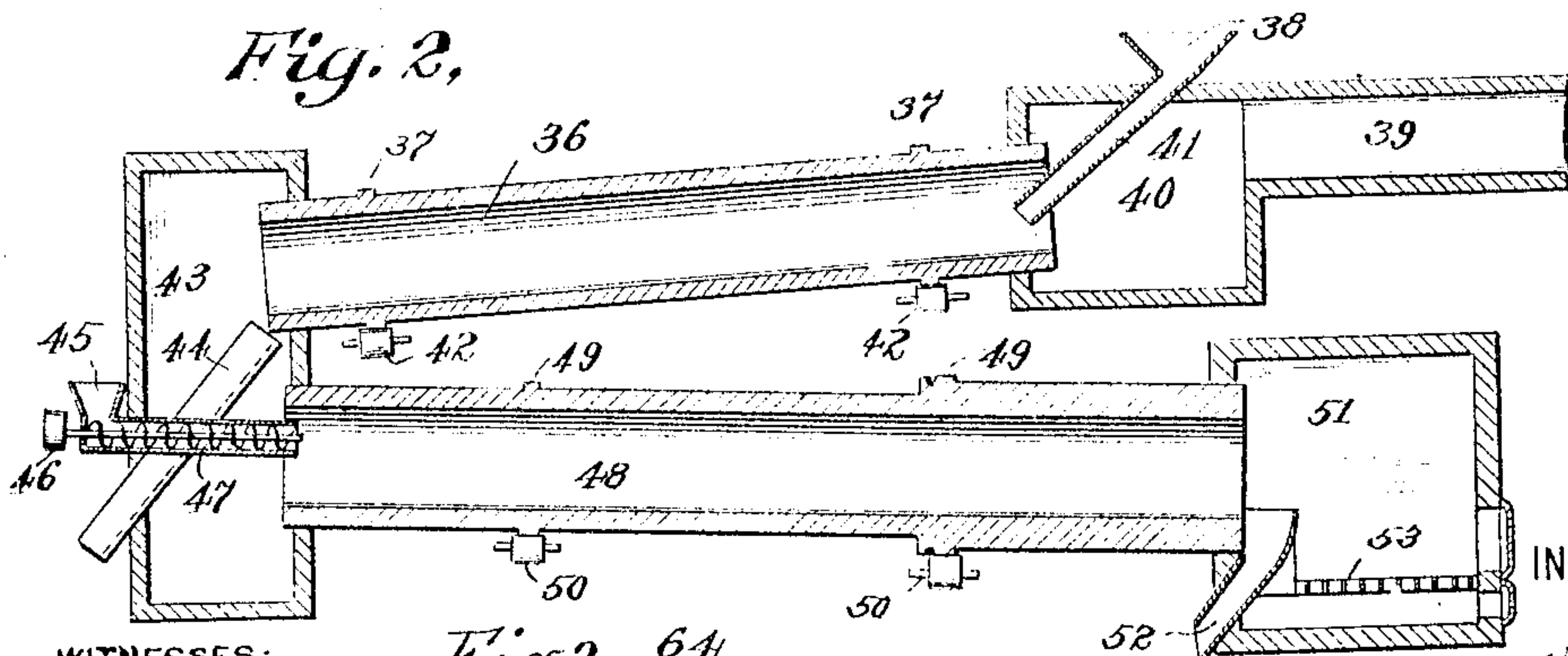
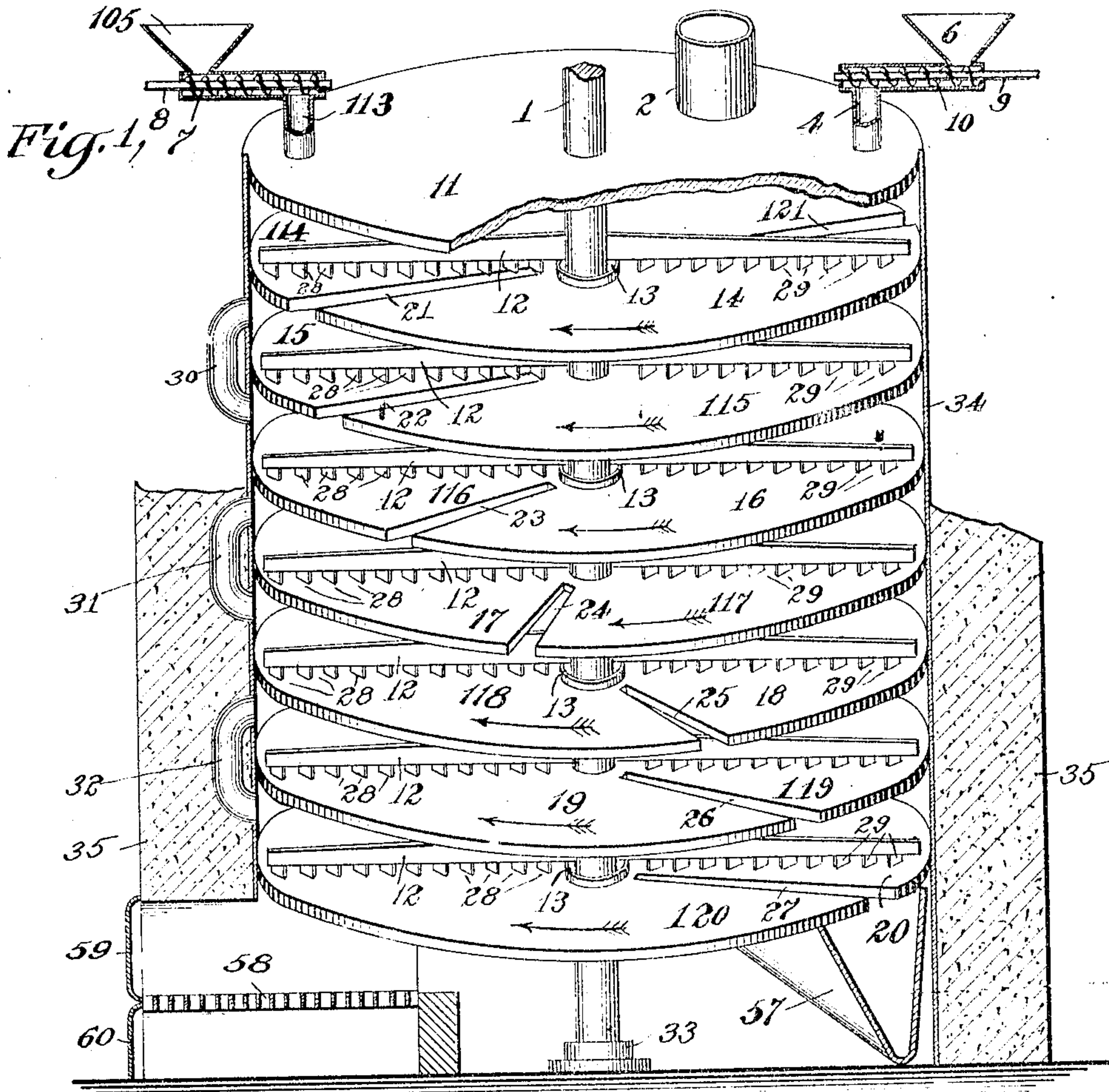


