A. J. GARVER.

ROASTER FOR ORES.

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954,729.

Patented Apr. 12, 1910.

Fig. 1.

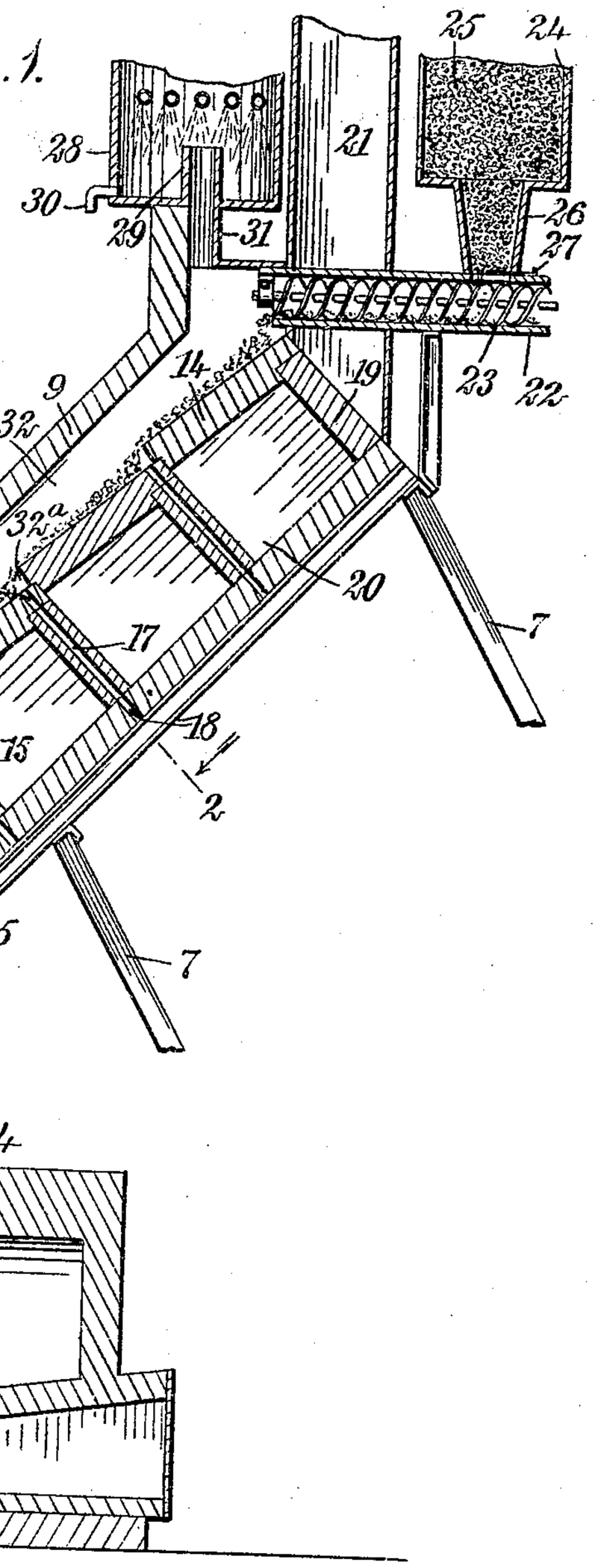


Fig. 2.

