

No. 725,056.

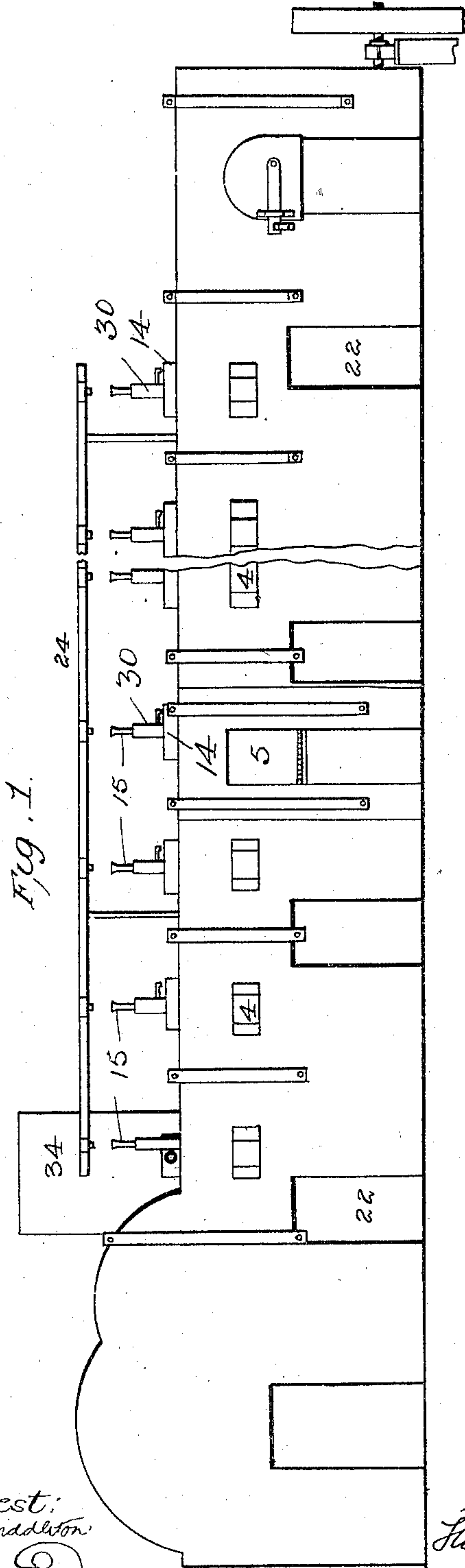
PATENTED APR. 14, 1903.

T. EDWARDS.
FURNACE FOR ROASTING ORES.

NO MODEL.

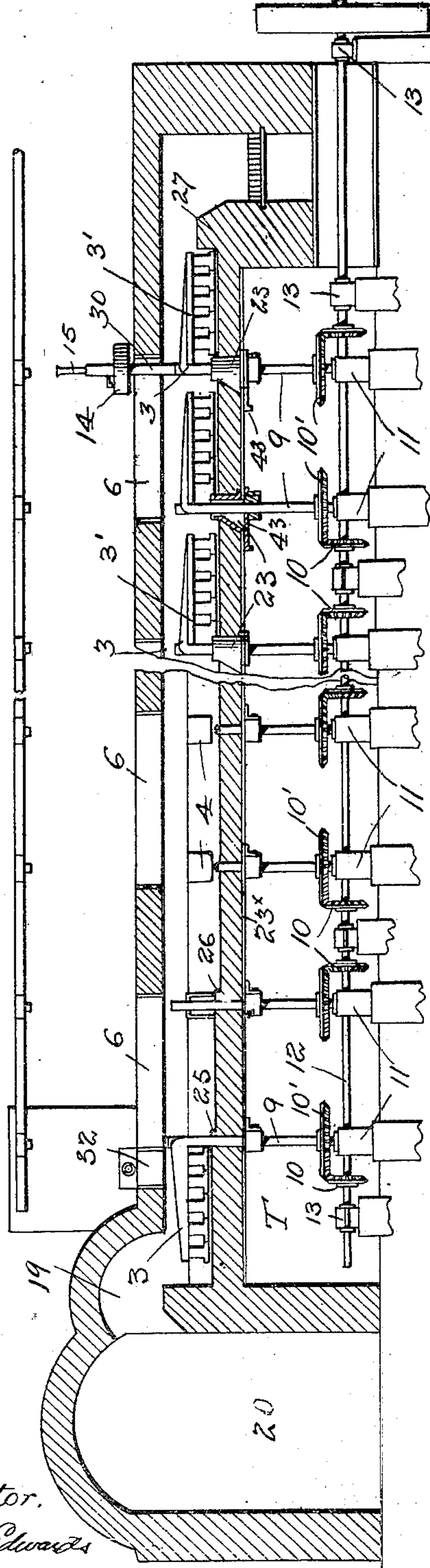
APPLICATION FILED NOV. 4, 1902.

