# DIAMONDS.

BY WILLIAM POLE,

FELLOW OF THE GEOLOGICAL SOCIETY, ETC. ETC.

*Extracted from* MACMILLAN'S MAGAZINE *for January*, 1861.

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WITH A NOTE ON

## THE IMPERIAL STATE CROWN AND ITS JEWELS.

BY

PROFESSOR J. TENNANT, F.G.S. ETC.

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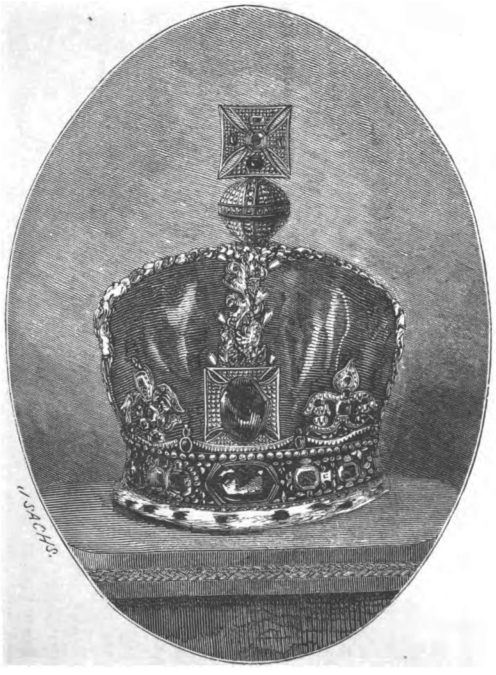
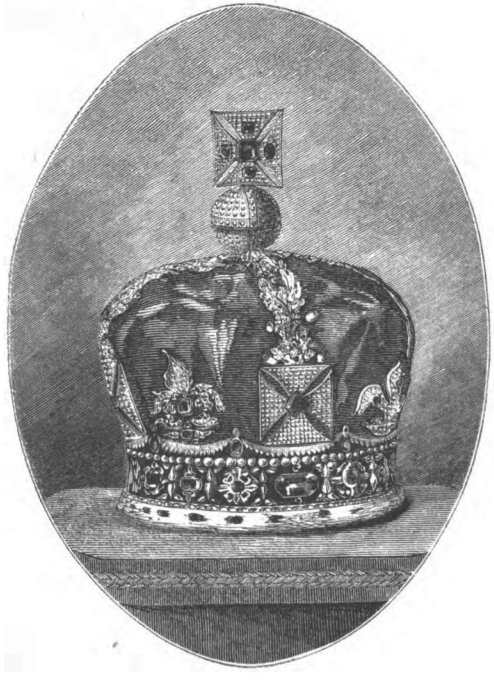
## THE IMPERIAL STATE CROWN OF HER MAJESTY QUEEN VICTORIA.



FRONT VIEW.



BACK VIEW.

(*See description at page* 15).

# DIAMONDS.

BY WILLIAM POLE, F.G.S.

WHO does not love diamonds? Where is there a mind in which the bare mention of them does not excite a pleasant emotion? Is there any one of rank too exalted to care for such baubles? The highest potentates of the earth esteem them as their choicest treasures, and kingdoms have been at war for their possession; while there is none so low or so poor as to be unable to find pleasure in the admiration of their splendour. Shall we turn to the domain of intellect, where surely the gewgaws of ornament should be lightly esteemed? The diamond offers to the philosopher one of the most recondite and subtle problems that have ever engaged the human mind; while the merest tyro in science may find in it the most instructive topics of study. Shall we look at it in an artistic point of view? The diamond is one of the most beautiful things in nature. No painter, were he ten times a Turner, could do justice to its effulgence; no poet, were he ten times a Shakspeare, could put its lustre into words. *Light* was the first and fairest gift of heaven to man; the diamond is fairer than light itself; it *is* light, only seven times beautified and refined. For one half the human race diamonds are delirium—the true eyes of the basilisk: their power over the sex we dare not do more than hint at, and the woman who would profess herself indifferent to their fascination simply belies her feminine nature. One of the most extraordinary romances in the history of the world was all about a diamond necklace and who would venture to number the true romances occurring every year of our lives in which diamonds take part? As regards the less decorative sex, the diamond forms altogether an exception to the usual idea of the propriety of ornament. A man who bedizens himself with gold or jewels in general is rightly pronounced an empty fop; but the wearing of a fine diamond will only mark its possessor as having a superior taste for what is most admirable and beautiful among the productions of nature. The minerals we call gems, jewels, "precious" stones, *par excellence*, are the most noble objects of inorganic creation; and the diamond is the queen of them all.

Let us then have a chat about Diamonds, which will interest everybody.

The localities where diamonds have hitherto been found, are Central India, Sumatra, Borneo, the Ural mountains, Australia, some parts of North America, and the Brazils; but the first and last sources only have been of any great extent. Down to a comparatively late period the continent of India was the only district of any importance, whence diamonds were obtained. The principal regions producing them were the high valleys of the Pennar near Cuddapah, and of the Kistna near Ellora (and not far from the hill fort of Golconda, the name usually associated with these ancient and rich mines), as also a rude, little known, mountainous district, containing the sources of Nerbudda and

Sone; and a range of hills in Bundelkund, between the latter river and the Sonar. The produce of these mines was enormous, both in regard to number and size. One of the Mohammedan Emperors, who died at the end of the twelfth century, after a long reign of plunder, is stated to have amassed in his treasury 400lbs. weight of diamonds alone. In later times, however, the produce from this part of the world has gradually fallen off, and is now entirely superseded by the more recently discovered mines of the Brazils.

