

the beets in water, which dissolves out the sugar; lime is then added, forming saccharate of lime; carbonic acid is then introduced, which precipitates the lime, and the saccharine liquid is then evaporated in the usual manner.

One of the features of the occasion was a simultaneous trial of various agricultural implements. At a bugle signal given by the host, a crowd of operatives, boys, girls, men and women, with asses, mules, cows, horses and oxen, all started to work in strips over the appointed field. The scene was instructive and peculiar.

In the evening a banquet was given, and in reply to the toast of America, United States Commissioner Professor Horsford made an interesting speech in German. The toast to the ladies was answered by Professor Thurston in a very brilliant manner. At 10.30 P. M. the party returned to Vienna. We gather these particulars from an interesting letter in the New York *Tribune*.

Herr von Horckysfeld is 72 years of age, and is celebrated throughout Austria for his success as an agriculturist. The excursion party numbered 150 persons, and were entertained wholly at the expense of the venerable farmer.

THE USE OF ZINC.

Although the use of zinc as a component of brass and similar alloys was known to the ancients, it did not, for a long time, meet with any use alone. In consequence, the production of this plentiful metal was a limited one. At the beginning of the present century scarce 200 tons of zinc were produced in all Europe, while to-day the total production is at least 125,000 tons.

It would seem as if zinc, on account of its low melting point and its relatively great power of resisting the action of the atmosphere, were excellently well adapted to the manufacture of all sorts of things, but its brittleness restricted its use within narrow limits. In 1805 it was discovered, at Sheffield, that zinc heated to 212° Fah. lost its brittleness, and from that time forward zinc began to be used alone, and especially for roofing; but this use was soon abandoned on account of the difficulty of fastening the sheets, and has been but recently renewed. For a long time only large masses, like weights, were cast in zinc. This use was not nearly sufficient to consume the quantities of zinc which could be obtained in Silesia, and hence, in 1826, the Society for the Advancement of Industry in Prussia offered a prize for the discovery of a use for zinc, which should cause an essential and generally useful increase in the consumption of the metal.

The prize was won by Berlin. Krieger, the chief mining counselor, first ascertained that it was possible to cast hollow pieces as well as plates and solid masses, and he had a number of utensils made of zinc for his household, but did not extend it farther. It happened, however, that a friend of his, named Geiss, who was the proprietor of an establishment for making fine iron castings, was hunting around for a suitable material for casting large architectural ornaments, and the idea struck him of employing zinc. He had now found a material which melted at a low temperature, and which could be cast in molds of moist sand, which was easily worked when cast, and which, above all—for this is of the greatest importance in making very large pieces—could be easily soldered. Geiss, whose factory is still standing in Berlin, now began to experiment very zealously. Beuth and Schinkel also interested themselves in it, and Berlin very soon began to employ zinc columns, capitals, architraves, cornices, and similar pieces of architectural work. The road was now broken for zinc casting, and zinc foundries sprang up rapidly in Berlin and other large cities; the price of zinc, which had fallen to \$1.50, soon rose to \$4.50 and the production of zinc in Europe increased, as stated, from 200 tons in 1808 to 60,000 tons in 1858, and to 125,000 tons at the present time.

This remarkable increase of production, not being followed by a decrease in price, shows that the employment of zinc for casting objects of general use has been kept up, and that its use has not been limited to architecture. As soon as it became known that zinc could be so readily employed for casting, it began to be used for chandeliers and the like, where it served a good purpose as substitute for the more expensive bronze. The introduction of this use of zinc is principally due to Spinn; Devaranne employed it for theater decorations, a use founded upon the power of polished zinc to reflect the light. Finally zinc was employed for making copies of large statues, which could thus be very cheaply produced. Geiss, at the very beginning, cultivated this use of zinc, but it first came into practical use when Hossauer introduced a process of depositing, upon the zinc structures, a layer of copper by galvanic action. When thus coated, they soon acquired the appearance of genuine bronze. This use of zinc is still quite general, as it enables persons of more moderate means to possess excellent works of art. They are made chiefly by Lippold and Geiss.

At present a great variety of articles are cast in zinc in Berlin; candlesticks and still smaller objects, chandeliers and gas brackets, statues and huge architectural pieces, whole monuments, and even pieces 30 or 40 feet high and weighing half a ton, are made of this metal. All this great variety can be made in the same establishment, for the operation is exactly the same with all. If we enter a zinc foundry, we see no huge contrivances; in the court yard we saw, perhaps, a copy of the colossal "Amazon," by Kiss, as large as the original, or perhaps a monument 20 feet high; we enter the works and find very small furnaces, small crucibles, and in fact only a small space for casting. The explanation of this is in the ease with which zinc is soldered. Everything, however artistic, is cast in small pieces weighing not over ten pounds each, and then soldered together. For all such

things the patterns only are kept; and when a cast is ordered a sand mold is made, the pieces cast separately, and soldered together and the joints finished off. In consequence of the small arrangements and fittings required by such foundries, their number in Berlin alone is quite considerable, there being about fifty in all. The majority of them, however, combine zinc casting with bronze casting; these are the manufactories of lamps, gas fixtures, and cheap substitutes for bronze ornaments.

