or stumps, the front pins being of wood will break and the shares will turn back on the hinder or metal pins as fulcrums. By this arrangement sudden wrenches or breakages of the machine are avoided. Another advantage of the arrangement is the facility of adapting shares of different forms to the machine, according to the nature of the soil on which they are required to operate.

(To be continued.)

On the Causes of the serious Loss of Silver which occasionally takes place during the Roasting of Silver Ores. By Prof. PLATTNER.

It has been long known from experience, that during the roasting of silver ores and furnace products in a finely divided state, in addition to the mechanical loss of silver through the formation of flue-dust, there also occurs a loss by direct volatilization, varying according to the properties of the ore from 1 to 10 per cent., and in argentiferous blende, exposed for a long time to a strong calcining heat, amounting to much more. These facts give rise to a question which may be divided into two parts, namely,—1st, How does it happen that in ores containing an equal per centage of silver, but of different qualities and composition, the loss per cent. in silver differs when they are subjected to the process of roasting? And, 2dly, In what condition is the silver volatilized?

To solve the first part of this question, many experiments were made on the small scale by the author, in the following manner:—Various substances, for the most part quite free from silver, were reduced to a fine powder, and mixed with other substances rich in silver, and also in fine powder, in such proportion that the mixture should contain from 1 to 2 per cent. of silver; these were then exposed to the action of heat and atmospheric air in capsules of clay. For this purpose a muffle was used heated to dull redness, and most of its openings closed so as to allow of a very moderate circulation of air within it. The heat was gradually raised until it reached the temperature at which sulphate of copper is slowly decomposed. The substances used to mix with those rich in silver were pyrites, blende, various anhydrous metallic sulphates and metallic oxides, and finely powdered quartz; those rich in silver were sulphuret of silver, light and dark Rothgiltigerz (pyrargyrite and proustite), metallic silver, sulphate, arseniate, and antimoniate of silver, all in fine powder.

These substances were roasted from three-quarters of an hour to an hour and a half, and then assayed for silver in the usual way; but in order to ascertain more accurately the amount of silver which should have been obtained from them, an equal amount of the unroasted ore was assayed with equal quantities of lead, so that the slight loss always occurring from the absorption of silver by the cupel ("Kapellenzug,") would be the same in each case; the loss of silver during the roasting was then found by comparing the weight of the two buttons.

* From the Lond. Chem. Gaz., No. 324.

The results of these experiments showed :—

1. That the loss of silver in question was occasioned chiefly by chemical causes.

2. That a volatilization of silver appeared to take place when the silver in the ore either passed from the state of sulphuret into that of metal, or when the oxide of silver, in combination with sulphuric acid, again suffered decomposition.

The loss appeared to be greatest in light, loosely aggregated substances whose particles had little cohesion and were not disposed to sinter together, as they were more readily penetrated and traversed by the atmospheric air.

3. That the loss of silver was greater when the roasting was protracted, if at the same time the temperature was increased.

4. That the loss was increased when magnetic oxide of iron or suboxide of copper exercised a reducing action on sulphate of silver.

5. That generally the loss of silver was greater when the silver existing as sulphate was exposed to a protracted roasting at a high temperature in company with free metallic oxides, than when it was present as arseniate or antimoniate of silver. The reason of this is, that the sulphate of silver is decomposed and reduced to metallic silver before either of the other salts, and more particularly before the arseniate, although their behavior at a high temperature is not altogether the same, as the antimoniate of silver is very rapidly decomposed, the other two salts more slowly.

With regard to the second part of this question, in what condition is the silver volatilized? The following experiments on the small scale were instituted by the author :—

1. 3 grms. of silver, in a minute state of division, were carefully mixed in a glass mortar with an equal volume of finely powdered quartz; this mixture was introduced into a glass tube $\frac{1}{2}$ an inch wide, and about 20 inches long, of difficultly fusible glass. And after that part of the tube which contained the mixture had been enveloped with platinum foil in order to ensure a more uniform application of the heat, it was raised by means of a spirit-lamp to a moderate red heat (incipient *strong calcining* heat), while from a gasometer a current of dry hydrogen gas was passed slowly over it. Although this experiment was prolonged for upwards of an hour, not the slightest appearance of volatilization of the silver could be perceived. 2. An experiment conducted in the same manner with carbonic oxide, led to the same result. But 3, when a similar mixture was treated with oxygen gas, there quickly appeared in the neighborhood of the mixture, towards the open end of the tube, a slight, dull, grayish-white coating, which gradually increased, and extended about an inch along the tube; afterwards that portion of the coating nearest to the mixture was converted into a shining, annular, metallic crust. At the conclusion of the experiment, which like the former ones was carried on for an hour, a portion of the sublimate was removed, and on rubbing it in an agate mortar was found to be metallic silver, and this was confirmed by testing in the wet way. The part of the glass tube where the mixture had rested was found to be stained of a light to a dark yellow by oxide of silver, both above and below, and a

little to the right and left of it. 4. A mixture of finely divided silver and ignited oxide of zinc, treated in the same manner with oxygen gas, gave in general the same results; the metallic coating, however, was not quite so striking; the tube also was found to be colored yellow by oxide of silver where the mixture had rested.

From the results of the above experiments we may draw the conclusion, that that portion of the silver which in addition to that carried off as flue-dust escapes during an oxidizing roasting, is removed, not in the metallic state, but at a certain temperature commencing at a low red heat, as oxide of silver, which afterwards, in its free state and at a low temperature, is again reduced to metallic silver; but as it then exists in such an extremely minute state of division, it becomes mixed with the gaseous products of the combustion of the fuel, and also the gases and vapors resulting from the oxidation of the ores, and is readily carried away with them into the atmosphere.—*Berg-und hüttenmann Zeitung*, 1855, No. 35.

*On Antimonial Vermilion.** By E. MATHIEU-PLESSY.

The author has invented a process which furnishes antimonial vermillion of a beautiful color, and which is sufficiently simple to be employed in its preparation on the large scale.

Hyposulphite of soda is best prepared by the action of sulphur upon sulphite of soda; it is not usually allowed to crystallize. The sulphite of soda must be in the neutral state to avoid the action of the sulphurous acid upon the hyposulphite. The sulphite of soda is most simply and cheaply prepared in the following manner, recommended by Camille Köchlin. In the upper part of a vessel, the bottom of which is broken out, a sieve containing large crystals of carbonate of soda is fixed. Into the lower part of the vessel projects a furnace pipe bent at right angles, which is attached to a small clay furnace. Into this furnace sulphur is thrown by little and little, and burns into sulphurous acid, which passes through the tube into the vessel, and there acts upon the carbonate of soda. The combustion of the sulphur may be regulated as occasion requires through the door of the furnace; the draft is quite sufficient, and in the course of three or four days the crystals of carbonate of soda are acted upon to a considerable depth. The very friable sulphite of soda may be readily separated from the unaltered nucleus if any remains, and the latter may then be put back into the sieve. The sulphite of soda is dissolved in water so as to produce a solution of 25° B., and this is saturated whilst hot with crystallized carbonate of soda. When effervescence no longer occurs on the addition of this salt (which is the best criterion, as litmus paper gives no satisfactory indications), or rather when the dilute sulphite furnishes a slight effervescence of carbonic acid on the addition of muriatic acid, flowers of sulphur are added, and the mixture is heated in an earthen vessel for three hours on the water-bath, stirring and replacing the water that evaporates. When the fluid is cool, it is filtered and diluted until it shows 25° B.

Perchloride of antimony is prepared by heating powdered black sul-

* From the *Lond. Chem. Gaz.*, No. 322.