No. 891,300. PATENTED JUNE 23, 1908.

W. H. SMYTH.

ORE ROASTING FURNACE.

APPLICATION FILED OCT. 28, 1903.

2 SHEETS—SHEET 1.

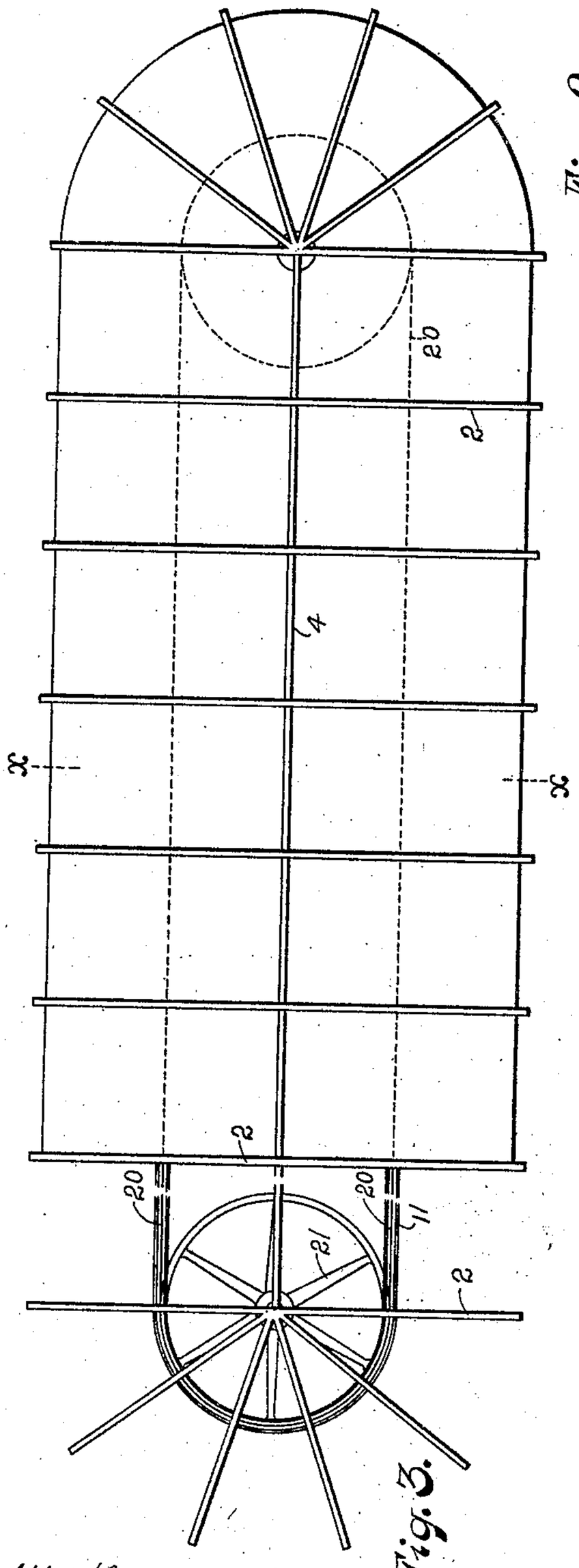

Fig. 2.

Fig. 3.

