MACHINE FOR SHARPENING TWIST DRILLS.

One of the most recent inventions of the house of Heilmann-Ducommun & Steinlen, of Paris, is a machine for sharpening the end of twist drills of the American type. This machine gives still another proof of how generally this American tool has come into use, inasmuch as for one of the operations which, at first sight, seems one of the simplest, the manufacturers have been led to substitute an apparatus for the hand of man.

The principal part of the machine is a vertical emery wheel, which revolves very rapidly, and to which the horizontally arranged bit to be sharpened presents itself with an obliquity corresponding to the conicalness to be obtained. The sharpening is effected in two periods—that is to say, after half the conical surface is finished the operation is arrested in order to give the drill a half turn, so as to complete the sharpening. During the operation, moreover, and while the emery wheel is describing a constant plane, the drill takes on an oscillatory motion, which corresponds to about a quarter revolution; and, finally, the carrier undergoes a slight horizontal oscillatory motion, from whence it results that the form of the cut is not exactly conical, but assumes a shape slightly like that of an ogive.

We shall now proceed to describe this important tool, which is represented in all its details in the accompanying plate.

Fig. 1 gives a view of the machine, which is partly a perspective one and partly a longitudinally sectional one on the wise of cast iron), that contains different important parts of the mechanism. It is upon this same table, F, that is mounted the carrier that holds the drill to be sharpened. This carrier, H, consists of a cast iron cylinder connected with the horizontal base plate by a support having an elliptical section.

As the different figures (especially Fig. 2) indicate, the axis of the drill-carrier forms with the plane of the emery wheel an angle which corresponds with that which the sharpened extremity of the drill is to possess. But its position is not absolutely fixed; for, during the work, it must describe a slight angular movement, according to a fixed point as a center situated in a line perpendicular to the extremity of the bit. At this point (see Fig. 5) the base plate, H', carries a socket which traverses the table, F, and holds a bolt, *a*, on which the base plate turns in its angular movement. The base plate, H', is beveled off at its opposite extremity, and is adjusted concentrically to the bolt, *a*, in a piece, *b*, which secures regularity in the motion of the drill-carrier and holds it in a vertical direction.

Independently of this general motion of the carrier, which has the effect of giving the cut a somewhat ogive form instead of that of a regular cone, which it would have were the carrier, H, immovable, the bit makes a quarter revolution during the operation, as before stated, so that the emery wheel acts at first on half of the surface to be sharpened, and then, on a half revolution of the drill, completes the operation.

