No. 627,333. Patented June 20, 1899.

W. HARVEY.

ROASTING OR DRYING FURNACE.

(Application filed July 25, 1898.)

(No Model.) 2 Sheets—Sheet 1.

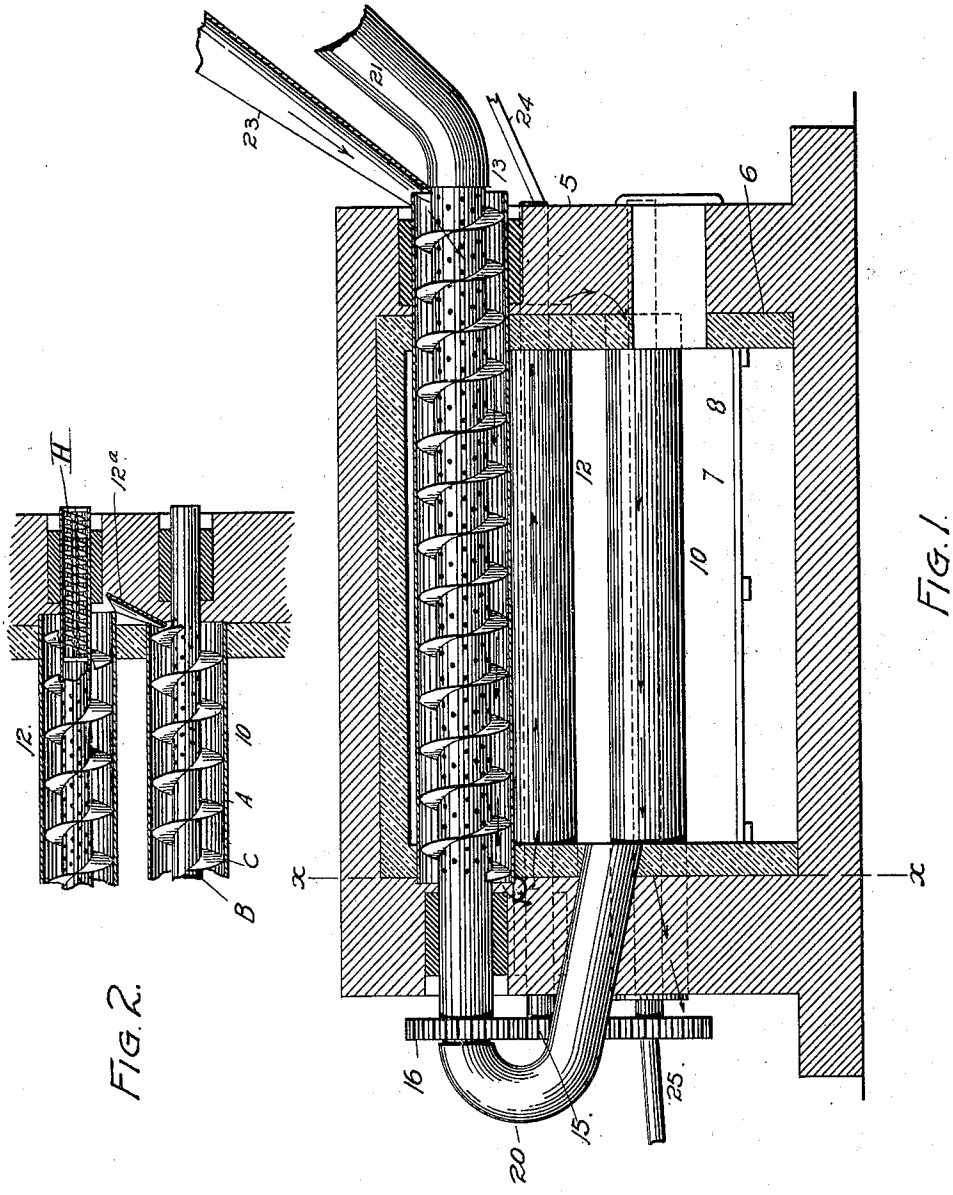


FIG. 1.

FIG. 2.