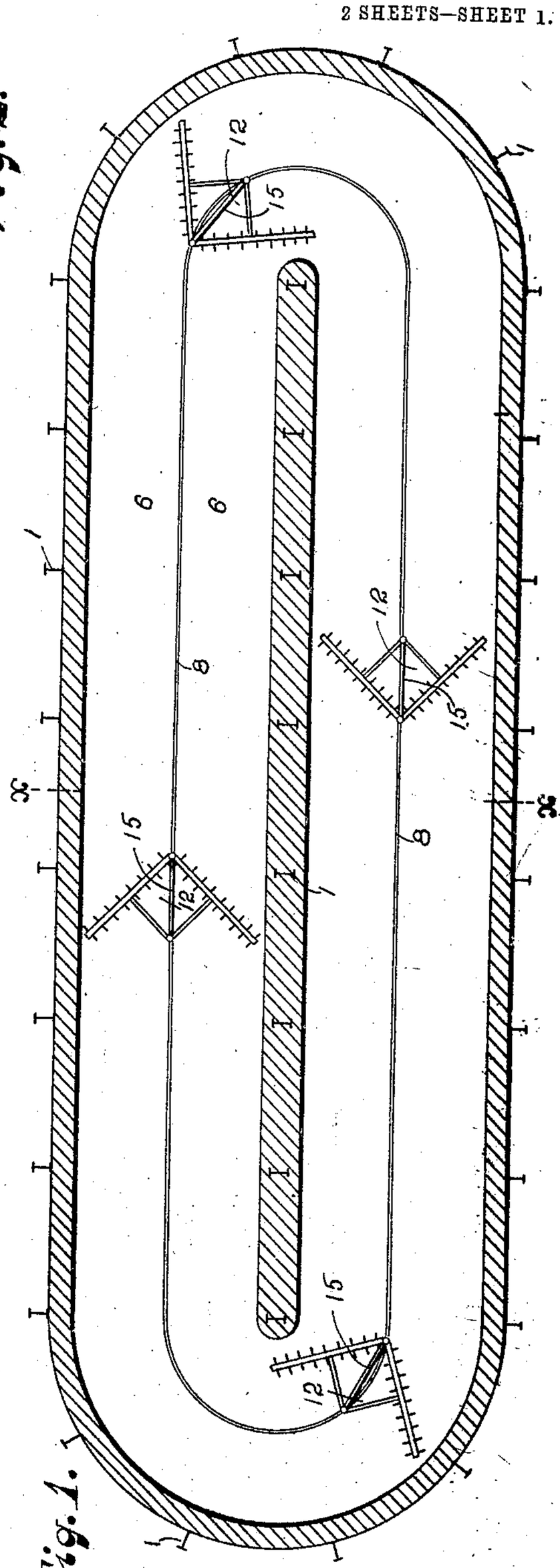

Fig. 1.

Witnesses:
Jesse R. Goff.
H. Wallbridge

Inventor:
William H. Smyth.

No. 891,300. PATENTED JUNE 23, 1908.

W. H. SMYTH.

ORE ROASTING FURNACE.

APPLICATION FILED OCT. 28, 1903.