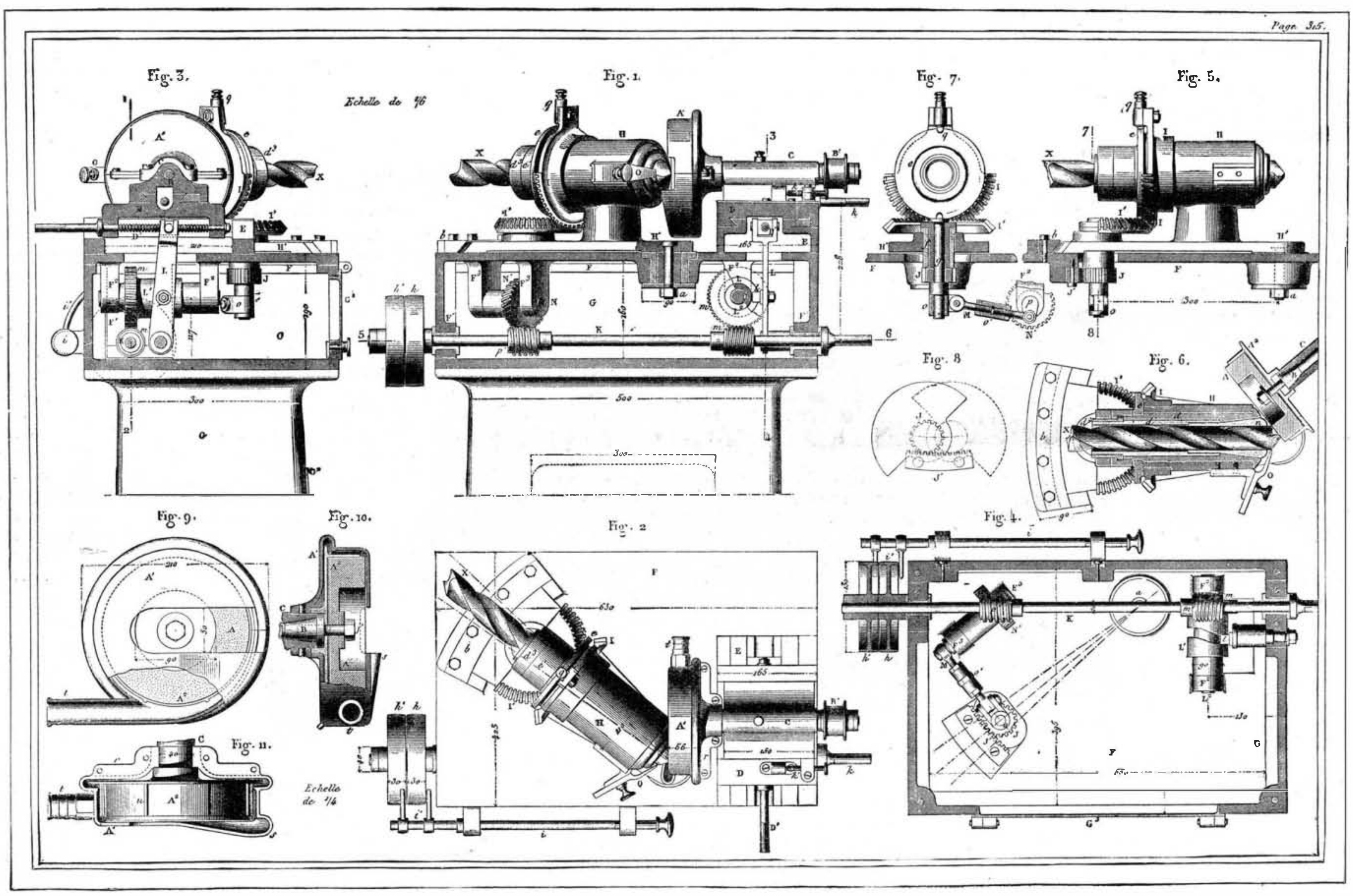
tube, *t*, on which may be adjusted a rubber tubing for carrying off the dust through the draught set up by the revolving wheel. This important accessory is represented in detail and on a larger scale in Figs. 9 to 11.

THE FIRST MOTION OF THE EMERY WHEEL.

The wheel, A, which is represented in detail in Fig. 9, has a wide opening in its center, and is adjusted on the axle, B, by a central screw, *j'*. This axle, B, which revolves in the interior of the sleeve, C, is adapted thereto by a conical bearing for the purpose of obviating all longitudinal play. This adjustment, in order to produce all its effect, is finished off at the opposite extremity with a conical ring, which has a thread on its cylindrical part that carries the pulley, B'. As has been seen, this sleeve really forms part of a puppet mounted with slides on the support, D, and this effective movement is given it in order to bring about the approach of the emery wheel and the drill to be sharpened. Such movement is produced, as usual, by means of a screw, *k*, fixed in the puppet, C, and traversing nuts connected with the support, D. This movement and the degree of approximation are limited by the contact screw, *k'* (Fig. 1).

TRANSVERSE MOTION OF THE EMERY WHEEL.

To properly understand this motion, which is much more complicated than the preceding, and which is, moreover, entirely mechanical, it will be necessary to consult Figs. 1 and 3, where it will be seen that the support, D, is traversed by a screw, D', upon which is mounted a spring block that is embraced by the forked end of a lever, L, oscillating around



IMPROVED MACHINE FOR SHARPENING TWIST DRILLS.

line 1–2, to allow the mechanism to be seen that is contained in the case upon which the tool is mounted. Fig. 2 shows a horizontal projection. Fig. 3 is a transverse section on the line 3–4. Fig. 4 shows, in section and beneath, and on the line 5–7, the case containing the mechanism of the driving gear.

Conformably to the general definition that we have just given, the principal tool of the machine is an emery wheel, A (Fig. 6), mounted on the extremity of an axle, B, that operates like the shaft of a lathe; but, as this axle has to possess the property of an effective longitudinal movement, it is mounted in the interior of a cast iron sleeve, C, which is adjusted, like a carriage support, on a plate, D, upon which it is capable of sliding and carrying along the emery wheel and its entire mechanism.

