the circle x, and another line M, about 10° from N. Omit the smaller circles between these lines, and instead of them draw inclined lines between lines N and M, at sufficient distance apart to insure perfect clearness, say for every second or third circle. The lines running obliquely upwards to the left are drawn at an angle of 120° from the line running from the front corner to the center a, and show the inclination of the driving plane of a club tooth; the lines running downward and to the left are at angle of 28° from the aforesaid radial line, and show the inclination for the fore face of the tooth. As the under surface of Swiss wheels is generally beveled off to make the ends of the teeth thinner, it is well to also draw a tooth-gauge with these lines running in the opposite directions to those shown, as marked on the left side of the figure, to allow the wheel to be turned over with its upper surface in contact with the sizer, as the angles can be compared more closely. A gauge similar to the former, having only the lines of the front face, can be made on the lower half, for English wheels, or those lines on the Swiss gauge can be also used for English wheels.

(352) Make the sizer of hard brass or German silver. At a, make a smooth hole with a fine, conical pointed punch, also have the dividers properly pointed, smooth and well polished, so as not to wear this hole untrue by the numerous measurements, etc. All lines should be far enough apart to secure distinctness; even if there are not enough lines or circles to include all sizes, it is easy to compare the piece with the nearest one, observe the angles, etc. After making all the markings and finishing as above, drill through, at a, a hole large enough to take in the largest escape wheel pinion. In the large figures on the circle x, the holes on the lines running to the pallet center d, are cut through to admit the pallet arbor and allow the pallets to lie flat upon the sizer while comparing or testing them. In making the sizer, the proper

order is to first draw lines a L, a b and a c, then the circle x, and the large figures at the top and bottom, next the lines N N and M, and lastly the inner circles and the remaining parts.

(352) *Using the Sizer.*—To select pallets for a given wheel, put the wheel on the sizer concentrically, (its pinion in the hole at a,) and notice the number of the circle which is the size of the wheel, or get the points of the teeth equally distant from the circle which is nearest to its size. See if the center distance in the watch agrees with the one on the lines a L and R, for that size of wheel. If so, we select the pallets as follows: For Swiss pallets, lay them on the sizer so that their front corners will he exactly over the points where that circle crosses the lines a b and a c. The nearest horizontal line will insure both corners being on the same circle. Or, we may measure the distance between those points with the dividers, and compare them with our pallets till we find one of that size. Then lay them on the sizer, and, while held in the position above stated, their center of motion, or the center of their arbor hole, should come exactly at the hole on the line a L which indicates the proper center distance for that size of wheel.

(354) In selecting English pallets, having found the circle for the wheel as before, select pallets whose center of motion is correct according to line a L, when they are held so that their front corners touch the lines a b and a c, (325,) while the circle which corresponds to their wheel strikes the driving plane of the short arm half way across, *i. e.*, midway between the front and discharge corners; and strikes the driving plane of the long arm a trifle more than one-third of the way across. Thus it will be seen that the distance between the front corners of English pallets is greater than of those of the Swiss style, both having the same size of escape wheel. And suitable pallets for that size of wheel will span between the lines a b and a c further from the center a, in the former case than in the latter. When the pallets are already on their arbor, instead of laying them on the sizer as above described, we may measure them directly with the dividers, as for Swiss or American pallets.

(355) To test the breadth of the arms of the pallets, try the driving plane of the arm being tested between the lines a b and a K, as described in section (351), at the circle corresponding to the size of the wheel, or in the same position as was occupied by the wheel between the nearest circles. If the arms are narrower than the space between these lines at the proper position, there will be a loss of lift or impulse; if broader, they will require too much motion of the lever fork in order to escape, and the teeth will be liable to clog or catch. There is always a little latitude for variation from perfect correctness without causing actual stoppage of the watch. And if the very best condition is not required, or perfectly fitting pallets cannot be obtained, a greater breadth of the arms can be allowed when the distance between the front corners is rather too much than when it is rather scant.

(356) To test the inclinations of the locking and driving faces, use the test lines on the outer circle. It is not necessary to pay any attention to the lines b d and c d, but merely keep the front corners of the two arms just on the horizontal line b c. To test the short arm, slide the pallets to the left till its front corner touches the point b, when the locking face should agree with line b e, and the driving plane with b g. To test the long arm, slide the pallets to the right till its front corner touches c, when the locking and driving planes should agree with lines c f and c h respectively. To test English pallets, set the front corner of the two arms on the horizontal line m m, slide the front corner of the arm being tested to the proper point, m, and compare with the test lines as before. It will be perceived that these two figures on the sizer will test all the sizes of pallets, because, whatever their size, their *angles* should be formed according to the same rule. When the driving planes have a greater lifting angle than shown by the sizer, the teeth of the wheel may he a little narrower than 4°, so as to clear the pallets in escaping, or if the breadth is correct, the lifting angle on their ends may be a little lower than 4°.

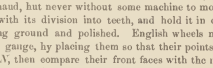
(357) To select an escape wheel for given pallets, lay the pallets on the sizer as directed in section (353) for the Swiss style, and in section (354) for the English, and find the circle they correspond to, which will he the proper size for a wheel suited to them. Then test the center distance, etc., for that wheel, with the actual center distance in the watch.

(358) To test the breadth of the escape wheel teeth, place the wheel concentrically on the sizer, with a tooth between the lines N N. If it just fills the space between them at that place, it is of correct width, but if either more or less than that width, it is defective. If the variation is small it may answer. But if much wider, it will he apt to catch and clog, and the back corners should he very slightly taken off in line with the center of the wheel. But no more should be removed than is barely sufficient to make them clear properly, as the tooth is better a little too broad than too narrow, which would destroy a portion of the lift, and convert it into useless if not injurious drop. Before making any alteration of the tooth, however, see if the apparently excessive width is not compensated for by a corresponding narrowness of the pallet arms, and *vice versa*, (337).

(359) To test the angles of club teeth, place the wheel concentrically as before, with the front corner of a tooth just touching the left hand line N, then compare the front face and the driving plane with the nearest lines running to the left, upward and downward respectively. Should the angles of the teeth not agree with these lines, they should not he altered by hand, but never without some machine to move the wheel accurately with its division into teeth, and hold it in correct position while being ground and polished. English wheels may be tested by the same gauge, by placing them so that their points touch the left hand line N, then compare their front faces with the nearest line running downward. In English escape wheels the teeth are nearly, hut not quite, pointed,—there being a just perceptible flatness or breadth at the ends.

(360) Another way to test the inclinations of the locking and driving faces of English pallets, is to take a thin metal slip about an inch

Fig. 2 1.



long, and cut it out as shown in Fig. 21. The end at a is filed out to the proper angles for the locking and driving planes of the long arm, while at d the angles for the short arm are given. These angles are easily marked upon the slip, by making the upper surface straight, as shown hy the line a b c d e, which corresponds to the line m m, in Fig. 20, upon which line the front corners of the two arms must he placed while testing the angles. From a to b is long enough, say $\frac{1}{2}$ inch, to contain the front corners of even the longest pallets. From d to c is short enough for the shortest pallets, say $\frac{1}{4}$ inch, so that the long arm may he received into the notch c b, while the short arm fits into the angle d, and hoth the front corners are in the line d a. This gauge is applied directly to the pallets, at the center or highest convexity of their jewels. By a slight change of the angles at a and d, a similar gauge can be made for the Swiss and American pallets. The angles or inclinations of the different faces should he the same, whether the pallets are large or small, in the case of the usual construction, as supposed in these articles, viz.:—a lift of 10° for the pallets, (or pallets and wheel together, in the Swiss style,) the pallets taking in three teeth and fitting into four teeth, etc. In the same way the angles of any part in the watch may be tested by drawing the lines correctly, with the protractor, on metal or paper, then cut out the angle accurately, and apply to the surfaces to be tested.

(361) Angles may also be tested hy applying the parts directly to the protractor. For instance, to try the angle which the driving plane makes with a line to the center of motion, set the front corner of the pallets being tested over the center of the protractor, with the line 0 over the pallet center, and the line which coincides with the driving plane will show the angle. The locking faces may be tested in the same way. For the convenience of the workman I will recapitulate the angles for the different parts, indicating them by letters (340), to save space. See Fig. 20. For English levers, short arm, c m m, 107°; c m d

80°; *d m m*, 27°. Long arm, *f m o*, 116°; *f m d*, 106°; *f m m*, 133°; *o m d*, 138°; *o m m*, 111°; *a n o*, 52°. For the Swiss style, with club tooth wheel, short arm, *e b g*, 94°; *e b c*, 104°; *e b d*, 74°; *d b g*, 20°; *g b c*, 10°. Long arm, *f e h*, 107°; *f e b*, 133°; *f e d*, 103°; *h e d*, 130°; *h e b*, 120°; *h e a*, 60°. The front face of the escape wheel tooth should form an angle of 28° from a line running from the point or front corner to the center. The driving plane of the club tooth should form an angle of 120° with that line. Or, as shown in Fig. 18, *a y v*, 28°; *a y z*, 120°. The foregoing directions and figures are not all of them theoretically exact, but are taken from a drawing with a radius of ten inches, and are practically correct. The error, if any, will be found so small as not to be discovered in measuring by the actual size of the parts. Very often the watchmaker has no piece in his stock which is just right, and it may be well to consider what can be done in such cases, before we take up the "escapement augle," or fitting the pallets and lever fork together properly, which will close up our treatment of the wheel and pallet action.

(362) Sometimes the arms of pallets are too narrow, but no better can be found. In an English watch, we may select an escape wheel a little too large and turn it down to the right size, which will make the ends of the teeth broad instead of pointed. Then give them a slightly inclined driving plane on their ends, after the Swiss style, which will remove the excessive drop and supply the reqnired additional "lift" to the wheel and pallet action. A wheel not much too large should be selected, as, after it is turned down so as to escape, the points of the teeth must not be very broad, because the arms of English pallets are broader than the Swiss and do not leave much room for extra breadth of teeth. But if the lift must be supplied by the teeth, and they have no freedom in the pallets, (321,) the discharge corners of the arms should be taken off a little, if they are plenty broad. But if they are already narrow enough, the back sides of the wheel teeth should be removed, to narrow the points, filing all the teeth alike, and preserving the original slope given to the backs by the maker. This, of course, refers to the English levers.