2 SHEETS—SHEET 2.

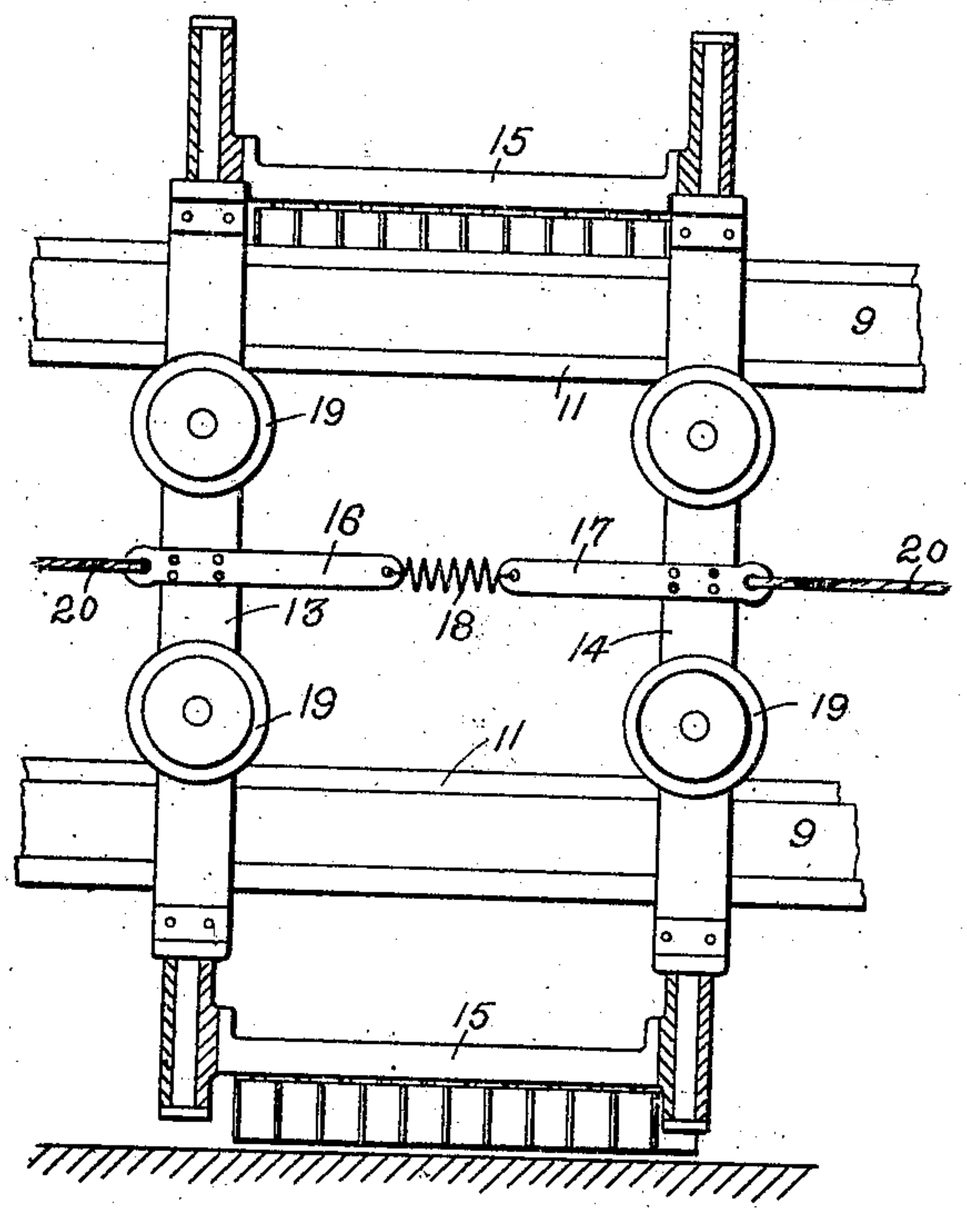

Fig. 4.