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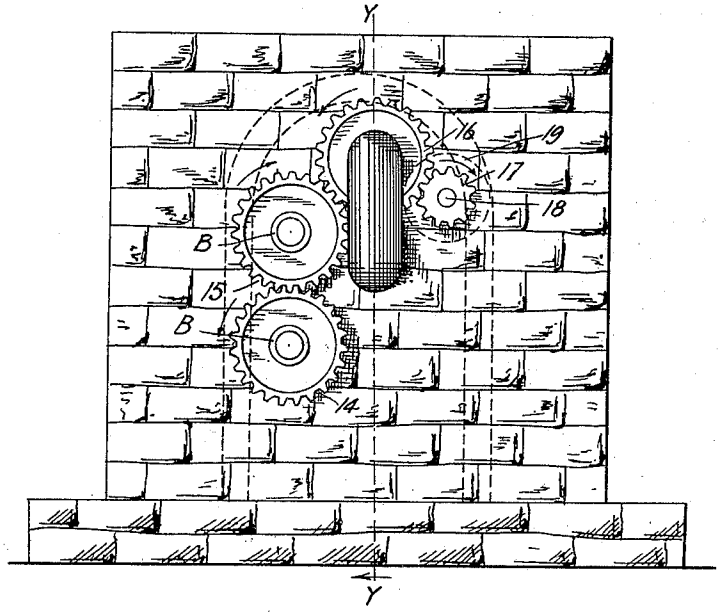
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(No Model.) 2 Sheets—Sheet 2

FIG. 3



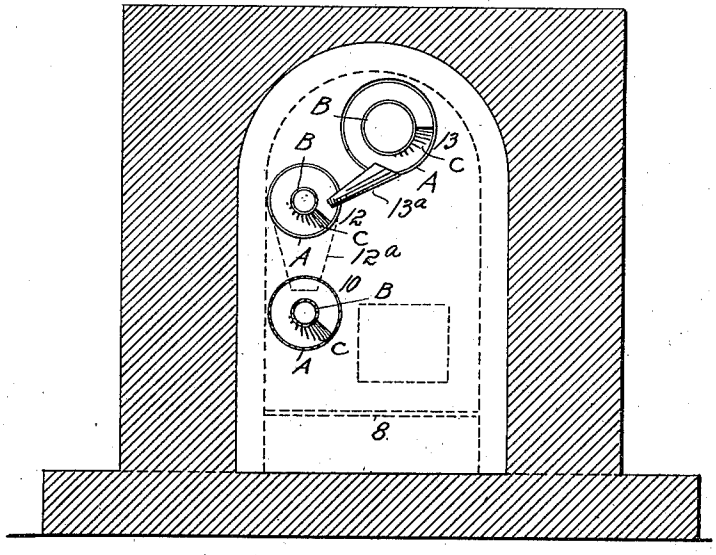


FIG. 4

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UNITED STATES PATENT OFFICE.

WILLIAM HARVEY, OF DENVER, COLORADO.

ROASTING OR DRYING FURNACE.

SPECIFICATION forming part of Letters Patent No. 627,333, dated June 20, 1899.

Application filed July 25, 1898. Serial No. 686,785. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM HARVEY, a citizen of the United States of America, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Roasting or Drying Furnaces; and I do 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, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in roasting-furnaces, my object being to provide an apparatus of this class which shall be simple in construction, economical in cost, reliable, durable, and efficient in use; and to these ends the invention consists of the features, arrangements, and combinations hereinafter described and claimed, all of which will be fully understood by reference to the accompanying drawings, in which is illustrated an embodiment thereof.

In the drawings, Figure 1 is a vertical longitudinal section taken through my improved furnace on the line *y y*, Fig. 3. Fig. 2 is a fragmentary section illustrating the two lower conveyers. Fig. 3 is end elevation of the furnace. Fig. 4 is a cross-section taken through the same on the line *x x*, Fig. 1.

Similar reference characters indicating corresponding parts in the views, let the numeral 5 designate the outer wall of the furnace and 6 the fire-clay lining surrounding the combustion-chamber 7, in which is located the fire-grate 8. Located above the fire-grate and journaled in suitable boxes in the end walls of the furnace are a number of revoluble conveyers 10, 12, and 13. Each of these conveyers is composed of an outer tube A, an inner tube B, and a spiral plate or screw-thread located between the two tubes and connecting them with each other. The inner tubes B project beyond the outer tubes, and their rear or left-hand extremities (referring to Fig. 1) are provided with gear-wheels 14, 15, and 16, respectively, through which the tubes pass. The gear 16 meshes with a smaller gear 17, fast on a shaft 18, carrying a pulley 19, (shown in dotted lines,) which may be connected with any suitable motor for operating the conveyers. As the gear 17 is turned in the direction indicated by the arrow, (see Fig. 3,) the gears are rotated in the direction indicated by the adjacent arrows in the same figure.

