

with acid at 66 deg., or in ten minutes with acid at 50 deg., the combination commences, and is carried on for an hour without further addition. As soon as the mixture becomes pasty and the action begins to decline, the water is turned on, the action recommences, the sulphate of alumina becomes hydrated after half-an-hour's boiling, when the boiler is filled up with water, and the alum is made. In twenty-four hours the deposit is effected. If the alum is for colors which iron does not affect, it may be used in this state, drawn off into a wooden vessel. The 10 hectolitre boiler contains 350 kilos. of real alum, and consequently 1 h., of 22 gals., 35 lbs. To get rid of the iron, prussiate is added to the extent of 3½ kilos. for every kilogramme of peroxyde of iron in the solution: the iron is thus precipitated in the form of Prussian blue. When drawn off clear, the residuum is passed through five or six woollen filters, and the result is added to the other solution; the residue in the filters is regenerated by the addition of soda. But even if the blue were lost the process does not cost more than 3 francs per 100 kilos. of alum produced. Making the total cost of 100 kilos., purified, from 10 to 11 francs.

THE COPAIBA TREE OF BRAZIL—HOW THE BALSAM IS COLLECTED.

MR. ROBERT CROSS, a correspondent of the *London Geographical Magazine*, gives, in a late number of that periodical, an interesting account of the tapping of the copaiba tree by the balsam collectors, an operation which, he says, has never before been accurately described by any traveller, nor explained in any scientific work in the English language.

The tree yielding the balsam, the *capivi* of commerce, has a wide distribution throughout the valley of the Amazon, and also in the forests of Guiana, Venezuela, and the United States of Columbia. There are several species of it, but all are leguminous, and belong to the genus *copaifera*. The finest variety, which produces the "white copaiba," grows in the province of Para, Brazil, from which large quantities are annually shipped to the French market. The trees are now comparatively scarce, owing to the method of gathering the balsam, and the collector is obliged to make long trips in a canoe up the tributaries of the Amazon, or penetrate deep into the forests along its banks.

Mr. Cross accompanied a collector and his boy into the forests of Para about the middle of October. Each carried a fair travelling load, consisting of food and necessities, the collector himself bearing in addition a large tin of the capacity of about five gallons. On reaching a copaiba tree, the collector struck the trunk with his axe handle, when a hollow sound was produced. The grand, symmetrical trunk was clear of branches to a height of at least ninety feet, above which the crown spread out flatly, the slender, interlaced bough, clothed with little pinnate foliage, forming an agreeable shade from the rays of the sun. The circumference at three feet from the ground was seven feet two inches.

"The person who successfully taps a copaiba tree must be a skillful axeman. A chamber or cavity is cut in the trunk not much broader than the axe, but sufficient to allow the workman to vary the course to the heart of the tree in such a way that he may not miss what is termed the 'vein' or channel, usually met with near the center, from which the balsam flows. The base or floor of the chamber must be carefully and neatly cut with a gentle upward slope, and it should also decline to one side, so that the balsam on issuing may run in a body until it reaches the outer edge. Below the chamber a pointed piece of bark is cut and raised, which, enveloped with a leaf, serves as a spout for carrying the balsam from the tree to the tin.

"The collector commenced the work by hewing out with his axe a hole or chamber in the trunk about a foot square, at a height of two feet from the ground. The wood at first was white to a depth of four or five inches, when it changed to a purplish red, very much resembling a piece of old oak taken from a peat moss or bog. The whole of the interior of the tree is of this color. When the center appeared to be reached, I was about to remark that there was no balsam, when suddenly the collector laid down his axe and called hastily for the tin. The balsam now came flowing in a moderate-sized, cool current, full of hundreds of little white bubbles, possessing a pearly transparency. At times the flow stopped for several minutes, when a singular gurgling sound was heard, after which a rush of balsam. When coming most abundantly, a pint jug would have been filled in the space of one minute."

Mr. Cross observed that all of the wood cut through and the chips were bedewed with drops of balsam, an important fact, showing that every atom of wood in the tree contains a certain amount of copaiba. The bark did not appear to possess any. Although balsam will drop slowly from a tapped trunk for a month, the custom is to allow a good tree only two or three hours to drain, and then proceed to another. The largest trees will sometimes yield four "potos," equal to eighty-four English imperial pints.