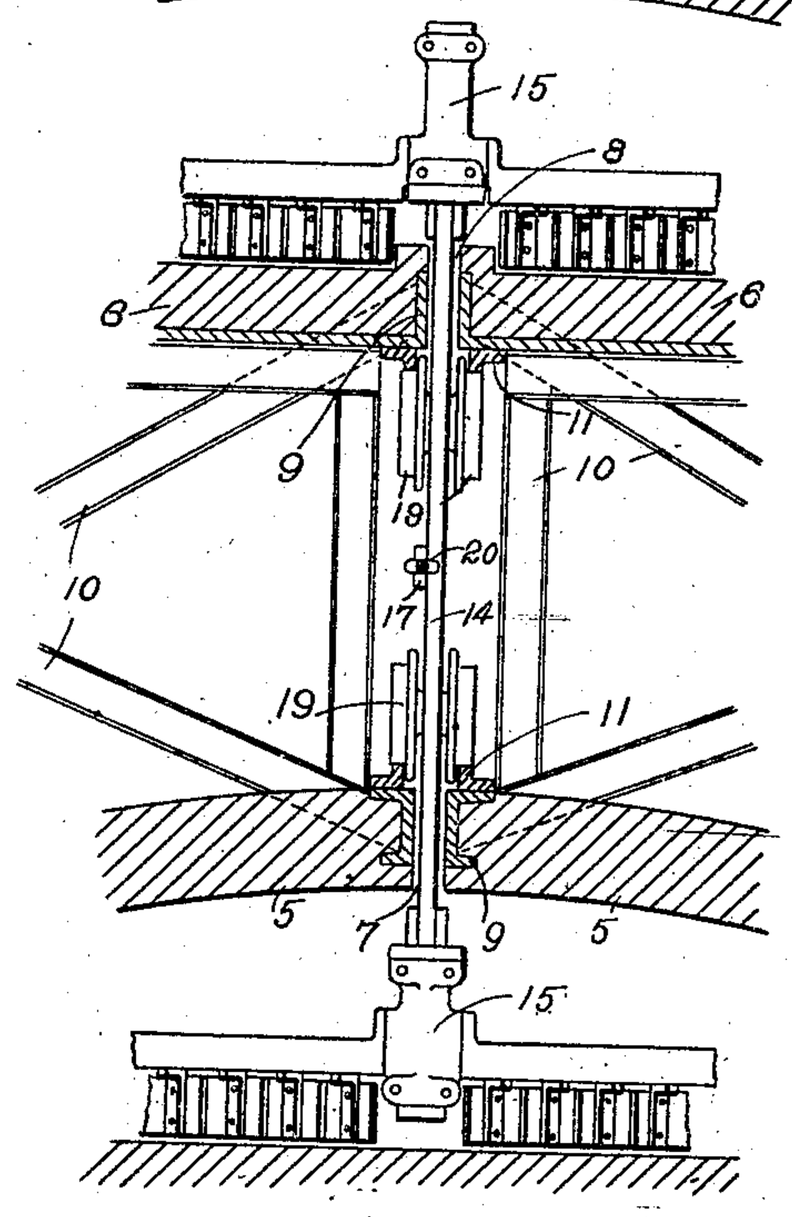

Fig. 5.

