

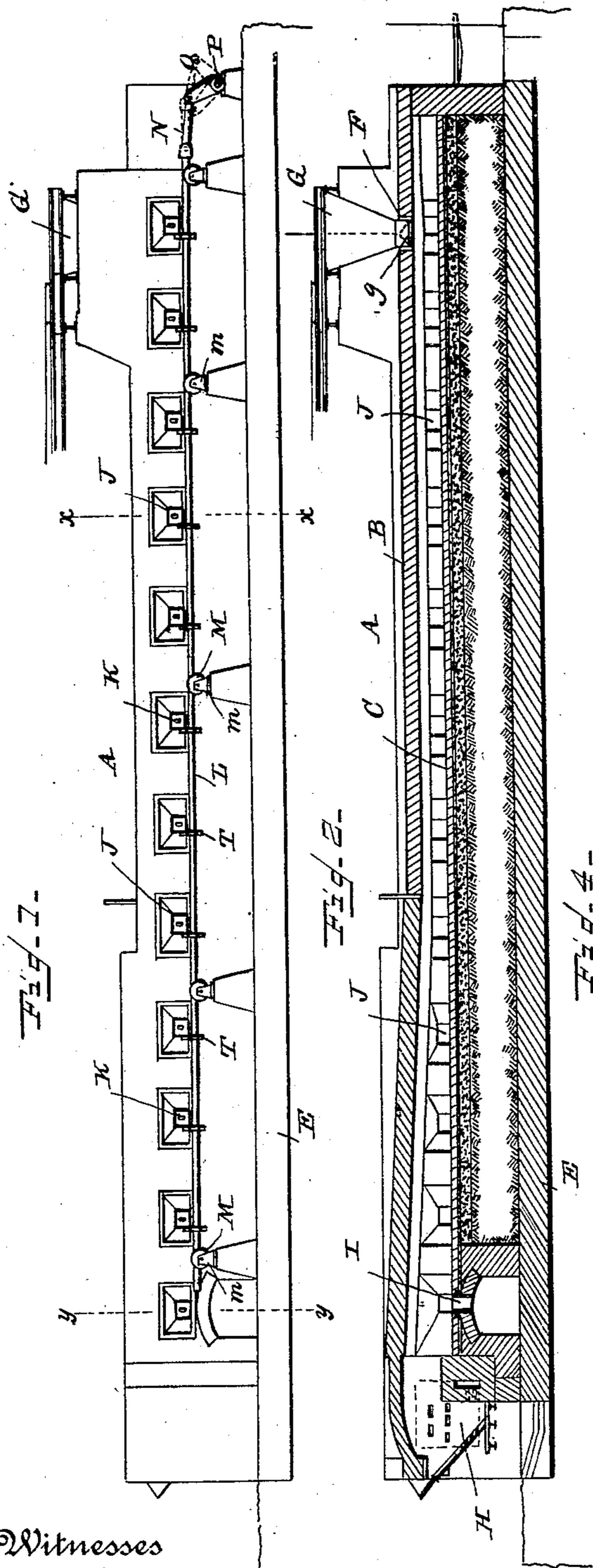
ORE ROASTER.

APPLICATION FILED MAR. 4, 1903. RENEWED MAY 21, 1908.