But, to prevent the emery wheel from always operating with the same part of its surface, the entire part that we have just described is arranged so as to have an automatic transverse movement during the action of the wheel; so this plate, D, upon which the sleeve is mounted after the manner of a carriage, is adjusted in the same way on the support, E, but perpendicularly; and it is then connected with a special mechanism that communicates to the whole that alternating transverse motion which is required for the proper working of the emery wheel.

The support, E, which serves as a base to this part, is fixed upon a cast iron table, F, which covers a case, G (like-

The same mechanism that causes the oscillation of the carrier also effects the rotary oscillation of the bit, through the following arrangement:

The cylinder, H, contains within it a second cylinder, *d*, which is so arranged as to receive the bit and hold it firmly. To the cylinder, *d*, there is affixed a disk, *e*, which is attached to a socket, I, mounted freely on the cylinder, H. This socket, I, is cast in a piece with a toothed sector, which gears with another sector, I', of the same size, whose axle revolves in a socket, *f*, adjusted in the plate, H'. The axle, *g*, traversing the socket, *f*, carries a pinion, J, which engages with a rack, J', fixed under the table, F.

The machine is actuated simultaneously by two different belts. The axle, B, of the emery wheel is revolved separately through the medium of a small pulley, B. A second, and narrower belt, running over a fast and a loose pulley, *h* and *h'*, sets in motion an axle, K, revolving in the bearings, F'. This axle, K, carries two endless screws, which are designed to effect respectively a transverse movement of the emery wheel and the combined motions of the bit carrier. There will be remarked in these different figures a rod, *i*. This carries the belt guide for the pulleys, *h* and *h'*. The machine, as a whole, is bolted to a base, G, which is hollow and serves as a tool chest. The emery wheel, A, revolves within a copper jacket, A', the object of which is to prevent the dust from the wheel becoming disseminated through the air and injuring the workman. It is also provided with a

its lower extremity as a center. The oscillatory motion of this lever is brought about by a cam, L', containing a screw-shaped groove, into which enters a slide, *l*, belonging to the lever. This cam is mounted upon an axle, L^2, revolving in brackets, F^2, cast in a piece with the table, F, and carrying likewise a helicoidal wheel, *m*. This latter, gearing with an endless screw, *m'*, on the axle, K, it results that the axle, L^2, is submitted to a continuous rotary motion, which, as regards the lever, L, becomes an oscillatory motion that is transmitted to the support, D, and consequently to the emery grinder.

ARRANGEMENT OF THE DRILL-CARRIER.

The arrangement of the interior of the cylinder, H, for fixing therein the drill is somewhat elaborate. It consists of the socket, *d*, which is submitted to the alternating circular motion, and to which is directly affixed the disk, *e*—the latter being held longitudinally by a nut, *e'*. This socket contains within it a second socket, *d'*, which is directly traversed by the drill, and is held in place by a screw collar, d^2, actuated by the ring, d^3. The drill is really held tightly in place by a conical plug screwed into the socket, *d'*. It is evident that the mounting of drills of different diameters is effected by substituting similar pieces of different sizes.

COMBINED MOTIONS OF THE BIT-CARRIER.

It now remains to show how the carrier is actuated. For this purpose we shall refer to Figs. 7 and 8. From these it may be seen that the axle, *g*, carries a socket, *o*, with which is articulated a rod, M, consisting really of two threaded rods connected by a nut, o', thus permitting the length of this piece to be regulated with accuracy. This rod articulates at its other extremity with the pin of a very small crank, p, belonging to the shaft, N, which revolves in the brackets, F^2, and which is arranged parallel with the axis of the mean position of the carrier. On the end of this shaft, N, there is fixed a pinion, N′, whose teeth engage with an endless screw fixed on the driving shaft, K. It results from this arrangement that the rod, M, communicates to the axle, g, an alternating motion, carrying with it the whole mechanism of the carrier, and thus determining its oscillatory motion; but, at the same time, the forced gearing of the pinion, J, with the fixed rack, J′, causes the former to make a partial revolution, which it transmits to the socket, d, and the drill that it holds. Fig. 8 is a geometrical diagram of this motion, showing the displacement of the pinions on the rack, the angular motion that results therefrom in the carrier, and the extent of its revolution. We have said that the interdependence between the motion of the sector, I′, and the socket, d, resulted from the connection between the disk, e, and the first sector, I. But this disk has still another important function. Its connection with the sector, I, results from a spring nut, q, bolted upon a projection belonging to the sector and entering a notch in the circumference of the disk, e. As there are, in reality, two like notches, diametrically opposite, this disk thus serves as a divider for changing the position of the drill and presenting the two halves of its extremity to the grinder with precision. Its longitudinal position for the two phases of this operation is likewise secured by means of a sort of alidade, O (Figs. 1 and 2), mounted at the extremity of the carrier, H.—*Machines, Outils et Appareils.*

First Use of Anthracite Coal.