2 SHEETS—SHEET 1.



Attest:
Edmondson
Miller Edmondson

Fig. 2.



Inventor.
Thomas Edwards
by Richards & Co atty's

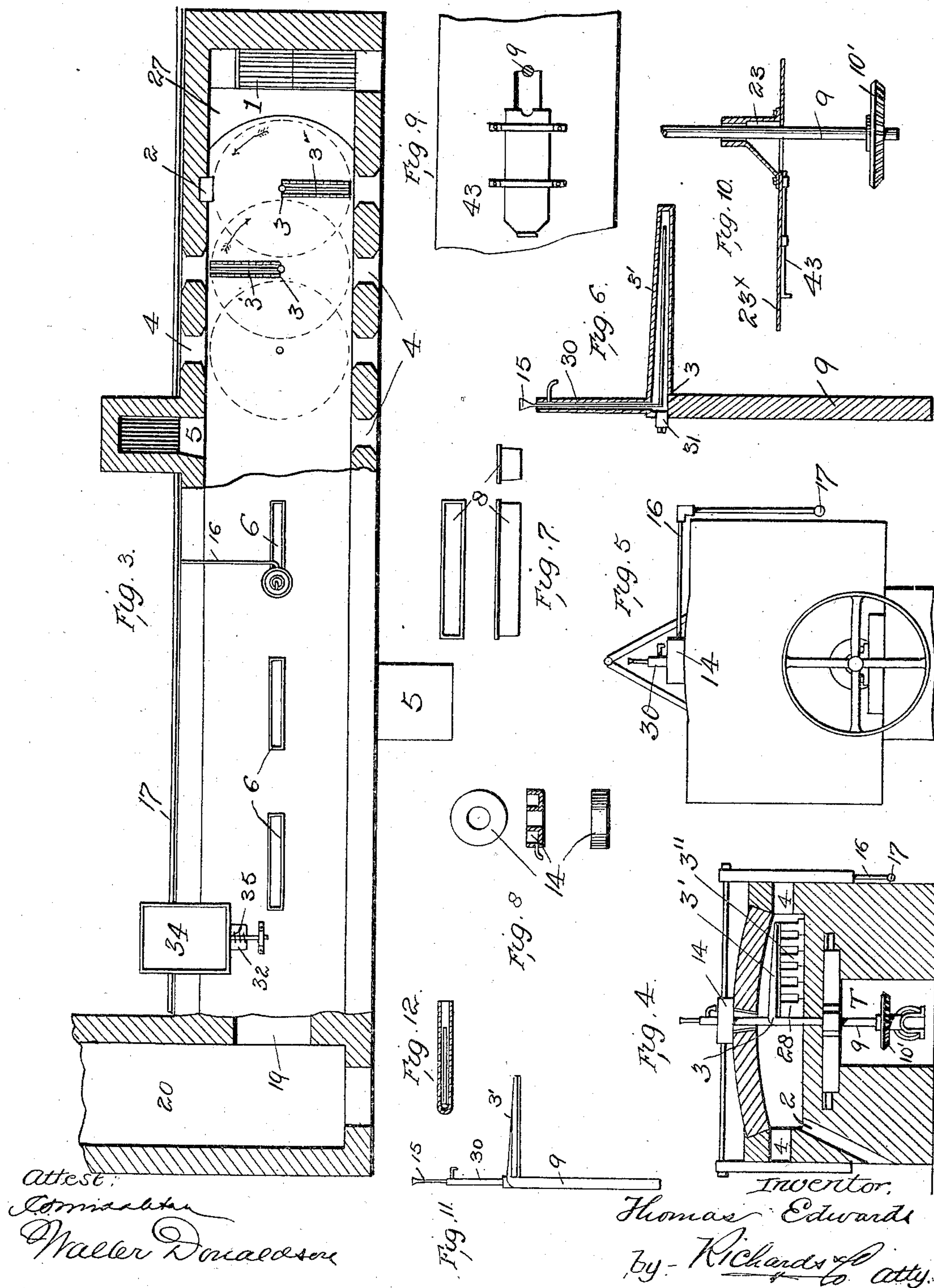
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UNITED STATES PATENT OFFICE.