(363) In turning down an English wheel to give more lift, the front corners of the teeth, after the driving planes are formed on their ends, should touch the same circle on the sizer which the points of the old or smaller wheel touched, while the distance of the back corners from the center *a* towards the circle *x* should be governed by the amount of lift to be supplied. This can be accurately determined by drawing the wheel and pallet action. Take say ten times the size of the old wheel, and draw a circle *x*, as in Fig. 19. Find the pallet center *d* as already directed. Then, on the line *a b*, and from the center *d*, mark the desired additional lift, which we will say is 2°. Now draw a circle outside of *x*, passing through the point on *a b*, 2° above *b*. This outer circle gives the proper diameter for the wheel at the heels of the teeth, and the circle *x* gives the place for their front corners. By drawing two radial lines 2° apart as at *y z*, Fig. 18, we have the proper breadth for the teeth at the points, in this case, which should not be exceeded, although it may be less. By diminishing the sizes to one-tenth, we have the actual dimensions for the parts. The wheel is turned down in the lathe to one-tenth the size of the outer circle, then a slight mark on the under surface by the graver, at one-tenth the diameter of the circle *X*, shows where the front corners should come. In this case, with a brass wheel, if the workman has no machine suitable for cutting down the ends of the teeth, he may attempt it by hand, with care, for he would scarcely make it any worse than it was unless he cut the front corners down so low as not to lock on the pallets. The brass wheel may be worked with a fine file and a burnishing file, but a steel wheel should be ground and polished with laps and suitable grinding and polishing powders. It may be taken as a rule that no alteration of the the places or shapes of the teeth or pallets should be attempted by the workman till he has acquired some skill by operating on waste or discarded pieces.

JEWELERS' ALLOY.—The following alloy was, not long since, patented in France: Copper, 720 parts; nickel, 125 parts; bismuth, 10 parts; zinc, 90 parts; soft iron, 20 parts; tin, 20 parts. This is said to form a fusible, malleable metal, easily worked by a silversmith; it resists the oxidizing action of the air, and is capable of being soldered.

Miscellaneous Items.

CANTERBURY'S ANCIENT CLOCKS.—In 1836, Prior Henry de Estria bought five bells for Canterbury Cathedral, whereof one, weighing 8,000 lbs., was called Bell Thomas, and was placed in the great clock house. Three others were set up in a new clock house built about that time. Somner, in his "Antiquities of Canterbury," 1640, makes no mention of so early as that named above being at that city. He is very elaborate and exact in his statements, and therefore is noticeable that if such a clock had been erected there the fact had escaped his attention. But he records that William Benet, who was Mayor of Canterbury in 1450, and who had been various times before one of the bailiffs of that city, by his will gave to the parson and wardens of St. Andrew's Church there 4s. 4d. per annum to keep and maintain the the clock for ever. This incident shows that the public utility of clocks began to be appreciated at that time. The fate of the clock at St. Andrew's does not appear; but we find that several parishioners of Canterbury bequeathed money at the end of the fifteenth century for the making of a new steeple to that church, the whole of which building was pulled down about the year 1764.

GENEVA CYLINDERS.—The length of a cylinder can be obtained by the following method:—Take off jewel covers, screw on the cock, and take the distance outside the jewel holes with a pair of pinion gauges—this is the length, pivots and all. The diameter is obtained from the scape wheel thus:—If the foot of the cylinder is held between two teeth and against the point of one, the heel of the next must be quite free of the cylinder. With a depthing tool, the watchmaker can put the scape-wheel and cylinder into it, and see if the cylinder has the same freedom inside and outside, that is, the tooth should have equal "drop" into the inside, and to the outside of the cylinder; but the point of the tooth should not drop too far into the cylinder, just enough to be safe is all that is required. There are three dots, one on the plate close to the edge of the balance, and another on the rim of the balance, to mark the place for the hair-spring stud, and when the balance is at rest, the dot on it is close to the middle one on the plate. In new watches these dots mark the extent of the balance of impulse, that is, a tooth escapes when the dot on the balance reaches the outside dots on the plate. Before the balance is riveted too tight, the cylinder should be put in and tried; and the balance turned round on the cylinder until the teeth escape at the dots: you will thus get the banking, and also the escapement right at once.

FILTER FOR METALS.—Professor Lampadius, of Freiberg, concluded at a certain low temperature of infusion the metallic impurities present in the more easily fusible metals would separate, partially as such, and partially as definite crystalline compounds, and float in the fused mass, from which they could be removed by filteration. Experiments by him in this direction were so far successful that the expected definite compounds were found upon the filter, but the metallic filtrate was still very impure. The filter was made of quartz-sand, slag, etc., which was not wet by the molten metal. Curter, however, according to a communication by him, in trying to adapt this principle to the purification of Bohemian tin, on a commercial scale, sought for material for a filter, which would be wet by the metal to be purified, without being dissolved in it. Iron, with its comparatively high temperature of fusion, and its adhesion for tin, as manifested in the tinning of iron was employed for the filter. Five hundred strips of tinned iron, as thin as paper, about 0·6 of an inch long, and one-fourth as broad, were packed tightly in a square iron frame, by the aid of wedges, and the frame was then luted into a suitable opening in the bottom of a graphic crucible. The tin melted in a second crucible was allowed to cool until the separation of fine crystals on the surface was noticed, and the thickening metallic mass was then poured into the filtering crucible, when the still fluid, pure metal, passed through, and a pasty magma was left, in which iron, arsenic and copper, concentrated to a great degree, were found combined with tin, while the filtered tin proved to be almost chemically pure. Fifty hundred weight were purified in the crucible described. Other forms and other materials for filters are suggested, and other possible applications of the method, as in the separation of silver from lead containing the former metal.

Proceedings of the Horological Club.

A DISTINGUISHED BODY OF WATCH AND CLOCK MAKERS.

Thirty-Fifth Discussion.—Communicated by the Secretary.

WATCHMAKERS' GUARANTEES AGAIN.

Mr. S. C. Levy sent in a blank copy of a guarantee, which he had used with success for two years, for the consideration of the Club. It was as follows:

Your influence solicited. LEVY the Jeweler 1817 Ridge Ave.

PHILADELPHIA,......................187

This certifies that Watch No.......... ..

Named.............................was repaired by us and is warranted to keep time if well used.

Registered.... ... .

Mr. Clerkenwell thought the above a good idea; but he was in the habit of saying to the customer that his watch was now in good running order, and with proper care he would warrant it to run and keep good time for a year unless it got broken or injured some way. He took pains to always mention this proviso, so that there could be no misunderstanding, as many persons took a warrant to mean that he would make it run no matter what happened.

Mr. Horologer doubted the policy of giving a written guarantee. Still, it would have a very assuring effect, only it bound the watchmaker rather too strictly. There would be one advantage: if the workman had backbone enough to refuse a warrantee when he ought to, which was, that a person who would not have his watch put in perfect order, and therefore could not get a warrantee, would understand distinctly that there was no warrant upon it, and the reason why. He had found that when he stated plainly what must be done to have a watch in good order, and placed the responsibility upon them to say whether it should be properly repaired or not, they almost always choose to have it right, so that it could be warranted. He advocated perfect candor, and plain but courteous talk with customers. He hoped to hear the views of the trade more generally on this subject.

ADJUSTABLE CLICK SPRING.

Secretary Horological Club.

Being a watchmaker and a subscriber to the CIRCULAR, and seeing your hearty welcome extended to inventors to submit their improvements to the Club, I will take advantage of your kind offer. Enclosed find click spring. I have it secured; intend to make them serrated on the underside, thereby preventing any possible chance of displacement. I shall await your judgment of its merits.

L. VAN DOREN.

This invention consisted of a block with a steady pin, to be screwed to the barrel bridge the same as the butt of the ordinary click. In this block, next to the bridge, a wedge-shaped slot was formed in which fitted the spring part of the click proper. This part of it was triangular in shape, with a flat side pressed against the bridge when the block was screwed fast. By this means the click could be fitted to either a long or a short bridge, and the end projecting outside of the block was then cut off. In case of a breakage, only a click need be fitted, the old block being as good as ever. He thought that by making the under side serrated, as proposed, it would be permanent and secure, and would be a valuable addition to the list of watch materials, taking rank with the adjustable case springs, etc.

CEMENT FOR RUBY PINS.

Gents. of the Horological Club:

The best thing that I have ever found for setting ruby pins is Mountfort's self drying crystal varnish. It is used by photographers for varnishing ferrotypes and negatives. It dries almost instantly with a very gentle heat, and is almost as hard as glass. It will not crack or peel off if the parts are clean. It is put up in six ounce bottles and sold by all photograph stock dealers at 40 cents per bottle. It is better to let it stand in an open vessel to thicken before using it.

M. A. MOREHOUSE.

Mr. Ruby Pin observed that whatever cement was used should be one which, even after becoming hard, could be softened again any number of times to alter the pin if required. He did not know whether Mountfort's varnish would do that or not. He had never used anything better than good shellac, either in the gum or in a thick solution with alcohol. He applied the heat with a "temper drawer," described by "Excelsior" in his "Practical Hints," for August. With this he could fasten or alter the pin, without removing the roller or hair-spring from the balance staff. He held the bow of the wire in the lamp till the shellac flowed freely, then, adjusting the pin, he pulled off the heated wire at once. In the same way he cemented the roller jewel on duplex balance staff, and many other similar jobs.

POOR MAINSPRINGS AND HAIRSPRINGS.

