

No. 854,766.

PATENTED MAY 28, 1907.

W. H. SMYTH.  
ORE ROASTING FURNACE.  
APPLICATION FILED SEPT. 29, 1903.

2 SHEETS—SHEET 1.

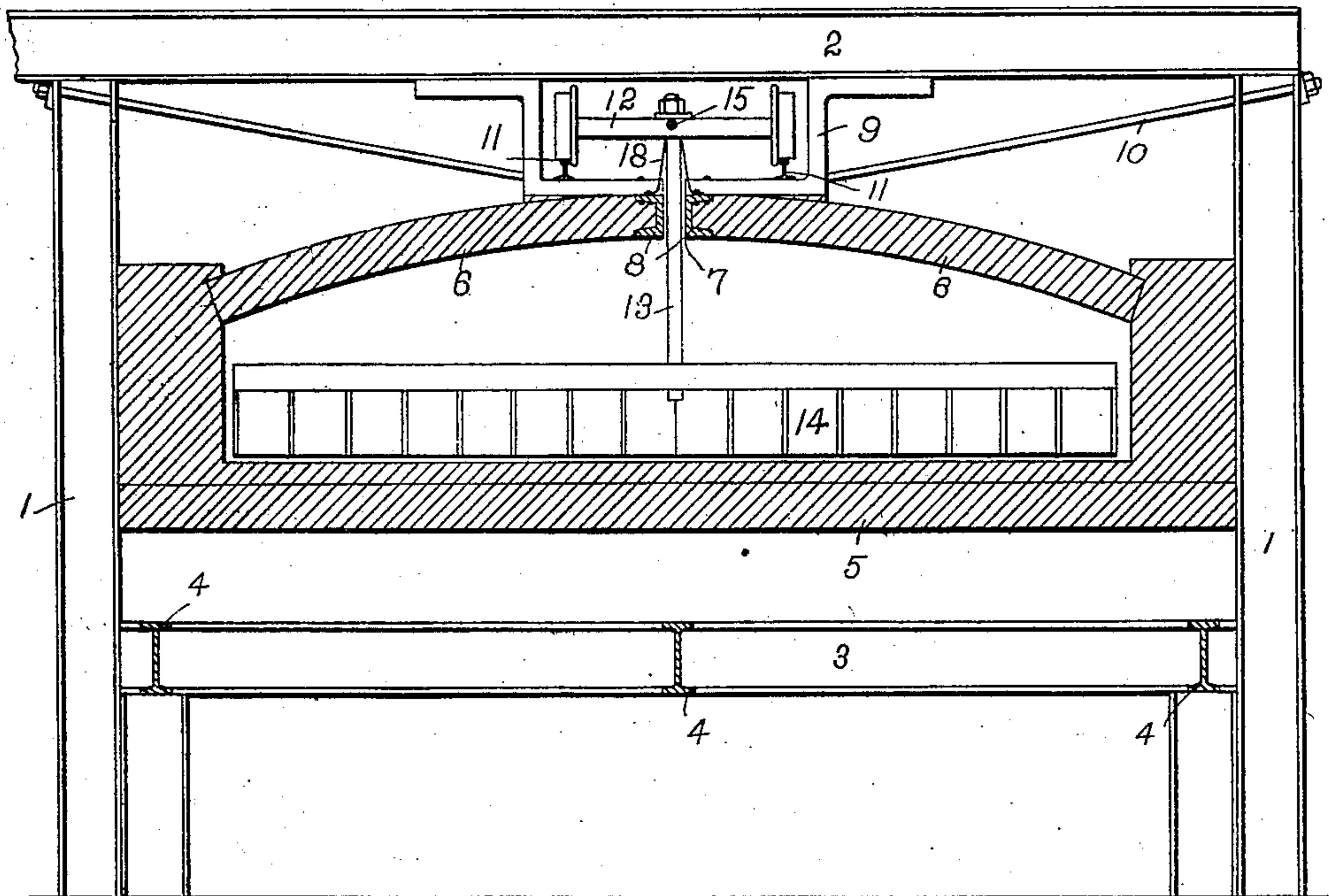


Fig. 1.

