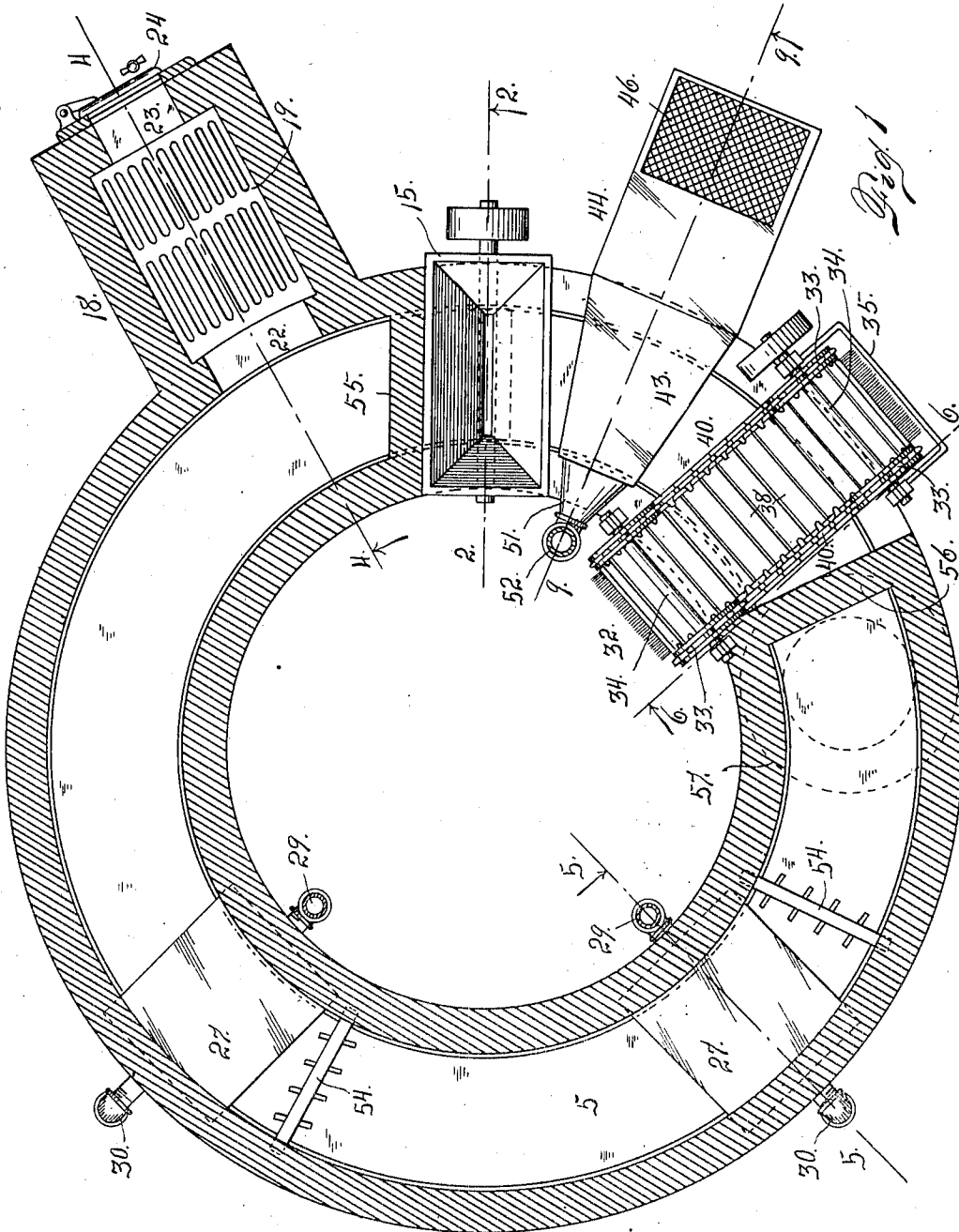


A. R. WILFLEY.
ORE ROASTER.
APPLICATION FILED DEC. 11, 1908.

969,927.

Patented Sept. 13, 1910.

6 SHEETS—SHEET 1.



Witnesses

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5 SHEETS—SHEET 2.