The existence of these was revealed to the eastern world by an accident in the year 1727. A Portuguese of the name of Bernardino Fonseca Lobo, when at the gold mines of Minas Geraes, saw the miners using, as card counters, small stones which they said were found in the gold washings, and which he, having seen similar ones in the East Indies, conjectured to be rough diamonds. He brought a quantity to Lisbon, where his suspicion was confirmed, and public attention was at once drawn to the rich discovery. The European dealers, who had hitherto obtained their stones from India, fearing that they would be depreciated in value, spread the report that the pretended Brazilian diamonds had been surreptitiously sent from Goa to South America; but the Portuguese soon demonstrated their authenticity, and turned the tables upon the merchants, by actually sending them to Goa, and selling them in India as native produce. The discovery once made, the sources of supply were soon found, and worked extensively, and proved very productive. The stones abound more or less on the great north and south ranges of the country between 13 and 21° south latitude; but the principal working, so long known as the diamond district, and in which the town of *Diamantina* lies, is a high, mountainous, and sterile tract of country, situated between the heads of the rivers Doce, Arassuahy, Jequetinhonha, and the great river of San Francisco. The ancient province of Bahia has also more lately become one of the principal sources. In 1843 a mulatto miner, who had gone alone into the interior to search for new washings, was working up to his ankles in water, in the bed of a stream at Sincora, in this province, when, dropping the end of his crowbar, to rest himself, on the ground below, he was somewhat surprised at hearing it sound hollow. He repeated the blow a second and a third time, when the bar fell through. He put his hand into the hole, and pulled out a handful of diamonds. Elated with his discovery he returned home, and offered the stones for sale to some of the parties with whom he had been formerly engaged. As the diamonds were of a different quality and shape from any they had seen before, they taxed him with having discovered a new mine, which for some time he strongly denied; but, on being thrown into prison on the charge of stealing the diamonds, he confessed his discovery, and, on promise of making it known, was released. The hole he had broken into produced alone ten pounds of superior stones, worth probably more than 100,000*l.* in their rough state; and, on the neighbourhood being searched, the produce was so abundant, that six or eight months afterwards, from 10,000 to 15,000 people had collected on the spot, and in the first two years it is supposed nearly 600,000 carats were extracted, to the value of above half a million of money: an influx into the market, which for a time very seriously depreciated the value. This circumstance, however, combined with the increased difficulty of extraction, the unhealthiness of the climate, and the high prices of provisions, soon checked the production, and brought matters again to a more normal state. Since this time another new mine has been discovered, producing good stones, and the diamond-bearing district is so extensive as to remove any fear of speedy exhaustion.

The total production of diamonds from the Brazilian mines has been estimated up to the year 1850 at upwards of 10,000,000 carats, or above two tons; and valued at 16,000,000*l.* sterling. At

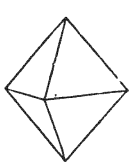
some seasons the general richness of the ground has been marvellous; after a rain the children would seek gold in the gutters, and often find large quantities; diamonds have been found in the vegetable roots in the gardens, and in stones carelessly thrown about the road; even the fowls would pick up diamonds.

The prevailing rocks in the diamond districts are the same as the usual auriferous strata, *i.e.* chiefly varieties of metamorphic mica schist, occasionally intersected with irregular quartz veins. The matrix in which the stones actually lie is a mineral called *Itacolumite*, from the mountain Itacolumi, in Brazil, where it was first discovered. It is a silicious conglomerate, cemented together with ferruginous matter, and appears to have undergone plutonic action. The diamonds lie often imbedded in flaky portions of this material, like the well-known specimens of garnets in mica schist. In some parts of the Brazils the stones have been sought to some small extent by working the original vein in the rocks; but this has been troublesome and expensive, and recourse is had in preference to the alluvial beds of streams and rivers, where the diamonds are brought down with the detritus from the hills above. These water-courses have been always considered the most productive in fine stones, as well as the most profitable in working. Gold dust, and some few other stones, are found along with the diamonds, but the latter always form the principal object. The colour, crystallization, and quality of the stones, are generally much alike in the same district, but the size varies considerably, large and small being found all together. The great majority of stones found are of small size; it is said that only about one in ten thousand will exceed, when cut, ten carats in weight, and hence the disproportionate increase in value of large sized stones.

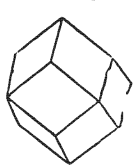
The Brazilian mines were formerly worked by government; but bad management and the extensive system of robberies practised by all classes concerned, caused this plain, to fail and they are now farmed out to private individuals, who carry on the workings at their own risk and profit. Slave labour is still employed, but all possible precautions are taken to prevent dishonesty. Thefts are severely punished, and rewards are offered for integrity and success in working. The slave who finds a diamond of 17½ carats, is crowned with a wreath of flowers, and led in procession to the overseer, who gives him his freedom, accompanied with a new suit of clothes, and permission to work for his own profit; minor rewards are given for smaller stones.