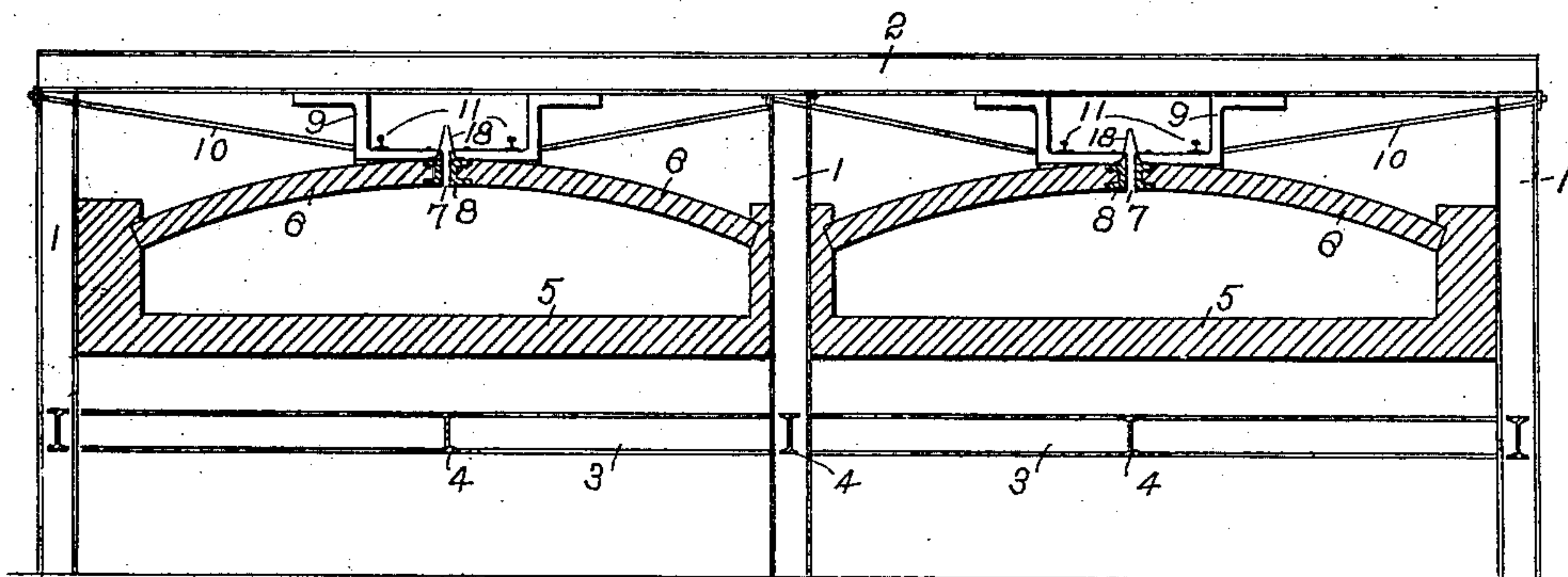


Fig. 2.

Witnesses:

Jesse P. Off.  
Wm. H. White

Inventor:

William H. Smyth.

No. 854,766.

PATENTED MAY 28, 1907.

W. H. SMYTH.  
ORE ROASTING FURNACE.  
APPLICATION FILED SEPT. 29, 1903.

2 SHEETS—SHEET 2.

Fig. 4.

Fig. 3.