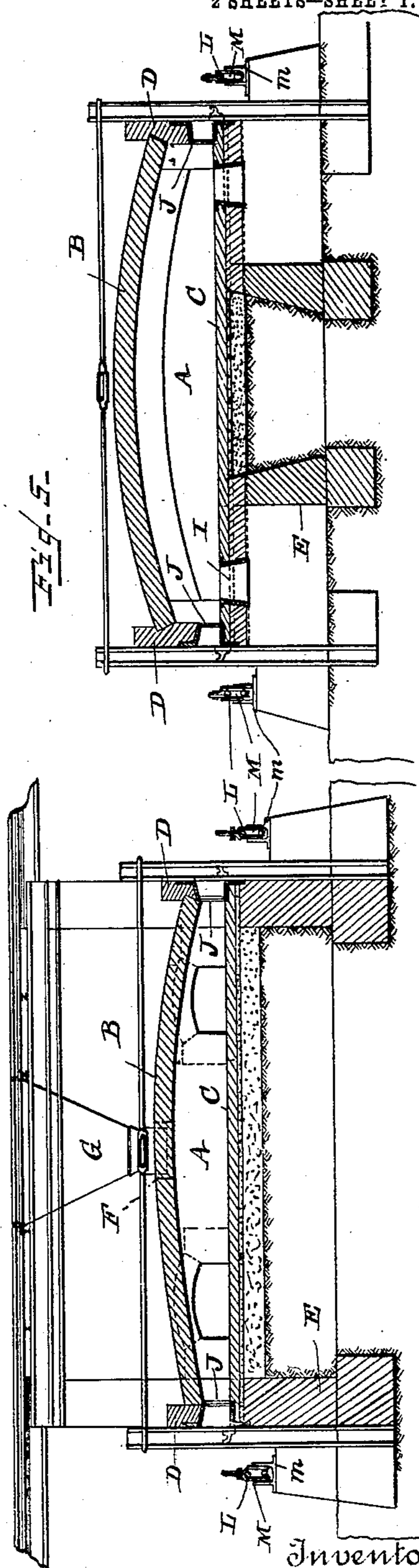
908,425.

Patented Dec. 29, 1908.

2 SHEETS--SHEET 1.



Witnesses
Edwin L. Jewell
E. M. Anderson.



Inventor
Cyrus Robinson
By *A. H. Blize*
Attorney

C. ROBINSON.

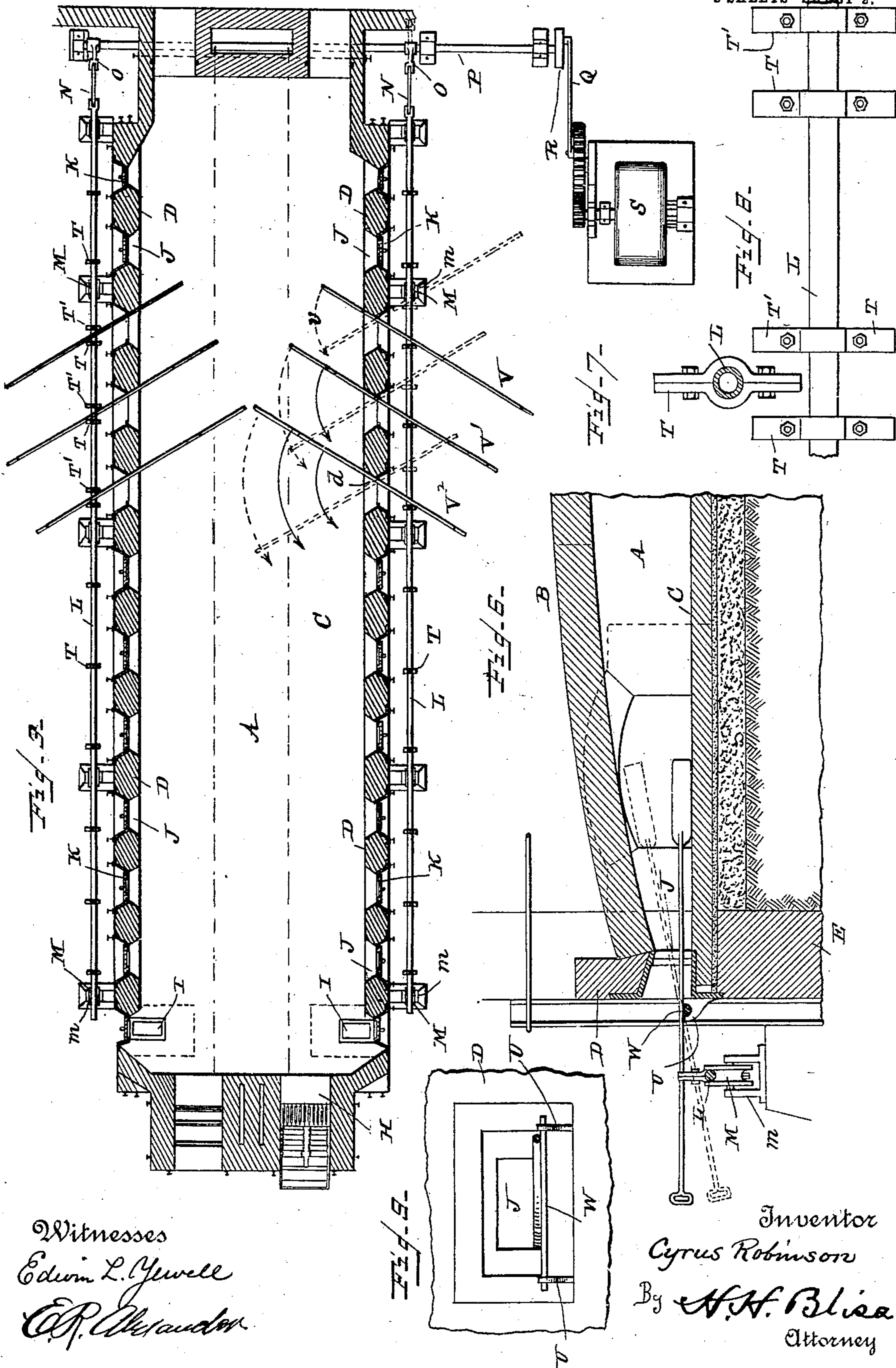
ORE ROASTER.

