P. SARRASIN.

HORIZONTAL MECHANICAL FURNACE FOR ROASTING.

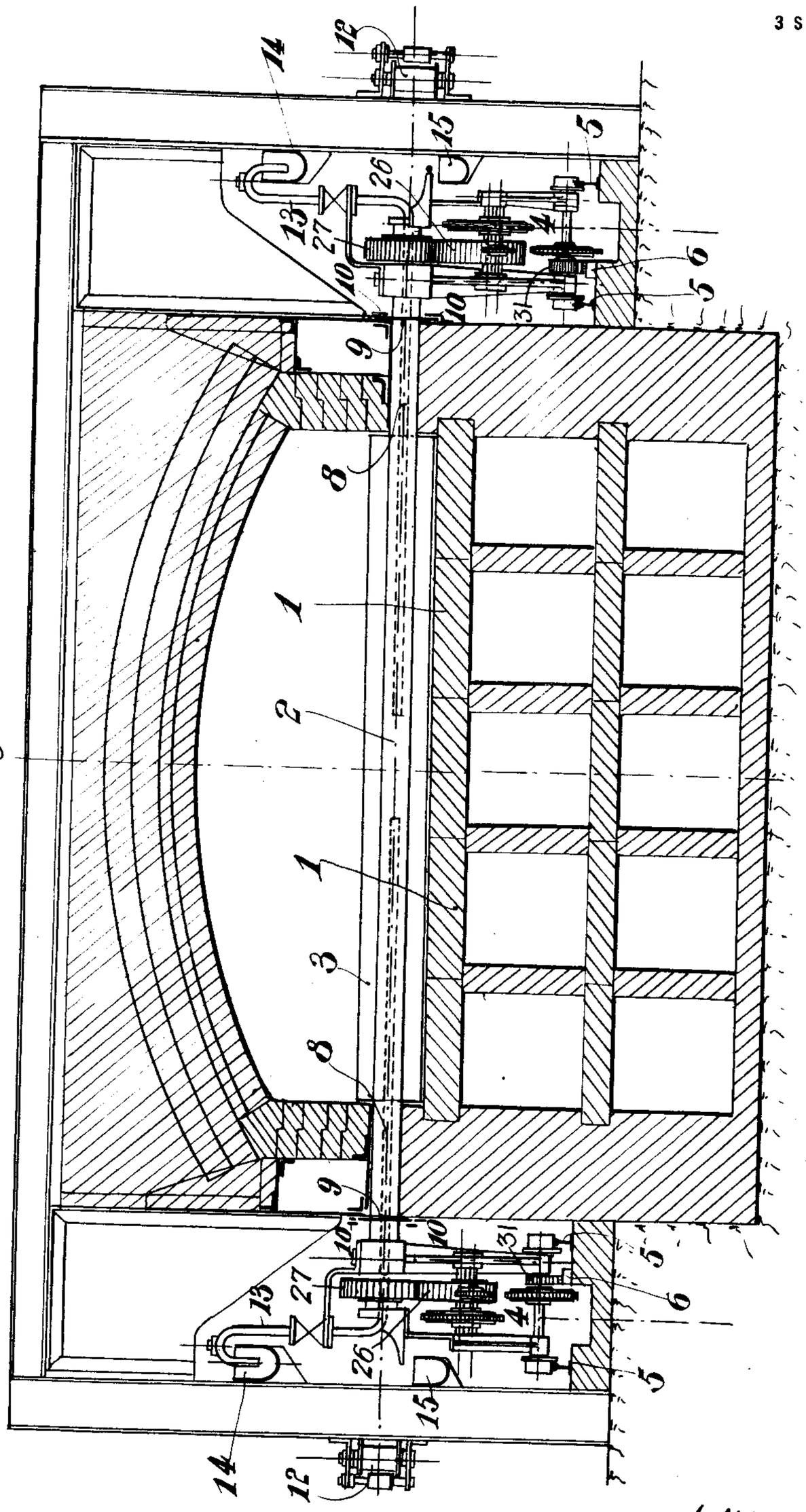
APPLICATION FILED NOV. 29, 1913.

1,167,118.

Patented Jan. 4, 1916.

3 SHEETS—SHEET 1.

Fig. 1.