To the Secretary of the Horological Club:

Do main and hairsprings fail so as to be worthless while in use, or running every day, while they really look as well as ever? I have about made up my mind that such is the case. It may be a well-known fact to almost every workmen, but I have never heard it remarked on. I suppose there is no way to ascertain, except to fit new ones if they are suspected.

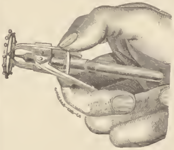
S. J.

Mr. Isochronal said that springs which were too soft when made, either from the temper being drawn too low, or not being properly hardened, could lose their elasticity by use, and become worthless. Mainsprings of that kind would be known by their refusing to spring out when removed from the barrel, but remaining bent or pretty closely coiled. Hairsprings in that condition would have but little elasticity, and not give the balance a lasting and lively vibration, but would die right down when made to vibrate. The softness of a spring can be told by bending the projecting end. A soft hairspring is a poor thing, whether new or old.

FRESE'S PATENT ROLLER REMOVER.

Gentlemen of the Horological Club:

I would submit for your consideration the enclosed Roller Remover. It is a tool of my design, improved to obviate the defects of the best tool in the market, the Tracey. It can be operated with one hand, while holding the balance in the other as shown in the cut. The jaws open and close simultaneously by means of a slide, and are strong enough so that one cannot give before the other, as spring jaws are apt to do They have also a circular groove which is to close up on the roller table, and will always place the balance staff in line with the plunger, so that the pivot will, without requiring any attention, always enter into the hole in the plunger. Although it costs considerable more to make them than other tools used for the purpose, I offer them for the same price, viz., $2.50 at retail.



B. FRESE,
99 E. Madison St., CHICAGO, ILL.

Mr. McFuzee said that the cut and the above description would explain its operation sufficiently, except that, after the roller was properly placed, the side lever was slowly pressed down, to protect the plunger and push the staff through the roller. He thought the shape of the jaws was such as to prevent one side of the roller slipping off the jaw and breaking the pivot off, as some tools were liable to do. Altogether it was a very simple and efficient tool, and was also very tastily gotten up.

SUNDRY INQUIRIES ON WATCH REPAIRING.

Secretary Horological Club:

Can you inform me of the most accurate method, or name of any tool, whereby I can ascertain the precise center of a Swiss lever barrel bridge, after being bushed, where there is no lower plate with orifice, as is often the case, as the arbor and ratchet only operate in the bridge? 2d. Is there any perfect tool in the market whereby I could adjust the pallets, or often called *ancre*, perfectly to the lever, and obtain the correct angles on driving planes of pallets, also correct depth, to secure a perfect escapement in every particular point connected therewith? So many cheap foreign levers are imperfectly adjusted and made to sell rather than keep time. I find the Swiss depthing tools also imperfect and cannot secure good results with them on escapements, and the common way, by observation, of testing and trying, is a tedious and tiresome work, say nothing of much lost time. 3d. In JEWELERS' CIRCULAR, No. 9, clause 314, where it says "If the balance staff itself is out of true, and cannot be trued by straightening the pivots or otherwise," do you consider the balance wheel to run in a true circle or to vibrate in harmony with the staff? Again, after turning down a perfect roller to work on an imperfect staff, would not the next jeweler have serious trouble with the same roller, providing he had occasion to insert a perfect staff? Would it not be more workmanlike to insert perfect staff in first place?

S. P.

Mr. Uhrmacher replied to Mr. P.'s inquiries in their order as follows: The way to mark the barrel bridge, after plugging up the hole, is to remove the arbor from the barrel, then mount the main and center wheels in the depthing tool in the usual way, and mark the bridge from the center wheel hole. Drill on this curve, at the point in the centre of the racket wheel sink in the bridge. 2d. There is no such tool in the market, and no way to adjust an escapement except by trying the action of the different parts. The best ways for doing that are now being given by "Excelsior" in his exhaustive articles on Watch Escapements in the JEWELERS' CIRCULAR, which Mr. P. will find practicable and reliable. Depthing tools should be overhauled and made perfect before using them; and, when using

them eare must be taken to keep them perfectly vertical to the watch plate or pieee being altered. 3d. The balanee is supposed to run truly of eonrse, otherwise a new staff should be fitted. In "Exeelsior's" articles, when a defect is mentioned, and the remedy given, it is al. ways understood that otherwise the parts are *correct*. And in this ease, if all were true but the roller, that should be trued. If another workman put in a new staff, he would also have to put in a new roller. It would be better to put in a new staff at first, provided the owner was willing to pay for it. But, if not, then the next best thing must be done, and "Exeelsior" had told bow to do it.

THE LOW PRICED AMERICAN MOVEMENTS DENOUNCED.

Gents of the Horological Club:

As we watchmakers look to you for help and advice in our troubles and perplexities, I desire to call your attention to an evil of the first magnitude, which not merely threatens but is already upon us. I allude to the course of certain American Watch Companies in deluging the country with cheap and worthless movements. They are too low priced to do any service, yet they are sold as "genuine American watches," giving dishonest dealers a chance to take advantage of ignorant buyers. This class of traders have heretofore done their swindling by putting cheap imitations of American movements in heavy cases and getting heavy prices for these bogus watches. But now they can get this trash just as cheaply, and warrant it "genuine American." So far has this gone, that the Swiss have almost lost this market through the introduction of such rubbish.

It is not hard to see where all this must lead. The injury affects all classes—the manufacturers, the dealers and the wearers. The public may be thus swindled for a time, but when they find out that "genuine American movement" in a three or four ounce case is not worth "a tinker's d—n" for time, the result will be that they will give American watches the go-by thereafter. Confidence, once lost, is very hard to regain. The companies pandering to this taste may make a temporary profit by their course, but they will pay dearly for it in the future. They are either very blind, or very anxious for a present gain. In the case of a company which was "hard up," and must raise the wind somehow, at any cost, we might comprehend this reckless disregard of their reputation and permanent well being; but that companies well established in wealth and prosperity would thus throw away their good name for petty present profits on these cheap movements, is very, very strange. One of these companies goes a step further and makes a direct bid for the trade of pretentious dealers, by putting out their movements without a name, so that "dealers can sell them on their own reputation," or, in other words, they will help them to make all they can out of their confiding customers. And now I have just learned of another addition to the list of manufacturers of this cheap trash. Common sense ought to teach them that a decent regard for their reputation and present prosperity would dictate that no movements should be made except such as will give at least fair satisfaction to the owner. By following that course, the confidence of the public in the quality of American watches would be retained.

If foreigners can furnish such movements for less money, they ought to have the trade, and in the end they will. Whether they can or not, for the American companies to make these cheap movements to compete with them, is useless in the former case, needless in the latter, and suicidal in both. They are mere rubbish which cannot be made to give satisfaction, and give the workman no end of trouble. They bring the whole line of higher grades into contempt, as they are all alike sold as "American watches," and all are judged by them. I: frequently happens that the reputation of a skilful and honest workman is injured by his inability to "doctor" them into decent condition. They are no credit to American manufacturers, and are a nuisance to honorable dealers and to their wearers, tending to bring the whole trade into disgrace. RETAILER.

Several members spoke on this question, agreeing in the main with "Retailer" as to the injurious effect of these cheap movements on the trade. Mr. McFuzee then arose and remarked that business was business, and the reasou why the low priced movements were made was because the trade demanded them. If dealers disapprove of them as strongly as Mr. R. intimated, why did they buy them and demand them? If they were not called for they certainly would not be made. As for their quality, without naming any names he would like to have Mr. Retailer specify in what respect the cheap American movements were inferior to any foreign made movements of the same price. Whether they were or were not just as good, the question of their injuring the trade, etc., was one which the trade itself could dispose or as it chose, by buying them or letting them alone.

Mr. Horologer thought that that view of the matter would hardly meet the case. Dealers bought these cheap movements because they had thus far found that American made watches were reasonably certain to give satisfaction and had impressed that idea upon the public. But if they could no longer depend on that being the case, then the American had no advantage whatever over the foreign movements. The dealer must buy them the same as all others, by examining each one and taking it on its individual merits. For a time the American movements might retain their *prestige* of superiority, but it would not be long before all would be on the same basis, and dealers would each have their favorite brand of watch, which they would recommend and push in preference to all others, foreign or American. This was already the case to a considerable extent, and he thought that the urging of these low-priced movements would greatly hasten the change. It was unquestionable that they were very troublesome and annoying to the workman who was expected to make them do any kind of service, such as American watches were called upon to doing. Whatever advantage they had in respect to interchangeability of parts, was fully offset by the fact that almost every body knew the prices and the discounts off, so that it was very hard for the dealer to make anything on them. He thought that the American companies could not afford to trifle with their present reputation and prosperity, and that the cheap movements would be too much for them to carry without harm.

Several other members agreed with Mr. Horologer as to the trouble often given by the cheap movements of two of the companies, and the impolicy of producing them.

Mr. McFuzee replied that the cheap movements were sold as such, and were not recommended as being any better than they really were. It was for dealers themselves to say whether they shall continue to be made or not. As to their alleged poor quality, he again requested to be informed in what respect they were inferior to any foreign made movements sold for the same price. It was therefore suggested by the Chairman that Mr. Retailer should send in a specific statement of the defects of the low-priced American movements made by the different companies.

