No. 876,539. PATENTED JAN. 14, 1908.

A. J. GARVER.

REVOLVING ORE TANK.

APPLICATION FILED JAN. 10, 1907.

3 SHEETS—SHEET 1.

Fig. 1.

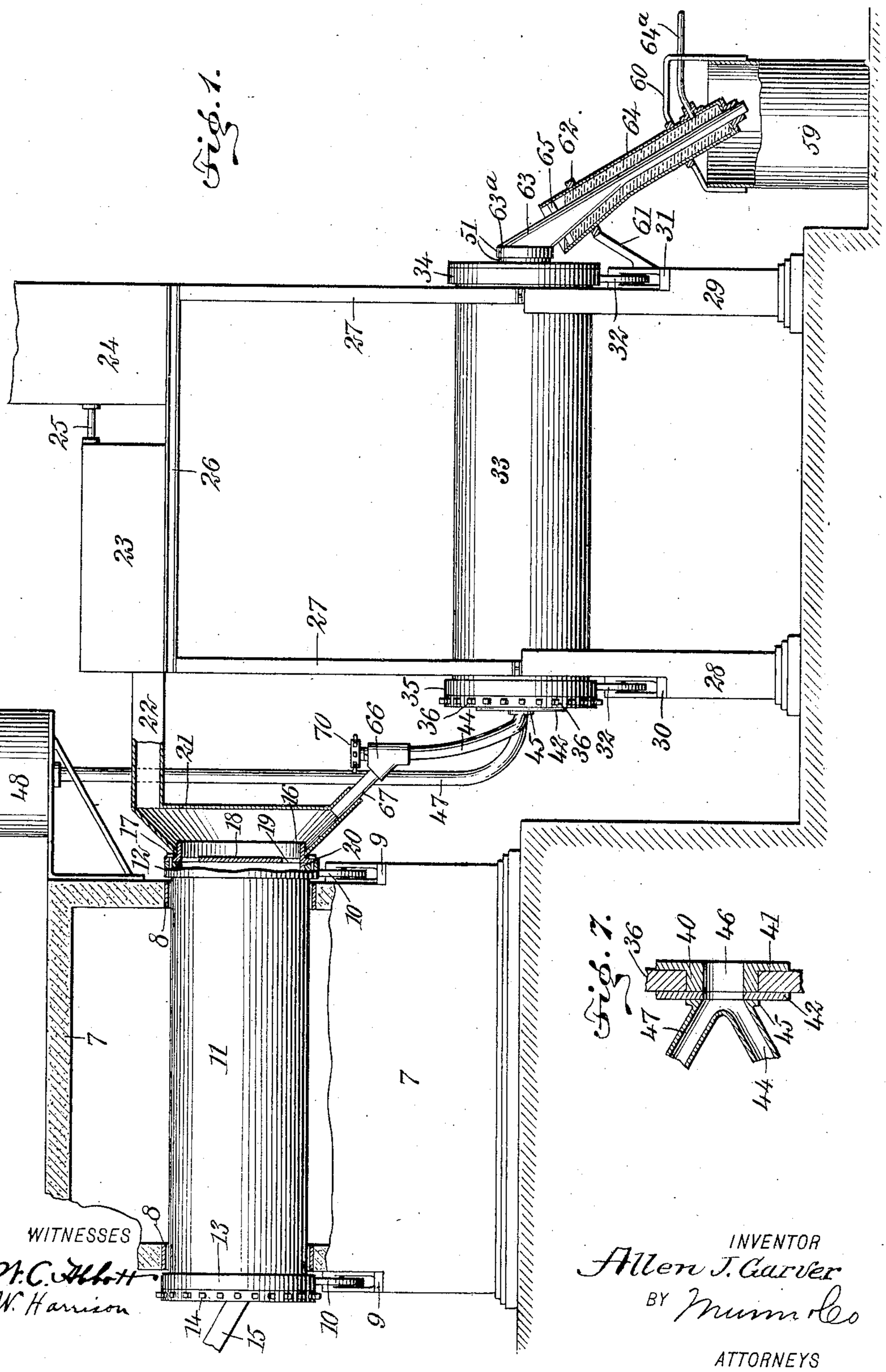

Fig. 7.