WITNESSES;

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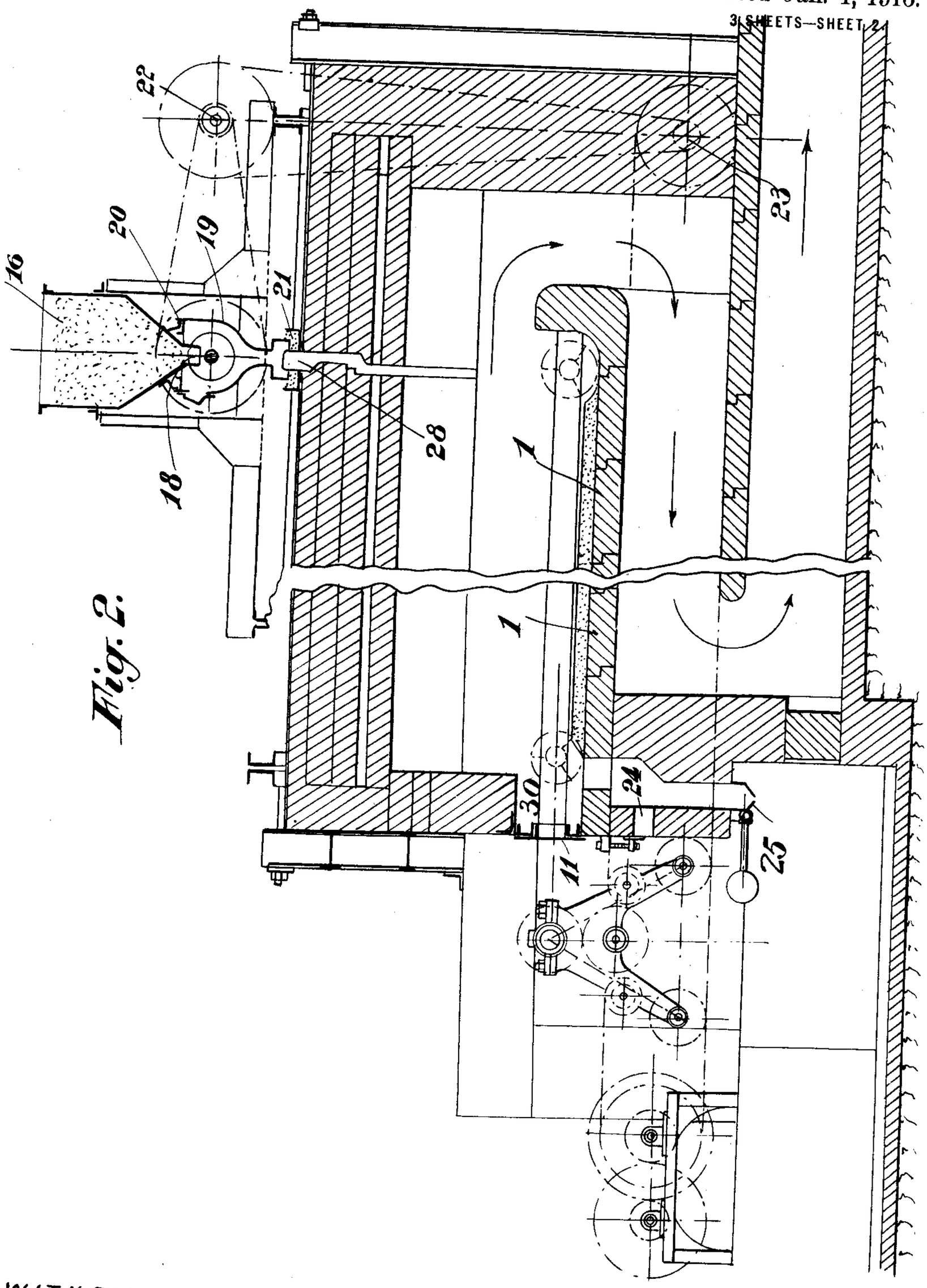

Fig. 2.

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3 SHEETS—SHEET 3.

Fig. 3.