THOMAS EDWARDS, OF BALLARAT, VICTORIA, AUSTRALIA.

FURNACE FOR ROASTING ORES.

SPECIFICATION forming part of Letters Patent No. 725,056, dated April 14, 1903.

Application filed November 4, 1902. Serial No. 130,020. (No model.)

To all whom it may concern:

Be it known that I, THOMAS EDWARDS, a subject of the King of Great Britain, residing at Ballarat, Victoria, Australia, have made certain new and useful Improvements in Furnaces for the Roasting of Ores, of which the following is a specification.

My invention relates to roasting-furnaces whereby copper ore, pyrites, matte, tin ore, antimony ore, quartz, and other sulfurous ores and other compounds may be efficiently and economically roasted and, if desired, chlorodized.

This invention consists of improvements in and relating to reverberatory furnaces in which coarse or finely-divided ores are roasted.

In this invention I have sought to improve the structure and generally to increase the durability and efficiency of the furnace, and in illustration of same drawings are attached, in which—

Figure 1 is a side elevation of a reverberatory furnace containing my improvements. Fig. 2 is a longitudinal section of the furnace and flue with rabblers and driving-gear in elevation. Fig. 3 is a plan view of the same furnace, partly in section. Fig. 4 is a cross-section of the furnace. Fig. 5 is an end elevation of the furnace. Fig. 6 shows details of the rabblers. Fig. 7 illustrates details of iron boxes. Fig. 8 illustrates details of the waterpan used in the furnace. Fig. 9 illustrates details of sleeves and air-regulators. Fig. 10 is a further detail of the parts shown in Fig. 9. Figs. 11 and 12 are detail views of the rabble.

The drawings represent the invention as applied to a furnace which is arranged to roast all classes of sulfid ores and may be constructed of stone, brick, or other suitable material and strongly tied together with tie-rods and stays.

As is well known among mining men and smelters, a long-felt want exists for a dead-ore roasting-furnace of large capacity which is economical in labor and consumption of fuel. I have sought to supply this want by making a long-hearth reverberatory furnace similar to the long hand-worked furnace in use, which I work mechanically.

To simplify the arrangement of the mechanism for rotating the rabblers for the stir-

ring of the ore contained in the furnace, I have constructed a tunnel, as at T, under the hearth the whole length of the furnace. In said tunnel I have placed a shaft 12, resting on journals 13, which shaft is fitted with bevel-gears 10 to drive or rotate the rabblers on the hearth above. The rabblers are shown at 3 on shafts 9, carrying bevel-gears 10', meshing with the gears 10 on the shaft 12.

In this invention the furnace can be extended to any desired length or width and at any time can be increased in length, if necessary, without interfering with the working of the furnace but for a few hours, as there will be little else to do but couple the additional shaft to the one in use.

The advantages of the arrangement in a long reverberatory furnace of having the gearing and shafting under the hearth instead of above or on top of the furnace are apparent, as it is less costly to put this driving mechanism in the tunnel than to erect the same on top of the furnace. In the tunnel it is protected from dust. Consequently there is less wear and tear on the wearing parts in this system of gearing, and by this means the rabblers can be more easily and quickly removed from the furnace and changed when required.

Fig. 3 shows a feed-screw 35, hopper 34, charge-hole 32, flue 19 and 20, fire-bridge 27, discharge-hole 2, rabblers 3, sight-holes 4, the fireplace 1 at the end of the furnace, and one or more fireplaces along each side of the furnace, as shown at 5, according to the length of the furnace. All of these fires may not be continually used at the same time, for if the ore contains a large percentage of sulfids it would be wrong to use all of them; but it would be absolutely necessary to use them all for small percentages of sulfids contained in the ore.