WITNESSES

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3 SHEETS—SHEET 2.

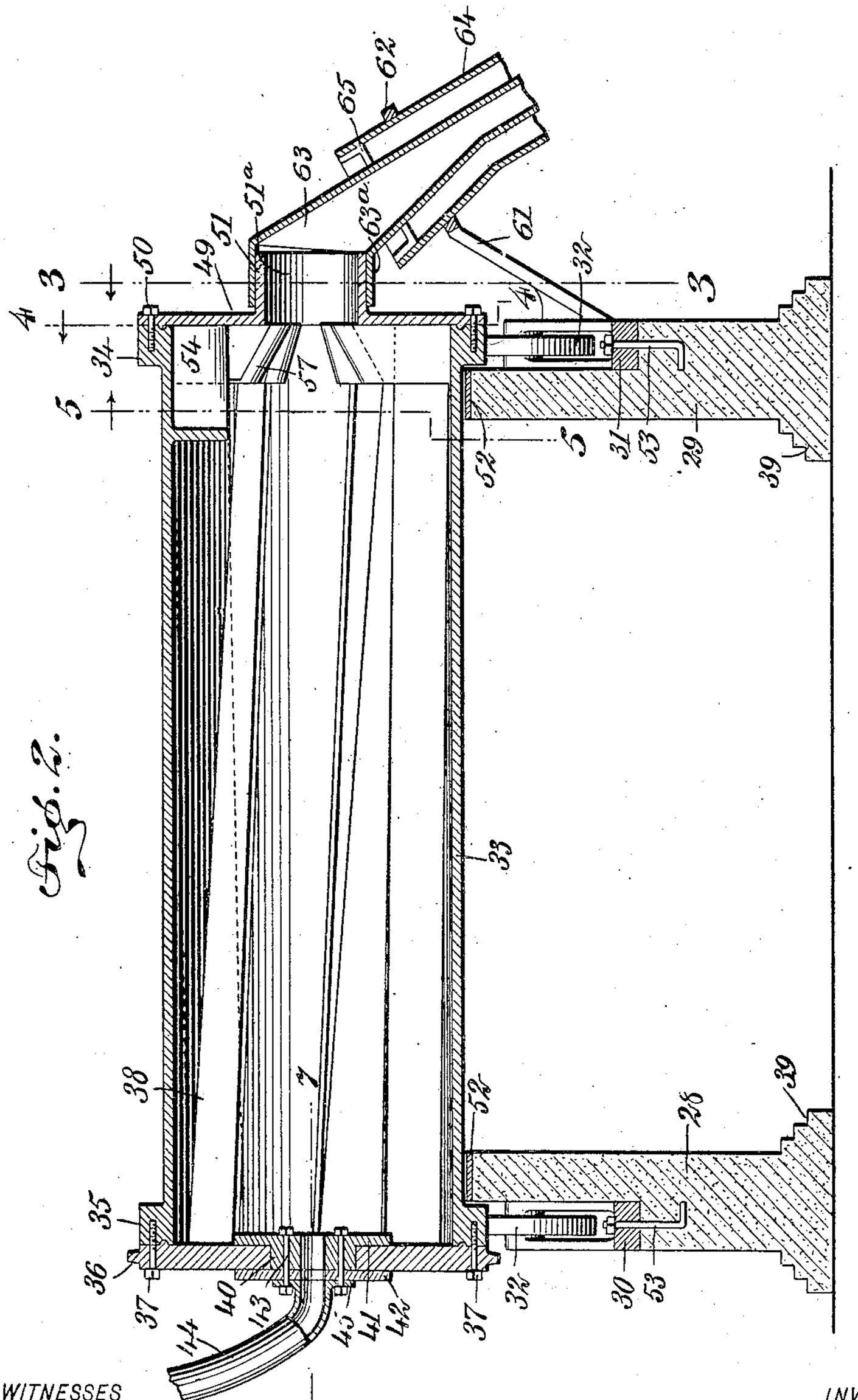

Fig. 2.