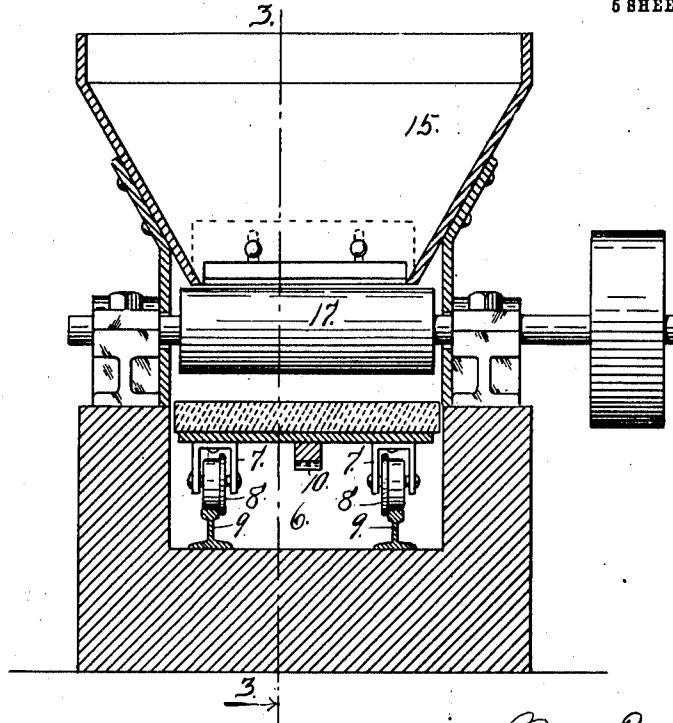


Fig. 2.

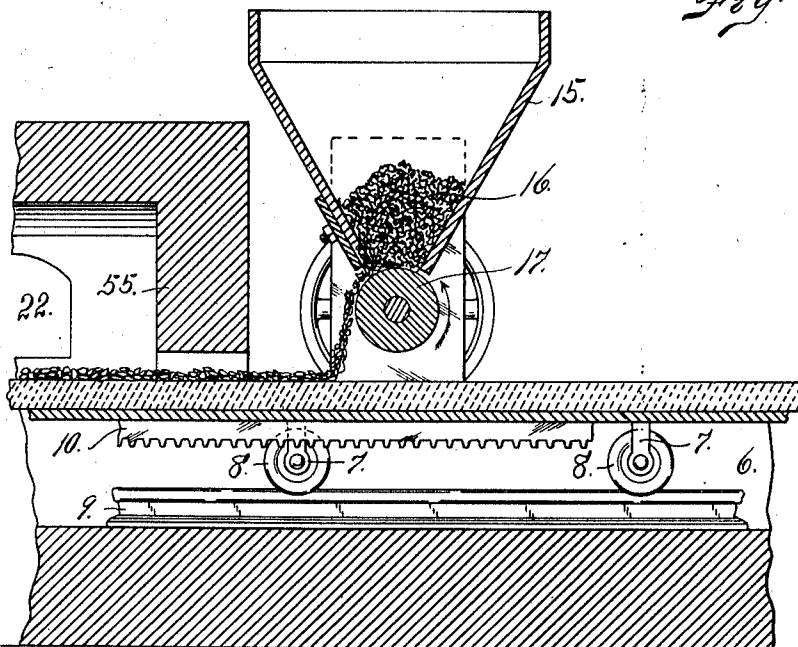


Fig. 3.

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5 SHEETS—SHEET 3.