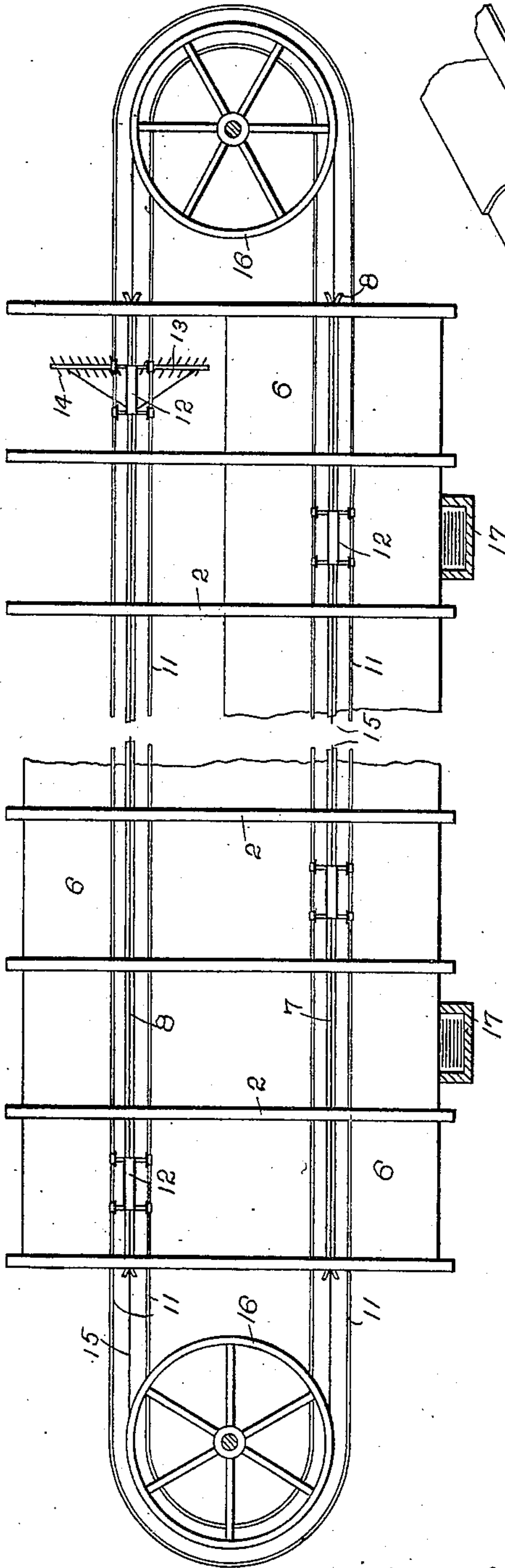
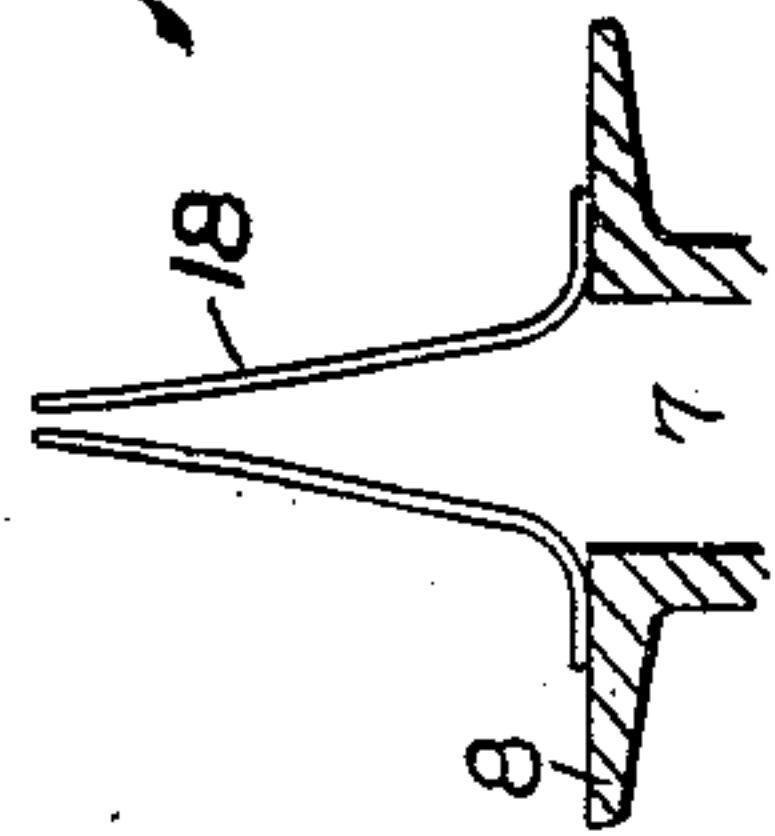
