

WHERE AGATES COME FROM.

Southern Brazil, and especially the province of Rio Grande do Sul, with the neighboring Uruguay, is the principal source of those stones which are sold under the name of opal, chalcedony, and agate. The trap rocks that penetrate the province in many directions, especially in the strip of high ground that branches off from Taguary, not far from the provincial capital, Porto Alegre, furnish considerable quantities of the finest agates, and in the greatest variety. They find their way mostly to Germany, and that too to the neighborhood of Oberstein. These semi-precious stones, which afterward develop great beauty, look very unattractive at first embedded in their dark colored clay.

Owing to the want of any railroad and the scarcity of wagon roads, it is necessary to convey them to the river in panniers on the backs of asses, mules, and horses. Of course before they are packed an effort is made to ascertain, as nearly as possible, the value of these ill-favored lumps of stone. Therefore many persons devote zealous study to testing and recognizing valuable nodules of agate, and those agate seekers who are practically as well as theoretically schooled in this are richly rewarded for their trouble.

The chief point in South Brazil for the collection of these semi-precious stones, and at the same time the seat of the agate exchange, which is still in its infancy, is the little city of Rio Pardo, at the mouth of a river of the same name, where it enters the Rio Jacuhy, one of the oldest places in the province of Rio Grande do Sul. Up to 1870 the agate exchange was ruled almost exclusively by a Swiss firm named Luchsinger. In front of their shabby little stores long trains returning from the inland country halt every week to pile up their rough stone treasures in and about the house. For months these heaps grew to small mountains, until their bulk and weight were sufficient for a ship's cargo, when they were shipped on the river sailing vessels called Lanchaões to the port at Porto Alegre or Rio Grande.

The European destination of these rough agates, etc., is either Belgium or the home of the German agate polishers at Idar or Oberstein. The Brazilian semi-precious stones have a rival hard to conquer in the Indian carnelians, opals, agates, and jaspers, which come into competition with them at Oberstein, and pour in there uninterruptedly, and are at least as numerous as the former. Still the demand for raw material is very considerable, and since the Franco-Prussian war there has been an increase not to be underestimated from the return of hundreds of German agate polishers and engravers that have been driven out of Paris.

OBERSTEIN.

According to Mayer the Brazilian agates have been wrought at Oberstein for half a century, and have almost entirely crowded out the native raw material. Mortars, burnishing stones, cameos, clasps, bracelets, rosaries, cane heads, knife handles, and other trinkets are the articles for which important quantities of agate are used up year in and year out. The number of persons employed at Oberstein in polishing agates is estimated at about 6,000.

The working in agate has been known in that strip of land beyond the Rhine for centuries. Of more recent origin only is the co-operation of the portrait carvers, cutters, and gold workers.

In the course of time the Oberstein agate industry has developed from small beginnings to a branch of industry that is in communication with the whole world. Its intimate relations with Brazil probably date from the time of the first great emigration of Germans to Brazil in 1820. The persons who, according to the *Cologne Gazette*, sent over a cargo of stones in 1834, may have been lapidaries that migrated from Oberstein. Kluge puts the importation of Brazilian stones somewhat earlier, in 1827.

An agate exhibition at Idar, near Oberstein, in July, 1879, offered a striking picture of the state of this industry at that time. We are indebted, says *Austand*, to this favorable opportunity and to the kindness of the well-known engraver, Mr. Charles Fuchs, of Kempfeld, near Oberstein, for the following description and statistics.

QUANTITY USED.

The agates which are brought from Brazil and worked up here annually amount to about 250 or 300 tons. The moss agates and heliotropes from India, which are used in Oberstein, are estimated at 300 cwt. (15 tons). The jaspers, which are found in the region of the Saar, are mostly blue, and are known in the market as real jasper, of which there are about 500 tons. Besides all these, there are used at Oberstein about 300 to 400 cwt. of so-called real lapis-lazuli, then amethysts, labradorite, obsidian, and quartz crystals.

There is a sale of such raw material almost every week, mostly at public auction and by weight. Under these circumstances the prices vary extraordinarily, as, for instance, from \$37.50 to \$500 per cwt., and not unfrequently still higher prices are paid. Stones, for example, that are found to be particularly adapted to making cameos and intaglios, have the highest value, and will bring \$750 per cwt.