The Adjuster-of-the-French-School declared that the American watch companies were like all other companies, mere soulless corporations, gormandizers of the gullible, and deserving of the most immoral reprehension. Preaching to them about their duty and things was breath thrown away. He knew whereof he spoke, for he had undergone a fearful experience with one of them which he would narrate as a solemn warning against putting your trust in 'em. It was well known that he was the discoverer of the great secret of adjusting watches in the supramundane position, which was the most incomparable improvement ever prognosticated in the annals of horology. This was indubitably proven by the stupendous performances of watches which had been inculcated under his manipulations. He had received the most fallacious arrangements with a certain watch company for the solitary purpose of practically degurgitating this wonderful process to their movements. And he was the undoubted individual who had succeeded in elaborating an incomprehensible perfectibility of operation seldom surpassed and never equalled. The average variation did not exceed two seconds in a year. One very ordinary movement was closely compared, and after allowing for the error of the clock and the transit instrument, and the variation in the motion of the sun, produced by the attraction of the pole star, it showed no perceptible error after running 72 weeks, 10 days, 01 minutes, and four ten-thousandth parts of a second, siderial time. An innumerable multitude of other movements had done even better than that. The fame of this company's watches was spread throughout the earth. Everybody wanted them; even the children cried for them. But the avaricious capitalists of the company were not willing to protuberate to him au equitable consideration for his gigantic services. They even had the ineffable audacity to liquidate his miserable pittance with orders for ready made clothing. *Horrible dictu!* Therefore he withdrew the sunshine of his immeasurable presence from their profane structure. What was the consequence? In an infinitessimal space of time their watches lapsed from unsurpassibility to nothingness, and the whole unmitigated and blasphemous concern collapsed, went where the woodbine twineth, and was never heard of more.

Since then he had stood ready to give some other company the incalculable benefit of his stupendous discovery, and confer upon it honor, happiness and prosperity. But no! They were incapablo of appreciating the auriferous blessing within their grasp. What would be the consequence? They, too, would defunctuate, would obliterate to where the woodbine twineth, and ere long this gorgeous globe would cease to be blasted by the hideous desecration of American watch factories. Then the Adjuster-of-the-French-School would promulgate his immortalizing secret to all the world about, joy and riches would consequently prevail, and the whole wide earth would rejoice and be exceeding glad.

A Treatise on Isochronism and Elasticity of Metallic Springs.

BY JAMES FERGUSON COLE.

FLAT SPIRAL SPRINGS.

The tool for flat springs consists of a square block of plate brass 3-4ths of an inch wide, having a central hole 1-20th of inch diameter, thickness of the square plate 2-10ths of inch. A common turning arbor, to fit the central hole for turning the faces true, and for racing a circle 4-10ths of inch diameter, the circle to be divided into four equal parts for drilling four upright holes on the circle, which will be required; into these holes four turned steel pins must be fitted, each pin to be flatted away 1-3rd of its thickness, so as to admit of being turned by center hole to fit the same turning arbor for flatting the bottom and for turning the top side convex to half its thickness, leaving a short pipe at top. This cover must be cut with four straight notches to fit free over the four flatted pins. Next to this the center winding arbor is to be made of two pieces of flat, forged steel three inches long; these are to be laid together face to face, and secured by two suitable screws one inch and a quarter apart, and when the two pieces are screwed they will form a bar 1-8th of inch square; the ends filed even must each have a center mark at the join of the pieces for drilling a small hole quarter inch deep, drilled from own center of the bar, the holes cleared with a broach; then file off the corners ready for turning a pivot at each end to fit the center hole of the brass plate but not let in until the two ends of the bar are tempered separately.

Now prepare and fit two conical steel pins with slight shoulders for stopping against the pivot ends when fitted tight for running the centers; the pivots, now fitted at a length to match the thickness of the block and pliers for adjustment. There is also required a circular brass cover plate with a cover, separate the bars, for snailing the proper edges of only one pivot first, for trying the shape by a piece of 12 or 14 size spring wire. Any length from 24 to 30 inches must be thinned at the middle of the length 3-8ths of an inch, and passed through the flame of a spirit lamp carefully, so as to turn the color just over blue; if made too hot it will break. This center part of the wire so let down may be placed in the tool for winding in the soft wire intended for only two springs; and if the snail form is correct the spiral shape of the coiling will appear quite true. This done, put on the four-notched cover, pressing it on the wire lightly for a few turns, and then wind the whole length tight into contact with the four flatted pins, nip off the surplus wire, leaving a fag-end for lifting it out of the tool. It must now be held on a half length of ordinary steel wire, not large, but with a conical collet fitting the center hole for holding the block without the cover, in the flame of a spirit lamp until pale red hot. This done, remove the soft springs by pliers, but not until the winding arbor is forced round sufficiently for breaking away the bit of wire across the center. This little matter has been a difficulty with a solid arbor, which, when forced for breaking the cross wire, the bondage on the arbor would drag the inner coils through the center hole and spoil the springs. The object of making this divided winding arbor on a contractile plan was by the removal of the conical center pin, the pivot would contract, and liberate itself so as to let the arbor come out easily without drag of the coils as with the solid winding arbor. By modifying the snail shape of the other pivot the same tool will answer either for three or four springs wound in together.

The next thing is the hardening of these flat spiral springs. To do this, prepare a few pieces of plate brass not thicker than a shilling, cut them out as circular pieces for turning on a common arbor, and fit a pair of the plates within the circle of the four flatted pins; the edges of these pieces to be turned square with the sharp corners sloped off, they are to be filed quite flat, and a center screw made to go free through the center holes with a steel nut to match the screw head for binding the plates and soft springs together tight. The sloped-off corners form a channel for a single round of suitable binding wire six inches long, so that when fixed on the tool by a twist, the loose ends will serve to fasten the pair of plates and springs to a stronger piece of steel wire as a holder; the hardening can now be done by a spirit lamp and blowpipe, away from the light part of the room. When hardened in water, warm the tool and springs to dry off the moisture slowly, and when quite dry and warm, dip the tool in oil, and if held in the flame until a little smoke appears, the springs will be at a suitable temper for removal and for separation.

This is done by putting the pair of springs on the holder with conical collet, and by passing the thinned end of a flatted round broach, as a parting tool, between the outer coils, and rotating the wire-holder with the two springs will readily separate quite flat, and in a fit state for polishing. This is easily done by placing a square of good cork (covered with linen) in the vice and pressing it into a slightly convex form as a hearer, charging the surface with mixed sharp stuff and oil, using a conical polisher of ivory or peg-wood, reduced sufficiently for passing free through the eye of each spring, using the ivory first because stiffest, and the wood afterwards with dry stuff; in this mode of polishing the inner side, the coils lie down in a conical shape, and may be reversed alternately during the process. After this polish the other spring in the same manner.

The next thing to be done is to prepare a tool for polishing the outside; this tool is only a hard-wood file-handle 5-8ths of an inch thick, centered true on sharp centers for drilling a center hole half an inch deep and fitting in the hole a tight steel center pin, for laying the eye of the springs on. At the center hole where the spring is to be fixed in, apply the sharp center of the turns, and shape that end of the handle as a long-shaped convex cone, so that a spring when put on the steel pin, can be laid on to the cone, and held tight by pressure of the thumb or finger, and brushed clear with a suitable short-haired brush, charged with sharp stuff mixed with oil.

BLUING FLAT SPRINGS.

Before the bluing, it remains to polish the flat faces of the springs; this is done by laying each spring separately on a square of stout card—paper charged with sharp stuff and oil; the springs are rubbed over the paper with the finger or otherwise until the black is polished off. This oil work being properly done, the process will have to be repeated in like manner throughout with a good clean brush frequently charged by a dry piece of middling stuff, such as will adhere by rubbing on the peg-wood polisher. With the same brush and dry stuff, used with the springs on the cone handle, the outside of the wire is to be treated as at first, and in similar manner the four flat faces of the springs must lastly be finished off on a doubled square of blotting paper, charged with dry powder scraped off the solid lump of stuff, as if rubbed on, it would rag the paper and endanger the springs.

A clean, soft brush, charged with fine lime, will clean the coils, so as to see that all are free from spots of any kind. If perfectly clean and bright, the two springs must be laid one on the other on a clear piece of plate glass, using two short pieces of steel sloped off and smoothed for putting the two springs together as when first wound in the state of the soft wire; they are readily put together by passing the sloped wires carefully from the center outward over the coils, which makes them ready for bluing.

Next to this a flat two-inch plate of brass, 1-10th of an inch thick, with six inches of steel wire screwed into the edge as a holder. Screw the holder into the vise so as to hold the plate quite level; now prepare two discs of thin plate glass made round 3-4ths of an inch across, clean the glasses as nicely as the springs, quite free from dust or flue, otherwise the springs may turn spotted; now warm the glasses on the pan to throw off damp, put the springs carefully pressed flat between the glasses and apply the spirit lamp, and continue the heat until straw color is seen. When cold remove them from the glasses, and now separate the two by putting them on the ivory tool, and a slight tap or two on the rod will immediately separate the springs, preparatory to bluing them.

The two springs now separated, examine carefully if there are any spots or other faults; if right, place each of the springs separately with only one piece of glass on the pan, as if the top glass is laid on the single open spring, it may injure the truth; as now laid, apply the heat until perfectly blued, treating the second spring in the same manner. The first heating gives the true figure and set of the coils at

straw color, and the perfect blue is given with more certainty while open by the second heating, but if any unevenness of color appears by the first heat the flat faces can be brightened and again re-blued if needful, which seldom happens with proper care.

It will be seen that by the sure plan of putting the springs together in the polished condition a perfect form is ensured, and when finally set by bluing the finished springs are so elastic as to bear handling without injury.

I have read with care the description of certain chemical processes for hardening and tempering polished steel without oxidation or discoloring, but these chemical processes appear to present complications and would occupy more time than the polishing process herein described.

Tool-making as here described will give an appearance of being more troublesome than the ctual work, which once done will last for some considerable time and will not often have to be repeated; similar work will be required, as in the customary modes of manufacturing flat-tempered balance springs.

Diamonds and Precious Stones.

In the enumeration that follows we shall place the precious stones in the order of their actual value. When an extraordinary demand, however, occurs, that causes a rise in price of any particular gem, there flows into the market such an overplus that the value is at once effected. This is the case at present with the beautiful Hungarian opal, which in the last ten years has become abundant, the mines producing it being more actively worked, on account of the high price of these stones, which for a while has surpassed that of the sapphire. The oriental ruby is, for its price as well as its beauty, in the first rank among colored stones. In order to appreciate its color in its finest quality we must compare it with the blood as it spurts from an artery, or the red ray in the solar spectrum. It is the pure red on the painter's palette, with out any admixture, on the one side, of orange, or, on the other, of violet Many of the stained-glass windows in our ancient churches, when traversed by the rays of light, give this color in its brilliance. The ruby is excessively hard, and, after the sapphire, which surpasses it a little in this respect, is the first of stones, always excepting the diamond, to which there is nothing at all comparable.