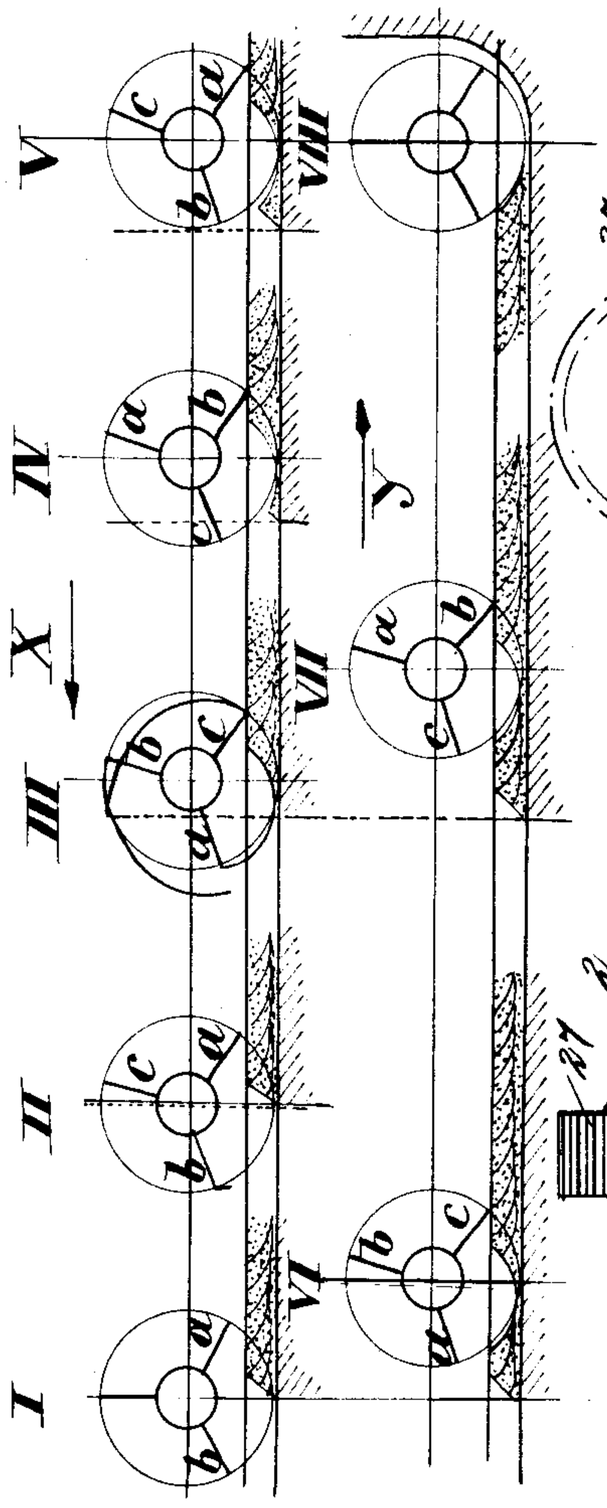
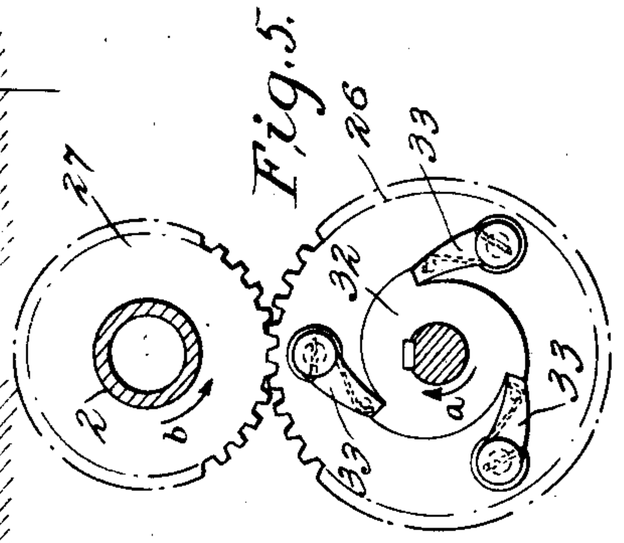


Fig. 5.