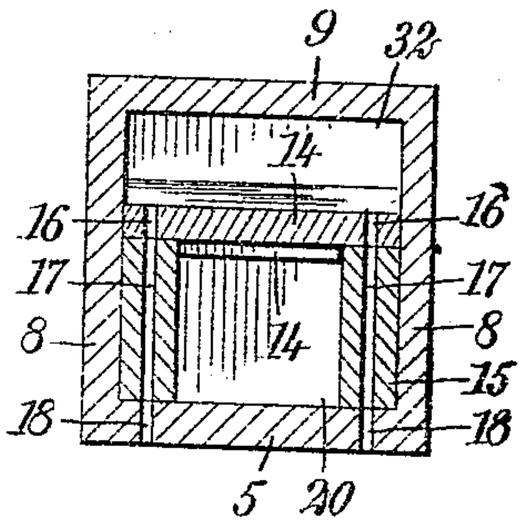
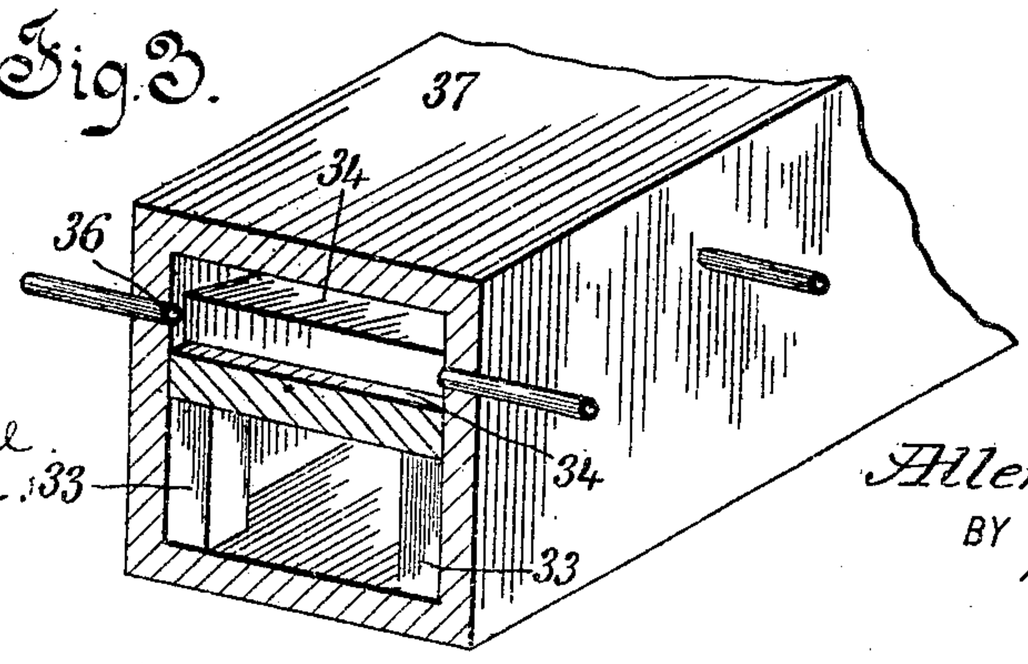


Fig. 3.



WITNESSES

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ROASTER FOR ORES.

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To all whom it may concern:

Be it known that I, ALLEN J. GARVER, a citizen of the United States, and a resident of Clarkston, in the county of Asotin and State of Washington, have invented a new and Improved Roaster for Ores, of which the following is a full, clear, and exact description.

My invention relates to roasters for ores; my more particular object being to produce a simple type of roaster in which the ore while heated is brought into minute contact with the air so as to completely desulfurize the ore and otherwise prepare it within a short time for smelting.

My invention proceeds partly upon the idea that if the ore be broken into comparatively fine particles, then heated and subjected while hot to the free action of air, especially hot air, the ore may be desulfurized quickly and otherwise prepared for smelting.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a central vertical section through my improved roaster, showing how the ore is fed in at the top and is carried step by step down an incline, being brought into contact with hot air at a series of different points and finally discharged at the bottom as thoroughly roasted; Fig. 2 is a cross section upon the line 2—2 of Fig. 1, looking in the direction of the arrows, and showing the air passages and their relations to the steps over which the ore glides in succession; and Fig. 3 is a perspective showing my roaster in a slightly different form, in which the air is supplied to the ore through passages arranged horizontally and in a manner somewhat different from that exhibited in Fig. 2.

A furnace is shown at 4 and may be of the usual or any desired construction. Extending obliquely upward from this furnace and forming practically a part thereof is an inclined bottom plate 5 disposed upon I-beams 6, the latter being secured rigidly in position by braces or posts 7. Extending upwardly from the bottom plate 5 are side walls 8 and these are connected together by a top plate 9. The bottom plate 5, side walls 8 and top plate 9 together constitute a tubular member having substantially a rectangular cross section, as will be understood from Fig. 2.