The method of working for the stones is very simple. The streams are diverted, and the water exhausted as much as possible from the beds by pumping; the gravel and alluvial soil are then excavated and washed in troughs by means of currents of water; the earthy particles being first carried away, the remaining gravel is carefully searched for diamonds, which are easily recognised by those acquainted with them. The process of working is carried on as long as the dry weather lasts, namely, from April to the middle of October, all vestiges of the diggings being soon destroyed by the succeeding heavy rains. All the work is done by hand, no machinery having been hitherto found to answer.

Diamonds are usually found in crystalline forms—principally six, eight, and twelve sided, called by mineralogists the cube, the octohedron, and the rhombic dodecahedron; the two latter forms being the most common. In the rough state



*Octohedron.*



*Dodecahedron.*

the stones are semi-transparent, but quite devoid of brilliancy; much resembling small pieces of gum-arabic. Experienced persons can, however, in this stage, easily judge of what their future quality and value will be.

The rough diamonds are transmitted by the owner to the coast, and shipped,

generally, at Rio Janeiro, to merchants in Europe; by far the greater part coming to London. These merchants again sell them to other houses, whose business it is to get them cut, and so to give them the precious brilliancy which is their principal characteristic.

The art of cutting diamonds into a regular shape is of comparatively modern invention; they were long worn in their natural state, or only cleaned and polished. It appears, during the fourteenth century, some attempts were made to cut them into regular forms, but without any view to the improvement of their brilliancy; and it was only in the year 1456, that a certain Louis van Berquen, of Bruges, discovered the principle of cutting *facets* upon them, on which their lustre, as now known, so much depends. Cardinal Mazarin, about 1650, invented the perfect form of the brilliant, and had twelve large diamonds of the French crown cut into this shape, which has ever since been acknowledged the best possible for exhibiting the beautiful optical properties of the stone.

Diamond cutting, in the present day, is almost exclusively done by Jews at Amsterdam, where large diamond mills have been established; and it is calculated that 10,000 out of the 28,000 persons of the Jewish persuasion living in that city are dependent directly or indirectly on this branch of industry.[1] One of the largest establishments is that of Messrs. Coster, in the Zwanenburg Straat, who use steam-power to drive their machines, and employ from 200 to 300 hands.

The process of cutting the diamonds is as follows:—The rough stone is first given into the hands of an experienced workman, who examines its natural form, and determines what general shape and size it can most advantageously be made to assume. Having settled this in regard to *two* diamonds, he beds each of them in a mass of cement placed at the end of a piece of wood of a convenient size for handling, and then proceeds to rub the two stones one against the other, on the principle of "diamond cut diamond," changing from time to time the parts acted on, and so bringing both stones gradually into the form he desires. The mutual abrasion of the two stones produces diamond powder, which is carefully preserved for the subsequent operations. When the diamond has received its general shape, it is sent into the mill to be finished, by cutting upon it the numerous small angular "facets," as they are termed, which make up the surface. This is done by exposing the stone to the action of diamond powder on a steel plate revolving with great velocity—an operation perfectly analogous to that of glass cutting, or the ordinary well-known lapidary's wheel. The cutting plates are usually about ten or twelve inches in diameter; they are placed horizontally with their spindles vertical, and are made to revolve about thirty or forty times in a second; the part acting on the diamond travelling over the facet at the rate of about a mile in a minute. Diamond powder, of extreme fineness, mixed with the best olive oil, is placed with a feather upon the upper table of the wheel, and the apparatus is then ready for action on the diamond. The stone is embedded in a mass of soft metal, an amalgam of lead and tin, easily fusible, and yet hard enough to retain the stone firmly in its position; this is fixed in a moveable handle, which is again attached to a small frame. The workman, having first heated the metal to a soft state, beds the diamond in it in the required position, and fixes it there by plunging into water; the frame is then placed to project over the wheel, and the diamond, being downwards, comes in contact with its upper surface, on which the diamond powder is placed; weights are then applied, and the result of the friction, at the immense velocity, is to cut a facet upon the stone in a very short space of time. When one of these is finished, the workman softens the metal, extracts the stone, and replaces it

[1] The writer had lately the advantage of visiting the Amsterdam diamond works, along with Professor Tennant, one of our best English connoisseurs in precious stones, and to whose kindness he is indebted for much of the information in the present paper. See also Kluge's "Handbuch der Edelsteinkunde."