APPLICATION FILED MAR. 4, 1903. RENEWED MAY 21, 1908.

908,425.

Patented Dec. 29, 1908.

2 SHEETS-SHEET 2.



Witnesses
Edwin L. Yewell
C. P. Alexander

Inventor
Cyrus Robinson
By *H. H. Bliss*
Attorney

UNITED STATES PATENT OFFICE.

CYRUS ROBINSON, OF NEW YORK, N. Y.

ORE-ROASTER.

No. 908,425.

Specification of Letters Patent.

Patented Dec. 29, 1908.

Application filed March 4, 1903, Serial No. 146,238. Renewed May 21, 1908. Serial No. 434,161.

To all whom it may concern:

Be it known that I, CYRUS ROBINSON, a subject of the King of Great Britain, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Ore-Roasters, of which the following is a specification, reference being had therein to the accompanying drawing.

Figure 1 is a side elevation of a sufficient portion of an ore roasting mechanism to illustrate the manner of applying my improvement. Fig. 2 is a longitudinal section. Fig. 3 is a longitudinal horizontal section. Fig. 4 is a vertical transverse section on the line $x-x$ of Fig. 1. Fig. 5 is a transverse section on the line $y-y$ of Fig. 1. Fig. 6 is a partial transverse section on a larger scale, looking toward the receiving end. Fig. 7 is a view of one of the rabble engaging devices, detached. Fig. 8 shows part of a modified power-transmitting device. Fig. 9 shows a face view of one of the rabbling apertures.

The roasting furnace shown in the drawings is indicated as an entirety by A, and may, so far as its details are concerned, be of any of many of the now well known forms. It has the arched top B, the roasting hearth C, the side walls D, and the foundation and supporting structure at E.

At F is the opening in the arch or top B, through which the ore is initially introduced, the latter being delivered from the hopper G, having a suitable valve at g , and mechanism combined therewith for operating it as desired. At the opposite end of the hearth is the fire chamber H, and at points near thereto are formed the discharge openings I, through the hearth C. In each side wall there are formed at intervals a series of apertures J, each aperture in one of the side walls being opposite a corresponding one in the other wall. These are preferably shaped as shown, that is to say, they are tapered outward and inward, widening in both directions from the midway vertical plane. Reinforcing metallic plates or boxes are inserted in the outer parts of these apertures or openings. Each of these openings is provided with a door or closing device K.

