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UNITED STATES PATENT OFFICE.

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MANUFACTURE OF ZINC OXIDE.

No Drawing. Application filed June 7, 1923. Serial No. 644,054.

To all whom it may concern:

Be it known that we, HOWARD H. UTLEY, a citizen of the United States, and a resident of the city of Florence, in the county of Fremont and State of Colorado, and JEAN McCALLUM, a citizen of the United States, and a resident of the city of Florence, in the county of Fremont and State of Colorado, have invented a new and useful Improvement in Manufacture of Zinc Oxide, of which the following is a specification.

Our invention relates to the removal of lead and impurities from an igneous concentrate or fume product and has for its principal object to devise a process suitable for the manufacture of commercial zinc oxide from igneous zinc concentrates or zinc fume product or other similar material containing lead and impurities. It consists principally in chloridizing the lead and other impurities of the said materials in order to remove the lead and other impurities and then reducing the zinc and burning it to an oxide. It also consists in other features hereinafter described and claimed.

Heretofore it has been uneconomical to manufacture the so-called lead-free and low leaded grades of commercial zinc oxide from ores containing any considerable percentage of lead; and it has been the practice commercially to select zinc ores substantially free from lead for the manufacture of the so-called lead-free zinc oxide. We have found that by proper treatment, zinc ores and zinc concentrates containing lead and other impurities may be utilized for this purpose and that a commercially lead-free zinc oxide superior in all respects to the commercial products now on the market may be economically manufactured from such ores and concentrates.

We prefer to start with the fire process concentrates of mixed ores commonly known as "zinc concentrates," which consist mainly of a mixture of zinc oxide and lead sulphate together with some zinc sulphate and some lead oxides and other impurities. These so-called zinc concentrates are a finely pulverulent bag house product resulting from the smelting of sulphide ores as, for instance, by the process set forth in Hall Patent No. 1,276,058, dated August 20, 1918.

With the zinc concentrate is mixed common salt (sodium chlorid or other suitable chlorides) in sufficient quantity for chloridizing the lead and other impurities. The mixture is then heated to a temperature in the neighborhood of 800° to 1000° centigrade more or less for about two hours more or less. Under these circumstances, the lead and other impurities unite with the chlorin of the salt to form lead and other chlorides, and the sodium of the salt combines with sulphur of the charge to form sulphate of sodium, while the zinc combinations are substantially unchanged. During this operation, substantially all of the chlorid of lead and other impurities are volatilized and are removed in the form of fume either by draft or suction to a suitable place of deposit, where it is or may be recovered and utilized in any suitable way.

The residue remaining after the removal of lead and other impurities from the charge is a granular product consisting of zinc oxide, sulphate of sodium and minor impurities; and the next step in the process is to effect the separation of the zinc and its recovery in the form of zinc oxide. For this purpose, said residue is mixed with a suitable reducing agent, such as coke breeze or granulated coke or anthracite dust or charcoal chips, and the mixture is then shoveled or otherwise suitably fed into a heated Wetherill grate or other suitable furnace. Under these conditions, the zinc oxide is reduced to metallic form and the zinc is immediately burnt to an oxide which passes out in the form of a fume. This fume is collected in the bag house in the usual manner and constitutes an exceptionally pure zinc oxide in the most desirable form for ordinary commercial purposes, especially for use in paint making and for use in the manufacture of rubber goods. The process is adapted to produce zinc oxides containing any desired percentage of lead, as well as to produce lead free zinc oxide, as above described. By varying the amount of salt or other chlorid used and by varying the length of time that the process is carried on, a zinc oxide containing any desired percentage of lead may be produced.

Under some circumstances it may be preferable to leach or wash the residue remaining after the chloridizing operation, in or-

der to remove sodium sulphate and sodium chloride therefrom. The leaching or washing produces a product that will burn properly and give a very high recovery of zinc.

Among the principal advantages of our invention are first, the fact that it enables mixed ores to be used for the production of a commercially pure and high grade product in place of the more limited lead-free ores that have heretofore been required, and second, it provides a feasible method of separating zinc from lead by a dry process whereas wet processes have heretofore been required for this purpose.

While we have described our process as applied to the treatment of "zinc concentrates," it is obviously applicable to the treatment of other zinc and lead mixtures. For instance, it is especially applicable to the so-called leaded zinc oxide which is a commercial zinc oxide containing lead. It is also especially applicable to by-products produced in the manufacture of zinc oxide from lead bearing ores or concentrates.

What we claim is:

1. The process of manufacturing zinc oxide from fume product containing zinc and lead, which comprises chloridizing the lead and other chloridizable matter and thereby separating by volatilization the lead and other chloridizable matter from the zinc oxide, mixing the residue with carbonaceous reducing material and roasting the mixture.

2. The process of manufacturing zinc oxide, which comprises chloridizing by heat fume containing zinc and lead to remove the lead and impurities and then roasting the residue in the presence of a carbonaceous reducing agent to form and remove metallic zinc and oxodize and recover the same as zinc oxide.

3. The process of manufacturing zinc oxide from a mixed charge of zinc and lead fume bearing material, which consists of impure zinc oxide, lead sulphate and other impurities or sulphates, such process consisting of chloridizing this fume, with proper amount of chloridizing agent to remove lead and other impurities and subsequently roasting the residue in presence of carbonaceous material, on grates to produce and oxidize zinc.

4. The process of manufacturing zinc oxide from a mixed charge of zinc and lead fume, which consists in chloridizing the lead and other impurities thereof at a temperature sufficient to volatilize and remove the lead and other volatile chlorids produced thereby, and then reducing the zinc oxide in the presence of carbonaceous material to metallic zinc at a temperature high enough to volatilize said zinc and then convert it back into zinc oxide, removing said zinc oxide and cooling and collecting it in finely divided powder.

5. The process of manufacturing zinc oxide from fume product containing zinc and lead, which comprises chloridizing the lead and other chloridizable matter, at a temperature sufficient to volatilize and remove the lead and other volatile chlorids produced thereby, leaching or washing the residue, then mixing the residue with carbonaceous reducing material and roasting the mixture.

6. The process of manufacturing zinc oxide which comprises chloridizing fume containing zinc and lead at a temperature sufficient to volatilize and remove the lead and other volatile chlorids produced thereby, leaching the residue to remove any remaining chloridizing agent and other impurities and then roasting the residue in the presence of a carbonaceous reducing agent.

7. The process of manufacturing zinc oxide from a mixed charge of zinc and lead fume bearing material, which consists of impure zinc oxide, lead sulphate and other impurities or sulphates, such process consisting of chloridizing this fume in the presence of a chloridizing agent to volatilize and remove lead and other impurities, leaching the residue to remove any remaining chloridizing agent, sulphates or other impurities and subsequently roasting the residue in presence of carbonaceous material, on grates to produce zinc oxide.

Signed at Florence, Colorado, this 31st day of May, 1923.

HOWARD H. UTLEY.
JEAN McCALLUM.