A conduit 20, communicating with the chamber 7, leads to one extremity of the inner tube B of the uppermost conveyer. The smoke and products of combustion, as well as the fumes from the ore, pass from the chamber 7 by way of this tube to a conduit 21, leading to a suitable stack. (Not shown.)

In using the apparatus the ore or other material to be treated is fed into the forward extremity of the tube A, belonging to the uppermost conveyer 13, by way of a chute 23. The rotation of this conveyer carries the material rearward between the two tubes A and B through the medium of the interposed screw-thread C. After reaching the rear extremity of the conveyer 13 the material is discharged from the conveyer by way of a chute 13^a into the tube A of the conveyer 12 and carried thence in the opposite direction or forwardly through the last-named conveyer, since this conveyer rotates in a direction opposite the conveyer 13. After reaching the forward extremity of the conveyer 12 the material is discharged by way of a chute 12^a into the tube A of the conveyer 10, through which it is again carried rearwardly and discharged from the apparatus. While traveling slowly through the conveyers the process of roasting is going on through the agency of the heat generated in the combustion-chamber 7, the outer tubes A being directly acted upon by the heat.

The tubes B of the conveyers 12 and 13 are perforated their entire length, while the corresponding tube of the conveyer 10 is perforated only a portion of its length. (See Fig. 2.) The forward extremity of the tube B of the conveyer 12 is provided with an interior left-hand screw H for the introduction of salt, which passes through the perforations in the tube, coming in contact with the ore between the tubes A and B. This salt meets the ore, which is traveling in the opposite direction, and is discharged with it into the lowermost conveyer 10, where it meets the steam gen-

erated by the introduction of a jet of water at the rear extremity of the tube B. The salt and steam form hydrochloric acid, which facilitates the removal of those elements in the ore which retard the separation of the mineral therefrom. The salt is introduced by way of a chute 24 and the water by way of a pipe 25. (See Fig. 1.) Of course the conveyers may be supplied with any other substances which may be found desirable or necessary in carrying out the roasting process, whose function is the removal from the ore of the refractory elements, as heretofore stated. The course of the ore while traveling through the conveyers is indicated by the arrows in Fig. 1.

It must be understood that any number of revoluble conveyers may be employed in the construction of my improved furnace or drier without departing from the spirit of the invention.

It may be stated that one reason for having the tubes B of the conveyers open-ended is to permit the attachment of hoods or other apparatus for the purpose of condensing or saving any mineral values that may have escaped with the fumes. The hood apparatus is not shown, inasmuch as nothing is claimed thereon in this specification.

Having thus described my invention, what I claim is—

1. In a roasting-furnace, the combination with the combustion-chamber and a number of conveyers journaled therein, means for delivering the material to one of the conveyers, means for discharging the material from one conveyer to the other, means for rotating the conveyers, whereby the material is made to travel through the adjacent conveyers in opposite directions, and a conduit communicating with the combustion-chamber and leading to one end of the uppermost conveyer, whose opposite extremity communicates with the smoke-stack.

2. In a roasting-furnace, the combination with the combustion-chamber, of a number of conveyers journaled therein, each comprising two open-ended tubes, one placed within the other and connected by an interposed screw-thread, means for delivering the material to one of the conveyers, means for discharging the material from one conveyer to the other, means for rotating the conveyers, whereby the material is made to travel through the adjacent conveyers in opposite directions, and a conduit communicating with the combustion-chamber and leading to one end of the inner tube of the uppermost conveyer, the opposite extremity of the last-named conveyer communicating with the smoke-stack.

3. In a roasting-furnace, the combination with the combustion-chamber, of a number of conveyers journaled therein, each comprising two open-ended tubes, one placed within the other and connected by an interposed screw-thread, the inner tubes being perforated, means for conveying the material to one of the conveyers, means for rotating the conveyers, whereby the material is made to travel through the adjacent conveyers in opposite directions, and a conduit communicating with the combustion-chamber and leading to the inner tube of the uppermost conveyer whose opposite extremity communicates with the smoke-stack.

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

WILLIAM HARVEY.

Witnesses:
A. J. O'BRIEN,
EDITH HIMSWORTH.