The foregoing description will be understood to apply to roasting furnaces such as are now well known. The manner of rabbling the ore is also well known. The workmen insert their rabbling irons through one door or another from time to time, and, by a

swinging action or thrust, shovel or push forward the ore, advancing it from one section of the hearth to the next, this being done periodically according to the substances and the character of the material that is being treated on the hearth. And after the material has been thus advanced, section by section, the workmen introduce their rake-like tools and distribute the material properly and uniformly over the hearth, that it may be treated properly during the following period of time.

The labor is very arduous which is involved in manipulating the heavy rabbling irons and in pushing the ore forward, and the operatives having the strength and endurance for the work are exceptional, and even with the strongest operatives a long time is necessary at each of the stages of advancing the material.

My invention consists in providing for hand rabbling tools (that is to say, tools which can be inserted from time to time through the side of the furnace), power mechanism of such sort that the heavy and arduous work is taken away from the operative and is accomplished mechanically.

My invention can be carried out in any of several ways. For illustration, I have presented in the drawings one of the forms which I prefer under many circumstances.

L L are rods mounted by the sides of the furnace and sufficiently close thereto. They are capable of longitudinal reciprocation, each being sustained by suitable supports at proper distances apart, preferably by anti-friction rollers M M mounted in carriers or brackets $m m$. The rods at one end of the furnace are connected by pitmen N, with the cranks O of the rock shaft P. To this a rocking motion is imparted by means of a link or pitman Q, eccentrically connected to a wheel or crank R, which is actuated by an engine or motor at S. To each rod there are secured lugs, arms or projections T, there being one of these preferably at a point and adjacent to each of the barring doors or openings in the furnace wall.

When the apparatus is in operation, the rods L L and the arms or lugs T T are slowly reciprocated across the vertical planes of the rabbling holes. When it becomes necessary for an operative to rabble or advance the material over any section of the hearth floor, he inserts his rabbling iron through the door or opening that controls that section of the

hearth, bringing it into the position shown in Fig. 4, at which time the stem or handle part of the rabble rests against the wall at the edge of the opening and this brings the handle down so that the adjacent arm or projection T engages with it on the next throw of the power rod L. After such engagement occurs, the power devices rock the rabbling iron around the wall abutment as a fulcrum and push the material forward, which is against the operative portion of the rabble. Then as the power rod L reverses, the operative is enabled to swing the rabbling iron back again, and as he does so, he thrusts it inward somewhat to engage with another load of the material, which load is then thrust forward by the arm on the power rod, again rocking or swinging the rabble.

I have been able to greatly enlarge the operative part or shovel part of the rabbling irons, and can advance all of the material on a hearth section in three reciprocations of the iron. This, however, will vary with the width of the hearth, the weight of the material, and other factors. If desired, lugs or projections such as shown at U may be provided upon the metallic housings or casings which surround the outer parts of the doorways to serve as rests for the horizontal fulcrum for the rabbling tools at W.

A number of operatives can work simultaneously, as is shown at V, V', V², these indicating a series of rabbling tools and the paths which they pass through. That at V is shown as about to commence its first reciprocation, the arrow at v showing the direction in which it will be moved by the rod L. The tool at V' is shown as having finished its first swinging movement and as having been thrust in far enough to be ready to take the second charge of material forward; and the tool at V² is ready to finish the section of the hearth controlled through its doorway. After the material on the hearth has been thus advanced toward the delivery end, rabbling rakes of the usual kind are inserted and operated in the common way for evenly distributing the material again and properly subjecting it to the heat.