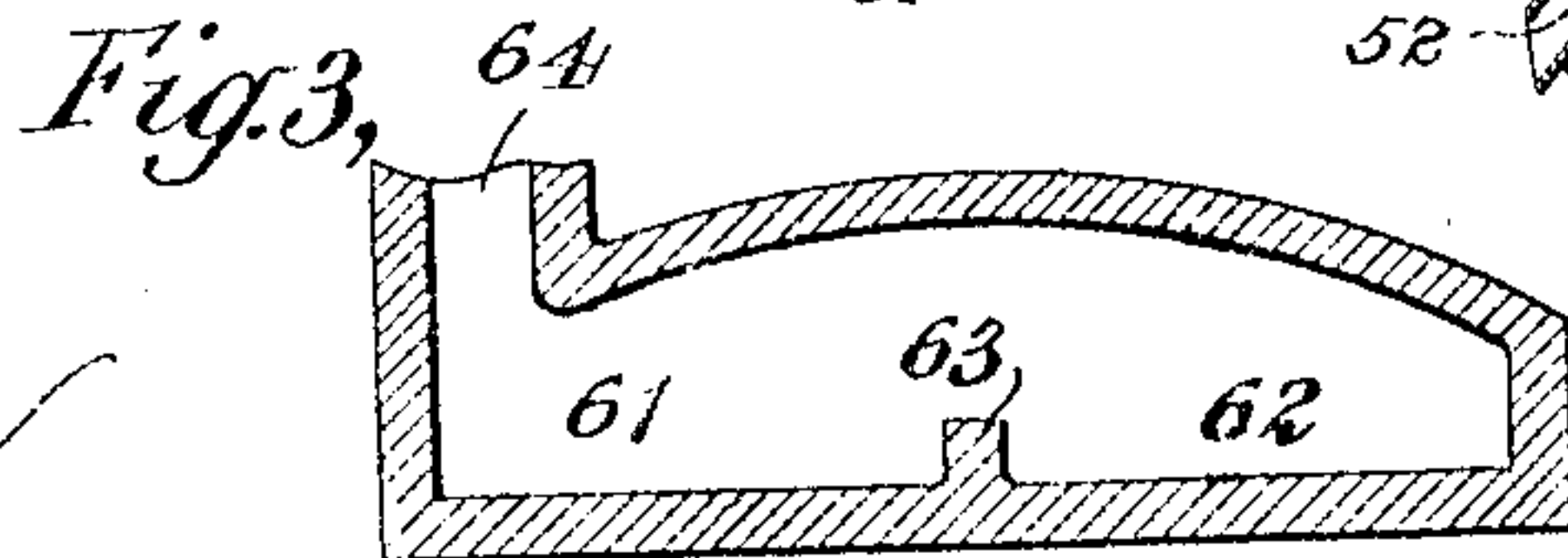
No. 882,217.

