UNITED STATES PATENT OFFICE.

WOLDEMAR HOMMEL AND HENRY LIVINGSTONE SULMAN, OF LONDON, ENGLAND, ASSIGNORS TO THE METALS EXTRACTION CORPORATION LIMITED, OF LONDON, ENGLAND.

OBTAINING ZINC OXID FROM ZINC ORES AND PRODUCTS.

966,209. Specification of Letters Patent. Patented Aug. 2, 1910.

No Drawing. Application filed November 9, 1907. Serial No. 401,513.

To all whom it may concern:

Be it known that we, WOLDEMAR HOMMEL, Ph. D., a citizen of the Swiss Republic, and HENRY LIVINGSTONE SULMAN, a subject of the King of England, both residing in London, England, have invented certain new and useful Improvements in Obtaining Zinc Oxids from Zinc Ores and Products, of which the following is a specification.

This invention relates to improvements in the separation and the recovery of zinc from its ores, compounds and other products. In the previous patent application Serial No. 341,350, of H. L. Sulman, No. 875,866, January 7, 1908 a process is described in which such products containing zinc oxid are treated with a solution of sulfurous acid so as to obtain a solution of bisulfite of zinc from which the zinc is precipitated as insoluble monosulfite by the addition of zinc oxid to the solution, and the present invention relates to improved processes based on similar principles.

According to this invention a process of separating zinc from its ores or compounds consists in roasting the ore if necessary, volatilizing from the roasted or unroasted ore the zinc contents in the form of oxid together with other metallic matters, collecting the product thus blown off, treating it with a solution of sulfurous acid so as to obtain a solution of bisulfite of zinc and precipitating the zinc as insoluble monosulfite which is then calcined to produce zinc oxid.

With certain ores it may be that there is not sufficient sulfur present for carrying out the process satisfactorily. In such cases iron pyrites or other ore rich in sulfur is added to supply the necessary quantity of sulfur for sulfurous acid and the iron thus introduced serves as a suitable flux for the subsequent smelting of the lead contained in the ore.

Another feature of this invention consists in condensing the material blown off from the ore in a series of condensing chambers so that the zinc oxid condensed in the remoter chambers is practically free from lead and other impurities, whereby the impure zinc oxid condensed in the first chambers can be treated with sulfurous acid as above described while the purer zinc oxid from the last chambers can be utilized to precipitate zinc monosulfite from the solution of zinc bisulfite. As in the previous process of Sulman the zinc is dissolved as bisulfite by treating the material containing zinc oxid with a solution of sulfurous acid. According to this invention the zinc oxid contaminated with lead and other substances is treated in hermetically closed vessels with water and sulfurous acid gas under pressure.

A practical method of carrying out the solution process consists in collecting the sulfurous acid obtained by roasting the ore, pumping it into a hermetically closed vessel containing water and introducing the highly saturated solution of sulfurous acid into the hermetically closed vessels where the dissolving of the zinc oxid takes place.

In the process of separating zinc from its ores as described above an important feature of the present invention consists in introducing the solution of zinc bisulfite into a closed vessel and precipitating the zinc as insoluble monosulfite under reduced pressure. In a practical method of carrying this into effect, the solution of zinc bisulfite while in a finely divided condition is subjected to such a degree of vacuum that sulfurous acid is liberated therefrom and the zinc is precipitated as insoluble monosulfite without the addition of other reagent. Alternatively the precipitation of the zinc monosulfite from the solution of zinc bisulfite is effected partly by the addition of zinc oxid and partly by the application of a vacuum to the solution.

The following is a description by way of example of one method of carrying this invention into effect:—The ore is first roasted in the usual manner and if there is not sufficient sulfur already present, iron pyrites or other ore rich in sulfur is added and the iron thus introduced serves as a suitable flux for the smelting of the lead contained in the ore. Other fluxes such as chalk, silica or the like could be added if necessary. The roasted ore is now either mixed with coal and suitable fluxes and placed in a suitable furnace or converter containing burning fuel whereupon air is blown through the heated mass; or alternatively, the roasted ore is introduced into a furnace without coal and treated with burning gas derived from a gas producer. Or the zinc may be volatilized by an electric current. In any case the zinc is driven off as oxid together with part

of the lead and possibly other matters contained in the ore. This oxid is collected in a series of flues, condensing chambers or the like, and during the condensation a partial separation of the zinc and lead takes place in the condensing chambers so that the remoter chambers contain a zinc oxid which is practically pure.

The zinc oxid mixed with lead, etc., condensed in the first chambers is treated in hermetically closed barrels with water and sulfurous acid gas under pressure. By this means it is possible to use a very high proportion of sulfurous acid and therefore to obtain a rapid and effective solution. Preferably the sulfurous acid derived from roasting the ore or otherwise is collected and pumped into a hermetically closed vessel containing water and the highly saturated solution of sulfurous acid thus obtained is introduced into the hermetically closed barrels where the dissolving of the zinc oxid takes place.

Other methods of applying the sulfurous acid under pressure could be adopted.

The contents of the extracting barrels, consisting of zinc bisulfite solution and an insoluble residue containing lead, etc., are emptied into a number of air-tight columns or towers in which the residue is allowed to precipitate to the bottom while the zinc solution overflows near the top and is led into a second series of barrels, where by mixing it with fresh zinc oxid (such for example as the purest zinc oxid from the condensing chambers) all the zinc is precipitated as monosulfite.