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3 SHEETS—SHEET 3.

Fig. 3.

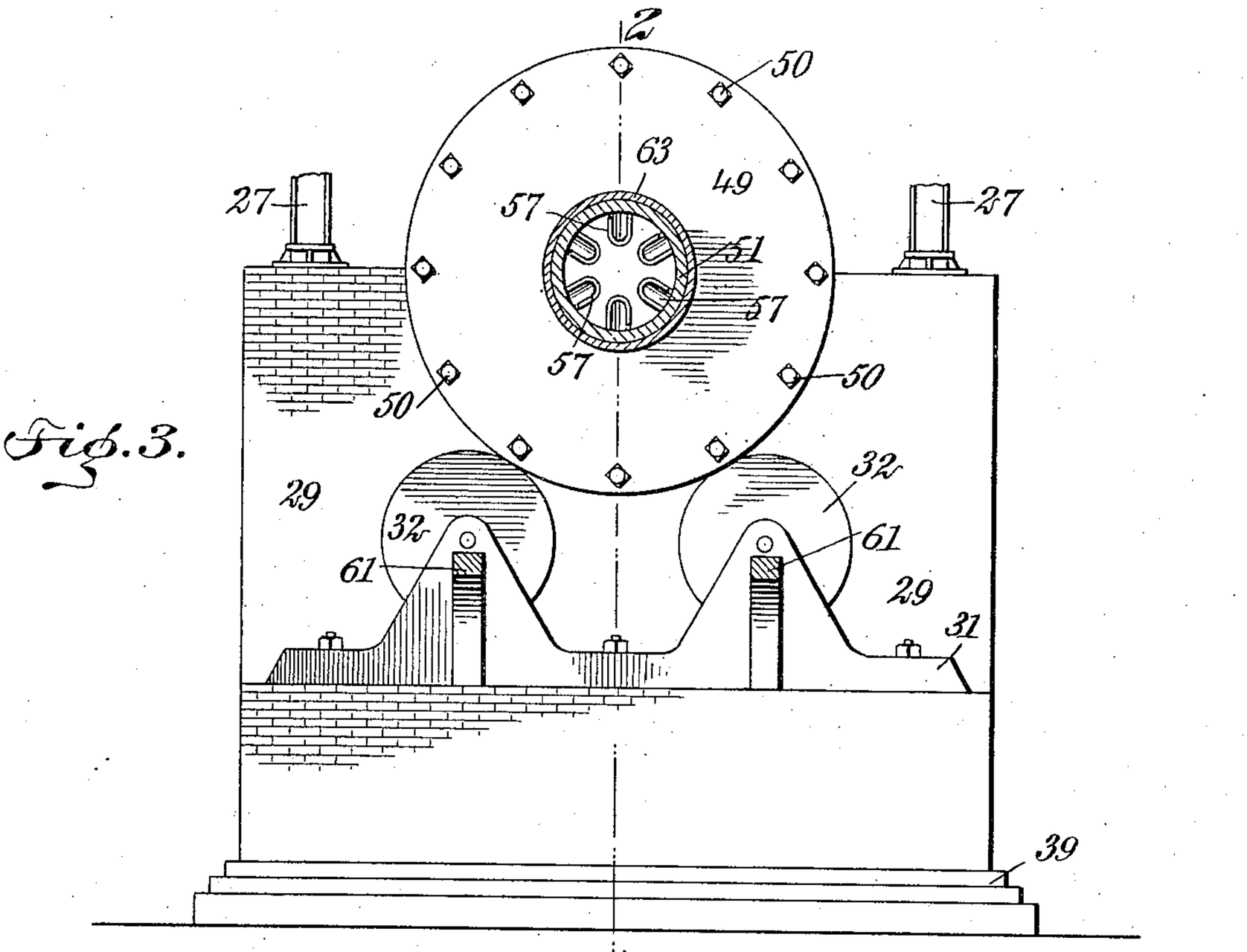


Fig. 4.