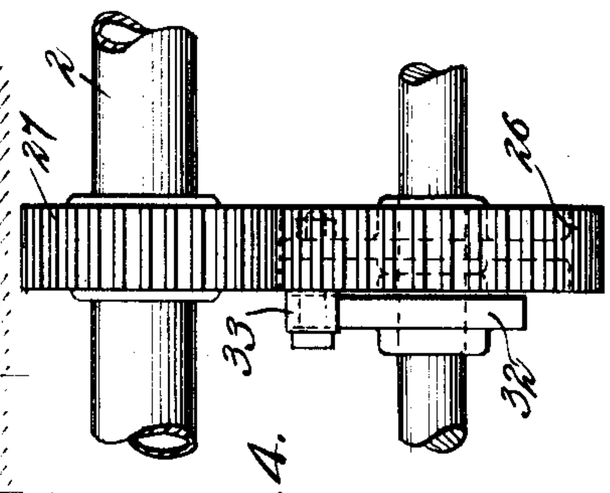


Fig. 4.

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UNITED STATES PATENT OFFICE.

PAUL SARRASIN, OF DIJON, FRANCE.

HORIZONTAL MECHANICAL FURNACE FOR ROASTING.

1,167,118. Specification of Letters Patent. Patented Jan. 4, 1916.

Application filed November 29, 1913. Serial No. 803,658.

To all whom it may concern:

Be it known that I, PAUL SARRASIN, a citizen of the Republic of France, residing at 30 Rue Longvic, Dijon, in the Republic of France, have invented certain new and useful Improvements in Horizontal Mechanical Furnaces for Roasting; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

I, PAUL SARRASIN, of Dijon, France, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement.

The present invention relates to a horizontal furnace for roasting pyrites blendes, etc. with mechanism for working the ores, in which the charging, the stirring and turning over of the ores and their discharge after roasting are effected automatically.

The essential characteristic of this furnace consists in the mechanical working of the ores being effected by means of a shaft provided with rabbles over the whole width of the furnace and actuated by a device placed on the outside of the furnace so as to rotate and to move lengthwise of the furnace simultaneously this latter movement being in the inverse direction to that in which the ore subjected to roasting is fed forward on the hearth. When the shaft provided with rabbles or stirring apparatus has reached the end of the longitudinal course it ceases to rotate without the rabbles touching the ore and returns in this position toward the front of the furnace.

The annexed drawings illustrate by way of example the application of the invention to a single furnace,. Figure 1 being a transverse vertical section. Fig. 2 a longitudinal vertical section. Fig. 3 is a diagrammatic illustration of the different positions of the mechanical devices by which the ores are worked. Fig. 4 is a front elevation of the dog-clutch mechanism for the rabble shaft, portions thereof being broken away. Fig. 5 is a detail side elevation of the same.

Above the hearth 1 of the furnace the stirring apparatus moves that serves for feeding the ores forward during the roasting. It consists of a hollow shaft 2 on which the rabbles 3 are fixed. It is supported at each end on bearings by the carriages 4 moving on the rails 5 arranged on each side of the furnace and parallel to the length. The movement of these carriages in the one direction or the other is effected in any suitable manner. In addition to the movement of the carriages in the two directions, a rotary movement is imparted to the shaft by the devices borne by the carriages such as gears and pinions arranged so as to impart the required speeds to the shaft and so that the shaft can only rotate in a single direction of movement of the carriages, viz., during the movement of the stirring apparatus from the front to the back of the furnace.

Racks 6 engaging with the pinions 31 keyed to the carriage axles are arranged parallel to the rails. They serve to prevent any sliding of the running rollers on the rails in order that the forward movement of the stirring apparatus may always be in suitable relation to the rotary movement of the shaft.

The longitudinal openings 8 permitting the passage of the shaft 2 are constantly closed by a metal band 9 lined with asbestos on the inside of the furnace or by a band of suitable incombustible material. This band is fixed by the ends to a collar borne by the shaft that acts with it during the movement of the carriages. This band is guided by rollers 12 with supports fixed to the mountings of the furnace thus forming an endless band. It slides in the guide grooves 10, the lower groove forming a small longitudinal cup filled with refractory sand. The band slides in this sand which forms a perfect joint allowing of any dilation, preventing any entry of air and enabling the least possible play to be given between the band and the edges of the upper guide groove. The opening existing in the front of the furnace and necessary for the entry and the exit of the stirring apparatus is closed by the plug 11 which can be removed as desired.