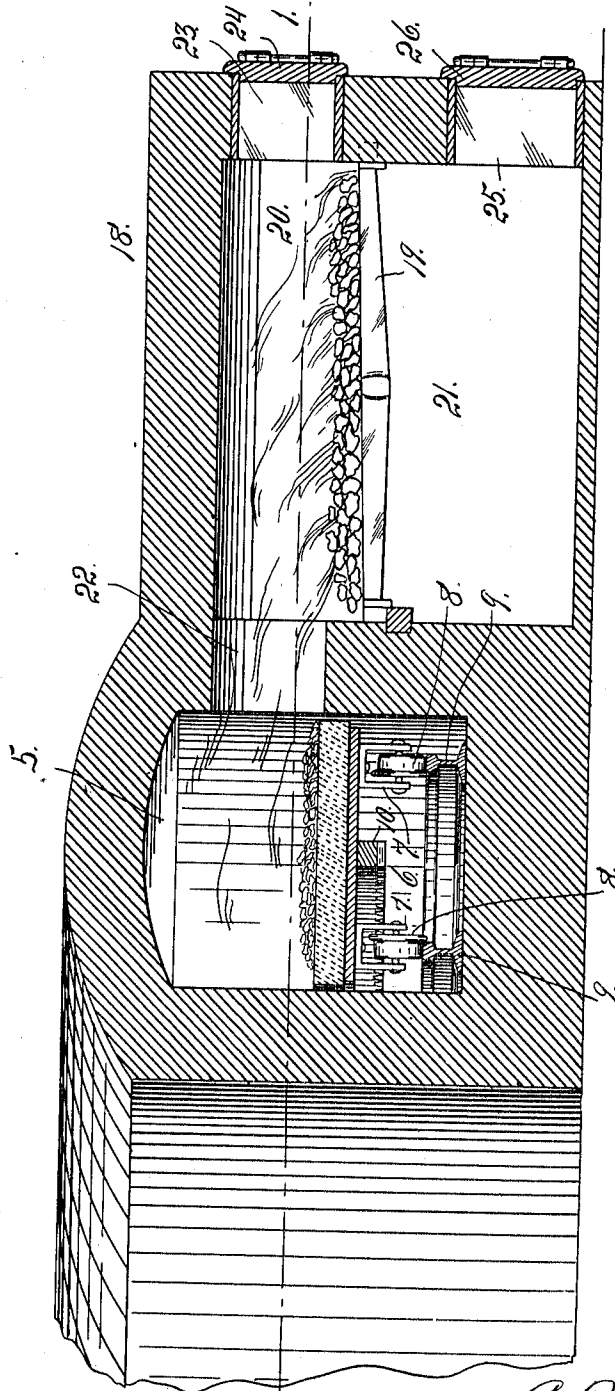


Fig. 4.

Witnesses

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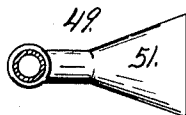
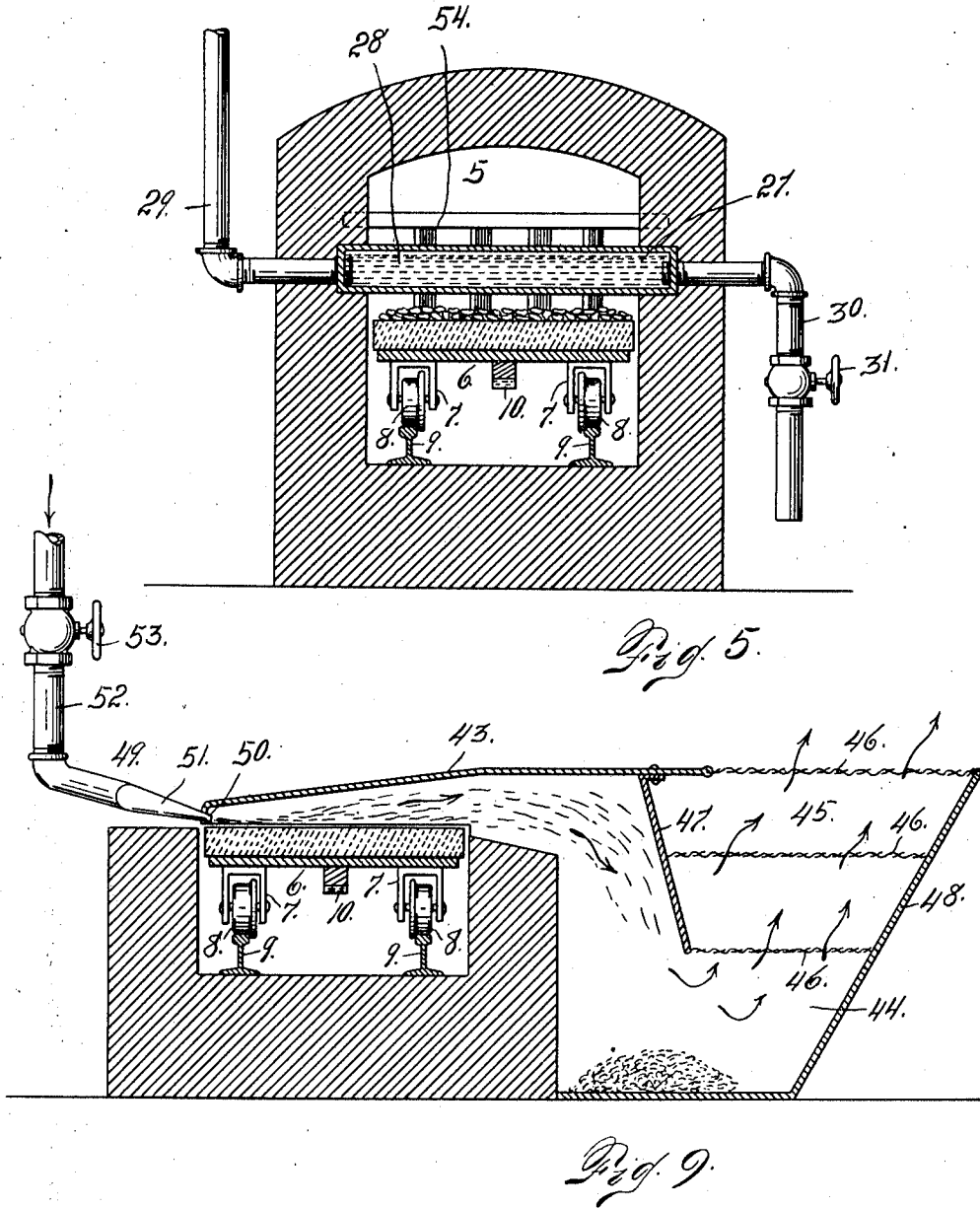
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6 SHEETS—SHEET 4.