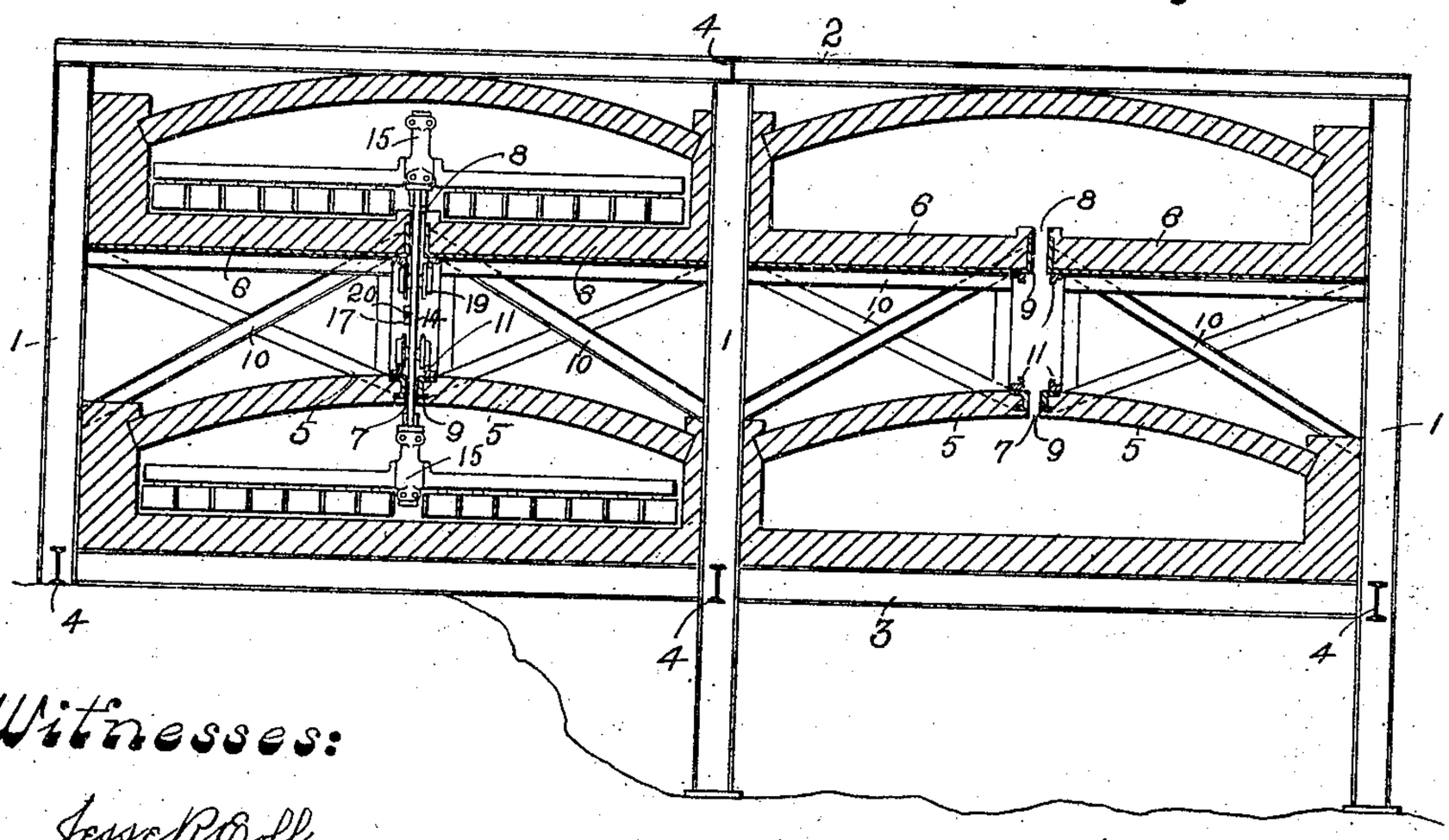

Fig. 6.

Witnesses:

Jesse R. Goff.

H. Wallbridge.

Inventor:

William H. Smyth.

UNITED STATES PATENT OFFICE.

WILLIAM H. SMYTH, OF BERKELEY, CALIFORNIA.

ORE-ROASTING FURNACE.

No. 891,300. Specification of Letters Patent. Patented June 23, 1908.

Application filed October 28, 1903. Serial No. 178,945.

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.

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

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

It also has for its object to provide 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.

It also has for its object a provision whereby the rabble carrying mechanism may effect the travel of the rabbles within the furnace by connections to the exterior of the furnace without undue loss of heat or intrusion of an excess of the cold outside air.

It also has for its object to provide a construction to 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.

It also has for its object a more economical construction of furnace both as regards material and floor space.

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

Figure 1 is a plan view in section of this invention. Fig. 2 is a plan view of a slightly modified form of the furnace having one of its ends open. Fig. 3 shows a plan of a power or rope wheel. Fig. 4 is a side view partly in section of the rabbles and their carriers, on a large scale. Fig. 5 is an end view of Fig. 3. Fig. 6 is a transverse section of either Figs. 1 or 2 on the line X X.

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 or skeleton consists preferably as shown in the drawings, of a series of frames which tie the furnace structure together, portions of the frame forming supports which may, or may not, raise the furnace proper from the ground as shown in Fig. 6.

The construction of this furnace is peculiarly adapted to multiple hearth furnaces and is especially adapted to the superimposing of hearths. For this purpose the roof of the lower furnace is slotted and the hearth immediately above it is slotted preferably to correspond with the slot in the roof. The hearth of the upper furnace is preferably separated slightly from the roof of the lower furnace, leaving a space for the rabble carrying mechanism which is common to both furnaces.