in the proper position for making another facet; and here comes into play a very remarkable feature of the operation, namely, the accuracy of judgment which skill and experience give in arranging the faces of the stone. It is obvious that, in any many-sided solid body whose shape is to have any pretensions to regularity or symmetry, the different faces must not only all staud in certain definite angular positions in regard to each other, but must all bear a certain size in relation to the magnitude and form of the whole. Further, any one acquainted with geometry will know, that for a solid figure of fifty or sixty sides, the determination of these angles and surfaces, by any theoretical rule, would be a matter of great difficulty; while the attempt to make such a figure practically, by any one unskilled in the operation, would only lead to continual trial—and error—attempts, which, even if the thing were ever properly done at all, would waste a large portion in the operation, and consequently much diminish the ultimate available size. Any one who will try, for example, to cut a turnip or a potato, by his eye and hand only, into a regular octohedron, or solid figure of eight equal and similar sides, will at once appreciate the difficulty. Yet the diamond-cutter has to do a much more difficult problem, namely, to give about sixty symmetrical and regular faces to stones sometimes only about an eighth of an inch diameter; without any mechanical aids whatever to his judgment; and yet producing, without a particle of unnecessary waste, the very largest stone geometrically possible out of the rough body. This of course can only be the result of great skill and long experience. Having made one facet, he judges by his eye the exact angle at which the stone must be placed to cut the new one, and the exact depth to which the grinding for the latter must be carried; and so accurately is this done, that it is very seldom a good workman ever has to revert to a facet for correction, after he has once passed it over. The stone is so fixed in the metal as to leave other facets visible for constant comparison with the one under progress; and the handle is capable, by a sort of universal joint, of adjustment to any nicety for the position of the stone in touching the wheel. There is no further division of labour than between the rough cutter and the finisher—the latter taking the stone from the former in its roughed-out state, and returning it to the proprietor in the shape of the perfect finished brilliant ready for sale. The last touches to the facets consist of polishing, or giving to them the peculiar diamond lustre; but this is in no wise different from the grinding, except in being done with more care. The man can at any time adjust the weight or force with which the stone is pressed upon the wheel, or he can remove it entirely, and substitute the gentle pressure of his hand; and he can also modify the veloity of the grinding action; for, although the wheel itself is kept at a constant number of revolutions per minute, he can place the stone nearer to, or further from the axis, as he likes, which will of course give a less or greater effective velocity, according to the radius of the acting circle.

The diamond powder, of which a large quantity is used, is obtained partly from the first process, of rough-cutting the stones; partly from diamonds of a quality not good enough to cut for sale, which are broken up for the purpose; and partly from the newly discovered substance, "carbonado," which is hard enough for this use, although of a somewhat coarse quality. The powder is carefully sifted cleaned from dirt and extraneous matters, and, when about to be used, is mixed with the finest vegetable oil.

The workmen are all Jews, and are regularly educated to the trade. They are paid by piece-work. Formerly, they did their work at their own houses, their wheels being turned by manual power; but it is now found more advantageous for the large proprietors to provide workshops of their own furnished with steam power, for the use of which the men pay out of their earnings Some of the more skilful and industrious men realise considerable incomes. There is,

of course, always temptation to dishonesty, from the great value which is compressed into so small a space; but all possible precautions are taken, and the character of the men is made of so high weight in all the transactions with them, that losses very seldom occur.

The form into which a diamond is cut has great influence on its beauty and fire. The two most common are what are called the "brilliant," and the "rose" or "rosette." The latter, so named from its similarity to an unopened rosebud, was one of the earliest forms in use, and is applied generally to the cheaper kinds of stones. It is a sort of pyramid, with a flat base, and inclined facets, terminating upwards in a pointed apex. The flat base is imbedded in the setting; and, therefore, in the rose diamond, the whole of the stone appears projecting above.

The brilliant is the more valuable form; it may be considered as formed of two pyramids, connected together at their bases, with the apex of each truncated or cut off, and the sides worked into facets, as in the case of the rose. The stone is held in the setting at the broadest part, or junction of the pyramids; one pyramid projects upwards in sight, the other is hidden below, so that only half the stone, or somewhat less, appears; but the hidden part is most powerfully effective in adding to the brilliancy. The apex of the upper pyramid is cut off to a considerable extent, and the large facet thus formed is called the *table*: the corresponding facet below, formed by the truncation of the lower or hidden pyramid, is much smaller, and is called the *collet*. The rim where the setting takes hold, or, as we have described it, the junction of the bases of the pyramids, is called the *girdle*. There are thirty-two facets cut round the upper slanting surface of the stone, *i.e.*, between the girdle and the table, and twenty-four on the lower part, between the girdle and the collet. All these facets have names by which they are known to the cutters; and all the dimensions of the stone should, in order to produce the best effect, bear certain definite proportions to each other. The most favourable form of brilliant for exhibiting the lustre of the stone is considered to be a square, having the corners slightly rounded off; but, of course, many stones will not admit of being cut to this form without loss, and, therefore round, oval, pear shapes, &c., are perhaps more common. The stones lose about fifty per cent. in cutting, more or less, so that, to make a brilliant of one carat, a rough stone of two carats is required.

The *chemical nature* of the diamond is well known. It consists of pure carbon; identically the same thing as the soot from a kitchen chimney, but in different form. Sir Isaac Newton suspected, by its optical properties, that it was a combustible body; and its character has been subsequently proved beyond a doubt. If sufficient heat be applied, diamonds will completely consume, combining with oxygen to form carbonic acid, precisely like charcoal or coke in an ordinary furnace.

There have been many speculations as to the mode by which nature has effected this wonderful metamorphosis, and many have been the attempts made to imitate her; but hitherto she has kept her secret well, and baffled all her admiring followers. Sir David Brewster has suspected, by optical peculiarities exhibited in some examples, that diamonds may not be of mineral origin, but may have resulted from the hardening of a kind of gum, something like amber.

A curious substance has lately been found in the Brazilian mines, called "Carbonado," or amorphous diamond—a kind of intermediate grade between diamond and charcoal, combining the hardness of the former with the black unformed character of the latter. Close inspection shows curious traces of a passage between the two states; and it is thought further examination of this substance may lead to some better insight than we at present possess, as to the chemical nature of the change.

The diamond is totally insensible to

the action of any chemical reagents. Its specific gravity is about 3·5.