In Fig. 2 the sight or air openings 4 along each side of the furnace are shown raised a little above the hearth. At suitable intervals along the center of the hearth midway between the walls of the furnace I make holes through the hearth corresponding in number to the number of rabblers required in the whole length from the feed end to the discharge end of the furnace. Into each one of these holes I fit or place an iron sleeve 23,

which is bolted to the iron roof 23^x of the tunnel, (see Figs. 9 and 10,) the top of which sleeve rises about five inches above the hearth of the furnace. This effectually prevents the ore from falling off the hearth down through the sleeve into the tunnel, and through each of these sleeves I insert the stem or shaft 9 of one of my rabbles, which rabble consists of a foot 3', extending parallel to the surface of the hearth and having wearing-shoes 3'', carried near but not touching the hearth-surface. These rabbles form stirrers with inverted stems projecting down through the sleeve, and to each of these stems is fitted a bevel-wheel 10', the teeth of which gears into the teeth of the bevel-wheels 10, which are keyed on the shaft 12, placed under the hearth of the furnace. The stem 9 of the rabble rests in footstep 11. The rabbles are hollow and are kept cold with water flowing through them. Said water after cooling the rabbles passes up through the stem 30, only one of which is shown in Fig. 2 and which projects up from the rabble through the hole 6 in the crown of the arch and discharges the water into the waste-water pan 14, which is placed on the arch. This water is conveyed through pipe 16 to longitudinal waste-water main 17, (shown in Figs. 3, 4, and 5,) into which the water from the whole of the rabbles is run to be conveyed away from the furnace. The water from main supply-pipe 24 passes into the water-induction pipe 15, is passed down through the stem 30 and into the hollow foot of the rabble 3, and thence passes out, as above described. The boxes 6 are closed with plates or tiles, leaving only sufficient room for the motion of the stem 30 of the rabble when at work. The inverted spindles are arranged in a series extending longitudinally of the tunnel and may be of any desired and suitable construction and material.

To suit the requirements of the various classes of ore to be treated, my mechanical rabbles are geared to work in opposite directions (see arrows, Fig. 3) to insure a thorough stirring and mixing and exposure of all particles of the ore to the oxygen of the air in the furnace, and also by this means and with the constant motion of the rabbles the ore is gradually carried along from the feed end of the hearth to the fire end, where the roasted ore is automatically discharged from the furnace through the hole 2. (Shown in Fig. 3.) The fumes are carried out through flue 19 into flue 20.

The ore is fed into the furnace through the hole 32 from the hopper 34 by means of a screw 35, which can be driven from any convenient position.

To facilitate the removal of the cold damp ore from under the feed-hole to a warmer place in the furnace where less effort is required to move the ore along, two steps are formed in the hearth. Step 26 rises two inches above the main floor of the hearth and step

25 is raised two inches above step 26. The wear-shoes of the rabbles can be easily removed and replaced, through sight or air holes 4, by others when required without having to remove the rabble or allowing the fire to go down. The holes 6 in the crown of the arch are made more particularly for convenience of changing the rabbles. If a change of rabbles is necessary, the gear-wheel 10' is loosened on the stem of the rabble, and the red-hot rabbles are lifted out through the openings 6 with ease and celerity and again may as easily be put back in position.

The top of the tunnel is covered with plate-iron, on which the hearth of the furnace is laid. The tunnel is contracted at the fire end to allow space for the ash-pit; but there is sufficient room in it for all purposes.

The subways or manholes 22 (shown in elevation, Fig. 1) are for the convenience of getting to and working in the tunnel, as well as for oiling. Under the bottom of the various sleeves 23 are shutters or regulators 43 to regulate the necessary quantities of air passing up around the stems through the sleeves 23 into the furnace, which is of great importance. By this means the air is better diffused over the roasting ore in the middle of the furnace, which otherwise would receive little or no air from the side holes 4. The air from the holes 4 would supply oxygen along the sides of the furnace. Thus the whole area of the roasting ore will be supplied with the necessary air for thorough oxidation.

Fig. 6 is a detail of the rabbles, which are made of iron or other suitable material, the rabble being shown with the induction water-pipe 15 passing down through the discharge-pipe 30 into the foot of the rabble, also the solid stem to which the gear-wheel is to be fitted. 31 is a plug for convenience of putting in pipe 15.

Fig. 11 is an elevation showing the foot of the rabble and the inverted stem 9, also the hollow water-stem 30, projecting upward. Any suitable wear blocks or teeth can be used on these rabbles.