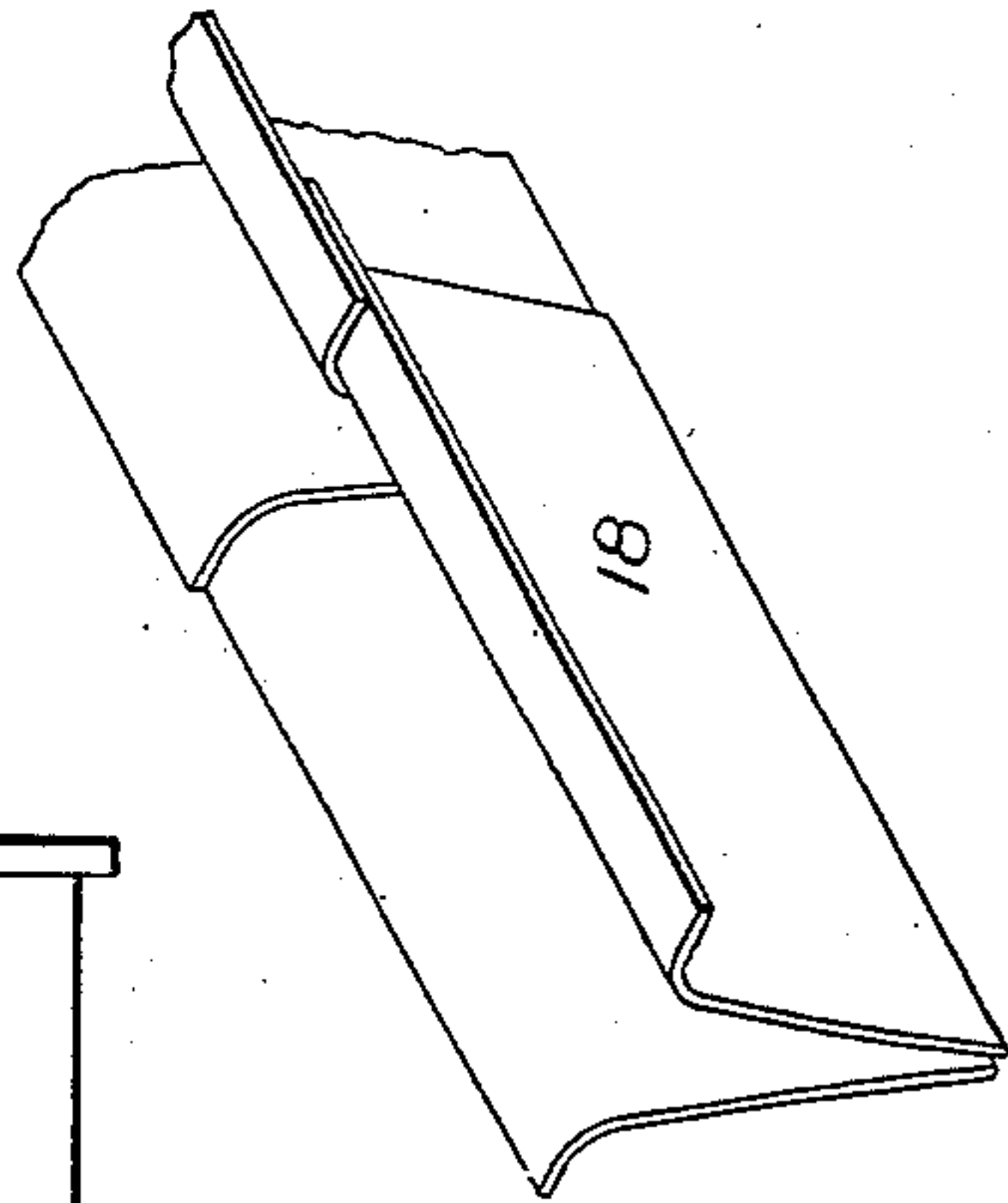


