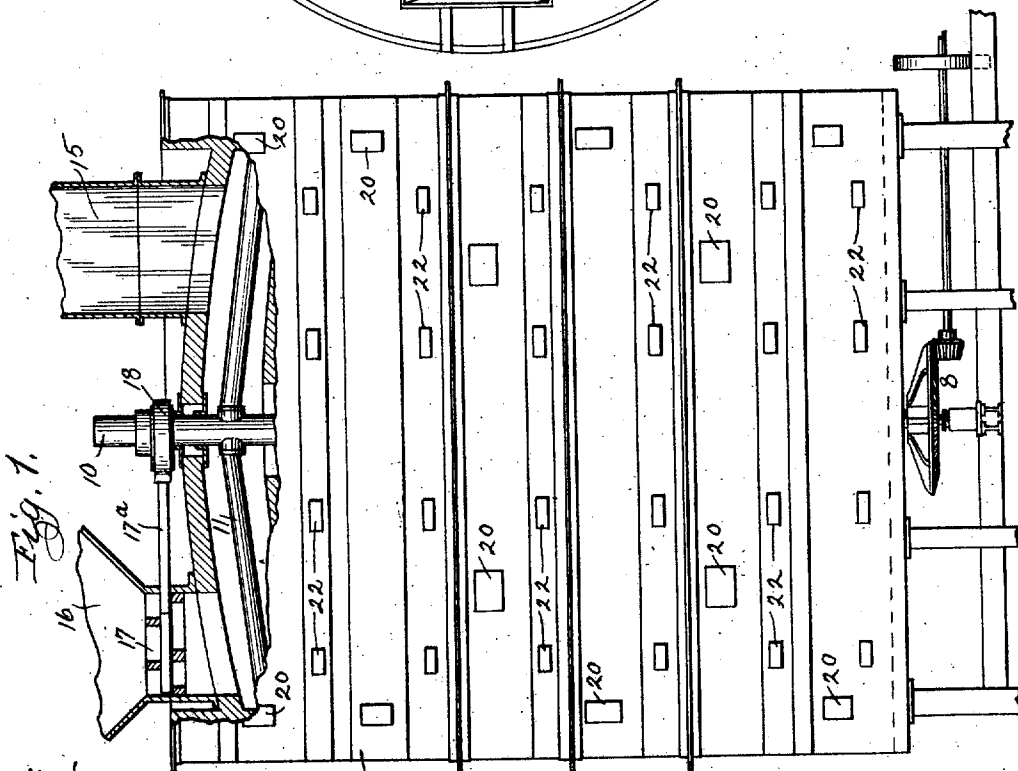
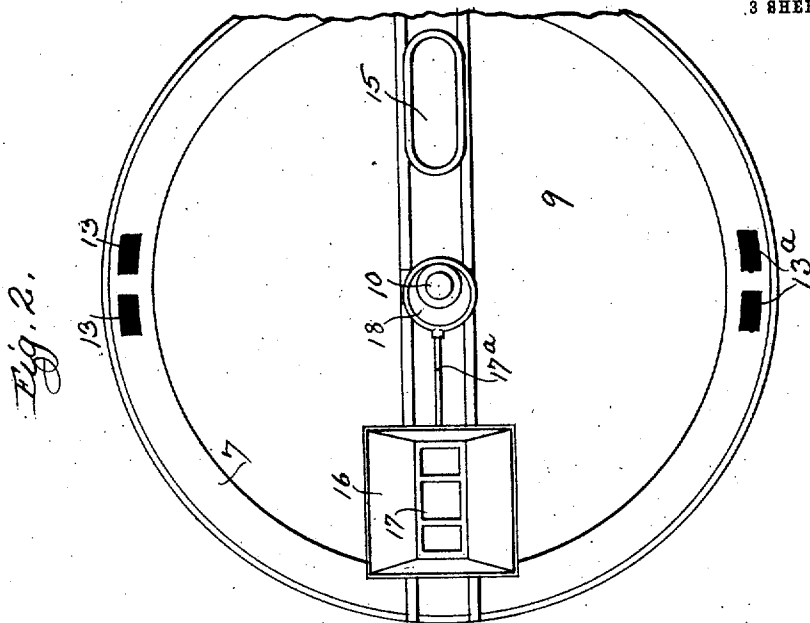


N. L. HEINZ & W. H. FREELAND.
FURNACE FOR ROASTING ORES.
APPLICATION FILED MAY 25, 1910.

986,709.