By a construction which will be more fully described hereinafter, the one rabble carrying mechanism may serve for four separate furnaces as may be indicated by Fig. 6 in connection with Fig. 4; or for two furnaces having endless hearths, Fig. 1; or two furnaces having U shaped hearths, Fig. 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 tied by lengthwise beams or ties 4 or other suitable connections. The floors or hearths of the furnaces are supported directly or indirectly upon the skeleton frame. The roof of the lower furnace and the hearth of the upper furnace are formed of two longitudinal sections 5—5 and 6—6 respectively, separated from each other by longitudinal slots 7 and 8 respectively. The slots 7 and 8 are preferably lined on each of their sides with metallic walls formed of longitudinal members 9 which are connected together and with the standards 1 through the intervention of suitable beams 10. In the present construction each of these beams 10 consist of a skeleton or lattice work secured at its outer end to the standards 1 and so formed as to provide for and act as a support for the section 5—5 and 6—6 respectively.

Suitably supported between the furnaces are tracks or rails 11 upon or between which run trucks or carriages 12 of peculiar construction. The tracks 11 are preferably secured directly or indirectly to and are sup-

ported by the metallic frame or skeleton. The carriages 12 preferably consist of two vertical supports 13 and 14 respectively each adapted to pass through the slots 7 and 8 to the interior of the furnaces, as shown. At each end of the vertical supports 13 and 14 is pivotally secured a rabble carrying member 15, which member also serves to tie 13 and 14 together thus forming a complete rabble supporting frame common to both upper and lower furnaces. The vertical supports 13 and 14 are preferably connected by a flexible or jointed connection, shown in the present instance as two bars or links 16 and 17 connected by means of a spring 18. Suitable bearing wheels 19 are provided, which support the rabble frame upon the tracks. By this peculiar construction of the rabble carriages extremely desirable results are produced which will be more fully described hereinafter.

A cable 20 or other suitable funicular connection is provided, to which the rabble carriages are attached. One or more pulleys or sheaves 21 are located at each end bight of the cable. A suitable power device is provided which may be represented by one of these pulleys to effect the travel of the rope and its attached trucks and rabbles.

I do not deem it necessary to describe at length the construction or arrangement of the heating fire boxes or flues of the furnace as these may be of the ordinary forms and within the knowledge of mechanics skilled in the art and are not specifically involved in this invention. Any suitable means for closing the furnace exit and entrance may be employed and also means for feeding and discharging the ore.

Though I have shown in Fig. 1 a continuous hearth furnace with round ends and parallel stretches, it is not essential to this invention to so construct it. Either the round ends of the hearth may be omitted, or the parallel stretches may be omitted, or one of the round ends may be omitted as indicated in Fig. 2 with Fig. 3.

In the form suggested in which the brick work is omitted from both the circular ends, the furnace would then be practically a nest of four longitudinally adjacent and practically independent furnaces.

It is owing to the peculiar construction of the rabble carriages that this Fig. 1 or Fig. 2 form of furnace is possible or practical in that the rabble carrying and supporting bars can pass around a short curve without widening of the slot at the end curves. It also permits of a thinner rabble supporting bar on account of the closeness of the tracks to the rabbles and so allows the use of so narrow a slot as to avoid the necessity, in most instances, of anything in the form of slot closers. The swiveling of each vertical member 13 and 14 on its own vertical axis brings the wheel base of the truck to line contact, so that the truck can practically turn on any radius, no matter how small.

Though the construction herein, has been described and shown as representing superimposed hearth furnaces, it is applicable where the hearths are not superimposed.

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 desirable 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 more than doubled without any addition to the moving parts of the construction, at least so far as concerns the rabbling of the ore, and where the furnaces are superimposed as shown in Fig. 6, the capacity is quadrupled. 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 ore 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.

It thus is seen that a furnace constructed as shown in Fig. 1 would occupy the least possible ground room for the amount of hearth surface and by the construction of the rabble mechanism, but one rope and power connection is necessary to effect the rabbling of both hearths or of four hearths if the furnace is constructed with the hearths separate.

This form of furnace also permits of other useful modifications in which the ends may serve as cooling hearths and in fact, many changes and modifications may be made to adapt the furnace to the varying conditions of use without departing from the essential nature of the invention.