PATENTED MAR. 17, 1908.

W. G. SWART.
ORE TREATING PROCESS.
APPLICATION FILED FEB. 25, 1905.



WITNESSES:
Jessie B. Kay
Joseph J. Collier



INVENTOR
Walter G. Swart
BY
Muncie & Muncie
ATTORNEYS

UNITED STATES PATENT OFFICE.

WALTER G. SWART, OF DENVER, COLORADO.

ORE-TREATING PROCESS.

No. 882,217.

Specification of Letters Patent.

Patented March 17, 1908.

Application filed February 25, 1905. Serial No. 247,211.

To all whom it may concern:

Be it known that I, WALTER G. SWART, a citizen of the United States, and resident of Denver, in the county of Denver and State of Colorado, have invented certain new and useful Improvements in Ore-Treating Processes, of which the following is a specification, taken in connection with the accompanying drawings, which form a part of the same.

This invention relates to ore-treating processes and relates especially to processes for roasting zinc blende, galena or other difficultly roasting sulfid ores, preferably in a continuous manner and in simultaneously roasting, preferably continuously, and out of contact with such ores, pyritical or other sulfur-bearing heating material, the hot sulfurous gases from said material being led into substantial contact with the partly desulfurized ore preferably passing in the direction opposite to the feed of said ore so as to heat the same and to mix with the sulfurous gases evolved therefrom.

Figure 1 illustrates in perspective, partly in section, a form of apparatus which may be used in carrying out this invention. Fig. 2 is a vertical sectional view of another form of apparatus. Fig. 3 shows still another form of roaster.

The novel form of roaster indicated in Fig. 1 may be used for carrying out this invention. The casing 34 which is indicated of metal is supported in a heavy masonry or similar setting 35 which materially decreases the heat radiation. A series of hearths or shelves of suitable material are mounted within this casing, each hearth being substantially divided by diametrical slots, such as 21 and 121 which form the two hearths 14 and 114 on this same level for the treatment of different material, if desired. The other hearths are divided in a similar manner. The non-aligned slots 21, 22, 23, etc. form a plurality of hearths on each level, each slot being arranged as indicated over the rear of the hearth below.