Fig. 7 illustrates details of the boxes 6, showing plan, side elevation, and an end elevation.

One of the most important features of my invention as above described consists in the tunnel extending under a long reverberatory hearth, in which tunnel a line-shaft extends longitudinally and is provided at intervals with driving connections for rotating the rabbles disposed at different points longitudinally of the hearth. So far as I am aware I am the first to provide such an elongated tunnel extending longitudinally beneath a reverberatory hearth, the connections from the rabbles extending down through the hearth into the tunnel beneath.

Another important feature of my invention consists in the means whereby air is admitted and regulated through the hearth midway between the side walls of the furnace to sup-

ply air to the roasting ore, thus furnishing an air-supply to that portion of the ore that would not be affected by the air entering the side holes 4 of the furnace, as this air would
 5 not travel to the middle of the furnace, but would travel close to the side walls of the furnace and escape through the flue, thus affecting the ore on the side of the furnace only. By introducing the air to the middle
 10 of the furnace the time of roasting is greatly reduced, because the air necessary to oxidize the ore is directed to the points of greatest advantage.

I do not wish to limit myself to the particular form of horizontal arrangement of the furnaces shown, as reverberatory furnaces may be either inclined or horizontal.

The elongated openings at the top of the furnace are arranged so that their ends will
 20 be over the spindles of the rabbles, each opening serving for the removal of two of the rabbles when the same are turned into alinement therewith.

I claim as my invention—

25 1. A reverberatory furnace comprising an elongated hearth, and openings disposed at different points lengthwise of said hearth and extending up through the same to feed air to the furnace, substantially as described.

30 2. A reverberatory furnace comprising an elongated hearth, openings disposed at different points lengthwise of said hearth and extending through the same and means for regulating the supply of air through the said openings, substantially as described.

35 3. A reverberatory furnace comprising a hearth, air-openings extending laterally through the wall of the furnace and air-openings extending through the hearth, substantially as described.

40 4. In combination with an elongated furnace, sleeves extending through the hearth thereof and a regulating-slide for each sleeve whereby the supply of air to the hearth may
 45 be regulated, substantially as described.

50 5. In combination with an elongated reverberatory furnace, a tunnel under the hearth thereof, said hearth having openings extending therethrough, sleeves within the said
 55 openings, air-regulators for controlling the passage of air through the said sleeves, rabbles within the furnace having stems projecting downwardly through the sleeves and having hollow stems projecting upwardly, a line-

line-shaft and the stems of the rabbles and means for supplying the rabbles with a cooling medium through their hollow stems, substantially as described.

6. In combination with a furnace, a tunnel 60 beneath the same, a line-shaft within the tunnel, rabbles within the furnace, and driving connections between the line-shaft and the rabbles, the said furnace having openings at the top of its arch for the introduction or re- 65 moval of the rabbles, substantially as described.

7. In combination with an elongated reverberatory furnace, a series of rabbles disposed along the same, and elongated openings in 70 the furnace-wall each having its ends opposite two of the rabble-spindles, substantially as described.

8. In combination in a reverberatory furnace, driving mechanism for the rabbles 75 connected with their spindles and openings through which the rabbles are removed, said openings and driving mechanism being located on opposite sides of the furnace, substantially as described. 80

9. In combination with the hearth, a rabble having its stem extending down through the hearth, means for driving the rabble and an air-inlet arranged adjacent to the rabble-stem, substantially as described. 85

10. In combination with a hearth, a rabble with means for rotating the same and an air-inlet comprising a sleeve extending through the hearth and above the same, substantially as described. 90

11. In combination with the hearth, a rotatable rabble, a stem extending through the hearth and carrying the same and a sleeve surrounding the stem and extending above the hearth for the entrance of air, substan- 95 tially as described.

12. In combination in a furnace having a hearth, a rabble for stirring the ore on the hearth, the said hearth having an air-inlet extending through it with its upper end above 100 the surface of the hearth to prevent the passage of the ore or dust down through the said opening and means for driving the rabble, substantially as described.

In witness whereof I have hereunto set my 105 hand in presence of two witnesses.

THOMAS EDWARDS.

Witnesses:

HENRY E. COOPER,
 C. S. MIDDLETON.