Patented Mar. 14, 1911.

3 SHEETS—SHEET 1.



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Fig. 2.

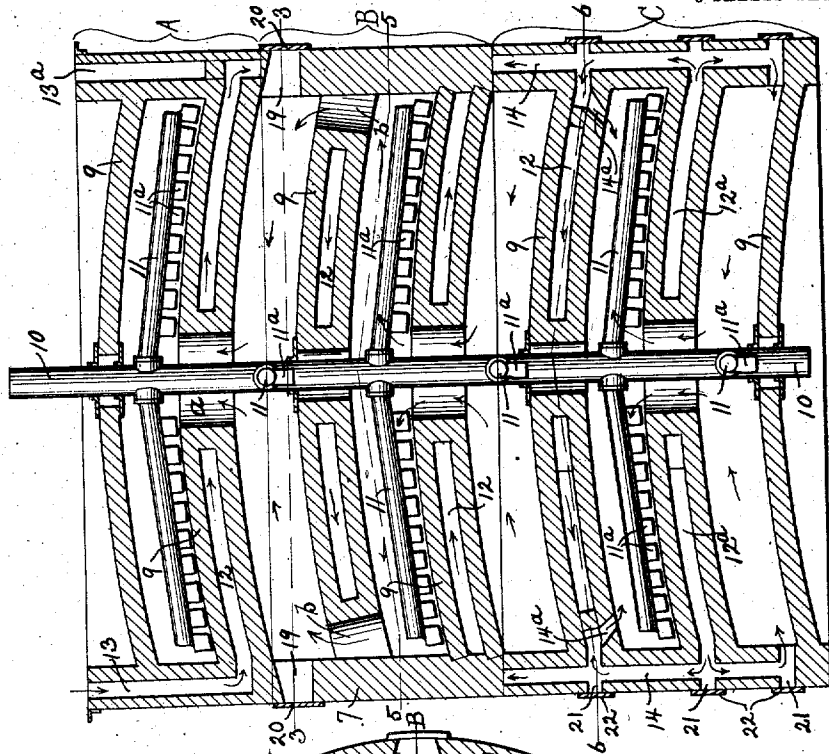
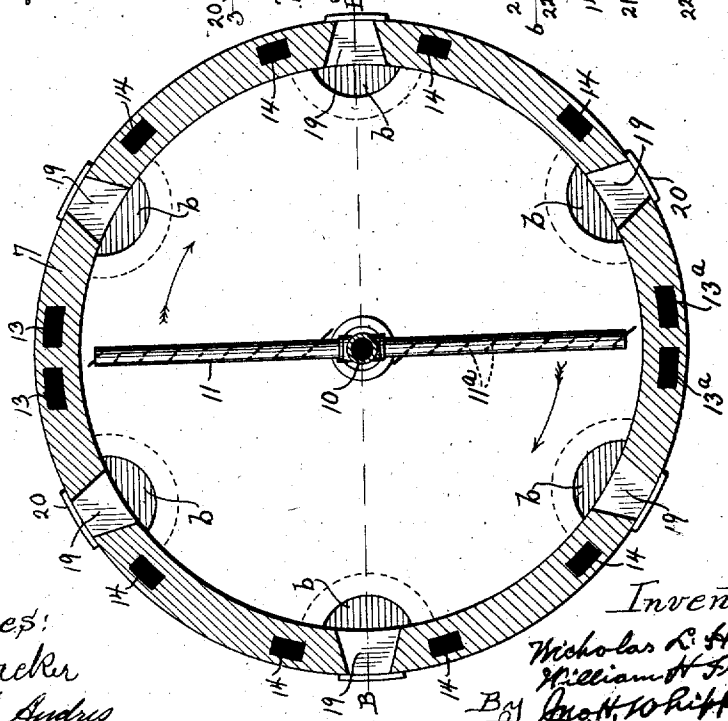


Fig. 3.



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3 SHEETS—SHEET 3.

Fig. 6.