Fig. 6.

Fig. 5.



Witnesses:

Jesse R. Poff.  
Jm R White

Inventor:

William H. Smyth



# UNITED STATES PATENT OFFICE.

WILLIAM H. SMYTH, OF BERKELEY, CALIFORNIA.

## ORE-ROASTING FURNACE.

No. 854,766.

Specification of Letters Patent.

Patented May 28, 1907.

Original application filed March 12, 1901, Serial No. 50,868. Divided and this application filed September 29, 1903.  
Serial No. 175,084.

*To all whom it may concern:*

Be it known that I, WILLIAM H. SMYTH, a citizen of the United States, residing at Berkeley, in the county of Alameda and State of California, have invented certain new and useful Improvements in Ore-Roasting Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the same.

This invention relates to ore roasting furnaces.

This application is a division of my application filed March 12th, 1901, Serial No. 50,868 having particular reference to the form illustrated in the upper part of Fig. 2 thereof. That is to say, that portion of the figure which illustrates a slotted roof furnace.

It has for its object a more efficient form of furnace than those at present employed.

It also has for its object such a construction of furnace as will permit of the rabble supporting and driving mechanism being located wholly without the furnace out of range of the destructive fumes and heat of the furnace.

It has for another object such a construction as will permit of a more economical utilization of the rabbling mechanism and the power necessary to operate them.

Another object is to provide such a construction as will permit equally free and unrestricted access to the driving mechanism and to the rabble carriers at all points of their travel, without inconvenience from the heat of the furnace.

Still another object is illustrated in the provision whereby the rabble carrying mechanism may effect the travel of the rabbles within the furnace by connections through the roof of the furnace without undue loss of heat or intrusion of an excess of the cold outside air.

A further object is to provide such a construction as will avoid disarrangement of alinement in the slot or between it and the track, caused by unequal lateral expansion of the brick work or other disturbing influence.

These objects are accomplished by means of the devices illustrated in the accompanying drawings in which:—

Figure 1 is a sectional elevation of a single hearth furnace. Fig. 2 is a sectional eleva-

tion of a double hearth furnace. Fig. 3 is a plan view on a smaller scale of the furnace shown in Fig. 2. Fig. 4 is a plan view on the same scale, of Fig. 3, a portion of the brick work being omitted. Fig. 5 is an enlarged detail in end view of a slot closing device. Fig. 6 shows a perspective view of the slot closing device shown in Fig. 5.

Referring to the drawings, I preferably construct this furnace with a metallic frame or skeleton upon which the brick work of the furnace is built wholly or in part. This metallic frame work or skeleton consists preferably as shown in the drawings, of a series of frames which transversely surround and tie the furnace structure together, portions of the frame forming legs or supports which raise the furnace proper from the ground as shown in Figs. 1 and 2.

1—1 are vertical standards tied together by transverse beams or ties 2 and 3 respectively above and below the furnace. The frames thus constituted may be longitudinally tied by lengthwise beams or ties 4 or other suitable connections. The floor or hearth 5 of the furnace is supported directly, or indirectly, upon the beams 3.

