

S. B. LADD.
METHOD OF SMELTING SULFID ORES.
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1,035,608.

Patented Aug. 13, 1912.

Fig. 1.

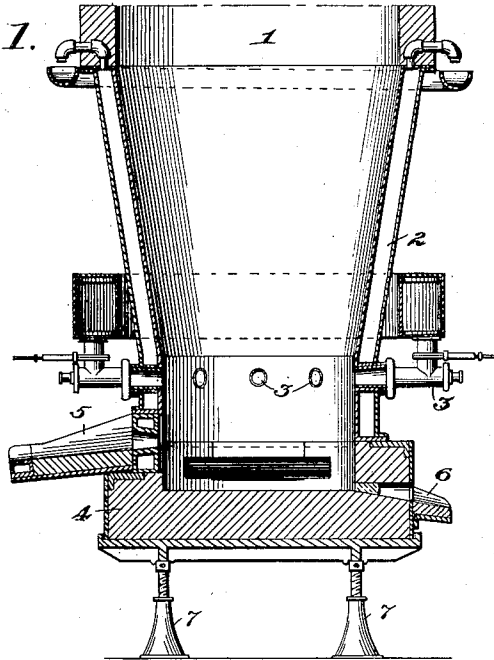
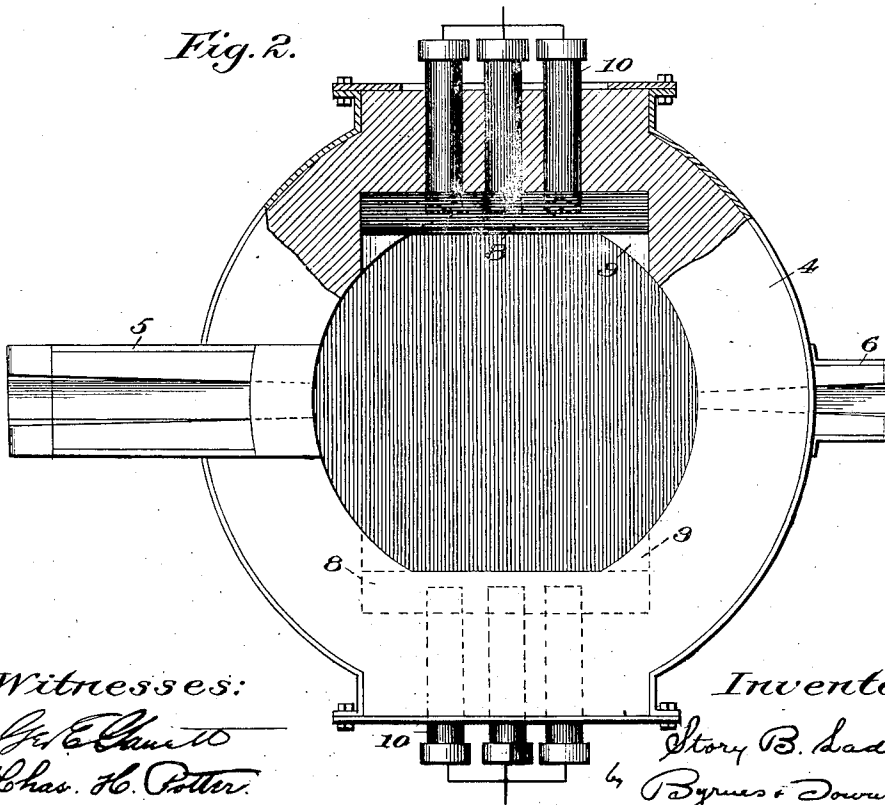


Fig. 2.



Witnesses:

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UNITED STATES PATENT OFFICE.

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METHOD OF SMELTING SULFID ORES.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, STORY B. LADD, a citizen of the United States, residing at Washington, in the District of Columbia, have
5 invented certain new and useful Improvements in Methods of Smelting Sulfid Ores, of which the following is a specification.