According to a perfectly just remark of M. Chas. Achard, more competent than anyone in France to give an opinion touching the trade in colored stones, there is a great difference between these and the diamond, which, from the minutest specimens, to those of princely or sovereign size, have a fixed price proportioned to their weight, as is the case with gold and silver. As for rubies and other gems, the very small specimens have hardly any value, and it is only when of some weight that they command high prices. Rubies are, therefore, much used for watch-pivots, and, from their abundance, are of little value; but for a ruby of 5 carats double the price of a diamond of the same weight may be asked for it, which price would be about 20,000 to 25,000 francs. All the world admits that a perfect ruby is the rarest of all the productions of nature. Its tint shows to the same advantage by day as by lamplight; but, to render the color more resplendent, it should be placed in the midst of the red rays of the spectrum in such a manner that the rest of the colors do not fall very near it. The possessors of choice collections of stones can repeat this interesting experiment with various stones, placing each in that color of the spectrum which is analogous to that of the stone itself. It is a severe test for the purity of tint; for if pure and unmixed, the stones will appear perfectly black in every other light but its own. Milky and turbid stones cannot bear this test.

When Pegu was annexed to British East India possessions, it was no night that that country, so rich in rubies, would send many of these stones, so jealously guarded by the Indian princes, into the European market. Such has not been the case. It is proven, however, that the ruby mines are still worked; and this part of Asia is the least known of all countries of the globe. Merchants in rubies will never cease expatiation on the number of tigers, lions, elephants, and venomous serpents which people the forests and the plains of this country, which, according to them, is only accessible by the openings of the rivers from the sea. The actual state of the island of Borneo, as authentically given, seems very much to confirm these rather interesting accounts. I do not know that the rajahs attach a superstitious importance to the possession of rubies, but it is certain that they never sell any of consider. able weight. With the *Koh-i-noor*, Runjeet Singh possessed a no less precious ruby, which was of the shape of the large end of an egg that had been cut in two. This enormous gem made a part of the necklace of this prince, and was estimated by him, without any fear of finding a purchaser, at 12,500,000 pounds sterling—about as much as 300,000,000 francs. We know nothing of the quality or weight of this ruby, which has not yet been brought to England. The ruby is, with the sapphire, the zircon, and the garnet, one of the heaviest of stones. In water it loses only about the fourth of its weight.

The Indian princes set their beautiful rubies in the collet of a ring, somewhat elevated, and surrounded them by several rows of small diamonds, so that the whole produces a kind of disproportionate elevation. contrary to our ideas of good taste, which admits but a single stone in a simple French setting, the stone not too prominent—for example, in diamonds, a solitaire of three or four carats. The composition of rubies is no less extraordinary than that of the diamond. Like the sapphire, the ruby is nothing more than a bit of crystallized earth, colored by iron, which naturalists call the painter of nature. It is too much to repeat the strange assertion, that nature has made the most precious stones with the most common materials; we will say that this kind of earth, called *aluminium*, or clay, and the white pebble or rock-crystal, called *silica*, or flint, form the base of nearly all the gems, Opal is rock-crystal with water. Topaz joins a little fluoric acid to silex and aluminium. The emerald, the chrysolite, the aqua-marine, the tourmaline, and the eulase contain another element besides silex and aluminium, viz., *glucine*. Finally, garnet is so ferruginous that it acts on the magnetic needle. The zircon, a stone very little esteemed in France, has for a base a peculiar kind of earth called *zircone*.

As accessory to the ruby, we may mention a stone less deeply red in color, called the *spinelle ruby*. The crystalline form of this differs from that of the oriental ruby, which is a six-sided cylinder, cut squarely at both ends, while the spindle is, like the diamond, a double pyramid. The name of *balass ruby* has been given to a stone of Magai, which several authors regard as a real oriental ruby, only having a less rich color. The ancients did not apply the name ruby to this stone. It is called by Pliny *carbuncule* (incandescent coal), and by Ovid and the poets *pyrope*, or that which has the color of fire—"*Flammas imitante pyrope.*"

With us the word carbuncle is little used, except to describe a ruby of considerable size. Pliny has evidently confounded the Indian ruby with the garnet which is found everywhere. Certain rubies cut spherically—a form which is called *callotte spherique*, tallow drop, or *cobochon*—present in the middle of their red tint, a white six-rayed star, which changes with the position of the eye, and forms in the sunlight a beautiful spectacle. This effect is called *asterie*. It is found also in the sapphire, a near relation of the ruby, like it being composed of aluminium, and colored by iron, differing only in its color, which is blue, while that of the ruby is the most vivid and purest red. Next in rank to the ruby we place the emerald, of which Pliny says no gem has a color so agreeable. This stone, which comes to us from Peru and New Granada, is very soft, hardly scratching rock-crystal. It is found in beautiful green crystals, implanted and produced in a kind of free-stone of a whitish color, and we can comprehend no cause other than electricity for such a deposit as that of the emerald in the midst of a stone differing both in nature and in color from this gem. Nero, who was near-sighted, used an emerald, hollowed on both sides, through which to look at the games in the amphitheatres. This was doubtless the first approach to spectacles, since the invention does not date very far back.

The emerald, like the ruby, is a six-sided prism, and squarely cut at the ends. The stone is very light, losing in water more than one-third of its weight. Its tint is so lovely that we overlook its want of hardness, which might properly almost exclude it from the rank of

distinguished gems. At the time of the conquest of Pern, a magnificent emerald was sent in homage to the pope; and several years afterwards the emerald mines there were said to be exhausted or lost. About twenty years ago the principal of a large establishment in Paris, M. Mention, received from South America some magnificent specimens, which quite revived the emerald trade, continued since, without interruption, by Charles Aebard. The deeper the hue of the emerald, the more it is esteemed. It is the largest end of the crystal that is the most strongly colored. The emerald loses none of its brilliance in artificial light—a valuable property in our modern society, where all great reunions are held at night. Hauy includes in the emerald family the aqua-marine and the beryl, one of a greenish blue, the other yellow, but both being like the emerald in form and chemical composition.

The emerald, as well as all stones whose color we wish to develop, should be cut with a flat upper surface, surrounded by retreating facets, continued all the way underneath. The orientals cut them in broad thin plates, which, apparently, ought to show the colors of the stone to the best advantage; but the reflection of white light from the large upper surface, becoming mingled with that which traverses the gem, renders the hues of the latter less discernible. This is the reason why they are not cut with a table and surrounded by facets; for thus, in avoiding a large reflecting upper surface, the stone is made to exhibit its fundamental color throughout its whole extent. The emerald, though much cheaper than the beautiful ruby, is, nevert eless, much admired and sought for. We might almost call it a "stone of general affection," so much is it esteemed by the many. The sapphire, which comes after the emerald, is the hardest of colored stones. It may be considered as a blue ruby, or the ruby as a red sapphire. With Hauy and Mawe, we can say that aluminium is susceptible of crystallizing in almost all colors. The mineralogical species to which the sapphire belongs is called corindon. After the red corindon, or oriental ruby, comes the blue corindon, or oriental sapphire. Sometimes the corindon is of a beautiful yellow color; then it is called oriental topaz. More rarely it is of a violet hue; then it takes the name of oriental amethyst Finally, it may be perfectly colorless, like rock-crystal when it greatly resembles the diamond, with which it is sometimes confounded, but, by its great weight and its double refraction, it may be easily distinguished.

By the microscope there may be discovered, in certain pale sapphires, traces in the direction of the faces of six-sided prisms. The light reflected by these internal filaments produces three small brilliant traces transversely to the filaments and to the faces of the prisms. The crossing of these little bright lines forms within the stone a six-pointed star, which gives to the stone the name of starry sapphire. Among the orientals these stones are highly esteemed, especially when they exhibit the star in a ground of deep blue. Corindons of all colors are susceptible of being thus marked. In his voyages in Africa, M. Abbadie wore a blue starry sapphire, which often commanded the respect of the natives. There are stars on a red, blue, or yellow ground, according to the color of corindon. As yet, this phenomenon has never been seen in the white sapphire. I have just said that this reflection arises from filaments within the stone. These may result either from some foreign substance or from minute hollows left by the regular disposition of the particles at the moment of crystallization. If, instead of trying to observe these starry appearances by reflection, the stone is cut so that it can be looked through, then the phenomenon can be easily seen. Unless the stone is of a very perfect crystallization, the observer who takes for the point of sight a lighted candle, placed at a moderate distance, will perceive these little luminous lines of light crossing all the series of filaments which the mineral contains. According as the stone has a four or six-sided form, we have a four or six-rayed star, and, if all the filaments are in one direction, we have a luminous band.

In scratching with the point of a diamond a plate of glass in various directions, we produce bands of light of the same number as the traces upon the surface, which are always in a transverse direction to these traces. We can even very simply produce a star in spreading with the finger a little wax or grease upon a plate of thin glass. It is necessary for this that the coating should be very thin, so as to merely dull the glass, and that the finger should be moved directly across—for example, from right to left, or from above downward; then looking through it at a lighted candle, there will be seen a band of white light crossing the direction of the lines of tarnishing. If the same operation is performed in two directions on opposite sides of the glass, then a four-limbed cross will be formed by the two luminous bands which cross each other before the eye.