I am aware that rabbling tools have been heretofore used or proposed of several sorts, each being connected to a power mechanism for imparting motion to the rabbler. In some cases the power-transmitting device interposed between the rabbler and the power devices was passed through the end of the furnace, imparting to the rabbler first a thrust in one direction and then a pull in the opposite direction. In other cases the rabbler was connected to one form or another of power mechanism which moved it continuously in one direction over the hearth longitudinally, and then returned it in the opposite direction, the return movement generally being effected on lines outside of the fur-

nace chamber, although in some instances being accomplished within it. But I am not aware of any one heretofore ever providing for a roasting hearth a power mechanism and a rabbling tool so constructed and related to each other that while the power mechanism was in normal position and while the rabbler was within the furnace near the hearth, the latter could be connected to or disconnected from the power mechanism.

It is now well known that the mechanical roasters of the class referred to, that is to say, those having power-driven rabblers, do not effect a treatment of the ore equal to that attained with the ordinary furnaces and hand rabbling. The power-driven rabblers, after commencing action at one end of the hearth, act uniformly throughout its whole length, agitating or turning over the ore not only at places where it can be so turned advantageously, but at others where it should be allowed to remain in quiescence for a longer period. Moreover, with these mechanisms, the material is always advanced at each agitating action, whereas, as is well known, it is desirable to stir or turn over the material without advancing it until it has been sufficiently treated on each section of the hearth. And finally, it is, for best results, quite necessary that upon the lower section of the hearth adjacent to the places of final discharge, the material should be subjected to a treatment quite different from that which it has received during the earlier period of its exposure.

When hand rabbling is depended on, the different masses of the ore can be treated in whatever way discretion demands, and a longer or shorter exposure can be permitted at different points along the hearth as is required for different ores and other differing conditions.

I overcome all of the difficulties that have been incident to hand rabbling, and retain its advantages by an apparatus such as I have shown and above described.

This mechanism enables me to avail myself of the labor of weaker men than could be employed in following the old plan of hand working; the time of treatment is greatly shortened, and much economy is the result.

When it is desired that the power devices shall act in both directions alternately upon the rabble, use may be made of supplemental arms or projections, as at T', on the rods L. The tools are shown in Figs. 6 and 9 as provided with the rocking fulcrum or pivotal supports U above referred to. These are preferably arranged in or near the doorways or passages through the side wall. They are adapted to carry the weight of the rabbles. After a load or charge of the material has been pushed forward by the inner end of the tool, the latter can be swung upward by the operative giving a downward swing to the

outer end around the pivotal support at W. Devices capable of so supporting the rabbles and permitting their vertical swing as well as their horizontal movements still further reduce the labor demanded of the operative. It will thus be seen that the rabbling tool is, when in working position, provided with practically a universal joint, each fulcrum at d causing it to swing horizontally and longitudinally of the hearth, and each fulcrum or pivotal support at W allowing it to swing vertically as above described.

As shown in Figs. 3 and 6 the material engaging end of the rabbling tool is elongated and blade-like in form, it being intended that during its operation this blade-like part should be maintained in substantially vertical position above the hearth.

What I claim is:

1. In an ore roasting mechanism, the combination with the hearth having a discharge passage at its end and a series of two or more openings in its side wall supplemental to the discharge passage adapted to have rabbling tools inserted therinto through said openings in its side walls, of a power mechanism adjacent to the hearth and adapted to detachably engage with and impart vibrations to the rabbling tools, in arcs in substantially horizontal planes while the tools are projecting through the side walls, substantially as set forth.

2. In an ore roasting mechanism, the combination with the hearth having a discharge passage at the end and one or more openings formed in the side thereof on lines transverse to the path of travel of the ore along the hearth toward the discharge passage, and adapted to have tools or rods inserted there-through into the furnace chamber, of a power mechanism outside of the heating region and rabbling tools adapted to detachably engage with the power mechanism while the tools are projected through the said openings, substantially as set forth.

3. In an ore roasting mechanism, the combination with the hearth adapted to have a rabbling tool or rod temporarily introduced into the roasting chamber, of a continuously actuated power mechanism adapted while in action to intermittingly engage with the said tools or rods while they are in position in the furnace chamber, substantially as set forth.