Anthracite coal was discovered in Pennsylvania soon after the settlement of the Wyoming Valley, but its first practical use was by Obediah Grose in his blacksmith shop, in the year 1768. In 1791 Philip Ginter discovered anthracite coal on the Lehigh. In 1802 Robert Morris, of Philadelphia, formed a company and purchased 6,000 acres of the property on which Ginter discovered the coal. The coal company was called the Lehigh Coal Mine. This company opened the mine and found the vein to be 50 feet thick and of the very best quality of coal. The company made every effort to secure a demand for the coal, but without success, and having become thoroughly disgusted with their speculation, leased the 6,000 acres of this mammoth coal field to Messrs. White & Hazard, of Philadelphia, for twenty years, at an annual rental of one ear of corn. Messrs. White & Hazard tried to use the coal in the blast furnace in 1826, but failed; the furnace chilled. In 1832 Neilson conceived the idea of the hot blast for saving fuel, and in 1833 David Thomas adopted the idea of the hot blast and anthracite together. White & Hazard had, previous to this, formed a company and bought the property. In 1839 Thomas made the use of anthracite for making pig metal a success, by which the twenty ears of corn were transferred into $20 000 000. And this is the early history of the great Lehigh coal mines of the present day. I remember well the banquet given by Burd Batterson and Nicholas Biddle at Mount Carbon in 1840, at which time they paid William Lyman, proprietor of the Pioneer Furnace, $5,000, the premium they had offered for the first successful use of anthracite coal as fuel in the blast furnace. But David Thomas was the lion of the day.—*Pittsburg Commercial.*

The Treatment for a Cold.

The *Monthly Magazine* (London) reports Dr. Graham as saying that it is not a correct practice, after a cold is caught, to make the room a person sits in much warmer than usual, to increase the quantity of bed clothes, wrap up in flannel, and drink a large quantity of hot tea, gruel, or other slops, because it will invariably increase the feverishness, and, in the majority of instances, prolong rather than lessen the duration of the cold. It is well known that confining inoculated persons in warm rooms will make their smallpox more violent, by augmenting the general heat and fever; and it is for the same reason that a similar practice in the present complaint is attended with analogous results, a cold being in reality a slight fever. In some parts of England, among the lower order of the people, a large glass of cold spring water, taken on going to bed, is found to be a successful remedy, and in fact many medical practitioners recommend a reduced atmosphere and frequent draughts of cold fluid as the most efficacious remedy for a recent cold, particularly when the patient's habit is full and plethoric.

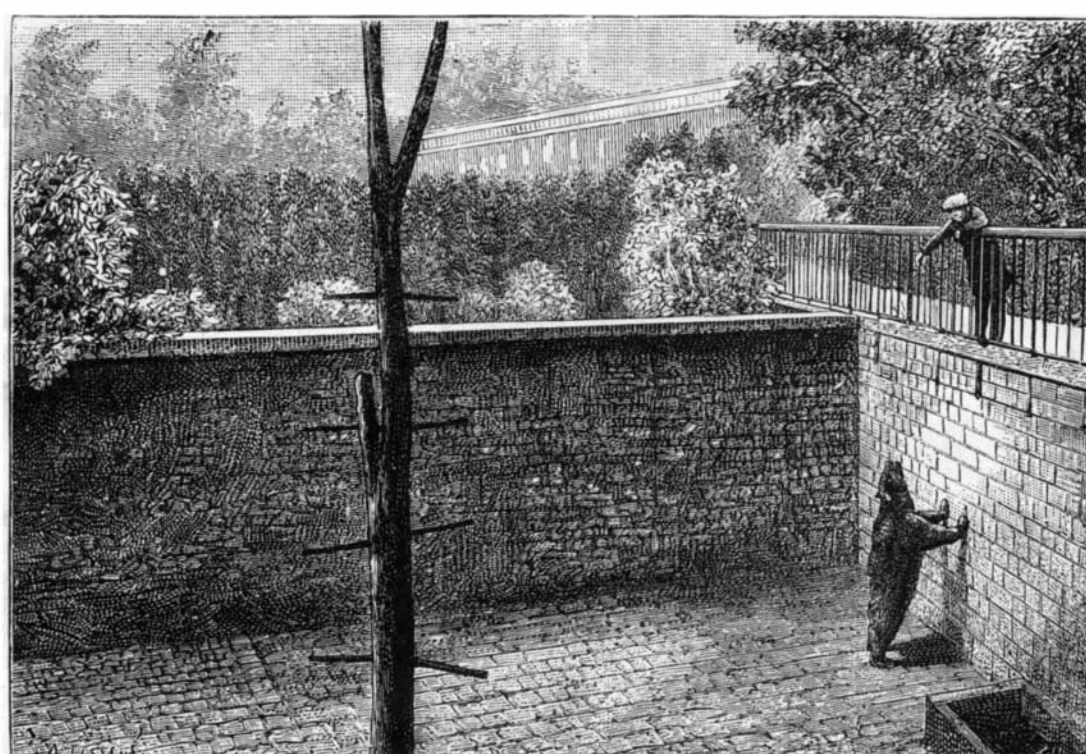
Dr. Graham further says:

