Jan. 29, 1929. 1,700,515

G. W. PRINCE

METHOD OF SMELTING ORES IN REVERBERATORY FURNACES

Original Filed July 23, 1926

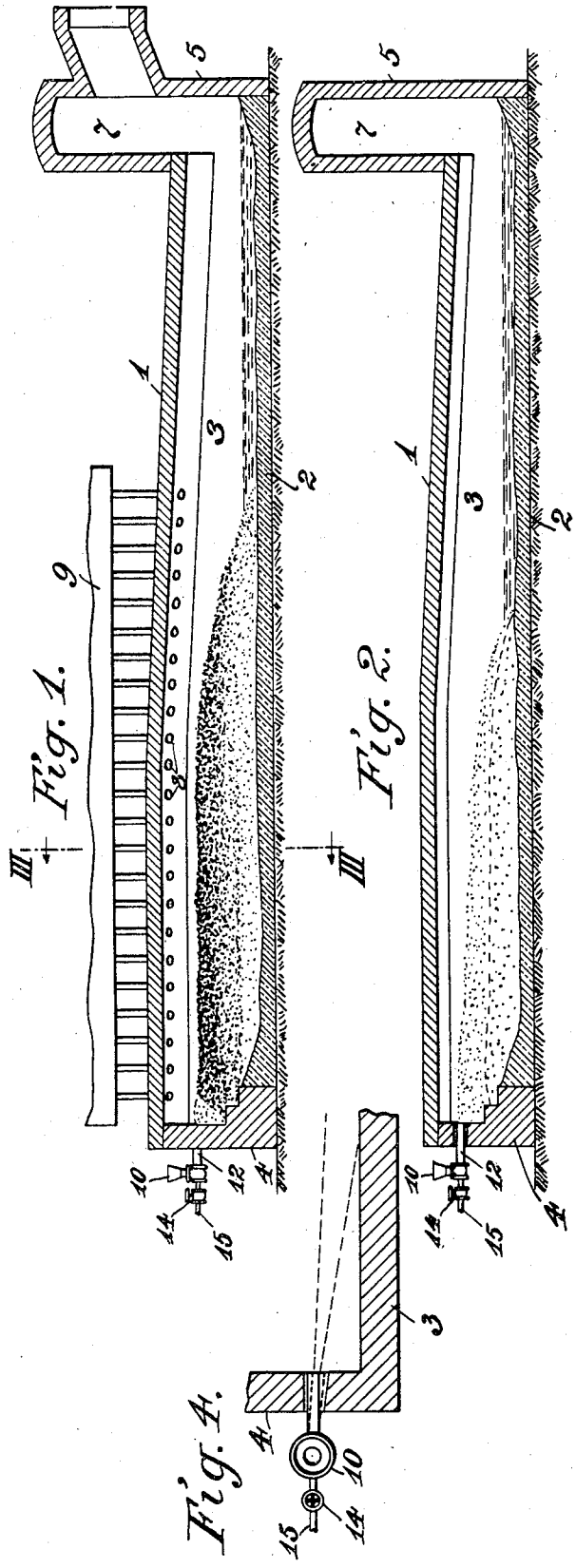


Fig. 1.

Fig. 2.

Fig. 4.

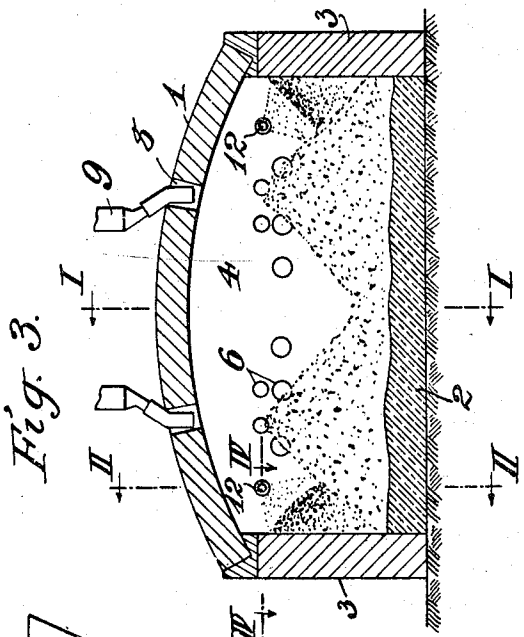


Fig. 3.