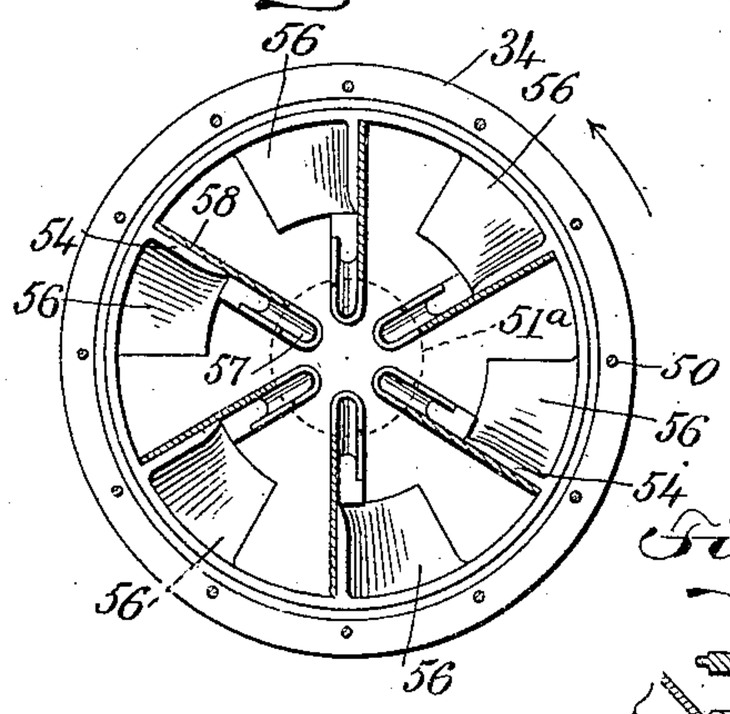


Fig. 5.

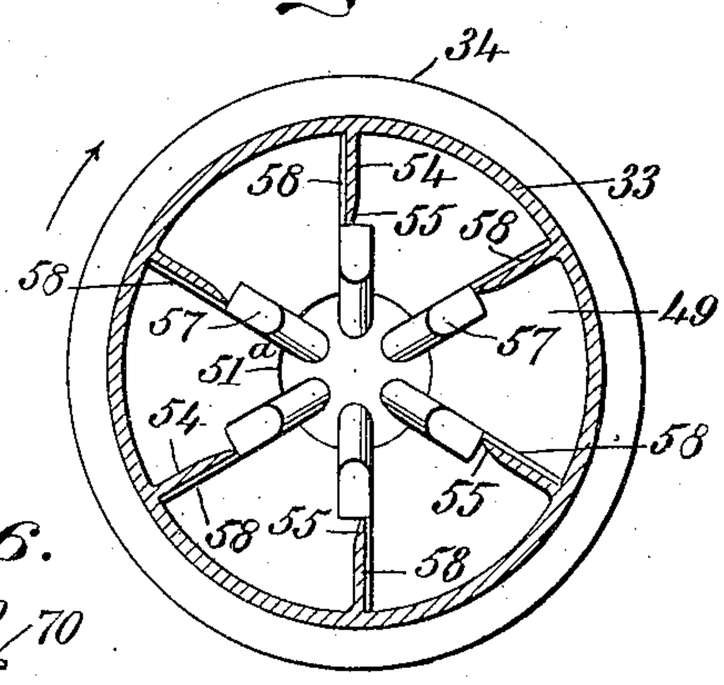
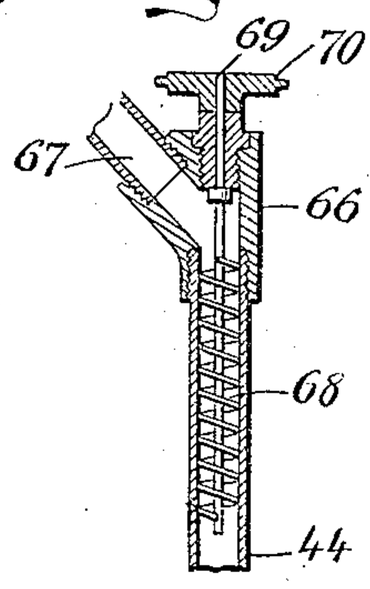