It is difficult to obtain seeds or plants of the copaiba, as the seeds on falling are immediately eaten by an animal about the size of a rat. Everywhere underneath the trees the ground is traversed by a network of paths made by this animal. Each little pod contains only one seed, which is coated over by a white wax-like substance having a delicious aroma. The seed itself is black, and about the size and form of a field bean.

The balsam, when flowing from the tree, has a powerful, pungent fragrance, which is not particularly disagreeable, but in the storehouses at Para the odor is by no means pleasant. It is possible that it may undergo some change in keeping.

OXYGEN.

A MR. ZINNO has just discovered a new method of obtaining oxygen in abundance by the action of hypermanganate of potassium on binoxide of barium, diluted with water. By this process, 200 cubic centimetres are obtained for each gramme of the substance used. This discovery may prove useful for lighting purposes.

COMPARISON OF BUTTER AND OLEOMARGARINE.

PROF. G. LECHARTIER states in the *Chemical News*, that fresh genuine butter which has not been melted appears under the microscope composed of ovoid granules, and contains no crystals. The artificial product obtained from tallow contains crystals. Artificial butter does not melt at once, like genuine butter, to a clear oil, but fuses gradually, a whitish "sauce" being first formed.

STAMPING MACHINERY.

EVERY improvement in machinery that effects economy in any way deserves the most serious consideration of miners.

When the figures referred to are grouped, as in the following table, they forcibly suggest that gravitation stamps, however venerable, are not the most effective or economical.

Disintegration, says a correspondent of the *Mining Journal*, is best effected by accelerating the stamps, and gravitation does not admit of acceleration beyond the limits already attained, hence the necessity to resort to other mechanical principles, as exemplified in the flexible stamp, No. 10 in the present list, which, on comparison with the gravitation stamps, shows that it stamps 100 tons in 24 hours, and requires only 18½-horse power, while No. 1 mill, stamping 100 tons in 24 hours, requires 57-horse power, this also being an average of the American stamps.

No.	Name of mine, or stamp.		Number of drops per minute.	Fall of stamp head in inches.	Weight of stamp head in lbs.	Tons of rock stamped in 24 hours per head.	Horse-power per head.	Horse-power required to stamp 100 tons.
1	International Mill, White Pine.....	Dry..	93	7½	750	1.10	1½	102.27*
2	Ditto ditto.....	Wet..	87	7½	750	1.57	1½	71.65
3	Stanford Mill, White Pine.....	Dry..	95	8	750	1.73	1½	65.02
4	Raymond and Ely, Pioche.....	Dry..	95	8	750	1.60	1½	70.31
5	Key Stone, Amador County, California.....	Wet..	85	8½	750	2.25	1½	50.00
6	Meadow Valley Mill, Pioche.....	Wet..	85	9	750	2.07	1½	54.34
7	Eureka Mill, Carson River.....	Wet..	90	9	950	2.65	1½	42.45
8	St. Lawrence, Placer County, California.....	Wet..	90	10	650	2.85	1½	39.47
9	Hunter's Valley, Mariposa County.....	Wet..	70	11	650	1.75	1½	64.28
10	Elephant Flexible Stamp, in Cornwall and New Zealand.....	Wet..	140	12	500	13.50	2½	18.50

* Average 57½-horse power required to stamp 100 tons of stuff.

PURIFICATION OF LEAD.

AN improved method of treating lead containing either gold or silver or other foreign metals, so as to remove such impurities, has been invented by Mr. C. Roswag, M.E., of Paris, and Capt. H. Geary, of Old Charlton, Eng. They operate upon molten pig-iron containing one or both of the precious metals, and either with or without the presence of antimony, arsenic, iron, or zinc, copper, or alloys of the same. The lead to be treated is melted down in an ordinary cast-iron crystallizing pan, and they then introduce compressed atmospheric air, either at the ordinary or at an elevated temperature, by means of a tube or pipe, or tubes or pipes, either of iron, fire-clay, or other suitable material, and, by preference, of about 2 in. in diameter; this tube or these tubes are placed nearly at the bottom of the pan—say about from 4 to 5 in. from the bottom. The tube or pipe, or tubes or pipes, are supported vertically by preference, are introduced into the center of the pan, which tube or pipe or tubes or pipes is in communication with a compressed air reservoir or other contrivance. The atmospheric air is compressed to the desired extent—say to about from three to four atmospheres, is then admitted into the molten lead; at the commencement of the operation the injection is by preference slow, and subsequently the admission is in larger quantity. Nearly the whole of the impurities contained in the lead are oxidized and obtained in the form of a scum or dross.