The zinc foundries, in the narrower sense, whose chief productions are architectural pieces and duplicates of plastic works of art, employ about 300 hands. Berlin, where this industry originated and where it is conducted with truly artistic taste, still takes the lead therein.

SIMPLE TESTS FOR MINERALS.

One of the first tests to which a mineralogist submits a specimen is a test of hardness. Hardness is expressed in two ways: By the degrees from one to ten, or by comparison with familiar substances, which are able to scratch it or which it is able to scratch; so we must begin with a

SCALE OF HARDNESS.

1. Talc, laminated light green variety, which is easily scratched by the nail.
2. Gypsum, crystallized. Not easily scratched by the nail; does not scratch a copper coin.
3. Calcite, transparent. Scratches and is scratched by a copper coin.
4. Fluor spar, crystallized. Not scratched by a copper coin; does not scratch glass.
5. Apatite, transparent. Scratches glass with difficulty; easily scratched by the knife.
6. Orthoclase, white, cleavable felspar. Scratches glass easily; not easily scratched by the knife.
7. Quartz, transparent. Not scratched by the knife.
8. Topaz. Harder than flint.
9. Sapphire. Harder than flint.
10. Diamond. Harder than flint.

With a knife, piece of glass and a copper coin, the hardness is soon determined, and a clue to its name and value obtained.

The minerals which, like quartz, are not scratched by the knife are seldom of value as ores. Their principal uses in the arts are as ornaments, or in cutting and polishing: for example, diamonds, agates, beryls, garnets, topaz, tourmaline and corundum. The most remarkable exception to this is capterite, an oxide of tin, with a hardness 6 to 7, infusible and insoluble, but which gives the blowpipe reaction for tin.

Ores of metals are usually heavy; and with a small pair of accurate balances, the specific gravity is easily taken. Suspend the mineral freely by a horse hair, from one end of the beam or scale pan, and weigh: next allow it to hang freely in a tumbler of water and weigh again; divide its weight in air by its loss of weight in water, and the result is its specific gravity.

The acid test is also easily applied. Effervescence indicates a carbonate, and is frequently some form of limestone. Iron ores usually dissolve in warm acid, especially if pulverized. So too most other ores of any commercial value are dissolved more or less rapidly by acids and heat.

GOLD AND PYRITES.

Gold and platinum occur in the metallic state and are dissolved only by *aqua regia*. Gold does not occur in large masses nor is it often crystallized. All these serve to distinguish it from iron pyrites, or fool's gold, of which so many specimens are sent to us for analysis. When pyrites are heated on charcoal before the blowpipe, they give off the well known sulphurous acid fumes and form a magnetic globule. Gold fuses. The specific gravity of gold is 19 to 19.5, that of pyrites 4.5 to 5; pure gold is scratched by a copper coin, pyrites are not easily scratched by the knife. Copper pyrites, chalcopyrites, are of a darker or brass yellow color, not so hard as iron pyrites, and dissolve in acid with a green or blue color.

TESTS FOR SOME METALS.

When gold is dissolved in *aqua regia*, the solution should give a purple color with protochloride of tin solution. Gold is also precipitated by sulphate of iron as a brown powder.

Silver dissolved in nitric acid gives a white precipitate with hydrochloric acid, which precipitate is soluble in ammonia. Mixed with carbonate of soda and heated on charcoal before the blowpipe, compounds of silver give white, brilliant metallic globules.

Lead also gives a white precipitate with hydrochloric acid, but it dissolves in boiling water. With bichromate of potash or iodide of potassium, a beautiful yellow precipitate is formed. Its compounds are very readily reduced on charcoal. Calena often contains silver, which can only be separated from the lead by an assayer.

Very dilute solutions of iron yield dense blue precipitates with yellow prussiate of potash. Since the acids sometimes contain iron, they should be tested first, and the solution greatly diluted. Ores of iron give characteristic black, brown or red streaks on unglazed porcelain.

Lime gives a precipitate with oxalate of ammonia. Barium is precipitated with lime by sulphuric acid.

Zinc and tin are not very difficult to reduce with a blowpipe, and the coatings formed give characteristic shades of green when moistened with nitrate of cobalt.

If our friends, who think they have discovered a rich ore of some sort, will take the trouble to apply the above simple tests, they will frequently ascertain for themselves that it is not all gold that glitters.

SCIENTIFIC AND PRACTICAL INFORMATION.