Ceylon produced a greenish stone traversed by filaments of white amianthus, which is called the *cat's-eye*, and which is usually cut spherically and quite prominent. We see in it a floating band, which comes from the play of light on the lines of amianthus within it. In general with these curious accidents of light exhibited by exceptional stones, the color of the starry radiance should contrast as much as possible with the tone of the stone itself. In simply scratching crossed lines on a beautiful carnelian I have succeeded in producing a white cross on a red ground. In minerals this starry quality is very valuable, because it reveals the primitive form of the substance in which it is found; and I repeat that, by looking through a stone suitably cut, we find these luminous transverse bands in a great variety of crystallized minerals. There is a very hard dust employed in the arts, called emery, a powder used in rubbing or grinding down bodies with hard surfaces. This substance is a species of corindon, or sapphire, containing a tolerably large proportion of iron, which has been substituted for the aluminum at the time of the formation of the stone. This substitution is quite common in chemistry and mineralogy. It is believed that the Chinese succeed, by patience, in cutting diamonds with emery. This must be very slow work, because the stone of which emery is composed is very much softer than the diamond; it is like sharpening steel by rubbing it on paper or linen. However, if patience can work miracles, it is doubtless reserved for the Chinese to accomplish this result.

We shall place after the sapphire the opal, which comes from Hungary and Mexico. The Hungarian opals are much the superior, and have not the disadvantage of deteriorating with time. Some years ago the opal was higher in price than the sapphire; but increase in value inducing a more active working of the mines, the price of opals, beautiful as they are, fell to what we find it at present. For the perfection of an opal it should exhibit all the colors of the solar spectrum, disposed in small spaces, neither too large nor too small, and with no color predominating. The opal is sometimes called the harlequin, in allusion to the great variety of colors which it displays. The substance of an opal is of a milky hue, and of a pale greenish tint. This milkiness is known by the term opalescence. It is the color of water in which a little soap has been dissolved. In order to explain the brilliant colors of the opal, we may imagine in the stone a great number of isolated fissures, of variable width, but always very narrow. Each fissure, according to its width, gives a peculiar tint, similar to the effect produced by pressing two plates of glass together; we may recognize violet, blue, indigo, red, yellow and green, the last two being exhibited more rarely than the others.

As a proof that the brilliant colors of the opal are due, as we have said, to narrow fissures, similar colors may be produced by partially fracturing, with the blow of a hammer or a wooden mallet, a cube of glass, or even a rock-crystal. Colors obtained in this way are known in optics by the name of colors of thin plates, and are of the same character as those of flowers, which result from the overlaying of the transparent tissues of which the petals are composed. Herein lies the secret of all their varied hues from their first opening until their final decay. Sometimes the opal is colored only in its substance, has not so great a play of light as when it is variously traversed by fissures, and then it is not so much esteemed. Again, it may have extended fissures, exhibiting a somewhat changeable single color—red, blue, yellow or green. The Empress Josephine once paid a very high price for a pair of these stones, it being then the fashion to wear two bracelets exactly alike, and it was quite difficult to get two stones perfectly matched, since the interior disposition of the fissures of the opal, which gives its peculiar play of color, depend entirely upon accident. At present, it is only the harlequin opals that are much valued, and those of Josephine would not now bring a tenth of their former cost.

Ancient Metalworkers.

The more ancient history is ransacked, and its treasures of art and industry are brought before the modern eye, the greater becomes the astonishment that works which have defied the ages, and which for skill and delicacy of manipulation, like the Egyptian sculptures, have never been excelled, should, as far as we know, have been executed with tools which in our day would be considered very amateurish, if not designated as the apparatus of a "snob" or a "botch." Mexico and Peru, shut off by an apparently impenetrable barrier of watery waste from the experience of the Old World—so different from the present time, when trades are transplanted and acclimatized like salmon and potatoes—made temples and shrines, adorned them with art-works in stones and metals, which excite admiration, if not humility in a progressive age which boasts of being always on the march, and of having tools and mechanical powers by which those of the ancients side by side would appear little less than rude, cumbersome, and childish toys. Some of the works of the ancient Peruvians in the precious metals are thus described by Mr. Prescott, in his *History of the Conquest of Peru*:—

"The most renowned of the Peruvian temples, the pride of the capital, and the wonder of the empire, was at Cuzco, where under the munificence of successive sovereigns, it had become so enriched that it received the name of Coricancha, or 'The Place of Gold.' It consisted of a principal building and several chapels and inferior edifices, covering a large extent of ground in the heart of the city, and completely encompassed by a wall, which, with the edifices, was all constructed of stone. The work was of the kind already described in the other public buildings of the country, and was so finely executed that a Spaniard, who saw it in its glory, assures us he could call to mind only two edifices in Spain, which, for their workmanship, were at all to be compared to it. Yet this substantial, and, in some respects, magnificent structure, was thatched with straw. The interior of the temple was the most worthy of admiration—it was literally a mine of gold. On the western wall was emblazoned a representation of the Deity, consisting of a human countenance looking forth from innumerable rays of light, which emanated from it in every direction, in the same manner as the sun is often personified with us. The figure was engraved on a massive plate of gold of enormous dimensions, thickly powdered with emeralds and precious stones. It was so situated in front of the great eastern portal that the rays of the morning sun fell directly upon it at its rising, lighting up the whole apartment with an effulgence that seemed more than natural, and which was reflected back from the golden ornaments with which the walls and ceiling were everywhere encrusted. Gold, in the figurative language of the people, was "the tears wept by the sun,' and every part of the interior of the temple glowed with burnished plates and studs of the precious metal. The cornices which surround the walls of the sanctuary were of the same costly material, and a broad belt of freize of gold, let into the stone-work, encompassed the whole exterior of the edifice.

Adjoining the principal structure were several chapels of smaller dimensions. One of them was consecrated to the moon, the deity next held in reverence, as the mother of the Incas. Her effigy was delineated in the same manner as that of the sun, on a vast plate that nearly covered one side of the apartment. But this plate, as well as all the decorations of the building, was of silver, as suited to the pale silvery light of the beautiful planet. There were three other chapels, one of which was dedicated to the host of stars, who formed the bright court of the sister of the sun; another was consecrated to his dread ministers of vengeance, the thunder and the lightning; and a third to the rainbow, whose many colored arch spanned the walls of the edifice with hues almost as radiant as its own. There were, besides, several other buildings, or insulated apartments, for the accomodation of the numerous priests who officiated in the services of the temple.

All the plate, the ornaments, the utensils of every description appropriated to the uses of religion, were of gold or silver. Twelve immense vases of the latter metal stood on the floor of the great saloon, filled with grain of the Indian corn; the censers for the perfumes, the ewers which held the water for sacrifice, the pipes which conducted it through subterranean channels into the buildings, the reservoirs that received it—even the agricultural implements used in the gardens of the temple—were all of the same rich materials. The gardens, like those described, belonging to the royal palaces, sparkled with gold and silver, and various imitations of the vegetable kingdom. Animals were also to be found there, among which the llama, with its golden fleece, executed in the same style, with a degree of skill which, in this instance, probably did not surpass the excellence of the material."

In another place Mr. Prescott thus narrates the method of smelting adopted by the Peruvian metalworkers:—

"The smelting was performed in small portable furnaces, or cylindrical tubes of clay, very broad and pierced with a great number of holes. In these the Indians placed layers of silver ore, galena, and charcoal, and the current of air, which entered the holes, quickened the fire, and gave it a great degree of intensity. These furnaces were moved from one elevation to another, according to the degree of high or low wind. When it was found that the wind was too strong, and consumed too much of the fuel, they were removed to a lower situation. By these means the natives obtained argentiferous masses, which were smelted again in their own cottages. This was performed by a number of persons, ten or twelve at a time, blowing a fire through copper tubes from one to two yards in length, pierced with a small hole at the extremity towards the fire, which thus acted in the same manner as the modern blow-pipe. By such processes as these, though a very large portion of the silver must have remained in the scoriæ without combining with the galena, yet such a quantity could be obtained as would satisfy the demands of the fiscal officers of the Inca."

Facts of this description are far from uninteresting, and go to prove that though classes may be without general education, technical and special knowledge of a high order may be imparted to them which will be productive of great results. Then, in the future, what may not be expected when an opportunity is within the reach of everyone of acquiring a good general education, in conjunction with a technical one, for in art especially the two go together, each guiding and inspiring the other—ideas create ideas to an infinite degree, increasing the probabilities of new departures from the beaten tracks of design, and raising the hopes that many of the eccentric forms which now pass muster for want of better will be speedily relegated to some limbo from which they shall never return.

On the Practical Regulation of Watches.

BY M. E. LEGRAND.

It would seem rash on my part to write on the subject of horology, after so many able minds have dealt with it, were I not impressed with the idea of coming to the aid of young watchmakers, who would gladly take the advice of a practical man, and thus avoid much fruitless research. Besides, I only decided to write upon the friendly invitation of the author of the best works actually published on horology—works which have put the rules of our art within the reach of all horologists. In them can be traced the hand not only of the scientific, but of the practical man, who knows how often science becomes for the moment powerless, and has to be guided by experience: I mean M. Saunier.

Without any further preamble I will enter upon my subject. I think that enough has already been said on the mechanical part of the subject in these works, in which the theory and practice of putting together, escapements, etc., have been perfectly treated, and watchmakers, both young and old, will always find something to learn in them; but there still remains, in my idea, a blank to be filled up by one or more articles simply written, and dealing with the regulating of pocket watches, an item of our trade which, it seems to me, is of the highest importance to the practical man, and which, I believe I am right in saying, is the most neglected.

I consider that the operation of regulating applies not only in the different positions, but also to the different temperatures, for every watchmaker knows how troublesome a watch (reputed of good quality) is, which is not regulated. I have here principally in view the anchor watch, destined to become the unique article.

What most enhances the value of a watch in the eyes of its possessor? That it be well regulated. The finest manufactured watch which does not possess this quality is by its owner considered a bad one. It is even remarked that it is nearly always from men of education, who can afford to buy the finest watches, that the most disagreeable remarks concerning watchmakers come. That arises, no doubt, from the fact that the seller has not known how to properly regulate the watch, or has badly instructed the purchaser on the value of the article, and what he might expect from it. The shopkeeper, in order to sell it, has guaranteed its good qualities as a timekeeper, often so difficult to obtain, and from then his troubles begin.