This invention is a method of smelting sulfid ores, and more particularly pyritic
10 ores containing copper.

The object of the invention is to effect the smelting of such ores and to maintain the heat necessary for the oxidation of sulfur and iron with the use of only such proportion of carbon for this purpose as considerations of economy may render desirable. According to the preferred form of my invention such additional heat as may be necessary to maintain the proper temperature
15 conditions for the smelting is electrically developed in the molten bath beneath the charge.

For a full understanding of my invention reference is made to the accompanying
25 drawings showing one form of furnace for carrying the method into effect, wherein:

Figure 1 is a central vertical section of the furnace; and Fig. 2 is a transverse section through the hearth, on an enlarged
30 scale.

Referring to the figures, the smelting furnace 1 is represented as of the usual form, having a water-jacketed bosh 2 and the usual twyers 3. The hearth 4 is provided
35 with a flowing tap 5 for slag and matte and a tap 6 through which molten products may be completely discharged. The furnace is illustrated as mounted on adjustable supports 7.

In the form of furnace shown the electrical heating means comprises oppositely disposed electrodes 8 of carbon or graphite, shown as supported in recesses 9 in the walls of the hearth and somewhat above its base; these electrodes are connected with a suitable source of current by graphite rods 10 having a sufficient cross section to convey the required current without undue heating. The current employed may be either
40 alternating or direct, the former being preferred as avoiding undesirable electrolytic effects.

In operation the pyritic charge is supplied to the furnace, with addition of carbon in
55 the form of coke, and admixed with the

usual siliceous flux unless the ore is sufficiently siliceous to enable the flux to be dispensed with; and the oxidation is effected by an air blast, preferably a hot blast, through the twyers. Sufficient current is transmitted between the electrodes 8, through the molten bath below the tap 5, to complete the smelting, the heat from the electric furnace also passing up through the charge and being completely utilized in the roasting of
60 the ore in the stack.

The above described method presents several definite advantages as follows:

1. It permits the smelting to be accomplished with only such proportion of carbon as it may be desirable to use in the interest of economy. This effects a decided improvement in the character of the resulting matte, for carbon monoxid derived from carbon acts to reduce both ferrous oxid and sulfid
70 dioxide and thereby to increase the percentage both of iron and sulfur in the matte, the percentage of copper being correspondingly reduced.

2. It provides a zone of highest heat at the base of the stack below the twyers; hence unfused material passing the zone of fusion just above the twyers is fused by the augmented heat from the bath. The furnace is thus cleared and the feed accelerated.
80

3. By increasing or reducing the current through the bath the temperature of the furnace can be held under complete control; this is especially important in pyritic smelting by reason of the low calorific value of iron and sulfur and the consequent sensitivity of the furnace to changes of temperature.
85

4. In case it becomes necessary to bank the furnace, it can be readily held banked by shutting off the blast and maintaining the necessary temperature by the current.

The development of heat by the passage of the electric current through the molten bath as distinguished from those forms of arc or incandescent heating which provide local centers of high temperature, is highly advantageous in the practical smelting of sulfid ores for the production of matte as distinguished from a metallic product, in that it is possible to avoid the reduction of the more refractory ore constituents, and also the local production of mattes which are so rich in metal content as necessarily to
100 105 110

involve the production of rich slags with the losses attendant upon the production of such slags.

I claim:

- 5 The process of smelting sulfid ores to produce matte, which consists in smelting the ore by means of an air blast, in conjunction with a carbonaceous fuel, above a molten bath of matte and slag, and uniformly heating the cross sectional area of said bath and supplying heat to the charge by pass-
- 10

ing an electric current through the molten bath, whereby the formation of centers of high temperature and the reduction of refractory constituents of the charge is avoided, substantially as described. 15

In testimony whereof, I affix my signature in presence of two witnesses.

STORY B. LADD.

Witnesses:

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