EFFECTS OF OPIUM.

In China, very few physicians employ opium for therapeutic purposes, though the drug plays an important part through its effects upon the customs and hygiene of the nation. In smoking opium, the taste at first is not unpleasant; but as is the case with tobacco, a person must become habituated to its use. The drug is prepared in a semi-fluid state and has a sweet oily flavor somewhat resembling rich cream. Smoking the substance for the first time, not over 130 to 150 grains per day can be used, as it is apt to cause violent vertigo, nausea, and headache. The first puffs render the smoker loquacious, then he becomes stupidly happy, and finally paleness and quick contractions of the face ensue. The sensations and dreams differ according to the temperament and nervous organization of the user. A deep sleep is generally produced lasting from two to three hours, during which time the pulse is low and very feeble. The physical effects are loss of appetite, extreme emaciation, and, frequently, idiocy.

THALLIUM FROM VESUVIUS.

Professor Palmieri has made many spectroscopic analyses of the sublimations of the fumeroles, or small holes on the crust of the volcano of Vesuvius through which vapors escape, and finds the metal thallium in most of them.

Thallium is the new metal discovered in 1861 by Dr. Crookes. In weight and appearance, it resembles lead. When burned in oxygen it yields a splendid green flame, and its chlorate, it is supposed, might be used in fireworks to advantage. Thallium is found in various mineral waters; its sulphate is very soluble in water.

IMPORTANT AFRICAN DISCOVERY.

A dispatch to the New York *Herald*, from the exploring expedition of Sir Samuel Baker in Africa, announces the discovery that the great lakes Tanganyika and Albert Nyanza are connected together, and communicate with the Nile, forming an inland sea seven hundred miles in length. Further, that vessels launched on the Nile above Murchison's Falls will be able to sail thence into and through the great lakes. This is a very important discovery, as it brings an immense and fertile portion of interior Africa into easy communication with the civilized world.

OZONE BY SLOW OXIDATION.

If a small quantity of petroleum benzine be placed in a large vessel and exposed to direct sunlight for a few days in summer, the vessel being frequently opened and shaken, the air in the vessel will contain ozone. The same change will take place in diffused daylight, or even in the dark and at a low temperature, but a much longer time is required. The slow evaporation seems to be the chief cause of this. This has been observed by Fudakowski, who published a full description of the oxidizing action of this active benzine in the "Proceedings of the Berlin Chemical Society."

HOW A SURGICAL DISCOVERY WAS ACCIDENTALLY MADE.

The *Aertzliche Hausfreund* is responsible for the following account of the cruel misdeeds of a brutal woman leading to the discovery of an important method of performing painless surgical operations.

A wicked stepmother placed a net upon the head of her eleven year old stepdaughter, and compelled her to wear it for two weeks continuously. On the 5th of March, 1872, the girl, suffering with headache, was brought to the clinic of Professor Dr. Dittel. Dr. Dittel made a careful examination of the head and found a deep furrow plowed into the head, at the bottom of which was the elastic cord of the net, covered with little caruncles. The poor girl died of inflammation of the cerebral membrane, and upon dissection it was found that not only the pericranium but also even the skull bones were cut through as if with a sharp saw. This proved what power is exerted by elastic cords, and since then Dr. Dittel has employed them for cutting off tissues and removing swellings and tumors. By this gentle means, the patient does not lose a drop of blood, suffers scarcely any pain, has no fever, and soon gets well. This method seems to have a great future in store for it. Many patients are so horrified by the sight of the dreadful knife that the date of their recovery is postponed by it, even if they do not faint quite away.

PROGRESS OF INSTANTANEOUS PHOTOGRAPHY.

During the recent naval review in honor of the Shah of Persia, at Portsmouth, Eng. a number of photographs were taken by means of dry plates, prepared by the use of the salts of uranium, after the process of Colonel Stuart Wortley. The steam vessels in motion, views of the ships with the men in the act of clambering into the rigging, yachts in full sail, all were produced in faultless perfection by the instantaneous exposure of the plates.

LA NATURE is the title of a new French illustrated scientific weekly, published in Paris. It is edited by M. Gaston Tissandier, a well known *littérateur* and *savant*, and enters a field, similar to that of the English periodical of like name, of popular science and the diffusion of recent and interesting industrial information. The journal is handsome in appearance, and in this wise rather above the standard of French newspapers; the two numbers received are well edited and entertaining.

NEW METHOD OF PROTECTING THE PLATES OF IRON SHIPS FROM CORROSION.—To prevent the corrosive action of bilge water upon the iron plates of ironships, James Young has suggested and tried the use of lime, to neutralize the acid of the water. Actual experiment, continued for several months, shows that a small quantity of lime in the bilge water wholly prevents the corrosion of the iron plates.