If desired, a suitable grate 58 may be arranged below the series of hearths and may be fired through the doors 59, 60 in the ordinary way. The gases of combustion pass up through the slots to some extent and also the alternate shelves are provided with collars 13 which form annular openings of any size desired near the center of these shelves. Also suitable circulating pipes 30, 31, 32 are

arranged at suitable intervals around the periphery of the other shelves so as to conduct the gases through the apparatus in a zigzag manner before they pass out through the flue 2 to be utilized in a Glover tower or other acid making apparatus in the case of sulfurous gases.

A vertical shaft 1 supported in the bearing 33 and rotated by any desired means in the direction of the arrows, is indicated as passing axially through the roaster. This shaft is provided with a series of arms 12 on which are arranged suitable rabbles 28, 29 which as indicated are inclined in different directions. In this way when rotated in the direction of the arrows one set of rabbles moves material circumferentially around the hearth to some extent and also displaces it outward. The rabbles on the other arm move the material around the hearth in the same direction and also displace it inward into the path of the rabbles on the other arm. In this way the material is continuously turned over and also slowly fed around the hearths in the direction of the arrows. Material may be fed into this roaster through one or more conveyers, such as the screw conveyer 10, driven by the rotating shaft 9 at any desired speed and thus feeding material from the hopper 6 into the tube 4 through which it drops onto the hearth 14. It is evident that this material will be fed around the hearth 14, will fall through the slot 21 upon the rear of the hearth 15 below and passing around this hearth in a similar manner will progressively pass over the hearths 16, 17, 18, 19 and 20, finally issuing through the discharge chute 57. If desired, other different material may be fed by the conveyer 7 on the rotating shaft 8 from the hopper 105 through the feed tube 113 upon the hearth 114. This material will be slowly fed through the roaster passing over the hearths 114, 115, 116, 117, 118, 119 and 120 before being discharged. These two materials will be kept separate throughout their passage through the roaster, but, of course, the gases evolved from them will mingle and one material can impart its heat to the other in an obvious manner both by the heat of the gases by radiation and by conduction through the various hearths.

Zinc blende, galena or other difficultly roasting sulfid ores can be conveniently treated in this apparatus by feeding the ore through the conveyer 10 over one series of

hearth where it is roasted and the sulfur driven off in the shape of sulfurous gas. The additional heat which is usually necessary in order to properly desulfurize such ores can be readily supplied by feeding through the other conveyer 7 and over the other series of hearths some other pyritical or sulfur-bearing heating material, such as iron pyrites, chalcopyrite, pyrrhotite or similar sulfid material, or, if desired, sulfur itself may be employed in some cases. After the roaster has been brought up to heat by the furnace indicated or by other heating means the desulfurization of the ore takes place in a well known manner, the proper amount of additional heat being supplied to the partly desulfurized ore by the feeding of sufficient pyritical or other sulfur bearing heating material so that not only is the ore properly desulfurized without the use of coal or similar heating material, but also the sulfurous gases are richer and better adapted for subsequent treatment in sulfuric acid apparatus and for utilization in other ways. If desired, however, instead of feeding the pyritical or other sulfur-bearing heating material through one of the screw conveyers and over one set of hearths this set of hearths may also be utilized for feeding ore through the roaster and the desired amount of necessary additional heat may be supplied by the roasting of pyritical or other sulfur bearing heating material on the grate 58 or in a furnace of other desired construction, preferably at the bottom of the roaster so that the sulfurous gases evolved pass through the roaster over the various hearths through the slots and other openings and thus heat is supplied to the partly desulfurized ore to roast it to the desired extent, removing the sulfur therefrom to the extent desired for its subsequent treatment.