Fig. 6.



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UNITED STATES PATENT OFFICE.

ALLEN J. GARVER, OF CLARKSTON, WASHINGTON, ASSIGNOR TO HIMSELF AND JONATHAN McASSEY, OF CLARKSTON, WASHINGTON.

REVOLVING ORE-TANK.

No. 876,539. Specification of Letters Patent. Patented Jan. 14, 1908.

Application filed January 10, 1907. Serial No. 351,669.

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 Revolving Ore-Tank, of which the following is a full, clear, and exact description.

My invention relates to apparatus for working ores and more particularly to an arrangement for bringing the comminuted and roasted ore into thorough contact with a hot solution, as a step incidental to the extraction of metals from their ores.

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 side elevation partly in section, showing my revolving ore tank as connected with the revolving ore roaster described in my pending application, Serial No. 327,852, the revolving ore tank being further connected with means for supplying it with solution and for enabling the ore tank to discharge ores and solution into a separate receptacle; Fig. 2 is an enlarged central section through the revolving ore tank showing particularly the manner in which the solution is caused to flow into and out of the tank while the latter is revolving; Fig. 3 is a fragmentary vertical section upon the line 3—3 of Fig. 2, looking in the direction of the arrow, and showing the arrangement of the radially disposed revolving spouts 57; Fig. 4 is a vertical section upon the line 4—4 of Fig. 2 looking in the direction of the arrow, and showing the manner in which the radially disposed spouts 57 are mounted in position; Fig. 5 is a vertical section upon the line 5—5 of Fig. 2, looking in the direction of the arrow and showing the spouts 57 and their mountings; Fig. 6 is a fragmentary detail showing in section, a conveyer screw 68 for forcing the roasted ore downwardly into the ore tank; and Fig. 7 is a fragmentary horizontal section upon the line 7—7 of Fig. 2, showing the admission inlet of the ore tank.

An oven is shown at 7 and is provided with annular members 8 each of a width representing the thickness of the oven wall. Brackets 9 are provided with anti-friction rollers 10 which support a revoluble cylinder 11, the latter extending through and being concentric with the annular members 8; in other words, the cylinder 11 extends directly through the oven. The cylinder 11 terminates in bearing-rings 12, 13, integral therewith, and mounted upon the ring 13 is a sprocket-disk 14 through which passes an inlet chute 15 for the purpose of discharging ore into the cylinder 11. The opposite end of the cylinder is closed by a disk 18 provided with an annular flange 16, this flange being connected by bolts 17 with the bearing ring 12 so as to be readily detachable therefrom. The disk 18 is provided with discharge openings 19. The cylinder 11 is provided with a fireproof lining 20, and a hood 21, the latter being connected by a pipe 22 with an acid chamber 23, the latter being connected with a receptacle 24 by a pipe 25. The acid chamber 23 is used in connection with the receptacle 24 for making sulfuric acid solution in case sulfurous ores are roasted in the cylinder or roaster 11, and may also be used for collecting any volatile substances driven off from the material being roasted in the cylinder 11.