4. In an ore roasting mechanism, the combination with the hearth having openings in the side adapted to have rabbling tools or rods passed therethrough into the roasting chamber, of power mechanism adjacent to the hearth and adapted to engage with the said tools and move them in one direction longitudinally of the hearth, said tools being detachable from the power mechanism and movable by hand or at will in the opposite direction, substantially as set forth.

5. In an ore roasting mechanism, the com-

bination of a hearth having a discharge passage at one end and supplemental openings in its side walls, power mechanism adapted to transmit power to advance the ore along the hearth toward the said discharge passage, and an ore engaging and advancing device arranged to be inserted laterally through any one of the said openings in the side walls and to be then detachably connected with the said power mechanism.

6. In an ore roasting mechanism, the combination with the roasting hearth, having a discharge passage at its end and supplemental openings in its side walls, of power mechanism adjacent to the side of the hearth in contradistinction to its ends, and a rabbling tool adapted to be inserted through said supplemental side openings and to advance the ore from one opening to the next and means for detachably connecting the tool with the power mechanism, substantially as described.

7. In an ore roasting mechanism, the combination with the hearth having a discharge passage at the end and supplemental openings in its side walls adapted to have rabbling tools inserted therinto, of the reciprocating power rods adjacent to the side of the hearth and adapted to move the rabbling tools across the said openings to engage with and be disengaged from them while the tools are in the side openings, substantially as set forth.

8. In an ore roasting mechanism, the combination with the hearth having a feed opening at one end and a discharge passage at the other end, and adapted to have a rabbling tool temporarily introduced into the roasting chamber, of a support for said tool permitting it to vibrate vertically at its inner end in planes at right angles to the longitudinal lines of the hearth, and power devices for moving the tool longitudinally of the hearth across the said planes of vertical vibration, substantially as set forth.

9. In an ore roasting mechanism, the combination with the hearth adapted to have a vertically stationary rabbling tool temporarily introduced into the roasting chamber, of a power mechanism adapted to engage with the tool and move it positively, laterally, and horizontally while normally stationary vertically, a bearing about which the tool vibrates horizontally, and a bearing about which the tool can vibrate vertically, substantially as set forth.

10. In an ore roasting mechanism, the combination with the hearth adapted to have a rabbling tool temporarily introduced into the roasting chamber, of a rocking support for the rabbling tool permitting it to vibrate vertically in planes at right angles to the hearth, and power devices for moving the operative part of the rabbling tool longitudinally of the furnace at right angles to

the said plane of vertical vibration, substantially as set forth.

11. In an ore roasting mechanism, the combination with the hearth, of power mechanism adapted to be reciprocated longitudinally of and at the side of the hearth to detachably engage with the rabbling tools and apply power thereto on lines in horizontal planes, and rest for the rabbling tool stationary relatively to the furnace and adapted to permit it to swing vertically and horizontally while engaging with the power devices, substantially as set forth.

12. In an ore roasting mechanism, the combination with the hearth, of a power-applying mechanism adapted to engage with a rabbling tool, and positively move its operative parts laterally in horizontal planes, while stationary endwise, and joint-like parts supporting the tool and adapted to permit the tool to be adjusted relatively to the hearth, substantially as set forth.

13. In an ore roasting mechanism, the combination with the hearth of power mechanism, and a rabbling tool adapted to engage with the power mechanism and to have its ore engaging end moved thereby in curvilinear paths transverse to the longitudinal lines of the tool and in horizontal planes over the hearth, substantially as set forth.

14. In an ore roasting mechanism, the combination with the hearth having a discharge passage at the end and side walls with supplemental apertures or passageways, of a rabbling tool arranged to be inserted laterally through any of said apertures in the said side walls, and power mechanism situated outside of the said side walls and adapted to detachably engage with the projecting parts of the rabbling tool when inserted through said passages into the roasting chamber and positively move the operative parts of the tools laterally on lines transverse to their longitudinal lines, substantially as set forth.