The roaster indicated in Fig. 2 may be employed, this apparatus comprising the ore roasting rotary furnace 36 of usual construction and mounted upon and rotated by suitable rollers 42 engaging the rings 37. The upper end of this furnace communicates with a suitable chamber 40, connecting with the flue 39 for the discharged gases. A hopper 38 and chute 41 or other suitable feeding device may be used to properly supply material to this furnace, the lower end of which rotatably engages the hood 43 and discharges material into the chute 44, the heating furnace, which may be a rotary furnace 48, and similarly operated by the rollers 50 engaging the rings 49 rotatably engages the hood 43 and is supplied with material by the conveyer 47 operated by the pulley 46 to regularly supply material fed from the hopper 45. This material after passing through the furnace 48 will be discharged through the chute 52, the lower end of the furnace engaging the fire box 51 provided with a suitable grate 53

or other heating device. In this way the hot gases from the furnace 48 pass through the hood 43 and the furnace 36 mingling with gases evolved therein and all the gases pass through the flue 39. The ore or other material treated in the furnace 36 is, however, separate from the material treated in the lower furnace 48.

In treating difficultly roasting sulfid ores in this apparatus, the ore, such as zinc blende, for instance, could be fed in a regular manner into the ore furnace 36 and roasted therein, the amount of additional heat necessary to properly desulfurize the ore being supplied by the roasting of pyritical or other sulfur-bearing heating material in the furnace 48, the gases from such material passing through the hood 43 and into substantial contact with the partly desulfurized ore moving in the opposite direction to the feed of the ore and mingling with the sulfurous gases from the ore itself so as to suitably enrich them for further utilization.

In some cases other forms of furnace may be used for carrying out this process. A pair of communicating or coaxial barrel furnaces of the Bruechner type may be employed, or, if desired, a reverberatory furnace, such as is indicated in Fig. 3, the difficultly roasting sulfid ore being preferably treated on the hearth 61 which is separated by the wall 63 from the hearth 62 on which the proper amount of pyritical or other sulfur-bearing heating material is roasted, the sulfurous gases mingling in this instance and passing out through the stack 64. Where sulfur itself is utilized as a heating material, it is not necessary in all cases to separate it from the sulfid ore treated in the roaster. Thus the ore which is preferably always integrated to the desired extent before treatment may be mixed with the proper proportion of sulfur before being fed into the roaster. A reverberatory furnace may be utilized for this purpose, the sulfur and ore being treated in the same chamber and if desired being mixed before being supplied to the furnace.

It is, of course, apparent that other forms of apparatus may be employed. The number, order and exact nature of the steps described need not be used in all cases in carrying out this invention or securing the advantages of the same. Without, therefore, being limited to the details of the disclosure which has been made in this case, what I claim as new and what I desire to secure by Letters Patent is set forth in the appended claims.

1. The ore treating process which consists in continuously feeding zinc blende through a roaster, in continuously roasting pyritical heating material out of contact with said zinc blende, in leading the hot sulfurous gases from said pyritical material into sub-

stantial contact with the partly desulfurized zinc blende, said gases moving in the opposite direction from the feed of said blende so as to heat the same and mix with the gases evolved therefrom.

2. The ore treating process which consists in roasting difficultly roasting sulfid ore, in roasting pyritical heating material substantially out of contact with said ore, in supplying heat from said pyritical material to said ore and in mixing the sulfurous gases from said pyritical material with the gases evolved from said ore.

3. The ore treating process which consists in roasting difficultly roasting ore, in roasting non-carbonaceous oxidizable heating material, developing an excess of heat on its

oxidation and in supplying heat from said heating material to said roasting ore and subsequently using the gases in the manufacture of sulfuric acid.

4. The ore treating process which consists in roasting difficultly roasting sulfid ore, in roasting non-carbonaceous oxidizable heating material developing an excess of heat on its oxidation and in supplying heat from said heating material to said roasting ore and subsequently using the gases in the manufacture of sulfuric acid.

WALTER G. SWART.

Witnesses:

ANDREW C. KOONTZ,
C. L. SOUTHARD.