The most characteristic quality of the diamond is its extreme *hardness;* it is the hardest substance known. This quality was the earliest that attracted attention, the name being derived from the Greek Ἀδάμας, *i.e.* incapable of being crushed or subdued. For the comparison of hardness in different degrees, mineralogists have adopted a scale represented by the following substances. 1, talc; 2, gypsum; 3, calcareous spar; 4, fluor spar; 5, phosphate of lime; 6, felspar; 7, quartz; 8, topaz; 9, sapphire and ruby; 10, diamond. Any one of these substances will scratch all below it in the scale, and may be scratched by all above it. The diamond, therefore, as far as destructibility by abrasion is concerned, defies all nature. This quality renders it of considerable value for other purposes than ornament—as for cutting glass, and for working other stones, for the pivots of watch-work, &c.

But, although the diamond is so hard, it is very easily broken, and, indeed, by a particular knack, it may even be cut with a common pen-knife. This apparent anomaly is due to what is called its *cleavage*, a result of the crystalline structure. Many well-known substances, as slate for example, split or cleave with peculiar facility in certain definite directions, while they offer considerable resistance to fracture in all others. The diamond has this property, cleaving easily in no less than four directions, parallel to the surfaces of the original octohedric crystal; and, therefore, when moderate force is applied in either of these ways, the stone splits into pieces. Pliny, mentioning the great hardness of the diamond, states that if laid upon an anvil, and struck with a hammer, the steel would sooner give way than the stone. This assertion is a matter of popular belief in the present day, but we would not recommend any possessor of a good diamond to try the experiment. The chances of some of the forces acting in the cleavage directions are so great, that the stone would in all probability fly to pieces under the first blow. The truth is, that Pliny referred not to the diamond, but to the *sapphire*, which, though less hard than the diamond, cleaves only in *one* direction, and might, therefore, withstand the test named.

The cleaving property of the diamond is made useful in two ways in the manufacture: first, by splitting the stones when they contain flaws, and secondly, in the preparation of diamond powder. When a rough diamond is seen to contain a defect of sufficient extent to depreciate its value as a single gem, it is split in two, precisely at the flaw, so as to make two sound stones. This is a very simple operation in appearance, done in a few seconds; but it requires an amazing amount of skill to do it properly. The workman, by a sort of intuitive knowledge, gained by long experience, knows, on a careful inspection of the stone, the exact direction which a cleavage plane passing through the flaw will take. Tracing this plane therefore to the exterior, he makes on the edge of the stone, precisely in that spot, a slight nick with another diamond. He then places a small knife in that nick, gives it a light tap with a hammer, and the stone at once cleaves in two, directly through the flaw. This operation, in daily practice in the Amsterdam works, is one of the most elegant and instructive processes in the whole range of mineralogy. It is reported that Dr. Wollaston, celebrated as almost the originator of the science of crystallography, once made a handsome sum by purchasing a large flawed diamond from Rundall and Bridge at a low price, and subsequently splitting it into smaller sound and valuable stones; the principle of the operation not being then generally known.

Another use of the cleavage principle is in the preparation of diamond powder. Small diamonds of inferior quality, are put into a steel mortar, and pounded and rubbed with a steel pestle, when they break up through their various cleavage planes into still smaller pieces, and at last rub themselves into the finest dust, fit for use on the wheel.

The cause of the wonderful *brilliancy* of the diamond is not popularly known. It has no inherent luminous power; it is simply transparent, like common glass, and yet, if the latter were cut into the form of a brilliant, it could no more be mistaken for a real one than for a sapphire or an emerald. The secret, therefore, of the brilliancy of the diamond must lie in something other than its clearness or its transparency. It is owing to its great *refractive* power. When rays of white light pass through transparent substances they are refracted, or bent out of their former course, and under certain circumstances are separated into their constituent elements, and dispersed in the form of the well-known prismatic colours. The cut drops of glass chandeliers show a familiar example of these properties. Now, the degree in which this effect is produced by any substance depends on the refractive power it possesses, and it so happens that the diamond has this power in an extraordinarily high degree, its index of refraction being 2·47, while that of glass, or rock crystal, is only about 1·6, and of water 1·3. The effect of this great refractive capability, particularly when aided by judicious cutting, is, instead of allowing the light to pass *through*, to throw it about, backwards and forwards in the body of the stone, and ultimately to dart it out again in all sorts of directions, and in the most brilliant array of mingled colours; and this is this marvellous effect that meets the eye. Sir David Brewster has shown[1] that the play of colours is enhanced by the small *dispersive* power of the diamond, in comparison with its refractive properties.

It is often supposed that diamonds are essentially colourless, but this is a mistake; they exist of many colours, yellow, orange, pink, blue, green, brown, and black. Three-fourths of the stones found are tinged with some colour or other, mostly pale yellow, or yellow brown. The perfectly pure and colourless ones are selected as the most valuable for the general market; but it sometimes happens that fine stones of a decided colour are more prized than white, from their peculiar rarity and beauty.[2] A blue diamond of about fifty-six carats, belonging to Mr. Hope, is a celebrated stone, combining the beautiful colour of the sapphire with the fire and brilliancy of the diamond.

The quality of diamonds depends upon their colour, purity, transparency, and freedom from flaws. Stones perfectly colourless, pure, clear, and free from all defects, are said to be of "the first water;" if they have slight imperfections, they are "of the second water;" and, if tinged with colour, or otherwise very defective, of "the third water."