Witnesses

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Fig. 10.

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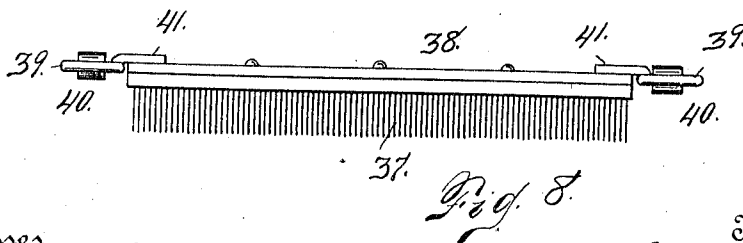
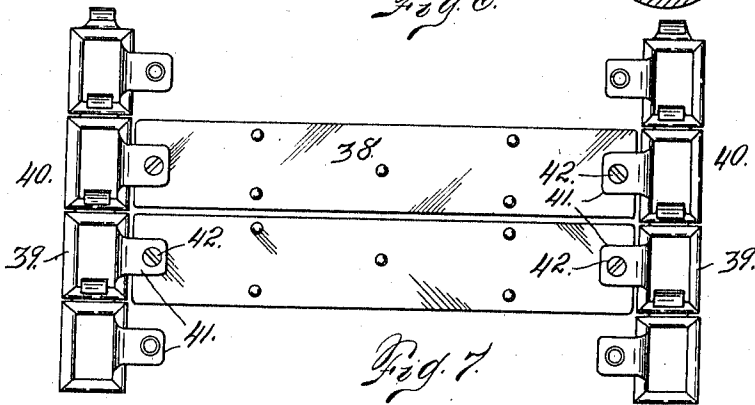
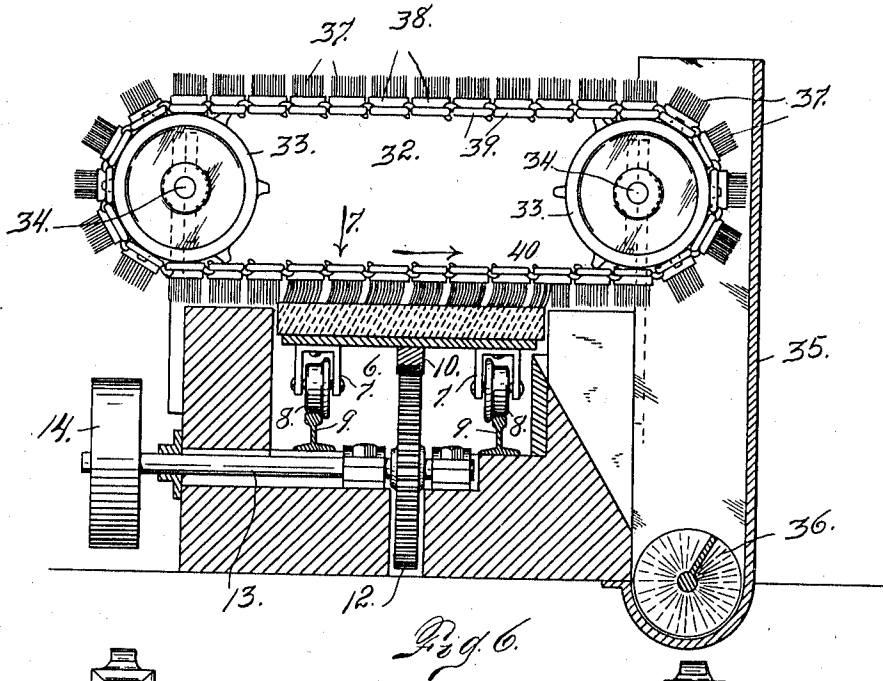
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5 SHEETS—SHEET 6.