The time required for the precipitation of the zinc monosulfite is considerably shortened and the zinc monosulfite is much more perfectly precipitated if the operation is performed under reduced pressure. This can easily be carried into effect by connecting the precipitating barrel to a pump which removes the excess of sulfurous acid gas from the solution. If the reduction of pressure be sufficient, it is possible in certain cases to precipitate the zinc monosulfite by the action of the vacuum alone without the addition of zinc oxid or other reagent. In order to release the sulfurous acid the zinc bisulfite can be reduced to a state of fine subdivision as by spraying, under which conditions the action of the vacuum is facilitated.

The precipitated zinc monosulfite is collected in a vacuum filter, a filter press, a centrifugal machine, or by other suitable means and is charged into a muffle calciner where the sulfurous acid is driven off and zinc oxid is obtained.

The residue from the extraction containing lead, etc., may be mixed for subsequent smelting with the bulk of the ore from which the zinc has been blown off or may be separately treated for the recovery of the values it contains.

In certain cases it may not be necessary to roast the ore but it may be possible either by means of an electric furnace, by direct treatment in a converter with suitable fluxes or otherwise to volatilize the zinc oxid from the ore.

What we claim as our invention and desire to secure by Letters Patent is:—

1. The herein described process for obtaining zinc oxid from zinc ores which consists in roasting the ore out of contact with the fuel volatilizing from the roasted ore the zinc contents in the form of dry oxid, together with other metallic matters, collecting the dry product thus volatilized, treating it with a solution of sulfurous acid so as to obtain a solution of bisulfite of zinc, precipitating the zinc as insoluble monosulfite and calcining the monosulfite to produce zinc oxid.

2. The herein described process for obtaining zinc oxid from zinc ores which consists in adding to the ore a preparation of another ore rich in sulfur, roasting the mixed ore, volatilizing from the roasted ore the zinc contents in the form of oxid together with other metallic matters, collecting the product thus volatilized, treating it with a solution of sulfurous acid so as to obtain a solution of bisulfite of zinc, precipitating the zinc as insoluble monosulfite and calcining the monosulfite to produce zinc oxid.

3. The herein described process for obtaining zinc oxid from zinc ores which consists in adding to the ore a preparation of iron pyrites, roasting the mixed ore, volatilizing from the roasted ore the zinc contents in the form of oxid together with other metallic matters, collecting the product thus volatilized, treating it with a solution of sulfurous acid so as to obtain a solution of bisulfite of zinc, precipitating the zinc as insoluble monosulfite and calcining the monosulfite to produce zinc oxid.

4. The herein described process for obtaining zinc oxid from zinc ores which consists in volatilizing the zinc contents from the ore in the form of oxid together with other metallic matters, collecting the zinc oxid and other matters blown off from the ore in successive portions according to their rate of condensation so that a partial separation may take place, treating the impure zinc oxid first condensed with a solution of sulfurous acid so as to obtain a solution of bisulfite of zinc, adding to the solution of bisulfite thus obtained the purer zinc oxid which condenses last so as to precipitate the zinc as monosulfite and calcining the monosulfite to produce zinc oxid.

5. The herein described step in the process of obtaining zinc oxid from zinc ores which consists in treating the material con-

tainii g zinc oxid with a solution of sulfurous acid under pressure containing such a quantity of dissolved sulfurous acid as will dissolve the zinc.

6. The herein described process for obtaining zinc oxid from zinc ores which consists in roasting the ore, collecting the sulfurous acid thus obtained, pumping it into water under pressure, mixing the highly saturated solution of sulfurous acid with the material containing zinc oxid so as to obtain a solution of bisulfite of zinc, precipitating the zinc as insoluble monosulfite, and calcining the monosulfite to produce zinc oxid.

7. The herein described step in the process of obtaining zinc oxid from zinc ores which consists in precipitating the insoluble zinc monosulfite from the solution of zinc bisulfite under reduced pressure.

8. The herein described step in the process of obtaining zinc oxid from zinc ores which consists in bringing the solution of zinc bisulfite into a finely divided condition and subjecting it to such a degree of vacuum that sulfurous acid is liberated therefrom and the zinc is precipitated as insoluble monosulfite.

9. The herein described process for obtaining zinc oxid from zinc ores which consists in dissolving zinc oxid from the material containing it with sulfurous acid, adding zinc oxid to the solution of bisulfite thus obtained, subjecting the solution to the action of a vacuum to precipitate the zinc as monosulfite and calcining the monosulfite to produce zinc oxid.

10. The herein described process for obtaining zinc oxid from zinc ores which consists in volatilizing the zinc contents from the ore in the form of oxid together with other metallic matters, collecting the product thus volatilized, treating it with a solution of sulfurous acid under pressure so as to obtain a solution of bisulfite of zinc, precipitating the zinc as insoluble monosulfite under a vacuum, and calcining the monosulfite to produce zinc oxid.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

WOLDEMAR HOMMEL.
HENRY LIVINGSTONE SULMAN.

Witnesses:
GEO. J. B. FRANKLIN,
T. J. OSMAN.