What I claim is:—

1. An ore roasting furnace having a hearth formed in two substantially parallel stretches the adjacent edges of which are structurally unseparated, a slot in each of the stretches intermediate of the sides thereof the slot being joined by a curved slot continuation, rabbling devices in the furnace and means projecting through the slots to effect their travel.

2. An ore roasting furnace having a hearth formed in two substantially parallel stretches the adjacent edges of which are structurally unseparated, a slot in each of the stretches intermediate of the sides thereof the slots being joined by a curved slot continuation at each end, rabbling devices in the furnace and means projecting through the slots to effect their travel.

3. An ore roasting furnace of brick or the like having a hearth formed in two substantially parallel stretches the adjacent edges of which are structurally unseparated, a slot in each of the stretches intermediate of the sides thereof the slots being joined by a curved slot continuation at the end, rabbling devices in the furnace and means passing through the slot to effect their travel, tracks for the rabbling devices and a metallic skeleton or frame arranged to form the support and attachment for the rabble-track and slots independent of the brick structure whereby the tracks and slots are maintained in alinement.

4. An ore roasting furnace of brick or the like having a hearth formed in two substantially parallel stretches the adjacent edges of which are structurally unseparated, a slot in each of the stretches intermediate of the sides thereof the slots being joined at each end by a curved slot continuation, rabbling devices in the furnace and means passing through the slot to effect their travel, tracks for the rabbling devices and a metallic skeleton or frame arranged to form the support and attachment for the rabble-track and slot independent of the brick structure whereby the track and slot are maintained in alinement.

5. An ore roasting furnace having a hearth formed in two substantially parallel stretches the adjacent edges of which are structurally unseparated, a slot in each of the stretches intermediate of the sides thereof the slot being joined by a curved slot continuation, rabbling devices in the furnace with means projecting through the slot and pivoted in the rabbling devices to effect their travel.

6. An ore roasting furnace having a hearth formed in two substantially parallel stretches the adjacent edges of which are structurally unseparated, a slot in each of the stretches intermediate of the sides thereof the slots being joined by a curved slot continuation at each end, rabbling devices in the furnace and means passing through the slot and pivoted in the rabbling devices to effect their travel.

7. An ore roasting furnace of brick or the like having a hearth formed in two substantially parallel stretches the adjacent edges of which are structurally unseparated, a slot in each of the stretches intermediate of the sides thereof the slots being joined by a curved slot continuation at the end, rabbling devices in the furnace and means passing through the slot and pivoted in the rabbling devices to effect their travel, tracks for the rabbling devices and a metallic skeleton or frame arranged to form the support and attachment for the rabble track and slots independent of the brick structure whereby the tracks and slots are maintained in alinement.

8. An ore roasting furnace of brick or the like having a hearth formed in two substantially parallel stretches the adjacent edges of which are structurally unseparated, a slot in each of the stretches intermediate of the sides thereof the slots being joined at each end by a curved slot continuation, rabbling devices in the furnace and means passing through the slot and pivoted in the rabbling devices to effect their travel, tracks for the rabbling devices and a metallic skeleton or frame arranged to form the support and attachment for the rabble-track and slot independent of the brick structure whereby the tracks and slot are maintained in alinement.

9. A device consisting of a longitudinally slotted hearth furnace superimposed upon a slotted roof furnace, the slots being adjacent and means projecting through the slots adapted to stir the ore in the furnace.

10. An ore roasting furnace having a hearth consisting of rectilinear and curved portions in the same plane, a substantially similar furnace superimposed thereon and rabble carrying devices common to both furnaces.

11. An ore roasting furnace having a hearth consisting of connected curved and parallel portions, a substantially similar furnace superimposed thereon and rabble carrying devices common to both furnaces.