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UNITED STATES PATENT OFFICE.

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ORE-ROASTER.

969,927.

Specification of Letters Patent. Patented Sept. 13, 1910.

Application filed December 11, 1908. Serial No. 466,928.

To all whom it may concern:

Be it known that I, ARTHUR R. WILFLEY, a citizen of the United States, residing in the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Ore-Roasters; 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 ore roasting apparatus, my improved construction being more especially intended for producing what is known as a magnetic roast, whereby the ore is heated to such an extent that a large proportion of its metallic values is made magnetic and may be separated from the other portion of the ore by magnetism.

It is well known that in order to produce what is known as a magnetic roast, conditions very different from those required to produce a sweet roast must obtain.

An important feature of my improved construction consists in mechanism whereby the ore is completely removed from the roasting hearth after it has traveled a predetermined distance, or after it has been subjected to the action of the heat for a predetermined period.

In my improved construction I have illustrated two instrumentalities for removing the ore from the hearth, either of which separately, or both of which combined, may be employed. In my improved apparatus I have illustrated a circular hearth mounted to rotate in a horizontal plane. In order to remove the ore from the hearth at the proper period, I have arranged an endless traveling brush whose lower run travels transversely across the hearth in such a plane as to brush the roasted ore therefrom. I have also employed a conduit for delivering air under pressure to the hearth in a transverse direction whereby the force of the air current removes the ore from the hearth. This air may be employed for re-

moving the ore from the hearth either alone or in combination with the brush, as heretofore explained.

In order to prevent the possible overheating of the ore during its travel with the rotary hearth from the feed hopper to the removing agency, I employ receptacles through which water is passed and in which it is continually changing for cooling purposes, the said receptacles being placed in suitable proximity to the roasting hearth, preferably extending transversely across the hearth and above the same. Any desired number of these receptacles for cooling water may be employed, as circumstances may require.

In my improved ore roasting apparatus, stationary plows or rabblers may be employed, adapted to stir the ore upon the hearth as the latter travels underneath the rabblers.

Having briefly outlined my improved construction, I will proceed to describe the same in detail, references being made to the accompanying drawing in which is illustrated an embodiment thereof.

In this drawing, Figure 1 is a horizontal section taken through my improved furnace on the line 1—1 Fig. 4 looking downwardly, the parts being shown on a smaller scale. Fig. 2 is a section taken transversely through the hearth, cutting the feed hopper. This section is taken approximately on the line 2—2 Fig. 1, the parts being shown on a larger scale. Fig. 3 is a fragmentary longitudinal section of the hearth taken on the line 3—3 Fig. 2. Fig. 4 is a transverse section of the hearth taken on the line 4—4 Fig. 1, looking in the direction of the arrow. Figs. 5 and 6 are sections taken on the lines 5—5 and 6—6, respectively, of Fig. 1, viewed in the direction of the arrows. Fig. 7 is a fragmentary view looking downwardly upon the lower run of the endless brush, or a view looking in the direction of arrow 7 Fig. 6. Fig. 8 is a detail view of one of the units or sections forming the endless brush. Fig. 9 is a section taken on the line 9—9 Fig. 1. Fig. 10 is a top plan view of a nozzle for delivering the air blast to the roasting chamber whereby the ore is removed from the hearth.

The same reference characters indicate the same parts in all the views.