The Brazilian stones come to the Oberstein agate market in blocks weighing 10 or 15 cwt., and so on down to 10 lb., to be soon converted by the skilled hand of the polisher into every possible article of daily use or of luxury. The most ungainly, gigantic blocks are first broken up with hammers and chisels, and from the pieces which are still unwieldy and inconvenient, smaller ones are sawed out by disks set with diamonds, and finally out of these the agates are formed on large sandstone plates. The chief articles made

at present, besides those already mentioned for ornamental purposes, are those for industrial uses, such as rollers for paper, stones for clocks and watches, compasses, smooth, and polishing stones, etc. In Brazil they know but one use for the round agate nodules, the natural stone bullets, and that is for bolas (stones used in throwing the lasso). At the present time the agate seeker in Brazil is, however, rarely able to collect his treasures entirely free from cost. Speculative Brazilian property holders have long been cognizant of the fact that when the agate balls are dug out of their property a possession is taken away which might bring them a small income. For some years past they have not allowed the agate seekers unlimited access to their lands, but demand that they shall either buy or lease the land.

Commercial agates are divided into two classes: natural stones and those that are artificially colored.

COLORING AND DYEING AGATES.

Red agates are often made in Oberstein by soaking them for a fortnight in nitric acid containing iron, and after drying them two weeks they are baked. The black colors are produced by warming them for fourteen days in a sweet liquid that contains honey, and then boiling them several days in oil of vitriol. Bright blue colors are obtained by the use of a bath of perchloride of iron, followed by yellow prussiate of potash. These are by no means all the colors that are produced artificially. A favorite shade of green is obtained by the use of nickel salts, followed by a soda bath. Yellows are obtained by crude muriatic acid or bichromate of potash. Favorite shades can be obtained by the use of chemicals if the stone is sufficiently absorptive. To determine this point an empirical test is in general use at Oberstein and Idar. The buyer knocks off a thin sliver from the part of the nodule that seems likely to be useful, and moistens it with the tongue, noticing whether the moisture dries slowly or rapidly, and in streaks. If the absorption take place in varied streaks the stone is suitable for dyeing, and particularly for onyx colors. (In 1879 Cullman and Lorenz took out a patent in Germany for converting agate into onyx.) This test is not always sufficiently decisive to decide the value of the stone, so that agate dealers prefer to make a real test by actually coloring a piece of the stone.

The method of coloring agates, by the use of honey, was at first a secret that belonged to a few agate merchants at Idar. Formerly lapidaries from Rome (Romances, as the lapidaries of Oberstein and Idar called them) used to visit this region and buy up all onyx-like stones. From them these few agate merchants had obtained the secret either by trick or bribery. It is difficult to determine whether these Romans were led to it by Pliny, which is scarcely probable, since he only half describes it, or whether the art was not rather transmitted by tradition from Italy. Agates, or onyx streaked with white, which are frequently met with among the Brazilian stones, are by far the most in demand.

POLISHING AGATES.

In conclusion, we may give some account of how the Brazilian stones are wrought at Birkenfeld, in Oberstein. There are now about 200 polishing mills, where they had, in 1774, only 26.

THE MILLS.

In each mill there are four or five polishing stones, as large as a big millstone; they are, however, vertical instead of horizontal, and all attached to the same axle, on which there is also an overshot water-wheel. The millstones are of strong and firm quartzose sandstone from near Zweibrücken. Two men can work side by side on one stone, and this is almost always done.

TRIMMING.

Many agates are first trimmed to nearly the desired shape with a hammer, in the use of which the workmen become very skillful, so as not to lose too much material. It depends upon the knowledge of the natural structure of the mineral and the use of the cleavage directions. When the stone is valuable, and large flat surfaces are to be polished, they are often sawed off with a smooth saw, emery and water being used.

POLISHING.

While polishing the workman lies almost horizontal, with the front part of his body resting in a long, hollowed-out wooden bench, and presses the stone with his fingers, or a wooden holder, against the very rapidly revolving stone, which is kept wet by a trough of water. Ordinarily, one side of the polishing surface is provided with grooves corresponding to all the round, curved, or angular shapes which are to be given to the polished stones. The polisher can move his bench any way he pleases, just as a boy does his sled, by pushing with his foot against blocks of wood driven into the ground. In this way he is able to press the agate very forcibly against the polishing stone. This rather inconvenient position of the polisher, on his breast and belly, is absolutely necessary, for in no other way would he be able to closely watch the position of the stone on the polisher from above.

One might think, remarks Kluge, from whose work on "Precious Stones" the last few statements are taken, that this position would induce breast troubles in the workers, but he has been assured that this is not the case. The violent pushing with the sole of the foot readily elevates the breast, and raises it up from the front part of the bench. The polishers are mostly strong, healthy men. Of course they cannot work very long in that position, so that the workman has

to rise up from time to time and assume an upright position, although it involves a loss of time.