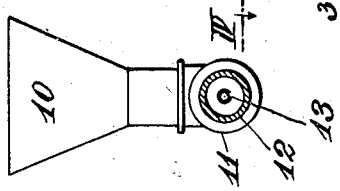


Fig. 6.

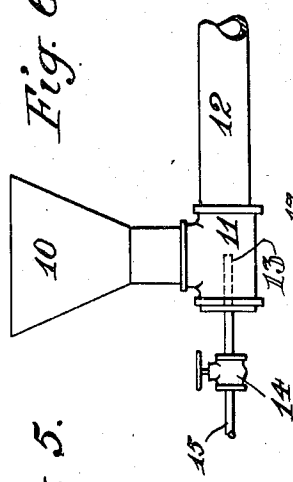


Fig. 5.

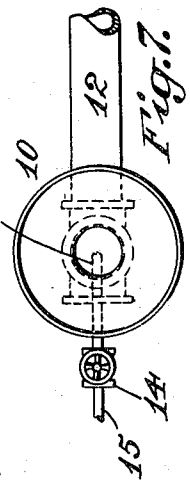


Fig. 7.

INVENTOR

George W. Prince

BY

Thomas Durand

ATTORNEYS

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UNITED STATES PATENT OFFICE.

GEORGE W. PRINCE, OF CLEMENCEAU, ARIZONA, ASSIGNOR TO UNITED VERDE EXTENSION MINING COMPANY, OF NEW YORK, N. Y., A CORPORATION OF DELAWARE.

METHOD OF SMELTING ORES IN REVERBERATORY FURNACES.

Original application filed July 23, 1926, Serial No. 124,457. Divided and this application filed October 28, 1927. Serial No. 229,440.

The object of my invention is to effectually protect the side walls of the furnace chamber from the deleterious action of the smelting ore and the extreme heat generated in the furnace chamber by supplying the fettling or other protective material, such as siliceous ore, to the sides of the furnace chamber from means such as fluid pressure guns located in the firing end wall of the furnace chamber, said means being preferably regulable both as to pressure and direction so that the material can be supplied in the desired quantities and at the desired points along the said side walls of the furnace chamber where the material will effectually protect the side walls. Some of the advantages to be obtained are:—The ability to regulate the amount of fettling material supplied to the side walls by varying the fluid pressure; the ability to supply the fettling material to the desired points along the side walls by changing the direction of the incoming material; the great saving in the expense of protecting the side walls by the elimination of special type of bricks; and the great increase in the life of the furnace and the saving in the expense of maintenance of the furnace, by eliminating the fettling holes through the side walls and arch of the furnace, which holes materially weaken the furnace structure.

Another advantage is the ability to use increased quantities of siliceous ores as the fettling material, because I can carry a higher percentage of silica in the charge, to economically produce a more siliceous slag than where the same amount of siliceous ores is added directly to the charge.

In the accompanying drawings:

Fig. 1 represents a longitudinal vertical section taken through a reverberatory furnace embodying the means for carrying out my invention, the section being taken in the plane of the line I—I of Fig. 3, looking in the direction of the arrows.

Fig. 2 represents a similar section taken in the plane of the line II—II of Fig. 3, looking in the direction of the arrows.

Fig. 3 represents on an enlarged scale a transverse vertical section through the furnace, taken in the plane of the line III—III of Fig. 1, looking in the direction of the arrows.

Fig. 4 represents a detail longitudinal horizontal section taken in the plane of the line IV—IV of Fig. 3.

Fig. 5 represents a side view of the gun for blowing the fettling material into the furnace chamber and along the side walls thereof, from the firing end wall of the furnace chamber.

Fig. 6 represents an end view of the gun.

Fig. 7 represents a top plan view of the gun.

The arch of the reverberatory furnace is denoted by 1, the bottom by 2, the side walls by 3, 3, the firing end wall by 4 and the flue end wall by 5. This furnace may be provided at its firing end with the usual nozzles 6 for the introduction of the heating medium and at its other end with the usual flue or uptake 7.

In the present instance where two longitudinal mounds of smelting ore are to be formed and maintained on the floor of the furnace chamber, the arch 1 is provided with two longitudinal rows of closely spaced passages 8, the rows being spaced about equally distant from each other and from the side walls, through which passages the smelting ores are fed in from hoppers 9 communicating with any suitable feeding mechanism (not shown herein) in such a manner that longitudinal mounds of smelting ores are formed and maintained with the apices of the mounds spaced from each other and from the side walls of the furnace chamber.