The cooling of the shaft 2 is effected by means of a siphon tube that dips into longitudinal reservoirs 14 fed with cold water and extending over the whole length of the furnace. These siphon tubes 13 extend into the interior of the hollow shaft so as to pour the cold water into the middle of its length, the water returning and flowing into the longitudinal discharge trenches 15. The ore is delivered on to the hearth by a hopper 16, the bottom of which is closed by a cylinder 17 provided over its whole length with a groove 18 the section of which can be regu-

lated by means of filling blocks so as to obtain the necessary volume corresponding to the desired charge. The weight of the charge may likewise be regulated by the rotary speed of the cylinder. When the groove comes to the bottom of the hopper it is filled with ore that has just been poured into the furnace.

The casing 19 of the cylinder which forms a passage for pouring in the ore is connected with the hopper by a joint 20 in the form of a cup filled with fine sand in which a piece of suitable form fixed to the hopper is sunk. The lower part of the casing 19 is immersed in another cup 21 formed by the outer frame of the opening through which the ore falls. Thus perfect joints are obtained facilitating the mounting allowing of any dilation and preventing any entry of air or exit of gas. The rotary movement is imparted to the charging apparatus through the shafts 22 and 23. The action of the apparatus is regulated so that the charge does not drop into the furnace at one or at several times except at the desired moment when the stirring apparatus has moved the charge of ore that dropped in the preceding course.

Passages 24 arranged in the lower part of the front of the furnace and into which the ore drops after the roasting are closed by the flap 5 that opens automatically at the required moment so as to allow the roasted ore to fall into the trucks or into a mechanical conveyer.

The action of the apparatus is as follows: Supposing that the hearth is uniformly charged with ore and the apparatus at the end of its course to the left (Fig. 2) position 1 in Fig. 3 at the moment when the rabbles are not touching the layer of ore. The carriages 4 are actuated and move from left to right lengthwise of the furnace. The rabbles of the shaft rotate and each in turn according to the curve described by it, and resulting from the simultaneous forward and rotary movements imparted to it, cuts the layer of ore which separates them into slices and carries them successively from right to left. At the position I in Fig. 3 the rabble *a* has not yet touched the layer of ore, the shaft 2 being still stationary in the position II the rabble *a* being in contact with the ore at III the rabble *a* has caused a first slice to drop into the passage 24 and the rabble *c* being in its turn in contact with the layer of ore, moved in consequence of the feed movement from left to right the slice displaced by the rabble *c* is carried thereby a little lower toward the left and a part will drop into the passage (position IV). The rabble *b* will come in contact in its turn with the layer of ore and will move another slice toward the left (position V). The different rabbles *a*, *b* *c* (the stirring apparatus may be constructed with two rabbles only) will again come in turn in contact with the layer of ore and will cause it to advance progressively from right to left toward the front of the furnace in the direction indicated by the arrow *x*, in a direction inversely to that of the forward movement of the shaft 2 bearing the rabbles (arrow *y*). The rabble shaft will arrive finally (position VIII) at the end of its course to the right when none of the rabbles are in contact with the layer of ore. At this moment the direction of action is reversed and the carriages return from right to left, from the back to the front of the furnace and the rabble shaft returns to the position I (Fig. 3). During this return of the shaft the stirring apparatus should not rotate, and the rabbles remain in the same position as is shown at VIII (Fig. 3) so as not to touch the layer of ore. This result is obtained by the action of a dog-clutch connecting the gear wheel 26, which is in mesh with the pinion 27 fixedly mounted upon the rabble shaft 2, with its shaft, upon which it is loosely mounted. This clutch mechanism is shown in detail in Figs. 4 and 5, wherein the numeral 33 designates each of the spring-pressed dogs or pawls which are carried by the gear wheel 26 and are in operative engagement with the teeth of a ratchet wheel 32 mounted fixedly upon the shaft for the said gear wheel. When the carriage advances from the front or discharge end of the furnace to the rear or feed end thereof, the shaft for the gear wheel 26 will rotate in the direction of the arrow *a* in Fig. 5, and the dogs 33 will thus engage the ratchet teeth in such a manner that the gear wheel 26 will rotate with its shaft. Consequently, the pinion 27 and the rabble shaft 2 will be caused to rotate in the direction of the arrow *b*. When, on the contrary, the carriage returns from the rear to the front of the furnace, the dogs 33 will ride over the ratchet teeth, so that the free gear wheel 26 is no longer connected with its shaft for rotation therewith. The rabbles will thus remain in position VIII, Fig. 3, during the whole movement of the carriage in this direction, so that the mineral upon the bed of the furnace will not be operated upon thereby. In this manner the whole of the layer of ore that was spread over the hearth has been conveyed a certain distance toward the left or front of the furnace without any dust having been produced, the rabbles 3 simply feeding the ore forward slowly and progressively without raising it and consequently without dropping it.