Extending obliquely upward from the furnace 4 and into the lower end of this tubular member is an inclined wall 10 so arranged as to afford a passage 11. A brick 12 rests partly upon the wall 10 and partly upon two other bricks 13, the latter being disposed internally of the tubular member and upon opposite sides thereof. Other bricks 14 are so arranged that one edge of each rests upon the next succeeding lower brick, while the opposite edge rests upon the bricks 15, the latter being arranged in pairs and stood upon end, as indicated in Fig. 2. Each brick 14 constitutes a step or ledge, the several succeeding steps or ledges slightly overlapping, as shown in Fig. 1. Each brick 14 is provided with holes 16 registering with holes 17 extending directly through the bricks 15, the holes last mentioned in turn registering with holes 18, through the bottom plate 5. The holes 16, 17, 18, thus in registry, constitute air passages extending from the outer atmosphere into the upper portion of the tubular member of rectangular cross section, as above described. The uppermost brick 14 rests at its top edge upon bricks 19 which are similar in form to the bricks 15 except that they are not provided with holes. The parts thus arranged constitute a flue 20 through which the gases of combustion pass upwardly from the furnace. A stack 21 is provided at the upper end of the flue and is used for discharging gases into the atmosphere and at a point higher up. Revolubly fitted into a pipe 22 is a screw conveyer 23 disposed below an ore bin 24 containing ore 25. The latter is broken up into small sizes, preferably 80 to 100 mesh, and is discharged by a hopper 26 directly into the pipe 22 and thus brought within reach of the screw conveyer. A gate 27 operated by hand is adapted to open and close the lower end of the hopper and thus to regulate the flow of the ore.

A solution tank 28 is provided internally at its bottom with an upwardly projecting tube 29. The solution tank is further provided with a discharge pipe 30 for drawing off the solution as formed. Just below the top plate 9 there is a longitudinal space 32

constituting the ore chamber. The ore 25, when discharged by the screw conveyer 23, spreads out in the form of a layer 25[a] in which the separate ore particles are continuously turned and mixed as the layer proceeds downwardly and is baffled in succession by the several ledges or steps. The ore finally emerges at 25[b].

By means of this furnace the roasting of the ore is accomplished in a few minutes. Air passes upwardly through the several air passages above described and is heated by the waste heat from the products of combustion escaping from the furnace diagonally upward. An additional air inlet is provided at 33, or in other words, at the base of the column of descending ore. The air being admitted to the ore, and the latter being heated to a proper degree, the sulfur and other combustible products contained in the ore are burned out. The resulting fumes of sulfur in gaseous form pass upwardly through a pipe 31 and into the solution tank, where they are condensed by a spray of cold water. This forms a solution containing varying proportions of sulfuric and sulfurous acids. The solution may, if desired, be used in treating ores.

In the form shown in Fig. 3 the tubular member 37, of rectangular cross section, is provided with air holes 36 and the bricks 34, constituting ledges or steps, rest upon bricks 33, the latter being placed on end. The air passing laterally inward through the openings 36 is brought into minute contact with the ore.

In both forms of my apparatus the air passing inwardly has a chance to enter spaces 32[a] (see Fig. 1) below the layer of descending ore. These spaces are so disposed that the ore in gliding past the ends of the air passages is unable to obstruct them, so that the streams of hot air flow in against the thin layer of ore descending in a direction independent of the travel of the air, while the gases of combustion of the furnace flow in a direction opposite the direction of travel of the ore and independent of the direction of travel of the inflowing air.

The operation of the roaster is continuous for the reason that the inflow of air, the downflow of the ore and the upflow of gases of combustion, are each conducted as long as desired without intermission.

Preferably the bricks above described are made of fire clay. In any event, practically the entire roaster is made of parts which are fireproof. There need be no metal exposed directly to the gases of combustion at points where the latter are hottest. The materials used in construction should also be capable of standing the action of the fumes.

My theory is that in roasting furnaces where considerable time is required for desulfurizing and otherwise roasting the ore, the trouble is that the delay in finishing the operation is in reality a delay in introducing air properly into the substance of the ore. Hence, if the ore be of fine mesh and exposed properly to the action of the air, the roasting may be accomplished almost instantly, or at least in a less period of time than is generally supposed.

Having thus described my invention, I claim as new and desire to secure my Letters Patent:

1. The combination of a flue provided with a bottom, bricks disposed within said flue and resting edgewise upon said bottom, said bricks and said bottom of said flue being provided with apertures registering with each other and communicating with the atmosphere, and a plurality of ledges mounted within said flue and provided with overlapping ends disposed adjacent to the air passages thus formed.

2. The combination of a flue provided with a bottom, a plurality of separate bricks mounted within said flue and resting edgewise upon the bottom thereof, said bricks being spaced apart so as to allow the passage of gases of combustion therebetween, and a plurality of ledges overlapping each other, each ledge being composed of a single integral brick resting upon said first-mentioned bricks.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ALLEN J. GARVER.

Witnesses:
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