The roof is formed of two longitudinal sections 6—6 separated from each other by a longitudinal slot 7. The slot 7 is preferably lined on its sides with metallic walls formed of longitudinal members 8 which are secured to the transverse beams 2 through the intervention of vertical members or brackets 9 or the like. Holding members 10 connect the side beams 1 with the vertical members 9 and parts 8. Each section forming the roof of the furnace is formed of an independent arch member, one of whose abutments is the side wall or frame of the furnace and the other a thrust or key member 8 which as shown, may form one side of the slot 7. The arch between the slot and the side of the furnace may be of any suitable character, either as to degree of curvature or relative heights of its abutments.

Suitably supported above the roof are tracks or rails 11 upon which run trucks or carriages 12. The tracks 11 are preferably secured directly or indirectly to and are supported by the metallic frame or skeleton. Depending from each of the carriages 12 is a bar or arm 13 passing through the slot, to the interior of the furnace. To this bar or



arm 13 are connected rakes or rabbles 14 arranged to stir, move or agitate the ore upon the hearth. A cable 15 or other suitable funicular connection is provided, to which the rabble carriages are attached. A pulley or sheave 16 is located at each end bight of the cable. One or both of these pulleys may be connected to suitable power devices to cause the rope with its attached trucks and rabbles to travel longitudinally of the furnace.

17 represents a fire box or other suitable heating device whereby the roasting of the ore is effected.

To prevent undue escape of the heated gases through the slot, there is provided slot closing means consisting of devices which normally close the slot but which permit the passage of the rabble carrying bar by moving out of its path and returning to their normal position after the passage of the bar. The devices I have shown for this purpose consist of plates or the like attached at one end to the side of the slot, the unattached end being free to move transversely across the slot. In order to avoid joints and such like complications, I have shown these slot closers as being flexible plates 18, disposed scalewise, though they may be of any suitable construction.

Any suitable means for closing the furnace exit and entrance may be employed, such as are common in this general type of furnace.

So far as concerns the single hearth furnace both stretches of the endless band may travel in either a horizontal or vertical plane as may be deemed expedient by the constructor or may best serve the convenience of the location of the furnace; both of these forms are shown in my application filed March 12th, 1901; Serial No. 50,868. Where ground room permits, I prefer to have both stretches of the endless cable in the same horizontal plane, as this allows of the ready change of the structure into a multiple hearth furnace which is constructed as follows:—Longitudinally adjacent and preferably adjoining and in the same structure is a similar furnace to that described. This is so arranged that a parallel stretch of the cable passes correspondingly above its roof as illustrated in Fig. 3. The tracks which serve for the rabble carriers for both members of this multiple hearth furnace, are suitably connected at their ends by curved sections so that the rabble carriages may pass above one furnace, around and above the adjacent one whereby the rabbles are transferred from one furnace to the other.

By the construction hereinbefore described, it will be seen that the rabble carrying mechanism is at all times open and accessible to inspection and repair. The arrangement of the two portions of the multiple furnace as shown, bring about very de-

sirable features of economy, in that the travel of the rabbles during the return half of their journey is utilized. The capacity of the furnace is thus practically doubled without any addition to the moving parts of the construction, at least so far as concerns the rabbling of the ore. The multiple arrangement also permits the discharge of ore from the furnace at practically the same point at which it entered. It also permits in the same structure and with the same rabbling mechanism of different temperatures being maintained in the furnace or other different and independent treatment of ores on the rabbling floors without interruption of a continuous process. Also by the arrangement and construction heretofore described, the slot and rails being in the same metallic structure and practically independent of the brick work, they are maintained in correct relative alinement, thus avoiding a serious practical difficulty and increasing the effective life of the carriage or trucks and the rabbling mechanism generally.

What I claim is:—

1. In an ore roasting furnace, an arched roof provided with a slot the full length thereof intermediate of its sides and means adapted to support the arch.

2. In an ore roasting furnace, a roof provided with a slot the full length thereof intermediate of its sides and a series of gates movable transversely of the slot.