The value is estimated according to the weight, which is expressed in *carats;* one carat being about 205 French milligrammes, or 3¼ grains troy.

For small stones, not exceeding one carat in weight, the value may be assumed approximately to be *proportional* to the weight; but, as the stones increase in size, this rule does not apply—the larger ones being more rare, and therefore having a value greater than is due to their mere size. To provide for this, it is generally assumed that, above one carat, the value shall increase as the *square* of the weight—*i.e.*, that a stone double the weight of another shall have *four* times the value; treble the weight, *nine* times the value; ten times the weight, one hundred times the value, and so on.

The money value of diamonds is a difficult subject to touch upon, as a distinction must always be drawn between the retail price asked by jewellers from the public, and the real market price of the diamonds as sold by the dealers. Moreover, the value will always vary according to the state of the market, as well as according to the quality and cut of the stones. As a rough approximation, brilliants of first-rate quality, and perfect in every respect, may be estimated at about 12*l.* per carat; reducible to half this, or even

[1] *North British Review*, Nov. 1852.

[2] A fine collection of coloured diamonds, belonging to Mr. Tennant, are now exhibiting at the Kensington Museum.

less, for stones of inferior water. According, therefore, to the rule of the weight above laid down, a diamond of half a carat might be estimated as worth 6*l.*; but one of two carats would be worth $2 \times 2 \times 12 = 48l$; one of five carats $5 \times 5 \times 12 = 300l$; and so on.[1]

This rule will, however, hold only up to the limit of stones in ordinary sale. Such as are very large and of exceptional production cannot be valued by any rule; they are worth just what the state of the demand among crowned heads and millionaires will enable their holders to get for them.

The general value of diamonds has been rising of late years; for, though the production is not scanty, the demand, owing to general prosperity, and the extension of ornament to wider classes in society, is largely on the increase.

Imitations of diamonds are generally of one of the following three kinds:

1. *White Topaz.*—This is nearly as hard as diamond, and about the same specific gravity, and may therefore be mistaken for it when tried by these tests. A London jeweller died lately in the belief that a fine stone he had come into the possession of was a valuable diamond, and left large legacies to be paid out of the proceeds of its sale; but it proved, on examination, to be only a white topaz, and of very little value. The difference may be recognised by the optical qualities, which differ much in the two stones.

2. *Rock Crystal* (Brighton diamonds, Irish diamonds, &c.)—This substance though hard enough to scratch glass, is much softer than diamond, and is easily scratched by it. It is also much inferior in brilliancy and in specific gravity.

3. *Paste.*—This, which is a glass prepared with metallic oxides, can be made equal to diamond in refractive power, and therefore can be given a great brilliancy; but it is very soft, softer even than common glass, and it does not retain its lustre.

There is also a method of deception sometimes practised by what is called half-brilliants; *i. e.* stones in the form of brilliants, in which the upper pyramid is a real diamond, and the lower a piece of some inferior stone, cemented to it; the whole being set so as to hide the junction. When this deception is suspected, the stone should be taken out of its setting for examination.

A very remarkable discovery has lately been made, that the chemical element *boron*, the base of the common substance borax, may, by a peculiar process, be obtained in transparent crystals which possess the high refractive power of the diamond, and a hardness as great, if not greater. At present, the crystals produced have been too small to be of commercial value; but it is quite possible that, hereafter, the discovery may prove to be of great importance.

It only remains to mention a few particular stones celebrated for their size, and which have had, on account of their great value, a history of their own.

The largest stone professing to be a diamond is the "Braganza" found in Brazil in 1741, and preserved, in its rough state, in the Royal Treasury at Lisbon. It is as large as a hen's egg, and weighs 1680 carats; but doubts are entertained whether it may not be in reality only a white topaz and no diamond at all; a supposition which, as the Portuguese Government decline to allow it to be cut or sufficiently examined, would appear quite possible.

The largest authenticated diamond

[1] Referring to the square or best form of brilliants, the solid content of a cut stone, of proper proportions, is about $\frac{3}{7}$ of that of the circumscribing parallelopipedon; and, taking the Sp. gr. at 3·5, we shall obtain the following rule. Let $d$ = side of the square, or breadth across the girdle, and $t$ = the thickness of the stone, from table to collet; both in tenths of an inch;—then

$$\text{Weight in carats} = \frac{d^2 t}{8 \cdot 3}.$$

In a well proportioned stone $t$ should be $= \frac{2}{3} d$, and the rule thus becomes

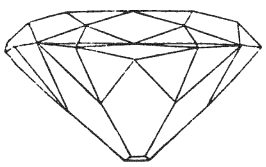
$$\text{Weight} = \frac{d^3}{12 \cdot 5},$$

or the value in £ $= \frac{d^6}{13 \text{ to } 30}$, so that the worth of stones varies, *cæteris paribus*, as the *sixth power* of their lineal dimensions. The height of the table above the girdle should be $= \frac{1}{3} t$;—the depth of the collet below $= \frac{2}{3} t$. The breadth across the table should be $= \frac{5}{9} d$.

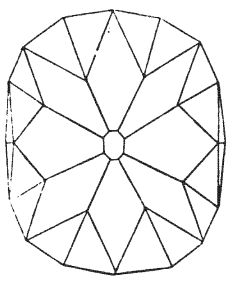
known is that of the Rajah of Mattan in Borneo. It is of the purest water, of a pear shape, and weighs 367 carats. It was found a century ago at Landack, and has been the object of many wars for its possession.