In teaching the regulating of watches, made carefully and by good methods, one might render a great service to watchmaking. I understand by good methods those which assure constancy in the going of a watch in all the positions in which it might be placed, and that only when taken to pieces should the regulator be displaced. But what are the means for attaining this end, and on what principles are they founded? It is here we encounter the first difficulty. Every experienced regulator knows that eight times out of ten the rigorous application of the theory will not produce the required effect, and it is necessary to have recourse to irregular means. We shall not try to explain this disagreement between theory and practice, which is only apparent, since, after theory has discovered the law, the difficulty of its application always remains, a difficulty inherent to the subject and its surroundings. It is for this reason we call attention to the remarkable work of M. Phillips on the regulating spiral, and recommend it to young watchmakers, confining ourselves here to the study of the practical part of the subject.

M. Immisch has also published a memorandum on isochronism, within the compass of all ordinary practicians; his work is very interesting, and contains the experience of one who understands in every particular the manufacture of the spirals of marine chronometers, from the preparation of the steel to the final result of the regulating. I feel certain that those most acquainted with the subject, although, perhaps at variance with him on the means to be employed, would not fail to recognize his ability. He does not mark, it is true, by figures, or evidence, the how and why he has obtained isochronism, but I believe it is impossible to give them. I find that he has good reason for saying that the spiral alone does not produce isochronism, and I will give my explanation further on. I must here remark the work is less complete than he promised at the commencement, and I shall point out where I disagree with him, for I expected, on reading his work, that its conclusion would be far different. I am surprised at the means he suggests to regulate watches in the positions. He seems to argue there are two methods, that is, to find at first the isochronism in the small and large arcs of vibration, and afterwards to regulate in the horizontal and vertical positions. For the last method he advises a procedure which, according to my idea, is not good; and he appears to forget that his two regulations are in reality one. The regulating in the horizontal and vertical positions consists in realizing isochronism in the small and large arcs of vibration of these two positions. The vertical position offers more difficulties, in consequence of the greater friction of the pivots; and, generally, in the horizontal position the arcs of vibration are greater and may be performed quicker. The point in question is to finish the small arcs of the vertical position in the same time as the large of the horizontal position.

The author appears to put forward the idea that there are some frictions useful for regulating; but I believe quite the contrary, and I think it necessary to reduce them as much as possible. Conformably to his opinion, he advises the making the ends of the pivots flat, or, what is even worse, on inclined planes; it is necessary, on the contrary, to give the greatest liberty to the *movers* (mobiles)—the duration of the regulation depends on it. Constancy of regulation is better assured in giving liberty to the pivots than in stopping it. The oils will thicken quite soon enough to prevent it.

The plan M. Immisch adopts is to retard the watch as much in the horizontal position as in the vertical; but mine is quite the reverse—that is to say, to make it advance as much in the vertical as in the horizontal.

I find I have gone further than I intended, since I announced I should only occupy myself with practical methods; I must, therefore, retrace my steps; and since I have addressed myself to young watchmakers, I feel it my duty to remark to them that it is necessary at all times to assure one's-self that certain defects do not exist, because their presence, if passed unperceived, might absolutely hinder the regulating. It is not, therefore, altogether superfluous to make a summary of these defects.

It is, perhaps, useless to reiterate that, in order to secure good regulation, all the various functions must be performed in a perfect manner, especially those of the escapement, for even the smallest defect might prevent the attainment of the desired end. First, then, we will notice those which inexperienced workmen do not readily perceive, because they are to be met with almost solely in fine watches. The most difficult defect to find, as one would not think of looking for it, is a too great precision in the performance of the escapement, which does not hinder the balance having a good movement, and therefore this defect escapes attention. In certain cases, in order to remedy this, it is necessary to take off the gilding at the place where the pallet rests while it is locked. In order to ascertain if the action is too strict, all the teeth of the wheel should be made to pass, by using a small wooden point, in order to push the pallet of the anchor to the locking point on each side of the escapement wheel. We shall find, in eight watches out of ten, that the teeth will not pass so well on one side as the other, and I repeat, it is often sufficient, in order to rectify it, to raise the bed of the gilding on one side. It is true this defect does not exist in the anchors in which the locking is made on the stem of the wheel; but we meet with few escapements of this kind, as they present more difficulties in their execution.

It is necessary to be certain that the ruby holes are not too exact, and there is no danger in allowing a little liberty to the pivots in the holes. In good watches the ruby holes are usually a fair size, well oiled, and well set, with the exception very often of the center holes, which are too exact. The manufacturing workman imagines that, in order to make them well, it is necessary to give them very little play, and where this is the case the oil does not remain in the pivots, and the going of the watch is rapidly altered, because this pivots wear rough and soon get out. In the execution of these holes more care is required than they generally receive. Perhaps it is necessary that I should here repeat, before going further, that by good regulation I mean when a watch is regulated in *all* positions.

We come now to the practical means to be employed, commencing by what I call the preliminaries of regulating. Nothing should be overlooked here, in order that we may not have to go back, and thus uselessly waste time, for some watches are very rebellious.

The axis ought to be well tempered, so as to have the pivots as hard as possible. These pivots, conical and well burnished, should not be too large, that is to say, they ought to be of such a size as not to leave any fear of breaking at the slightest shock. It is very important that the pivots be well rounded, since oval pivots produce the same effect as a balance of bad equilibrium, and give much trouble in establishing the isochronism of the positions. The ends of the pivots should be burnished and slightly rounded. It is best that the part of the pivot which works in the hole should be perfectly cylindrical, that it may leave the axis very little play between its counter-points.

The balance-spring requires much attention; it ought to be very upright and turn well round, and have been submitted to the following proofs. Many watchmakers have been somewhat surprised, after having well rounded a balance, and the watch being brought back in six months, to discover that the balance was no longer round, and the regulation changed. To avoid this, it is necessary to warm the balance on a metal plate, to a temperature between 60 and 70 deg. Cent., make it round, and warm it afresh, until quite certain that it is in the same condition as at first. Care should be taken, if it is held in the fingers during the very hot weather, to place it each time upon a plate of cold metal. Without this precaution, it may happen that the

heat will close it up, and that a moderate temperatnre might alter the diameter, and of course interfere with the regulating. Since I have mentioned the balance, I must add that it is usual to obtain its diameter and its height by the barrel and the mainspring. Its size should be the diameter of the cover of the barel, and the height of the rim just half that of the spring. It should be furnished with fourteen screws in gold, rather less than more. I must observe, if I have not already done so, that I am only concerned here with the anchor watch, elbowed spiral and compensated balance, and that I shall hereafter call attention to the regulating of the cylinder watch.

I should have been able to pass over the regulating at different temperatures, its practice being, it seems to me, sufficiently understood, but in addressing myself to young watchmakers, I may here say a very few words When a watch goes slower in heat, the screws or weights are carried towards the end of the blade of the balance, and if that does not suffice, change the last gold screw for one in platina. At the same time, with the length of spiral usually adopted, one is rarely obliged to come to that. If the watch gains in heat, it is necessary to put the screws back ; and after they have all been put back, if the watch still gains, the arms of the balance must be shortened and two additional small screws added. With a little practice the desired result will be obtained. Some regulators may think, perhaps, that I insist too much on the regulation of a balance to the different temperatures, an operation, to them, so simple and well-known. But I have so often seen some old watchmakers very much amused at this method of regulating, in seeing me put watches in a drying stove ; others, though never having tried it, imagining the thing very difficult. Doubtless there are many watchmakers who do not know what means to take to regulate a balance, and who believe it one of the most simple operations, since there is almost nothing to do, and that it is all reduced, after displacing them, to finding the proper position for the screws or weights.

I have spoken of the regulating of the balance before that of the spiral, in order that when we consider the latter we may not have to leave the subject again ; but we should remember we can only regulate the balance after having accomplished the isochronism of the spiral, because if it should be necessary to change the latter, the regulation of the former must be performed again. If the spiral is not yet fixed, or if it has to be replaced, because it does not regulate well, here are some rules upon which to make a selection, and the condition it should be in, for its regulating qualities will only be known after it is fixed and going. Several authors have recommended large spirals, others prefer them small. Practice teaches us to select moderate sized ones. With the small ones there is a greater difficulty in finding the isochronism, with the large ones it is much easier accomplished ; but these latter are not safe for a pocket watch ; the movements of the wearer, especially when the coils are close, causing them to touch one another or to touch the balance. Most watchmakers have seen the large spirals almost catching the center wheel, and have had to take means to prevent it. Besides, a long spiral is more susceptible of shocks, which might hinder the regulating. I advise those makers whose watches are liable to receive rough treatment, instead of having an accessory piece to prevent this catching of the spiral on the center wheel, to change the spiral, and to use one of the size here indicated

It is usual to take for the diameter of the spiral the radius of the balance, and the number of turns 15 ; this size and this number effect the separation of the coils, and prevent their touching each other through shocks. The spiral should be chosen as hard as possible, but this presents some difficulties in the case of small spirals, because it is almost impossible to meet with small spirals as hard as large ones ; this arises from a difficulty in the manufacture.

