

UNITED STATES PATENT OFFICE.

CARL V. PETRAEUS, OF JOPLIN, MISSOURI, ASSIGNOR TO OLIVER H. PITCHER, OF SAME PLACE.

METHOD OF SMELTING GALENA.

SPECIFICATION forming part of Letters Patent No. 588,289, dated August 17, 1897.

Application filed April 7, 1896. Serial No. 586,587. (No specimens.)

To all whom it may concern:

Be it known that I, CARL V. PETRAEUS, a citizen of the United States, residing in Joplin, in the county of Jasper and State of Missouri, have invented a certain new and useful Improvement in Methods of Smelting Galena, of which the following is a true and exact description.

My invention relates to the smelting of galena ore, and has for its object to reduce substantially all the lead contents of such ore to metallic form and at a low cost of treatment.

In my former patent, No. 556,691, dated March 17, 1896, I have described a method of treating galena ore in which the ore is first treated in an open-hearth blast-furnace, with the result of producing a certain quantity of metallic lead, a certain quantity of lead fume; consisting largely of lead sulfid, and slag and cinder both rich in lead. The fumes collected from this furnace are cindered together and resmelted and the metal-bearing slag and cinder are also resmelted in a low-cupola blast-furnace, the fume driven off from this furnace consisting, essentially, of lead sulfate and lead oxid, being agglomerated by pressure or cementation and again smelted to reduce them to metallic lead. In the treatment of my said former patent it was necessary to provide separate screen systems for the fumes obtained from the low-cupola blast-furnace and those obtained from the open-hearth furnace, because the fume obtained from the open-hearth furnace, consisting largely of lead sulfid, can be cindered together in condition for charging into a furnace by simply igniting it, while the fume from the low-cupola furnace cannot be cindered in this way, but requires comparatively expensive modes of treatment to fit it for use in a furnace, and it has been found that the mixture which would result from collecting the fumes from both furnaces in one screen system would require to be treated in the same manner as the fume from the low-cupola furnace, which treatment is more expensive and less satisfactory in result than the method of centering the fume when practicable by ignition.

The object of my present invention is to obtain a fume from both furnace treatments

which shall consist largely of lead sulfid and be of a character which will permit it to cinder by ignition, thus enabling me to provide a single-screen system for all the fumes generated in the treatment of the ore as well as to obtain a cindered fume of the best character for further furnace treatment from the entire mass of fume produced.

In the so-called "low-cupola" blast-furnace referred to in my former patent, also technically known as a "slag hearth-furnace," the surface of the charge and the top of the furnace are both very hot and of an oxidizing character, so that any lead sulfid which may be thrown off from the furnace in the form of fume is oxidized in the top of the furnace and passes to the flues and screen system as lead sulfate and lead oxid. In an ordinary stack-furnace, on the other hand, it has been found impracticable to treat material so rich in lead and sulfur as the slag-cinder and agglomerated fume from the open-hearth blast-furnace, because the fume generated in such a furnace forms "scaffolds," as they are called, upon the walls of the furnace so rapidly as to interfere very seriously with the operation of the furnace and because that from the air-pressure necessarily used in the ordinary stack-furnace there is produced a large quantity of lead matte, which is highly undesirable and which can only be avoided by the use of a very large quantity of iron flux, which is not always available, and if available is apt to be expensive.

Now I have discovered that the rich lead-bearing material, which in accordance with my former patented process was treated in the low-cupola blast-furnace, can be smelted in such a way as to produce a fume largely consisting of lead sulfid without serious trouble from the formation of scaffolds or crusts in the furnace and without producing any considerable amount of lead matte by smelting it in a stack-furnace the height and air-pressure of which are so regulated that the top of the charge and top of the furnace will be at a temperature too low to cause the oxidation of lead-sulfid fumes and in which the minimum air-pressure is maintained—that is to say, the furnace is made as low as practicable

consistent with the desired low temperature of the top of the charge—and the principal reason for this is that by constructing and operating a furnace as above described I keep
5 the smelting-zone of the furnace at a comparatively low temperature compared with the temperature used in stack-furnaces, and the formation of the lead matte appears only to occur when the temperature of the smelting-zone is high.
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In practice I have constructed my furnaces with a height of about five feet from the tuyers to the top of the charge and have used an air-blast which gives in this furnace a pressure
15 of from two to three inches of water, and this furnace I have found to give excellent results, producing a fume rich in lead sulfid and substantially no lead matte. The minimum height of the furnace charge should not be
20 less than four feet, nor is it advisable to construct a furnace for my purposes the charge in which would exceed six feet.

My new method of smelting galena ore consists, therefore, in first treating the galena in
25 the open-hearth blast-furnace, as in my former patented process, and collecting the fumes from this furnace and centering them by ignition. Then I take the slag and cinder from the open-hearth furnace together with the
30 cindered fume from the open-hearth furnace and the cindered fume prepared, as described, from the fume of the second furnace treatment and smelt these materials in a furnace of the construction above described—that is to say, one having a tempera-
35 ture at the top of the charge too low to cause the oxidation of sulfid fume and a low blast-pressure—and I collect and cinter by igni-

tion the fume from this furnace, charging the cindered fume again into the stack-furnace. 40

As the fume from both furnace treatments is of substantially the same character, I am enabled to use a single-screen system for collecting the fume from both treatments, which is a considerable source of economy in cost of
45 plant, and whether the fume is collected in one or two screen systems it is in any case of a better and more suitable character for further furnace treatment than where the low-cupola furnace of my former patented process
50 is used.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

The method of smelting galena which consists in first treating the ore in an open-hearth blast-furnace and collecting the lead fume containing a large percentage of lead sulfid driven off therefrom, treating the metal-bearing slag of the open-hearth furnace and cinder-
60 tered fume in a stack-furnace in which the temperature at the top of the furnace is maintained at so low a point as to prevent the oxidation of the lead-sulfid fume generated in the furnace, collecting the fume containing
65 a large percentage of lead sulfid drawn off from the stack-furnace, agglomerating the fume from both furnaces by cintering and smelting it in the stack-furnace aforesaid together with the slag from the open-hearth
70 furnace.

CARL V. PETRAEUS.

Witnesses:

A. E. SPENCER,
GALEN SPENCER.