3. An ore roasting furnace, the roof of which is longitudinally slotted intermediate of its sides, rabbles or stirrers in the furnace and longitudinally traveling means, supported upon tracks, to which the rabbles or stirrers are attached, said means passing through the slot.

4. An ore roasting furnace, the roof of which is longitudinally slotted intermediate of its sides, traveling rabbles or stirrers in the furnace and moving means projecting through said slot to which the rabbles or stirrers are attached and a series of gates movable transversely of the slot in the path of the moving means.

5. An ore roasting furnace, the roof of which is longitudinally slotted intermediate of its sides, rabbles or stirrers in the furnace and means projecting through said slot to which the rabbles or stirrers are attached and means adapted to close the slot consisting of overlapping plates.

6. An ore roasting furnace, the roof of which is longitudinally slotted intermediate of its sides, rabbles or stirrers in the furnace and means projecting through said slot to which the rabbles or stirrers are attached and means adapted to close the slot consisting of flexible overlapping plates.

7. An ore roasting furnace of brick or the like having a multiplicity of roasting chambers, each slotted intermediate of its sides,



rabbles adapted to travel in said chambers, means projecting through the slots to effect the travel of the rabbles, means for transferring the rabble moving devices from one slot to another and means independent of the brick structure to maintain the alinement of the slots.

8. An ore roasting furnace having a hearth with a roof slotted longitudinally and plates or gates to the slot adapted to swing transversely thereof and a traveling rabble device adapted to pass through the slot.

9. An ore roasting furnace having a multiplicity of hearths with longitudinally slotted roofs and means adapted to close the slots consisting of overlapping plates.

10. An ore roasting furnace having a multiplicity of hearths with longitudinally slotted roofs and means adapted to close the slots consisting of flexible overlapping plates.

11. An ore roasting furnace comprising a roasting hearth, side walls provided with projections which form an arch over the hearth and provide a slot the full length thereof, stirring devices adapted to pass through said slot and consequently the furnace from end to end, and means for transferring said devices in, through and out of the furnace.

12. In an ore roasting furnace having rabbles, a roof longitudinally slotted intermediate of its sides, traveling means projecting through the slot adapted to effect the travel of the rabbles and means adapted to reduce the width of the slot consisting of plates or the like lying across the slot in the path of the rabble moving means and attached by one edge at one side of the slot, so arranged that the free edge is moved transversely across the slot by the rabble moving means.

13. In a device for roasting ores, a furnace having a hearth and a roof, the roof being formed of longitudinal sections separated from each other by a slot, a metallic frame work having a transverse member above the furnace and means attached thereto adapted to support the slot side of the roof sections.

14. In a device for roasting ores, a furnace chamber constructed of brick or the like having a roof slotted intermediate of its sides, rabbling devices adapted to pass into and through said furnace, tracks for the rabbling devices and a metallic skeleton or frame suitably arranged to form the support and attachment for the rabble tracks and slot independently of the brick structure whereby the tracks and slot are maintained in alinement.

15. The combination with a hearth having arches longitudinally of the roof thereof; a longitudinal slot through the roof between the arches, rabbles and longitudinally traveling means projecting through the slot for effecting their travel.

16. An ore roasting furnace comprising a roof formed of sections which are separated

from each other by a longitudinal slot, means for supporting each of the roof sections attached near the slot edge thereof, an arm provided with rabbles projecting through the slot and means for effecting the longitudinal travel of the rabbles.

17. In an ore roasting furnace, a roof formed of longitudinal arch sections separated from end to end by a slot.

18. In an ore roasting furnace, a roof formed of longitudinal arch sections separated from end to end by a slot and means adapted to close the slot.

19. In an ore roasting furnace, a roof formed of longitudinal arch sections separated from each other by a slot and means projecting through the slot for stirring and advancing the ore.