A platform 26 supports the acid chamber 23 and receptacle 24, this platform resting upon standards 27 which are in turn supported by walls 28, 29. Brackets 30, 31 are supported by these walls, and revolubly mounted upon the brackets are rollers 32 which support a revoluble cylinder 33. This cylinder at its ends is provided with annular bearing-rings 34, 35 integral therewith, these rings resting on the rollers 32.

The bearing ring 35 is closed by a disk 36 having a sprocket form as indicated more particularly in Figs. 1 and 2. This disk is held in position by bolts 37 which pass through it and into the bearing ring 35. The cylinder 33 is provided internally with ribs 38, each having the form of a spiral blade and projecting radially inward. The walls 28, 29, are preferably thickened at their bases 39 so as to give the structure proper stability. A neck 40 separate from the disk 36 extends through the same and is provided with a flange 41. A disk 42 is connected with this neck 40 by means of bolts 43, in such manner that the rotation of the cylinder 33 does not disturb the position of the neck 40, flange 41 or disk 42, these parts being connected rigidly together. A pipe 44 makes a union 45 with a pipe 47, the union 45 being of annular form and integral with these pipes. The bolts 43 pass through this union and thus secure the

neck 40 and its accompanying parts rigidly in relation to the pipes 44 and 47, which connect with a central opening in the neck 40. A solution tank is shown at 48, and is connected directly with the upper end of the pipe 47.

The other end of the cylinder 33 is closed by a disk 49, held thereupon by bolts 50 and provided with a cylindrical flange. An aperture 51[a] coinciding with the inner surface of the flange 51 is used for discharging materials from the cylinder 33. The cylinder 33 is supported out of engagement with the walls 28, 29 and the latter are provided with shields 52 which are bent into substantially semi-circular form and partially encircle the cylinder 33. Anchor bolts 53 are used for the purpose of securing the brackets 30, 31, rigidly in position.

The cylinder 33 is provided internally with leaves 54 integral therewith, each leaf being provided with a bevel 55 and a supporting portion 56 integral therewith and serving as a brace (see Figs. 4 and 5). A number of spouts 57 which are of the shape indicated in Figs. 4 and 5 are each provided with a portion 58, the latter being secured directly to one of the leaves 54. These spouts have their openings so arranged as to radiate upwardly and being connected rigidly with the leaves, they turn whenever the cylinder 33 is rotated.

The settling tank is shown at 59 and is surmounted by a spider 60. The bracket 31 is provided with a branch 61 ending in a ring 62. A funnel 63 is provided with an annular portion 63[a] which fits, substantially watertight, over the cylindrical flange 51 but is not rigidly connected thereto, the arrangement being such that the rotation of the flange 51 shall not interfere with the funnel. A water jacket 64 encircles the funnel 63 and is connected thereto by aid of a spider 65. Connected with this water jacket 64, is a water pipe 64[a]. The purpose of the water jacket is to cool the solution and the ore as the latter is discharged from the cylinder 33. A pipe 67 is connected with the lower portion of the hood 21 and is also connected with a head 66. A screw conveyer 68 is revolubly mounted within the pipe 44 and is provided with a stem 69, the latter being connected with a sprocket wheel 70 whereby the screw conveyer 68 may be rotated.