Let the numeral 5 designate a circular roasting chamber in which a hearth 6 is mounted to travel for ore roasting purposes. As shown in the drawing the bottom of the hearth is equipped with hangers 7 in which are journaled wheels 8 which engage tracks 9.

Centrally mounted upon the bottom of the hearth is a large gear 12 fast upon an operating shaft 13 provided with a pulley 14, which may be connected with any suitable bar for operating the hearth.

As shown in the drawing, the roasting hearth is an endless structure traveling at suitable speed for the purpose.

Mounted above the hearth is a hopper 15 into which the ore to be treated is fed, and from which this ore designated 16 is delivered to the hearth through the agency of a feed roll 17 (see Fig. 3).

Located a short distance from the hopper, and in communication with the roasting chamber, is a furnace 18 having a fuel hearth 19 separating the combustion chamber 20 from the ashpit 21. The combustion chamber of the furnace is in communication with the roasting chamber 5 by an opening 22. The furnace is provided with a feed opening 23 normally closed by a door 24. The ashpit is provided with an opening 25 normally closed by a door 26.

Located beyond the furnace 18 in the direction in which the hearth is traveling, is a receptacle 27 containing cooling water 28 which is delivered to the receptacle by a conduit 29 and escapes therefrom through a conduit 30 provided with a controlling valve 31. This receptacle extends transversely across the roasting chamber slightly above the hearth, whereby its cooling influence is exerted upon the ore carried by the hearth, to prevent the latter from becoming too highly heated in order to accomplish the best results in obtaining a magnetic roast.

It will be understood that any desired number of these ore cooling receptacles may be employed. In the drawing two of these are illustrated. One or more may be used, according to circumstances, much depending upon the length of the roasting chamber, or the distance from the feed hopper to the location where the ore is removed from the endless traveling hearth.

Beyond the second receptacle 27 for the cooling water, and located at a short distance from the feed hopper, measured in a direction the reverse of that in which the hearth is traveling, is an endless traveling brush 32 actuated by sprocket wheels 33 mounted upon shafts 34. This brush passes through the roasting chamber and extends transversely across the hearth, the lower run of the brush hugging the hearth closely for

the purpose of completely removing the ore therefrom after it has traveled a predetermined distance in the roasting chamber. The ore removed from the hearth by the brush passes into a housing 35, falling thence into the bottom thereof, in which a screw conveyer 36 is located for the purpose of removing the roasted ore therefrom.

It will be understood that the endless brush may be of any suitable construction. As shown in the drawing, it is assumed that the brush is composed entirely of metal, the bristles 37 being formed of steel. Each brush section 38 is connected at its extremities with a link 39 of an endless traveling chain 40. As shown in the drawing, the links with which the brush sections are connected, are provided with lips 41 which are secured to the backs of the brushes by fastening devices 42.

Located between the hopper 15 and the endless brush 32 is a housing 43 which passes transversely above the hearth forming a chamber 44 at one side of the roasting chamber, and having an escape opening 45 for the air; the said opening being covered by a number of screens 46 arranged one above another and supported between a depending wall 47 and the side wall 8 farther from the roasting chamber.

A nozzle 49 is connected with the housing as shown at 50 near the inner edge of the hearth for delivering an air blast across the hearth in a transverse direction, whereby the hearth is thoroughly cleaned of its ore particles, in case any portion of the ore, no matter how small, has escaped the action of the endless brush. As shown in the drawing, the discharge extremity of this nozzle is flattened as shown at 51, and enters an opening formed in the housing, the nozzle being arranged to deliver the air blast to strike the hearth inclined in a direction slightly inclined to the horizontal, whereby the blast sweeps across the hearth and removes every particle of ore therefrom. The extremity of the nozzle 49 remote from the hearth is connected with an air conduit 52 provided with a valve 53.

From the foregoing description the use and operation of my improved ore roasting apparatus will be readily understood.

The ore to be treated is first delivered to the hopper 15 from which it passes to the hearth 6, which is traveling in the direction indicated by the arrow in Fig. 1. The roasting chamber receives its heat from the furnace 18, which is connected with the chamber a short distance forward of the hopper, as heretofore explained. As the hearth continues to travel, the ore which is fed thereto is carried therewith and passes underneath the first cooling chamber 27, thence to the second cooling chamber, and finally reaches

the endless brush 32 which is traveling in a direction crosswise or transversely of the hearth and in contact therewith, for the purpose of removing the pulverized ore therefrom. Any ore that may have escaped the brush, will be removed from the hearth by the air blast.