The introduction of air is arrested when a sample of the lead assumes a bluish-violet hue on cooling and ceases to be brittle. After this first operation has been performed the auriferous or argentiferous lead may then be subjected to the ordinary zinc desilverizing process, and the rich dross obtained be submitted to a process of eliquation with the object of removing the excess of lead contained in the dross. Having thus effected in this operation the separation of the precious metals by means of zinc from the lead, the molten lead is again submitted to the action of atmospheric air in the manner before mentioned, and the resulting scum which contains the last traces of zinc removed. This third operation is continued until the lead assumes a bluish-violet appearance on cooling, thus indicating that a soft lead has been obtained. The purified lead thus obtained may be cast into pigs or otherwise employed.

The oxides or scums resulting from the first and from the third operation by atmospheric air may be treated by a process known as Roswag's or other process. The rich dross, alloy of silver, zinc, and lead resulting from the second operation by the addition of zinc containing nearly the whole of the precious metals is submitted to the action of hydrochloric acid in order to dissolve the compounds of zinc, which, when dissolved, will be in the state of chloride of zinc, which chloride may be treated by Roswag's or other process in order to obtain zinc or compound of zinc therefrom. Should any lead be dissolved with the zinc it may be precipitated in a metallic state by means of spelter, and may be added to the residual lead containing gold and silver. The residue containing the precious metals and a certain portion of the lead, being thus freed from zinc, is washed, and is then melted down in a reverberatory or other furnace. This they call the fourth operation. When a sufficient quantity of the rich lead thus resulting is obtained it is to be melted down, by preference in a cast-iron pan, and submitted to the action of compressed atmospheric air with the object of effecting the oxidation of the whole or of the greater portion of the lead, the litharge thus produced being removed; should any residual argentiferous lead remain it is to be submitted to a similar subsequent and fifth operation. The litharge thus obtained, containing practically the whole of the precious metal or metals, is then treated with acetic or pyroligneous acid. Any silver contained in or mixed with the litharge will remain at the bottom of the vessel, together with some metallic lead, should any remain unoxidized. This is the sixth and principal operation. After washing the silver residue it may be melted down and refined. The solution of acetate of lead resulting may be crystallized or otherwise employed.

TINNING THIN CAST IRON.

In tinning thin cast-iron goods they run the risk of losing part of their substance by the filling or friction necessary for the removal of the oxide with which they are coated, or of twisting out of shape in the furnace if the oxide is removed by heat. They run the same risk from heat employed in the ordinary process of tinning. Where it is of consequence to avoid the evils, the first may be obviated by scouring with sand and a solution of 2 parts sulphuric acid in 8 of water until the rust vanishes. The goods are then washed with fair water and set in a solution of 1 part sulphate of copper in 8 parts water. Here they are left till they have become coated with a faint red coating of copper, which is cleansed with sand and water. They are now brushed with a solution of zinc and dipped at once into the

melted tin. If it is desired to give brilliancy to the tinning, the goods are again dipped, the second time in a second vessel, the molten tin in which is covered with a layer of talrow. The talrow prevents the tin from oxidizing during the operation, and the goods come out bright. The coppering of the goods before tinning facilitates the latter operation, which may be conducted at a heat such that the goods run no risk of warping.

SEPARATION OF IRON FROM CHROME AND URANIUM.

By M. A. DITTE.