20. In an ore roasting furnace, a roof formed of longitudinal arch sections separated from each other by a slot, means projecting through the slot for stirring and advancing the ore and means adapted to close the slot.

21. An ore roasting furnace comprising a series of chambers arranged side by side, each having an ore roasting hearth with an arched roof, each chamber being provided with an opening or slot intermediate of its sides the full length thereof, rails above said hearths provided with curved portions to form a continuous track, devices for agitating and advancing the ore on said hearths, mounted upon the track and means adapted to transfer the agitating devices from one slot to another.

22. An ore roasting furnace comprising a series of chambers, each having an ore roasting hearth with an arched roof, each chamber being provided with an opening or slot intermediate of its sides the full length thereof, means for covering said slot to prevent the escape of gas, a series of stirrers passing through said slots for agitating and advancing the ore and means for transferring the stirrers from one slot to another.

23. An ore roasting furnace comprising a series of chambers, each having an ore roasting hearth with an arched roof, each chamber being provided with an opening or slot intermediate of its sides the full length thereof, stirring devices mounted in the furnace and passing through the openings and means for moving the devices through and above the furnace from one slot to another.

24. An ore roasting furnace of brick or the like comprising a series of chambers arranged longitudinally side by side, each having an ore roasting hearth with an arched roof, each chamber being provided with an opening or slot intermediate of its sides the full length thereof, stirring devices passing through said slots, means for passing said devices through and out of the furnace from one slot to another, tracks supporting said



devices and trucks mounted upon the tracks and connected to the devices and means independent of the brick structure to maintain the alinement of the slots with the tracks.

5 25. The combination with a hearth having arches longitudinally of the roof, a longitudinal slot through the roof between the arches, an arm provided with rabbles projecting through the slot and means for effecting the longitudinal travel of the arm and rab-  
10 bles.

26. An ore roasting furnace having a multiplicity of ore roasting chambers, each of which is slotted intermediate of its sides,  
15 stirring devices passing through the slots and means for passing said devices from one slot to another and a series of freely movable plates adapted to reduce the width of the slot and metallic means to maintain the  
20 alinement of the slots.

27. An ore roasting furnace comprising a series of hearths arranged side by side, arches above said hearths, each arch being provided with an opening or slot the full  
25 length thereof, rails above said hearths provided with curved portions to form a continuous track, devices for agitating and advancing the ore on said hearths, mounted upon the track, means adapted to pass said  
30 devices from one slot to another and means other than the arches to maintain the slot.

28. An ore roasting furnace comprising a series of hearths, arches provided with an opening or slot the full length thereof above  
35 the hearths, means for covering said slot to prevent the escape of gas, a series of stirrers passing through said slots for agitating and advancing the ore, and means for transfer-

ring the stirrers from one slot to another and means other than the arches to maintain the  
40 slot.

29. An ore roasting furnace comprising a series of hearths, arches above said hearths each provided with an opening the full length  
45 thereof, stirring devices mounted in the furnace and passing through the openings, and means for moving the devices through the furnace from one slot to another and means  
50 other than the arches to maintain the openings.

30. An ore roasting furnace, comprising a series of hearths, arches for said hearths provided with an opening or slot the full length  
55 thereof, stirring devices passing through said slots, means for passing said devices through and out of the furnace from one slot to another, tracks supporting said devices, and trucks mounted upon the tracks and connected to the devices and means other than  
60 the arches to maintain the slot.

31. An ore roasting furnace, comprising side walls, projections provided thereon and extending inward to form an arch and provide an opening or slot the full length of the  
65 furnace, a hearth below said arch, two sections of track supported in and upon the furnace to form a continuous track, and stirring devices mounted upon said track and adapted to pass through said slot out of and over  
70 the furnace, means adapted to transfer said device from one slot to another and means other than the arch to maintain the slot.

WILLIAM H. SMYTH.

Witnesses:

D. B. RICHARDS,  
JESSE R. EOFF.