The skill of the polishers is very great, and in fact it is astonishing how by skillful turning between the fingers a perfectly round marble is formed such as boys play with. (The same marbles are made in a far more simple manner from the Untersberg marble in the mills at Saltzburg.)

PHOSPHORESCENCE.

It is not surprising that there should be a continuous stream of sparks formed by the friction of pieces of agate against the hard grindstones; but the cause of the small agates glowing all through with a pinkish-white light, even in the day time, cannot be identical with that which causes the stream of sparks, but must be looked upon as a real phosphorescence produced by the jarring of the molecules.

The grindstones have to be frequently roughened on the surface (sharpened), so they will take hold better on the agates.

DANGERS.

It frequently happened formerly that the great velocity would generate such a strong centrifugal force as to tear the stones in pieces, which would not only kill the workmen, but destroy the whole works up to the roof. Great care has to be observed in selecting the grindstones, and those having any flaws cannot be used. In recent times accidents of this sort are not common, owing to the great care taken in selecting the stones.

Depressions, like those in dishes, vases, caskets, boxes, plates, etc., are made by small rotating stones, corresponding in size to the cavity to be excavated. For boring holes the tool is armed with diamond points, or steel borers are used with diamond dust on them. Finally, the polishing is done on vertical or horizontal disks of lead or tin, covered with ferrous earth and water. Almost all the machines are geared to the main axle on which are the large grindstones, so that water power is used for all of them.

It might be supposed that the mechanical arrangements could be greatly improved, but in the great beauty of the work done these imperfections are forgotten.

Agate, it will be remembered, is nearly pure quartz, which has been deposited from solution in cavities, not unlike boiler incrustations, so that layers deposited at different times possess unlike density, and often unlike colors. This gives rise to banded agate, fortification agate, and many other beautiful and fanciful designs.

Long Bridges.

Mr. K. Pfarski has made a list of the longest bridges at present existing, which are the following, their lengths being given in meters—about 3 ft. 3 in.: Parkersburg Bridge, 2,147; St. Charles Bridge, over the Missouri, 1,993; Ohio Bridge, near Louisville, 1,615; bridge over the East River, 1,500; Delaware Bridge, Philadelphia, 1,500; Victoria Bridge, over the St. Lawrence, 1,500; New Volga Bridge, near Syssran, 1,485; Holland's Diep Bridge, near Moerdyk, 1,479; Bridge over the Pongabuda, near Gooty (India), 1,130; Dniester Bridge, near Kiev, 1,081; Rhine Bridge, near Mainz, 1,028; Dnieper Bridge, in Pultawa (Russia), 974; Mississippi Bridge, near Quincy, 972; Missouri Bridge, near Omaha, 850; Weichsel Bridge, near Dirschau, 837; Danube Bridge, near Stadlan, 769; Po Bridge, near Mezzana Corti, 758; Tamar Bridge, near Saltash, 665; Leck Bridge, near Kulenberg, 665; Mississippi Bridge, near Dubuque, 536; bridge over the Gorai River (India), 529; Britannia Bridge, near Bangor, 464; Saane Bridge, near Freiburg, 382; Theiss Bridge, near Szegedin, 355. The new Volga Bridge, near Syssran, is accordingly the longest in Europe.

The New Siamese Twins.

The brothers Tocci, born in Turin in 1877, are considered to be even more curious than the famous Siamese twins.

They have two well formed heads, two pairs of arms, and two thoraces, with all internal organs; but at the level of the sixth rib they coalesce into one body.

They have only one abdomen, one umbilicus, one anus, one right and one left leg. Their genital organs consist of a penis and scrotum, and at the back there is a rudimentary male genital organ, from which urine sometimes escapes.

It is a curious fact that the right leg moves only under the control of the right twin (named Baptiste), while the other is movable only by the left twin (named Jacob).

As a result, they are unable to walk. This left foot is deformed, and is an example of talipes equinus. Each infant has a distinct moral personality; one cries while the other is laughing; one is awake while the other sleeps. When one is sitting up, the other is in a position almost horizontal.—*Presse Medicale Belge*.

A New Style of Street Letter Box.

The Postmaster of Philadelphia has invented a new style of letter box. On the face of the box, at the bottom, is a notice of the time when collections are made by the carrier. Above this notice are the words: "Collections from this box reach the Post Office about —," the blank being filled by the figures of a revolving disk, which changes each time the carrier shuts the lid, without any further effort on his part. The disk is made to note on it any number of collections, and when the last carrier of the day, who leaves the post office at midnight, visits the box, he opens and shuts the door until he hears the bell ring, which indicates that the dial is set for the morning collection.