

UNITED STATES PATENT OFFICE.

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SMELTING LEAD SULFID.

No. 816,773.

Specification of Letters Patent.

Patented April 3, 1906.

Application filed May 26, 1905. Serial No. 262,490.

To all whom it may concern:

Be it known that I, ANSON G. BETTS, a citizen of the United States, residing at Troy, county of Rensselaer, and State of New York, have invented certain new and useful Improvements in Smelting Lead Sulfid, of which the following is a specification.

This invention relates to improved methods of desulfurizing lead sulfid by the action of a base and a carbon reducing agent in the presence of an alkaline metal and a heavy metal, which combine with the sulfur of the lead sulfid to form a heavy metal-alkali-metal matte.

The principal object of my present invention is to prevent the loss of alkali metal in the slag produced.

In my application filed herewith, "Processes of smelting lead sulfid," Serial No. 262,489, I have described a process of desulfurizing galena by the combined action of iron and soda, forming an iron-sodium matte; but in previously carrying out that process and in all previous processes of lead-smelting slags have been produced carrying considerable iron. In smelting lead sulfid with iron and sodium compounds I have found that the slag will run considerably lower in iron than sodium, a very rough but useful calculation being made on the basis that the Na_2O in the slag is three or more times greater than the FeO . As a consequence of my improvement in reducing the loss of alkali metal in the slag my slags run low in FeO , five per cent. FeO being about the upper limit. I have found that if a furnace charge is made up so that there is about enough sulfur present in a form which will not be driven out of the charge as SO_2 in smelting to combine with all the iron and alkali metal present to form the double sulfid matte and if a sufficiently-fusible slag is aimed at the percentage of alkali in the resulting slag may be reduced to a small figure.

The slag is not a very fusible one, as it contains not enough iron; but this can be corrected by adding fluorspar, barite, &c., to the charge, a good slag to make containing about thirty-eight per cent. SiO_2 , ten per cent. CaF_2 , twenty per cent. CaO , fifteen per cent. Al_2O_3 , FeO one per cent., Na_2O three per cent., MgO two per cent., BaO seven per cent. In a slag of the above description there is some doubt whether the amount of FeO is as great as one per cent., for the iron

given by analysis might be present as suspended matte. The sodium or alkali metal of the matte being recoverable, while the soda or alkali in the slag is practically a loss, makes it an advantage to have as much as possible of the alkali metal separate with the matte. In my application filed herewith above referred to I have described and claimed methods of utilizing this alkali metal in the matte.

This present process may be carried out in two stages, as follows: In the first stage an excess of the alkali-metal compound may be used, resulting in the production of a very fusible slag containing considerable alkali, the low working temperature resulting from the fusibility of the slag causing the loss of little or no lead by volatilization. The resulting slag is then treated, preferably with calcium or barium sulfate and carbon, and with iron sulfid—ordinary lead matte, for example—which produces an iron-alkali-metal matte and a slag containing very little iron and a small amount of alkali. Calcium sulfate is probably first reduced to calcium sulfid, which reacts with alkali silicate to form calcium silicate and alkali sulfid.

When lead matte is used to supply the iron sulfid, the dilution with alkali sulfid resulting settles out a considerable part of the contained lead.

Lead sulfate in presence of the carbon of the charge is equivalent to lead sulfid, it probably being reduced first to lead sulfid; but however that may be the result is practically the same as with lead sulfid.

Any of the well-known suitable smelting-furnaces may be used in carrying out the process.

If barium is present in the furnace charge, a considerable amount of barium will be found in the matte.

Either raw or roasted lead ores may be used in carrying out this process.

By the term "alkali metal" I mean the metals sodium and potassium, the other metals of the alkali group, and barium.

What I claim, and desire to secure by Letters Patent, is—

1. The process of recovering lead from compounds of lead and sulfur, which consists in smelting with materials containing a heavy metal, the sulfid of which forms with the sulfid of an alkali metal a fusible double sulfid, and an alkali metal, producing a heavy

metal-alkali-metal matte, and a slag containing less than five per cent. of ferrous oxid.

2. The process of recovering lead from compounds containing lead and sulfur which consists in smelting with materials containing iron and an alkali metal, producing an iron-alkali-metal matte, and a slag carrying less than five per cent. of ferrous oxid.

3. The process of recovering lead from compounds containing lead and sulfur which consists in smelting with materials containing iron and an alkali metal, producing metallic lead, and iron-alkali-metal matte, and a slag carrying less than five per cent. of ferrous oxid.

4. The process of recovering lead from compounds containing lead and sulfur which consists in smelting with materials containing iron and sodium, producing metallic lead, and an iron-sodium matte, and a slag containing less than two per cent. of ferrous oxid.

5. The process of recovering lead from compounds containing lead and sulfur which consists in smelting with compounds of iron and sodium, carbon, a basic compound of at least one of the metals iron and sodium, producing metallic lead, and iron-sodium matte,

and a slag containing less than two per cent. of ferrous oxid.

6. The process of recovering lead from compounds of lead and sulfur which consists in smelting with carbon, basic compounds of iron and of sodium, producing metallic lead, and an iron-sodium matte, and a slag containing less than two per cent. of ferrous oxid.

7. In the process of recovering lead from compounds of lead and sulfur by smelting with compounds of iron and an alkali metal to produce metallic lead and a light metal-iron matte, and a slag containing less than two per cent. of ferrous oxid, producing in the first place a slag with over two per cent. of ferrous oxid, and treating the slag at a smelting temperature with addition of sulfur compounds to form further quantities of alkali-metal-iron matte and a slag containing less than two per cent. of ferrous oxid.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ANSON G. BETTS.

Witnesses:

MARY BATES PARKS,
M. B. BARNHEIL.