THE separation of these metals presents certain difficulties. If we treat the substance under examination with oxidizing agents, so as to make the chrome pass into the state of an

alkaline chromate, either in order to determine the chromic acid as mercurous chromate, or with a view to reduce the chromate with hydrochloric acid and alcohol, precipitating the sesquioxide of chrome afterwards by means of ammonia, we necessarily introduce alkalis which it is difficult to get rid of, and whose presence may be inconvenient in the course of the analysis. As for the method of separating chromic oxide, by means of its solubility in cold potassa, it must be regarded as giving results scarcely even approximate. In like manner the separation of uranium by carbonate of ammonia, which ought to dissolve it entirely as uranate of ammonia, is not easily completed. We succeed better if, after having precipitated the oxides by ammonia, and having calcined them in a current of hydrogen, we treat the residue with dilute hydrochloric acid. The iron may be thus removed, but the protoxide of uranium is not perfectly insoluble in this acid unless it has been very strongly ignited. It is then washed, dried, and re-ignited in a current of hydrogen before weighing. The separation of these oxides may be effected with great accuracy by operating in the manner proposed by M. Sainte-Claire Deville for the separation of iron and alumina. The metals are brought to the state of sesqui-salts; all metals whose sulphides are insoluble in dilute acids are removed by known methods, and the ferric, chromic, and uranic oxides are then precipitated together by an excess of ammonia. Care must be taken to drive off by ebullition any free ammonia which might dissolve a portion of the latter. The oxides are well washed, calcined, placed in a porcelain tube, and heated to a redness in a current of pure hydrogen. The ferric oxide becomes metallic iron, the uranic oxide (a mixture of U_2O_3 and UO_3) is reduced to UO , while the chromic oxide remains unaltered. This mixture of iron, uranium protoxide, and chromium sesquioxide is weighed, returned to the tube, and submitted to the action of a current of gaseous hydrochloric acid at red heat. The oxides of uranium and chrome remain entirely unattacked by the acid, and their weight suffers no variation. As for the iron, it is entirely volatilized as ferrous chloride, and deposited in white crystals in a cooler part of the tube. After an hour or an hour and a half the heat is allowed to cool in a current of hydrogen intended to drive out the hydrochloric acid from the tube, and the mixture of chromic oxide and uranic oxide is weighed, and treated with pure nitric acid. The protoxide of uranium which remains in the form of a brown amorphous powder is at once attacked, even in the cold, with evolution of nitrous fumes and formation of uranium nitrate. It is well, however, to heat for a few moments in order to be certain that the chromic oxide retains no trace of uranium; the solution is then filtered off, and the residue calcined and weighed.

CERTAIN PROPERTIES OF THE SULPHIDES OF PLATINUM CONSIDERED FROM AN ANALYTICAL POINT OF VIEW.

By M. J. RIBAU.

PLATINIC sulphide, prepared either in the cold or at the temperature of the water-bath, and taken alone—or at any rate in the absence of the metals of the first two groups—may be considered insoluble in the ammoniacal sulphides and the alkaline mono and polysulphides. It may be placed in the second group along with mercury. Considerable quantities of platonic sulphide may be dissolved by means of well known artifices, such as pouring a solution of platonic chloride drop by drop into a sulphide, or melting a mixture of platonic sulphide and dry alkaline sulphides at redness. Platonic sulphide may be dissolved in ammoniacal sulphides and alkaline polysulphides in presence of metals of the first group, and in quantities the greater the more such metals are present. Platonic sulphide mixed with all the metals of the second group is not dissolved by ammonium monosulphide, but by the trisulphide, though less than copper. Platinous sulphide, according to its physical condition and the nature or degree of sulphurization of the solvent, may be considered as either almost insoluble or as soluble. But the platinous salts are rarely met with in analysis, and can be readily converted into platonic compounds. The presence of platinum in the first group, to which it does not seem to belong, seems due to entanglement. Platinum should be sought for in the first group, and especially in the second, where it may be found entirely or partly along with mercury. Its detection in the first has been pointed out; to find it in the second, the sulphides of the second group must be treated with boiling nitric acid diluted at most with an equal volume of water. Sulphides of mercury and platinum remain unattacked; when dry they are introduced into a small sublimation tube. On heating we obtain a volatile ring, sulphide of mercury, and a fixed residue, sulphide of platinum. We separate these two parts by breaking the tube, and dissolve the mercurial ring in *aqua regia*. The fixed residue is roasted a few minutes to convert it into metallic platinum, and is then dissolved in *aqua regia*.