It is generally supposed that it is the exposure to a cold or wet atmosphere which produces the effect called cold, whereas it is returning to a warm temperature after exposure which is the real cause of the evil. When a person in the cold weather goes into the open air, every time he draws in his breath the cold air passes through his nostrils and windpipe into the lungs, and, consequently, diminishes the heat of these parts. As long as the person continues in the cold air, he feels no bad effects from it; but as soon as he returns home, he approaches the fire to warm himself, and very often takes some warm and comfortable drink to keep out the cold, as it is said. The inevitable consequence is, that he will find he has taken cold. He feels a shivering which makes him draw nearer the fire, but all to no purpose; the more he tries to heat himself, the more he chills. All the mischief is here caused by the violent action of the heat.

To avoid this when you come out of a very cold atmosphere, you should not at first go into a room that has a fire in it, or if you cannot avoid that, you should keep for a considerable time at as great a distance as possible, and, above all, refrain from taking warm or strong liquors when you are cold. This rule is founded on the same principle as the treatment of any part of the body when frost bitten. If it were brought to the fire it would soon mortify, whereas, if rubbed with snow, no bad consequences follow from it. Hence, if the following rule were strictly observed—when the whole body, or any part of it, is chilled, bring it to its natural feeling and warmth by degrees—the frequent colds we experience in winter would in a great measure be prevented.

THE JARDIN DES PLANTES REPRODUCED BY PHOTOGRAPHY.

Photography is rendering incomparable services to all the sciences. Astronomy, physics, and chemistry are drawing on its resources every day to fix on the negative stars, luminous spectra, or microscopic objects. This art, so valuable, is likewise called upon to lend its useful aid to the natural sciences. Such a reflection recently arose in our mind on examining a remarkable photographic collection due to the talent of M. Pierre Petit. This collection includes more than two hundred photographs of large size, representing the entire Museum of Natural History of Paris. On looking over the album containing these photographs, we see reproduced with genuine art the hothouses, the gardens, the menagerie, the collections, the mounted animals, and even the living ones, taken at a flash by instantaneous photography in the posture peculiar to them. The annexed engraving was taken from one of these photographs representing a bear pit. The bear, "Martin," is seen standing upright at the moment at which the traditional piece of bread is about to fall from the hand of a visitor. This scene, as may be observed, is perfectly truthful, and forms a charming picture.



BEAR PIT IN THE JARDIN DES PLANTES.—FROM AN INSTANTANEOUS PHOTOGRAPH.

As well known, these bear pits are three in number—one for the white bears and the others for the brown ones. It was in one of these pits that was formerly kept the genuine "Martin," so celebrated throughout Paris for his size, beauty, and agility in climbing the tree planted in the middle of his pen, and especially for having hugged to death an old soldier who, having at night mistaken a metal button for a five franc piece, had the imprudence to enter the pit to get it. This celebrated bear no longer exists, but he has successors, and the visitors always see one "Martin," in the Jardin des Plantes.