The celebrated "Pitt" or "Regent" diamond was found in 1702, in the mines of Parteal, twenty miles from Masulipatam, by a slave, who having concealed its discovery from his employers, offered it to a sailor on condition that he would give him his freedom. The sailor lured him on board his ship, threw him overboard, and sold the stone to the then Governor of Fort St. George, whose name was Pitt, for 1000*l.*; he quickly ran through the money and then hanged himself for remorse. The diamond was purchased from Pitt by the Regent of France, for 135,000*l.* It weighed 410 carats in its rough state, but was cut into a fine brilliant of 137 carats, thus losing two-thirds of its weight in the operation. It is said to be the finest diamond (though not the largest) in the world, in beauty of form, and purity of water. During the reign of terror, when the Tuileries were plundered, the diamond disappeared, along with all the other crown jewels; but it turned up again, and was pledged by the Republic to a merchant in Berlin. Redeemed at a later period, it embellished the sword of Napoleon I., and was taken by the Prussians after the battle of Waterloo. It is now in the French crown, and was exhibited in the French Exhibition of 1855.

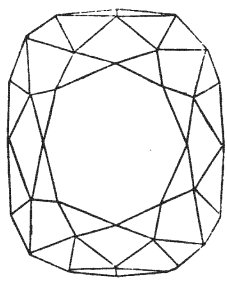
The "Star of the South," another large brilliant, was also exhibited there: it was found lately in the Brazilian mines, and weighs 125 carats; it is of an oval shape; 35 millimetres long, 29 wide, and 19 thick. It is very pure, but its colour is slightly inclining to pink. It is in private hands, and for sale.



*Section of "Star of the South."*



*Under Surface.*



*Upper Surface.*

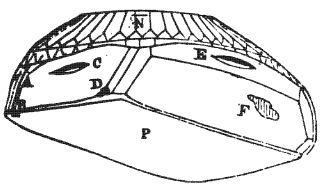
The "Sancy" diamond, of 53½ carats, has a singular history. It came originally from India, and, about the fifteenth century, was in the possession of the luxurious Duke of Burgundy, Charles the Bold, who wore it, probably as a talisman, in the unfortunate battle of Nancy, in Switzerland, where he was killed. A common Swiss soldier, who discovered the body in a ditch, found the jewel in the clothes, and, not knowing its value, sold it for a florin to a Swiss priest, who transferred it to the hands of the Confederacy. It subsequently came into the possession of the King of Portugal, who, in 1489, being in want of money, parted with it to a French trader. In the sixteenth century it found its way into the hands of a Huguenot nobleman, the Baron of Sancy, who happened to be in Soleure when King Henry III. was trying to negotiate a loan. Sancy offered him, as a true subject, the diamond, and his offer was accepted; but the messenger who was entrusted to convey it to the king (some accounts say Sancy himself) was waylaid and murdered, but had time before his death to swallow the stone, which subsequently was found in the stomach of the corpse. The stone was next traced into the possession of James II.

of England, who took it with him when he fled to France in 1688, and afterwards, when he was in distress for money, parted with it to Louis XIV. for 25,000*l.*—and Louis XV. is said to have worn it in the clasp of his hat at his coronation. It vanished in 1792, but reappeared in the Napoleon era, and was sold for 500,000 silver rubles to the Emperor of Russia, in whose possession it still remains.

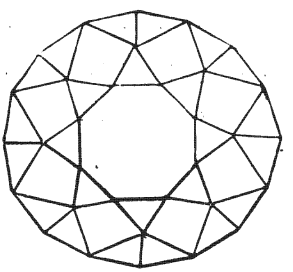
The "Nassack" diamond was captured during the Mahratta war in India, in the Peishwa's baggage, by the combined armies under the Marquis of Hastings; and, after changing hands several times, was purchased, about twenty years ago, by the Marquis of Westminster. It was afterwards partly re-cut by Hunt and Roskell, and is now a beautiful colourless stone, weighing 78⅝ carats. It is of a triangular or pear shape.

Many other large diamonds might be mentioned, each of which has a history, but perhaps the most interesting of all, is our own great diamond, the celebrated Koh-i-noor; the story of which would make a very fair true romance of three goodly volumes.

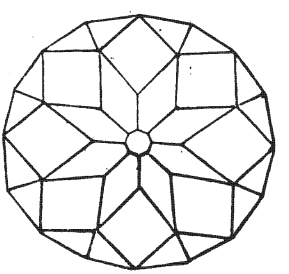
Its origin is older than any historical records reveal, but it can be traced as far back as the beginning of the fourteenth century, when it came into the treasury of Delhi; and from this time it became intimately associated with the entire history of the Indian




*Shape of the "Koh-i-noor" as exhibited in the Crystal Palace in* 1851.