When it is desired to take out the stirring apparatus (in order to replace one or other of the rabbles that are worn or have deteriorated for example) the plugs 11 closing the opening in the front of the furnace are removed, the carriages are moved on the

rails 5 to an extent sufficient for the apparatus to come entirely out. The furnace is closed and then with all the requisite facility outside the furnace the necessary repairs may be effected. In case repairs may require a little time it will suffice if the apparatus be entirely removed from the carriages and be replaced by a reserve apparatus, which can be done in a few minutes.

It is to be noted that the furnace instead of being established with two carriages, one at each extremity of the rabble shaft, may be constructed with a single carriage running on a single side of the furnace. The furnace would then have only one longitudinal opening for the passage of the rabble shaft, which projects into the interior of the furnace. Finally, if two simple furnaces are arranged systematically in parallel relation to each other, each having a single longitudinal opening, a double furnace will be obtained having a single common carriage with two rabble shafts.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. An ore roasting furnace having feed and discharge ends and a horizontal ore bed extending between the said ends, a transverse shaft mounted within the furnace for movement in a plane parallel to the said ore bed above the same and in a direction at right angles to its longitudinal axis, means for reciprocating the shaft in this direction, means for rotating the shaft only during its movement toward the feed end of the furnace, and rabbles provided upon the outer surface of the shaft for engagement with the ore upon the bed to press the same toward the discharge end of the furnace during movement of the shaft toward the feed end thereof.

2. An ore roasting furnace having feed and discharge ends and a horizontal ore bed extending between the said ends, a transverse shaft mounted within the furnace for movement in a plane parallel to the said bed and situated above the same in a direction at right angles to its axis, means for reciprocating the shaft in this direction, means for rotating the shaft during its movement toward the feed end of the furnace, means for securing the shaft against rotation during its reverse movement in the direction of the discharge end of the furnace, and rabbles provided upon the outer surface of the shaft for engagement with the ore upon the bed to move the same toward the discharge end during movement of the shaft toward the feed end of the furnace.

3. An ore roasting furnace having feed end, a discharge end, and a horizontal ore bed extending between the same, a transverse shaft mounted within the furnace for movement in a plane parallel to the said bed and situated above the same in a direction at right angles to its axis, means for reciprocating the shaft in this direction, means for rotating the shaft during movement of the same toward the feed end of the furnace, and rabbles provided upon the outer periphery of the shaft and being in the form of circumferentially spaced fins extending axially upon the shaft throughout the width of the furnace for engagement with the ore upon the bed to move the same in the direction of the discharge end during movement of the shaft in the opposite direction.

4. An ore roasting furnace having feed end, a discharge end and a horizontal ore bed extending between the same, a transverse shaft mounted within the furnace for movement in a plane parallel to the said bed and situated above the same in a direction at right angles to its axis, means for reciprocating the shaft in this direction, means for rotating the shaft during movement of the same toward the feed end of the furnace, and means for securing the shaft against rotation during its movement in the direction of the discharge end of the furnace and for maintaining the rabbles in inoperative position out of engagement with the ore upon the bed during this movement of the shaft.

5. An ore roasting furnace having an ore bed, a rabble shaft traversing the bed, means for translating said shaft at right angles to its axis, and means for rotating the shaft throughout its translatory movement in one direction only at a tangential speed exceeding the speed of translation.

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

PAUL SARRASIN.

Witnesses:
RENÉ BARBIER,
MARCEL BONNIÈRE.