The blade of the spiral should be selected high ; as high as the watch allows ; its expansion takes place more horizontally, and it is concealed less than that low of blade. It is possible to detect by the ear if the spiral works well, because, if so, the sound is scarcely perceptible. Generally the spiral of low blade produces a noise the accustomed ear soon detects, and which indicates a difficulty of regulation. It may be produced by an uneven steel wire, and in order to discover if the wire is equal throughout, watch attentively its working. If it is uneven a slight vibration of the thickest part will be observed. Upon making this discovery the spiral should be immediately changed, for it will only be a loss of time to attempt to render it isochronal. A spiral which is elbowed and well fixed, can be recognized by the following means :—it should not wriggle, and if the spiral is of 16 turns, the eighth should not leave its place. It may be remarked that this is contrary to the opinions of watchmakers, who have confounded the working of a blade, and its apparent displacement, and who make all the blades equally displaced, basing their idea on their helicoid spiral, where this effect is perceptible. The helical spiral increases or diminishes equally in all its extent, but it is not so with the flat or elbowed spiral, the first turn of which near the ferule is displaced more than the second, and so it diminishes gradually up to the eighth, which should not be displaced. The ninth turn is displaced less than the tenth, and so on up to the fifteenth, which, of course, is displaced more than the fourteenth. The eighth turn remains fixed, and at the end of the vibration of the balance, at the moment it is stopped by the tension of the spiral, the seventh and ninth close up to the eighth, which ought to be motionless to the eye. All these effects are produced in the same vibration, and I repeat they can only be produced by a good spiral, that is, only with one which fulfils these conditions can isochronism be easily realized.— *Translated from the Revue Chronometrique.*

Crystal Finding.

The use of rock crystal in the manufacture of optical instruments has led to the development of the curious and interesting profession of crystal finding. It is, however, an old occupation in the Swiss Alps, where not only the knowledge of the crystal finder, but his nerve and endurance are often put to a severe test. The rock crystal—pure silica, or crystallized quartz—is found in pieces of different size, color, and fineness, sometimes separately, sometimes in groups. The strahler—as the crystal finder is called—is equipped with a bar of iron four feet long, bent up at one end, a shovel, a hammer, a hack, a strong cord, and a leather sack, and starts for his work early in the morning. He is nearly always alone, as the Swiss are not fond of "going shares" in any piece of good fortune. He crawls along the flanks of the hills hours together, along the most perilous paths, looking out anxiously for any indication of a vein. This may be a long way above him, and he tries to reach it as best he can, being not unfrequently compelled to cut his steps in the rock. His first act, on reaching his find, is to strike it with his hammer, his ear telling him whether the crystals are attached to the walls, separate or mixed with sand. The most celebrated find of large crystals is the recent one made at St. Gothard. A hundred feet above the snow limit, an apothecary, a resident of Berne, saw, one evening, a vein of quartz sixty feet long, and four to twelve feet thick. A guide was with him, and the two resolved to ascend for an investigation. This, however, had to be deferred till the morning. The would-be finders passed the night in the hut, and rose early to make the ascent. Unfortunately, the mor n ing was misty, and threatened to cut off their retreat. They descended in haste, and were unable to renew their attempt until the following year, when the spring had melted the winter snows. The day at length arrived when they were able to begin work, and, by mining the vein, they pierced into its inner chambers, and collected three hundred weight of crystals, the largest of which were bought up by scientific institutions, and the fragments by opticians and instrument makers.

In his thermo-chemical researches on gold and its compounds, M. Julius Thomsen has observed that gold separated out forms different solutions, and by dissimilar reducing agents presents allotropic differences, three of which he has studied :—1 Reduced from chloride solution with sulphuric acid, gold forms a balled mass. 2 Reduced similarly from the bromide solution, it forms a very fine dark powder, which retains its powder form even after drying. 3 Reduced from the chloruret, bromuret, or ioduret, with sulphurous acid or hydrogen acid, it forms a very fine powder with metalic brilliancy and yellow color.

Trade Gossip.

Conch shell jewelry is in great demand.

Gold scarf pins are fashionable for ladies.

Since the Centennial, mosaic jewelry has risen in favor.

Bon-bon boxes made to represent cnenmhers are in vogue.

Gold pencil and pen holders are in as much demand as ever.

Turqnoise jewelry, set in gold or silver, is qnite fashionable.

'Tis a consummation devoutly to be wish'd: A happy and prosperous new year!

The favorite gold thimbles have tops made of some precious stone, with initials set in the edge.

In Brazil, diamonds are fonnd on mountains 6,000 feet above the sea. This is what makes them so high.

The Alabama legislature has repealed the law taxing "drummers" fifty dollars. It takes immediate effect.

Mr. C. L. Tiffany, the eminent jeweler of this city, fell on the side-walk and very seriously fractnred his leg.

The century vase, of solid silver, 2,000 ounces in weight, just brought back from Philadelphia, is offered for sale at $25,000.

The "diamonds" found at the Brooklyn Theatre fire were carefully examined, and prove to have been very good paste.

"Spectacles," says an exchange, "were invented by an Italian in 1248." Now, let's have the date of the first glass eye.

A new jewel case is made to represent a table: the legs and sides of silver, the cover of glass, and the box lined with tufted satin.

For mourning, an elegant necklace is of onyx. Each piece has a diamond in the centre, and they are joined together with gold work.

Silver watches seem to be unpopnlar in Philadelphia. Only 493 are assessed in the whole city, while the number of gold watches is 14,446.

M. J. Paillard & Co., importers of mnsical boxes, have opened a branch house in San Francisco, Cal., under the most encouraging auspices.

Traitel Brothers' jewelry manufactory, in Jersey City, was entered by burglars on the evening of the 12th ult., and robbed of about $2,500 worth of unfinished jewelry.

A reward of $25 is offered for the return of a gold hnnting case lever watch, No. 98086, Chadwick, Northampton Sqnare, London, stolen from W. W Philips, Shongo, Alleghany Co., N. Y.

Officers detached at Tiffany & Co.'s store, in Union Sqnare, have arrested two men, whose names are not divulged, charged with robbery. The recovery of a large amount of the stolen is expected.

There will be five eclipses in 1877, viz.: A total eclipse of the moon on February 27th, visible in the United States; a partial eclipse of the sun on March 14th, visible in Western Asia: a partial eclipse of the sun on August 8th, visible in Alaska, Kamshatka and the North Pacific Ocean; a total eclipse of the moon on August 23d, partly visible in the Eastern and Southern States, and a partial eclipse of the sun on September 7th, visible in South America.

An exhibition of fans is to open at Munich on November 1, 1877. It will last three months, and will comprise contributions from all countries. Some remarkable specimens are promised from different towns in Europe; that of Gratz, in Styria, among others, will lend the fine collection of the Johanneum. Next to China (a Paris paper says) France is the country that produces the most fans. Before the revolution there was a corporation comprising one hnndred and thirty masters. The seat of the manufacture is in the Department of the Oise, between Meln and Beauvais, where more than 3,000 workers gain a livelihood by mounting Paris fans. The frames, of plain or carved wood, are made in the same villages.

A facetions person went into a village jeweler's shop in Ohio, and was observed to be looking about, when the proprietor rose from his bench and remarked that they did not keep whiskey. "It would save yon a good many steps if you did," was the visitor's reply.

Baron Alfonso de Rothschild owns Voltaire's snuff-box, cane and waistcoat. Princess Czartoryska has the ring Qneen Elizabeth gave Essex, and an English gentleman possesses that fonnd on Scipio Africanus' finger. Sardou, the dramatist, has just purchased the door of the honse in which Corneille lived and died, and which has lately been razed.

A new British school of jewelry has been established at Rome, for the perfect imitation of ancient and mediæval works of art in gold and silver and precions stones. Each object is so executed as to show by its style to what epoch and nation it belongs. To effect the aim in view by this school much, however, has to be discovered, as ancient jewelers used chemical and mechanical agents nnknown to us. Amongst other arts connected with the craft, the old processes of melting, soldering, and wire-drawing, remain a problem, as also how to join and separate hardly perceptible pieces of gold.

Dr. Schliemann in writing of his discoveries says:—I hasten to inform you that in the same tomb were fonnd the calcined remains of two bodies, each with precisely the same number of gold leaves, round blades and crosses. All these objects have the same beautiful ornamentation of spiral lines and circles. I found also a hemlet, two diadems, a woman's large comb, a large breast-plate, three brooches, an immense mass of buttons, leaves and other articles; three large girdles, a silver vase, a stag cast in lead, with a mass of swords, daggers, axes and warriors' knives, all of bronze, with twenty-five flint-headed arrows.

A onrious little scientific toy has made its appearance in the opticians' windows, and, we should think, might rival in popularity the old gyroscope. It consists of a tiny windmill enclosed in a glass bulb of about three inches diameter, which revolves without any apparent motive power. The secret of the mystery is that the four vanes of the mill are blackened on one side, and coated with bright foil on the other The bright side reflects the radiant heat of surrounding objects, and the dark side absorbs it. The enclosing bulb being partially exhausted of air, the difference of temperature creates a sufficient current to cause the vanes to move. The contrivance is called Crookes' Radiometer, from an erroneous idea which its invontor had that its motion was due to the force of rays of light.

Torpodoes, which explode by clock-work, like the engine which caused the Bremerhaven explosion, are said to be favorite weapons in the Russian navy. We found them when our fleet was in the Baltic, and the vessels used to dredge for them, bring them up and destroy them. It is stated that on one occasion one of these devilish inventions was fished up and placed on the quarter-deck of an English ship-of-war where the officers proceeded to examine it, with the usual recklessness of the British sailor. Imagine the haste with which the inspection was concluded when the captain's coxswain, who had been bending over the machine, pulled his forelock and quietly observed: "Please your honors, the beggar's ticking!" meaning that the clock-work was still going, and that an explosion might occur at any moment.

The monster clock by Messrs. E. Dent & Co., of London, which has been in course of erection during the past six months at the south end of Crystal Palace, is now completed and in working order. This clock is almost a counterpart of the great Westminster clock (which was built by the same firm), with the exception of the striking and chiming apparatus, and the dial is the largest ever yet constructed, being 40 feet in diameter, or nearly 1,300 square feet in area. The diameter of the Westminster clock is but 23 feet. The hands, with their counterpoises, weigh nearly a quarter of a ton; the minute hand measures 19 feet in length, and moves half an inch at every beat of the pendulum. The distance traveled by the point of the minute hand is nearly four miles a week. During seventeen days of observation the variation was eight seconds only.

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