*Upper Surface in its present state.*



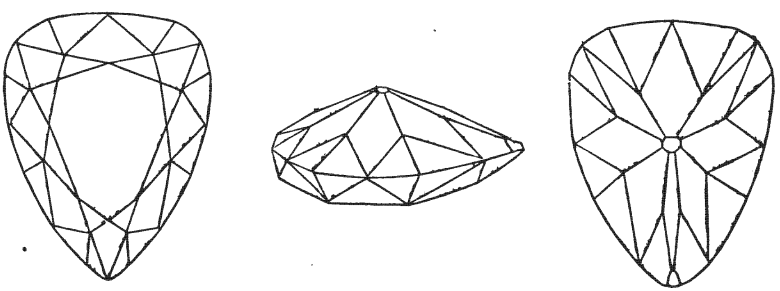
*Under Surface.*

wars and dynasties, until, on the late annexation of the Punjab, it was taken possession of by our government, brought to England in 1850, and presented to the Queen. It was shown at the international Exhibition of 1851, in the state it was received, weighing 186 carats; but it was so badly cut that its brilliancy scarcely exceeded that of a piece of crystal, and it had several flaws and defects in its structure. The Queen, after taking advice from competent judges, decided to have it recut; which was done in London (by workmen expressly brought over from Amsterdam for the purpose) in 1852. It has now the form of a regular brilliant; and, though its weight has been reduced to 102¼ carats, it has become, what it never was before, a most splendid jewel, worthy of its royal mistress, whose unsullied diadem may it long adorn![1]

[1] The illustrations to this reprint of the paper have been kindly supplied by Professor Tennant.

## POSTSCRIPT.

SINCE writing the above, I have had the opportunity of inspecting, along with Professor Tennant, a very beautiful diamond of extraordinary size, lately found in the Brazils, and in the possession of Mr. Dresden. The following cuts show its size and shape;—it weighs 76½ carats, nearly as heavy as the Nassack diamond, and is decidedly one of the finest and purest in colour known.



*April*, 1861.

A DESCRIPTION OF

# THE IMPERIAL STATE CROWN,

## PRESERVED IN THE JEWEL HOUSE AT THE TOWER OF LONDON.

BY PROFESSOR TENNANT, OF KING'S COLLEGE.

[Read before the London and Middlesex Archæological Society, July 7, 1858.]

THE Imperial State Crown of Her Majesty Queen Victoria was made by Messrs. Rundell and Bridge in the year 1838, with jewels taken from old Crowns, and others furnished by command of Her Majesty. It consists of diamonds, pearls, rubies, sapphires, and emeralds, set in silver and gold; it has a crimson velvet cap with ermine border, and is lined with white silk. Its gross weight is 39 oz. 5 dwts. Troy. The lower part of the band, above the ermine border, consists of a row of one hundred and twenty-nine pearls, and the upper part of the band a row of one hundred and twelve pearls, between which, in front of the Crown, is a large sapphire (partly drilled), purchased for the Crown by His Majesty King George the Fourth. At the back is a sapphire of smaller size, and six other sapphires (three on each side), between which are eight emeralds.

Above and below the seven sapphires are fourteen diamonds, and around the eight emeralds one hundred and twenty-eight diamonds. Between the emeralds and sapphires are sixteen trefoil ornaments, containing one hundred and sixty diamonds. Above the band are eight sapphires surmounted by eight diamonds, between which are eight festoons consisting of one hundred and forty-eight diamonds.

In the front of the Crown, and in the centre of a diamond Maltese cross, is the famous ruby said to have been given to Edward Prince of Wales, son of Edward the Third, called the Black Prince, by Don Pedro, King of Castile, after the battle of Najera, near Vittoria, A.D. 1367. This ruby was worn in the helmet of Henry the Fifth at the battle of Agincourt, A.D. 1415. It is pierced quite through after the Eastern custom, the upper part of the piercing being filled up by a small ruby. Around this ruby, to form the cross, are seventy-five brilliant diamonds.

Three other Maltese crosses, forming the two sides and back of the Crown, have emerald centres, and contain respectively one hundred and thirty-two, one hundred and twenty-four, and one hundred and thirty brilliant diamonds.

Between the four Maltese crosses are four ornaments in the form of the French fleur-de-lis, with four rubies in the centres, and surrounded by rose diamonds, containing respectively eighty-five, eighty-six, eighty-six, and eighty-seven rose diamonds.

From the Maltese crosses issue four imperial arches composed of oak leaves and acorns; the leaves containing seven hundred and twenty-eight rose, table, and brilliant diamonds; thirty-two pearls forming the acorns, set in cups containing fifty-four rose diamonds and one table diamond. The total number of diamonds in the arches and acorns is one hundred and eight brilliant, one hundred and sixteen table, and five hundred and fifty-nine rose diamonds.

From the upper part of the arches are suspended four large pendant pear-shaped pearls, with rose diamond caps, containing twelve rose diamonds, and stems containing twenty-four very small rose diamonds. Above the arch stands the mound, containing in the lower hemisphere three hundred and four brilliants, and in the upper two hundred and forty-four brilliants; the zone and arc being composed of thirty-three rose diamonds. The cross on the summit has a rose-cut sapphire in the centre, surrounded by four large brilliants, and one hundred and eight smaller brilliants.

*Summary of Jewels comprised in the Crown.*

| | |
|---|---|
| 1 | Large ruby irregularly polished. |
| 1 | Large broad-spread sapphire. |
| 16 | Sapphires. |
| 11 | Emeralds. |
| 4 | Rubies. |
| 1363 | Brilliant diamonds. |
| 1273 | Rose diamonds. |
| 147 | Table diamonds. |
| 4 | Drop-shaped pearls. |
| 273 | Pearls. |