The operation of my device is as follows: The solution tank 48 is filled with a solution for extracting metals from the ores, and the ores are fed through the chute 15 into the revoluble cylinder 11, which being heated externally by the oven 7, roasts the ore. The sulfur fumes or other volatile substances are driven off by the heat and pass through the pipe 22 into the acid chamber 23, this part of the operation being substantially the same as described in my pending application above mentioned. The ore, before passing into the chute 15, is comminuted to a proper consistency. The ore now passes downwardly through the pipe 67, and power being applied to the screw conveyer 68 by aid of the sprocket wheel 70, the ore is forced through the pipe 44 down into the revoluble ore tank 33. The solution from the tank 48 being supplied through the pipe 47, the ore and solution are brought into contact within the aperture 46 in the neck 40 (see Fig. 7) and lodged within the cylinder 33, and the latter being now turned by means of the sprocket disk 36, the roasted ore and the solution are thoroughly commingled and brought into the most minute contact. The precious metals, including gold and silver, are not the only ones which can be extracted, though in most instances I use the apparatus with them. Naturally more or less steam arises within the cylinder 33, especially as the action of the solution upon the ore tends to produce heat. The funnel 63 and water jacket 64 serve however as a condenser, and the solution is discharged in liquid form into the settling tank 59. That is to say, the revolving ore tank may contain steam or other vapors generated either by chemical action within the ore tank or by heating the materials before they reach the ore tank, and it is desirable that these vapors be condensed. Hence, the water jacket 64, by constantly cooling the funnel 63, causes the vapors to be condensed so that only liquids are discharged.

It will be understood that when any definite part of a volume of vapor is cooled so that condensation results, the rest of the vapor tends to flow toward the point of condensation, by the well-known phenomenon of diffusion.

The ore thoroughly admixed with the solution as above described, is thoroughly agitated within the cylinder 33 and is carried along by the blades 38, the latter raising quantities of the ore and the solution, and allowing these quantities to slide back repeatedly, to the bottom of the cylinder. Upon reaching the end of the cylinder indicated at the right of Fig. 2, the spouts 57 dip up quantities of ore admixed with more or less of the solution, and as the cylinder rotates, this ore and solution upon arriving at a point above the flange 51, slide downwardly and pass out through the aperture 51[a] into the funnel 63. The bevels 55 (see Fig. 5) facilitate the driving of both the comminuted ore and the solution from the leaves 54, into the spouts 57, as may be seen from Fig. 5. These materials, while guided by the leaves 54 can enter freely into the spouts 57, the bevels 55 permitting free ingress and tending to avoid the choking of the spouts. In this way, the ore is retained within the revoluble cylinder 33 for an appropriate length of time to permit of thorough extraction of the met-

als, and is then discharged continuously and uniformly without danger of clogging any part of the apparatus.

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

1. The combination of a revoluble ore tank provided with a disk, a pipe connected with said disk and adapted to discharge comminuted ores into said tank, said pipe being so connected with said disk as to permit the rotation thereof while said ore is being discharged thereinto, a second pipe connected with said disk so as to permit the rotation of said cylinder, said second pipe being adapted to discharge a solution into said cylinder, said pipes being connected directly together at a point immediately adjacent to said disk, and means for discharging from said cylinder an admixture of ore and solution.

2. The combination of a revoluble cylinder provided with means whereby it may be actuated, means for feeding ores and a solution into said cylinder while in motion, spouts mounted within said cylinder and revoluble therewith, for the purpose of discharging ores and solution therefrom, and an outlet member communicating with said spouts for receiving materials discharged therefrom.

3. The combination of a revolving tank, means for feeding thereinto quantities of ore and a solution for acting upon said ore, and a condenser connected substantially steam-tight with said cylinder, for the purpose of condensing the vapors from said solution.

4. The combination of a roaster, a revoluble ore tank, means for turning said tank, and a steam pipe connection from said roaster to said ore tank.

5. The combination of a revoluble cylinder, means for continuously feeding a solution thereinto, mechanism for feeding ores into said cylinder, a stationary discharge member connected with said cylinder for permitting egress therefrom of said ores and said solution, while said cylinder is in action, and a condenser connected with said stationary discharge member.

6. The combination of a revoluble cylinder provided internally with members projecting radially inward and provided with bevels, and a plurality of radially disposed spouts inclined obliquely toward each other and co-acting with said radially disposed members for guiding the flow of material from said cylinder.

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

ALLEN J. GARVER.

Witnesses:

FRANK E. BROWN,

S. ADAMS.