12. An ore roasting furnace having a hearth consisting of parallel adjacent or contiguous stretches and a curved portion connecting the stretches at each end, a substantially similar furnace superimposed thereon and rabble carrying devices common to both furnaces.

13. An ore roasting furnace having a portion of its hearth of U shape, a substantially similar furnace superimposed thereon and rabble carrying devices common to both furnaces.

14. A device consisting of a multiplicity of side by side and superimposed ore roasting furnaces, rabbling devices in each of said furnaces, an endless traveling funicular device having parallel stretches which are in the same horizontal plane suitably arranged to effect the travel of the rabbling devices in all the furnaces.

15. A device consisting of an upper and lower furnace, rabbling devices within the furnaces, a bar connecting and supporting said rabbling devices and means attached thereto adapted to effect its travel.

16. A device consisting of an upper and lower furnace, tracks between said furnaces, rabbling devices within each of said furnaces, a carriage upon said tracks supporting the rabbling devices and means to effect the travel of the carriage.

17. In an ore roasting furnace having rabbling devices, a carriage resting upon tracks, said carriage comprising members pivoted in the rabbling devices within the furnace.

18. A device consisting of an upper and lower furnace, rabbling devices within the furnaces, a bar pivotally connected to and supporting said rabbling devices and means attached thereto adapted to effect its travel.

19. In a mechanically rabbled ore roasting furnace, a rabble carriage consisting of two vertically pivoted bars, a rabbling device within the furnace in which said bars are pivoted, wheels upon said bars adapted to support the rabbling device and tracks upon which the wheels run.

20. In a mechanically rabbled ore roasting furnace, a rabble carriage consisting of two vertically pivoted bars, a rabbling device within the furnace in which said bars are pivoted, wheels upon said bars adapted to support the rabbling device, tracks upon which the wheels run and a second furnace having a substantially similar rabbling device in which the other ends of said bars are pivoted whereby the carriage formed by said bars are common to both rabbling devices and furnaces.

21. A device consisting of a multiplicity of ore roasting furnaces, one or more of which is superimposed, rabbling devices in each of the furnaces traveling in the same direction and a single funicular device adapted to effect the travel of the rabbling devices.

22. A device consisting of a multiplicity of curved hearth furnaces, rabbling devices traveling in said furnaces and a single funicular device adapted to effect the travel of the rabbling devices.

23. A device consisting of a superimposed ore roasting furnace having a slotted roof to the lower furnace and a slotted hearth to the upper furnace, rabbling devices traveling in said furnaces, a bar projecting through said slots connecting and supporting said rabbling devices and means attached thereto to effect its travel.

24. A curved hearth ore roasting furnace, rabbling devices pivotally connected in the rabble frame which travels therein and a funicular connection outside the furnace adapted to effect the travel of the rabbling devices.

25. A device consisting of superimposed ore roasting furnaces constructed of brick or the like, each having a slot intermediate of its sides, the slots being adjacent to each other, rabbling devices adapted to pass into and through said furnaces, tracks for the rabbling devices and a metallic skeleton or frame suitably arranged to form the support and attachment for the rabble tracks and slots independently of the brick structure whereby the tracks and slots are maintained in alinement.

26. A device consisting of superimposed ore roasting furnaces constructed of brick or the like, having a slotted roof to the lower furnace and a slotted hearth to the upper furnace, rabbling devices adapted to pass into and through said furnaces, tracks for the rabbling devices and a metallic skeleton or frame suitably arranged to form the support and attachment for the rabble tracks and slots independently of the brick structure whereby the tracks and slots are maintained in alinement.

27. In a mechanically rabbled ore roasting furnace having a slot, a rabble carriage consisting of two vertically pivoted bars, means adapted to aline the bars with each other and the slot, a rabbling device within the furnace in which said bars are pivoted, wheels upon said bars adapted to support the rabbling device and tracks upon which the wheels run.

WILLIAM H. SMYTH.

Witnesses:
JESSE R. EOFF,
J. J. MCINERNEY.