The refractory or fettling material as, for instance, siliceous ore, is supplied to the spaces between the mounds of smelting ore and the side walls of the furnace chamber to protect the side walls from the deleterious action of the smelting ores and the intense heat in the furnace chamber.

The means which I have shown for supplying the fettling material comprises fluid pressure guns located in the firing end wall of the furnace chamber adjacent the side walls of the said chamber. Each gun is shown as comprising a hopper 10 for receiving the fettling material, which hopper communicates with an L-coupling 11 provided with a horizontally arranged barrel 12 which projects through the firing end wall 4 adjacent one of the side walls 3. A fluid pressure supply nozzle 13 is located within the coupling 11 so as to blow the fettling material fed from the hopper 10 outwardly through the barrel

12 into the space between the mound of smelting ore and its adjusting side wall 3 of the furnace. A valve 14 is located in the fluid pressure line 15 for regulating the amount of fettling material blown from the gun by varying the fluid pressure. Furthermore, the fettling material blown from the gun may be directed to the desired points along the side wall by changing the position of the gun to the required adjustment.

From the above description it will be seen that the guns are regulable both as to pressure and direction, so that the fettling material may be supplied in the desired quantities and at the desired points along the side walls of the furnace chamber. By locating the guns in the firing end wall of the furnace chamber, I am enabled to eliminate the usual holes in the side walls of the furnace chamber and in the arch, which holes not only materially weaken the structure of the furnace but also shorten its effective life. By this arrangement I am also enabled to eliminate the necessity of providing special heat resisting bricks which are very expensive.

Furthermore, by this invention I am enabled to use increased quantities of siliceous ores where siliceous ores are used as the fettling material, as it is possible to carry a higher percentage of silica in the total charge and to economically produce a more siliceous slag by my method than where the same amount of siliceous ore is added directly to the charge, thereby obtaining a material saving in the cost of the flux.

Furthermore, it will be seen that there will be a material saving in the cost of operation.

Also by the use of fluid pressure devices located at the firing end of the furnace chamber for placing the fettling material along the side walls of the chamber, the smelting ore may be fed through the arch at a distance from its side walls, thereby forming longitudinal mounds spaced from the side walls whereby the smelting of the ore is greatly expedited because of the greater area of the ore being exposed to the heating medium.

Furthermore, the placing of the smelting ore and fettling material in the furnace chamber as herein described causes a uniform wearing effect on the arch as distinguished from those furnaces where the charge is fed into the furnace chamber adjacent its side walls and remains along the same.

The apparatus shown and described but not claimed herein forms the subject matter of my copending application filed July 23, 1926, Serial No. 124,457, of which this is a division.

What I claim is:—

1. In the method of smelting ores in reverberatory furnaces, depositing the smelting ore along the bottom of the furnace chamber from points spaced from the side walls thereof and blowing fettling material from the firing end wall of the furnace chamber into the spaces between said smelting ore and side walls of the furnace chamber, to protect the side walls from the action of the smelting ore and the intense heat in the furnace chamber.

2. In the method of smelting ores in reverberatory furnaces, depositing the smelting ore along the bottom of the furnace chamber from points spaced from the side walls thereof and blowing fettling material from the firing end wall of the furnace chamber into the spaces between said smelting ore and side walls of the furnace chamber at predetermined points along the same, to protect the side walls from the action of the smelting ore and the intense heat in the furnace chamber.

3. In the method of smelting ores in reverberatory furnaces, depositing the smelting ore along the bottom of the furnace chamber from points spaced from the side walls thereof and blowing fettling material from the firing end wall of the furnace chamber into the spaces between said smelting ore and side walls of the furnace chamber in regulable quantities, to protect the side walls from the action of the smelting ore and the intense heat in the furnace chamber.

4. In the method of smelting ores in reverberatory furnaces, depositing the smelting ore along the bottom of the furnace chamber from points spaced from the side walls thereof and blowing fettling material from the firing end wall of the furnace chamber into the spaces between said smelting ore and side walls of the furnace chamber at predetermined points along the same and in regulable quantities, to protect the side walls from the action of the smelting ore and the intense heat in the furnace chamber.

In testimony, that I claim the foregoing as my invention, I have signed my name this 22 day of October, 1927.

GEORGE W. PRINCE.