The collection of photographs that we have looked over is so interesting that we should like to be able to reproduce the whole of it. We have especially admired some photographs of the hothouses, and those of the reptile menagerie. The reproductions of the cases of insects and butterflies of the entomological collection are astonishing for their accuracy and sharpness; and they do the greatest credit to the talent of the operator, and will, we believe, render true services to naturalists.—*La Nature.*

Garnets.

The color of the garnet is blood or cherry red; when mixed with blue it passes into crimson and violet red, and when tinged with yellow into hyacinth red; it is also met with of a reddish brown color, liver-brown, and black, also greenish black. It occurs in mass, disseminated, in angular fragments, or crystallized. Its primitive figure is the rhomboidal dodecahedron, which, when somewhat lengthened, presents the appearance of a short six-sided prism, the faces of which are parallelograms terminated by trihedral summits with rhomboidal faces. Sometimes the original faces of the dodecahedron entirely disappear, and the result is a solid bounded by 24 equal and similar trapeziums. Sometimes all the sides of the primitive dodecahedron are replaced by lengthened hexagons, whence results a solid bounded by 12 rhombs and 24 hexagons. Other more complicated figures, but which cannot be rendered intelligible by mere description, originate from the mixture of the two preceding modifications. The size of the crystals is subject to great variations. Some are no larger than a pin's head, while others are four inches or more in diameter. The external luster is casual, but generally glistening; the internal luster is bright-shining, vitreous. Its fracture is perfectly conchoidal, passing into imperfectly conchoidal, coarse grained, uneven, or splintery. Its fragments are indeterminately angular and sharp edged. In sometimes occurs in granular or lamellar distinct concretions. It varies from transparent to translucent on the edges. Its hardness is superior to that of quartz. Its specific gravity is from 3·7 to 4·2.

It is often magnetic, and is fusible without much difficulty before the blowpipe into a black enamel. When strongly heated in a charcoal crucible, it affords a gray dusky glass full of grains of iron, often amounting to 10 or 12 per cent.

This mineral has been repeatedly analyzed by Klaproth, Vauquelin, and other able chemists, but without much agreement in the results; and as in general the same method of analysis has been adopted, the remarkable differences which have occurred can only be attributed to a real variation in its composition; they all agree, however, that it contains a large proportion of iron, and possibly this ingredient may be the one which principally influences its crystallization.

The Bohemian garnet has been analyzed by Klaproth, with the following results: Oxide of iron, 16·5; oxide of manganese, 0·25; silex, 40; alumina, 2·85; lime, 3·5; and magnesia, 10. Vauquelin's analysis of the same stone gives the following: Oxide of iron, 41; silex, 36; alumina, 22; and lime, 3. The Sirian garnet, according to Klaproth, contains: Oxide of iron, 36; oxide of manganese, 0·25; silex, 35·75; and alumina, 27·25. The most beautiful and valuable garnets are the oriental. They come principally from Pegu; and the town of Sirian having been formerly the chief mart for them, they are hence by corruption known among lapidaries by the appellation of Sirian garnets. They appear to be the carbuncle of the ancients; their color is crimson, verging into a very red violet; they are transparent, and have a conchoidal fracture. Of their geological situation we are entirely ignorant.

Next in estimation to the oriental is the Bohemian garnet. It is met with in the Mittelgebirge of Bohemia and in Saxony; its color is blood red, verging into yellow; it never occurs crystallized, but only in rounded and angular grains; it is transparent, and its fracture is conchoidal. It occurs in floetz-trap and in alluvial land, formed by the decomposition of this class of mountains; it is also met with in serpentine.

Common garnet occurs almost always in primitive rock, especially in micaceous schistus, chloritic slate, and serpentine; it is sometimes so abundant as to constitute the principal part of the rocky mass in which it is found, which is then an excellent flux for iron ores on account of its fusibility and the large quantity of this metal which it contains.

The oriental and Bohemian garnets when cut and polished are very beautiful, and were formerly (particularly the first) in high estimation, but by the caprice of fashion their employment, and consequently their value, have since much declined.—*Glassware Reporter.*

THE new elevator just erected in Detroit is one of the largest in the country. It is of brick, is 311 feet long, 93 feet wide, and 136 feet high. It has a capacity of 1,300,000 bushels. The belting is of rubber. The main belt is 48 inches wide. The elevator bucket belts are 20 inches wide. The machinery, it is said, has a capacity to handle in ten hours all the grain the elevator can store.