15. In an ore roasting mechanism, the combination with the hearth having an end discharge passage and side walls with a series of supplemental apertures or passageways, the rabbling tool, of power mechanism situated outside of the said side walls arranged on lines parallel to the line of the said side passageways and adapted to engage with the projecting parts of the rabbling tool when inserted through said passageways into the roasting chamber, and push said projecting parts on lines parallel to the lines of said passageways and a horizontal rest vertically supporting the rabbling tool, substantially as set forth.

16. In an ore roasting mechanism, the combination with the hearth having openings in the side adapted to have rabbling tools passed therethrough into the roasting

chamber, of a power device outside of and extending longitudinally of the furnace and adjacent to said openings, and adapted to be longitudinally reciprocated and to engage with the rabbling tools, when inserted as aforesaid, substantially as set forth.

17. In an ore roasting furnace, the combination with the hearth having a charging passage at one end, a discharge passage at the other end and a series of openings in its side wall, of a power mechanism adjacent to the said side openings and a rabbling tool detachably connected to the power mechanism and adapted to be inserted through the said side openings successively and to be moved while therein by the power mechanism from points relatively near the charging passageway to points relatively near the discharge passage.

18. In an ore roasting furnace, the combination with the hearth, of a rabbling tool, a power applying mechanism adapted to engage with the rabbling tool and move it bodily in horizontal planes transverse to the longitudinal axis of the tool, and a horizontal rest for the rabbling tool supported independently of the power mechanism and permitting the tool to vibrate in vertical planes, substantially as set forth.

19. In an ore roasting mechanism, the combination with a hearth, of a rabbling tool adapted to engage with material to be treated on the hearth, a power applying mechanism adapted to detachably engage with said rabbling tool and to move its material engaging end longitudinally over the hearth, and a bearing for the said rabbling tool supported independently of the power mechanism and adapted to provide a vertical axis around which the rabbling tool may turn.

20. In an ore roasting furnace, the combination of a hearth, a rabbling tool, power applying mechanism arranged to engage with said rabbling tool and to move its ore engaging end over the said hearth on lines transverse to the axis of the tool, and a rest for the said rabbling tool, supported independently of the said power mechanism and adapted to permit the tool to vibrate both vertically and horizontally thereon.

21. In an ore roasting mechanism, the combination with the hearth of a rabbling tool, a power applying mechanism adapted to engage with the rabbling tool, and a rest for the tool, supported independently of both the power mechanism and the tool and adapted to permit the tool to vibrate vertically while engaged by the power mechanism, substantially as set forth.

22. In an ore roasting mechanism, the combination with the hearth, of a rabbling tool, a power applying mechanism adapted to engage with the rabbling tool, and an arranged rest supported independently of both

the power mechanism and the tool, and around which the tool when engaged by said power mechanism can vibrate horizontally, substantially as set forth.

5 23. In an ore roasting furnace, the combination with the hearth, of power mechanism, and a laterally acting rabbling tool having a stem and an elongated blade-like material-engaging part arranged on the longitudinal
10 lines of the tool, the said stem of the tool being adapted to engage with the power mechanism at any one of several points longitudinally of the tool.

24. In an ore roasting mechanism, the
15 combination with the hearth having a feed opening at one end and a discharge passage at the other end and adapted to have a rabbling tool temporarily introduced into the roasting chamber, of a support for said tool
20 permitting it to vibrate at its inner end in

planes transverse to the floor of the hearth, and power devices for moving the inner end of the tool longitudinally of the hearth, substantially as set forth.

25. In an ore roasting mechanism, the 25 combination with the hearth having a series of openings in its side wall each of which is adapted to receive a rabbling tool, of the power driven mechanism extending adjacent the several openings and adapted to opera- 30 tively engage a rabbling tool when inserted in any one of the said openings, substantially as set forth.

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

CYRUS ROBINSON.

Witnesses:

F. W. HILLS,
CARL KOELLE.