The ore roasting chamber may be equipped with stationary rabbles 54, which are supported by the side walls of the roasting chamber and engage the ore upon the hearth for the purpose of stirring the ore and bringing new surfaces thereof into contact with the oxidizing atmosphere of the furnace. These rabbles may, or may not be used, as desired. It is thought it will be found practicable to feed the ore to the hearth in such a thin layer that no stirring or rabbling will be necessary for the purposes of a magnetic roast. If, however rabbling is required, it may be performed in the manner just explained.

It may be stated that the arch or top wall of the furnace is cut away between the vertically disposed walls or ledges 55 and 56, between which walls the hopper, the housing for receiving the air blast, and the endless traveling brush are located.

While I have illustrated an apparatus for removing the ore from the hearth by a direct blast of air, it is evident that the same purpose may be accomplished by suction, and the claims of this specification must be construed of sufficient scope to cover the removal of the ore from the hearth through the agency of an air current, whether direct or by suction.

The object of completely removing the ore from the hearth at predetermined intervals, or after the ore has remained a predetermined period, under the influence of the heat, is to prevent the possible overroasting of the ore or a portion thereof, for the purpose of magnetic separation.

In furnaces for ordinary roasting, or for the producing of what is ordinarily termed a sweet roast, meaning that practically all of the sulfur and other impurities which retard the separation of the metallic values from the gangue, are removed, there is no absolute necessity for the complete removal of the ore from the hearth at any particular or predetermined time, since the remaining of a portion of the ore upon the hearth for an indefinite period will do no harm. In other words, for ordinary ore roasting purposes, where a sweet roast is required, an over-roast or the leaving of a portion of the ore upon the hearth for a longer period than is absolutely necessary, in order to secure a proper roast, does not injure the ore for the purpose intended. On the contrary, for the purposes of a magnetic roast, the time during which the ore may be subjected

to the action of the roasting heat is limited, and if the ore is subjected to the heat for a longer period, the purpose of the roast is to a large extent defeated. It is, therefore, highly advantageous for the purposes of a magnetic roast to have the entire body of ore removed from the hearth after it has been subjected to the action of the roasting heat for a predetermined time, this time being very limited as compared with the time required for producing a sweet roast.

Having thus described my invention, what I claim is:

1. An ore roasting apparatus comprising an endless traveling horizontally disposed hearth, an endless traveling brush composed of hinged sections extending transversely across the hearth, and means for completely removing the ore from the hearth at a predetermined point of travel of said hearth, substantially as described.

2. An ore roasting apparatus comprising a circular hearth mounted to rotate in a roasting chamber, an endless traveling brush composed of hinged sections extending across said hearth as means of removing ore therefrom, and a blast for completely removing the ore from the hearth, substantially as described.

3. An ore roasting apparatus comprising an endless traveling hearth mounted to rotate in a roasting chamber, an endless traveling brush composed of hinged sections for removing ore therefrom, and means at a predetermined point for regulating the temperature of the ore, substantially as described.

4. In an ore roasting apparatus, the combination of a horizontally disposed hearth of circular shape mounted to rotate, means for feeding the ore to be treated to the hearth, and apparatus for delivering a blast of air crosswise of the hearth for the purpose of completely removing fine particles of the ore from the hearth, substantially as described.

5. The combination with an ore roasting chamber, of a hearth mounted to travel therein, and means for delivering to the hearth an air blast directed crosswise of the hearth for the purpose of completely removing fine particles of the ore from the hearth while in operation, substantially as described.

6. The combination with an ore roasting chamber, of a hearth mounted to travel therein, an endless traveling brush extending transversely across the hearth, and means for delivering to the hearth an air blast in a transverse direction, substantially as described.

7. The combination with an ore roasting chamber, of a traveling hearth, cooling tanks arranged in the circuit thereof, and

means for completely removing fine particles of the ore from the hearth after the ore has been carried a predetermined distance through the roasting chamber, substantially as described.

8. In an ore roasting apparatus, the combination of a traveling hearth, and apparatus for removing fine particles of the ore from the hearth through the agency of an

air current of suitable strength, substantially as described.

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

ARTHUR R. WILFLEY.

Witnesses:

A. J. O'BRIEN,

A. EBERT O'BRIEN.