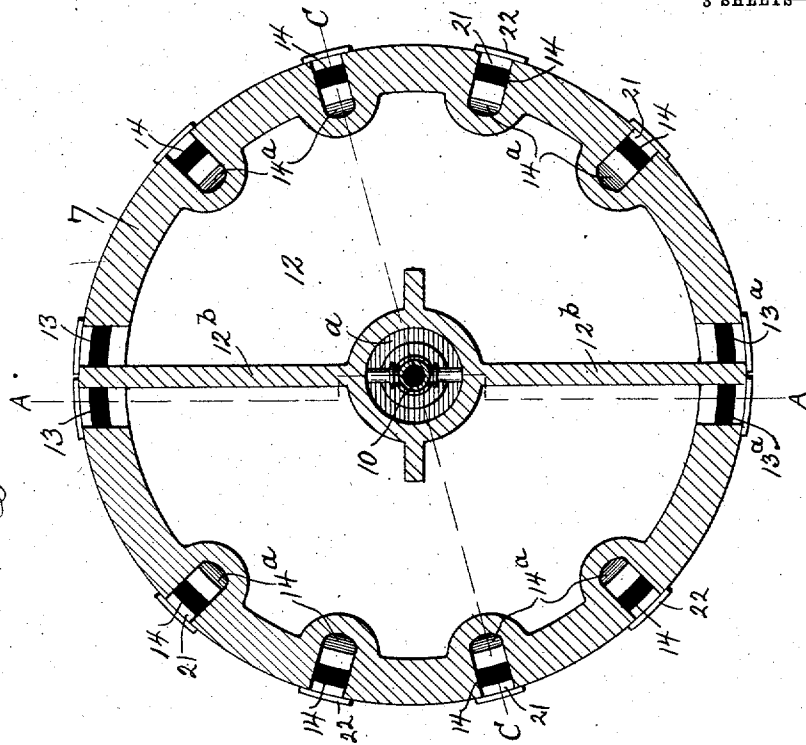
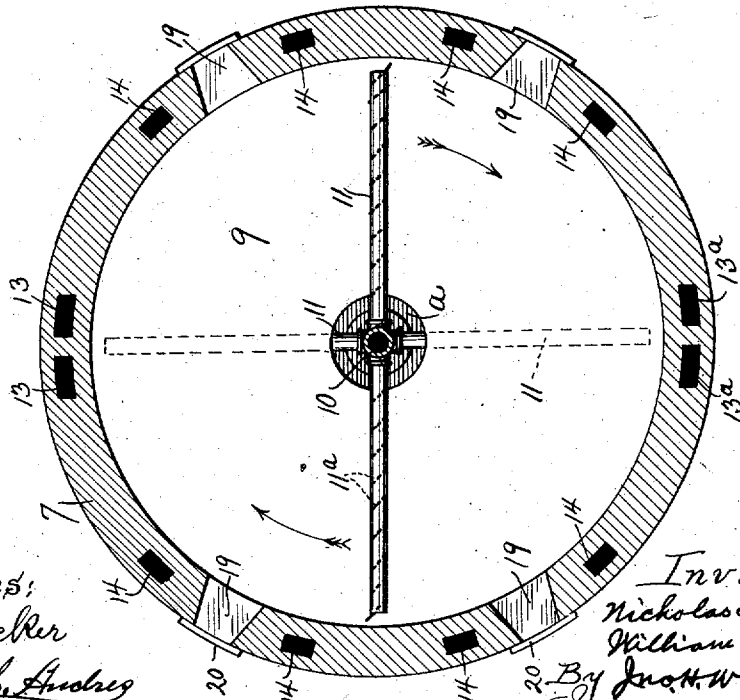


Fig. 5.



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UNITED STATES PATENT OFFICE.

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FURNACE FOR ROASTING ORES.

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Specification of Letters Patent.

Patented Mar. 14, 1911.

Application filed May 25, 1910. Serial No. 563,404.

To all whom it may concern:

Be it known that we, NICHOLAS L. HEINZ, of La Salle, in the county of LaSalle and State of Illinois, and WILLIAM H. FREELAND, of Isabella, in the county of Polk and State of Tennessee, have invented certain new and useful Improvements in Furnaces for Roasting Ores, of which the following is a specification.

Our invention relates to that class of roasting furnaces which have a series of superimposed hearths or ovens, through which the ore is successively passed from the upper in a zig zag course down on the lower ones and out at the bottom one. In furnaces of this class it has been found that the middle and upper hearths get hotter than necessary while in the lower ones, where the sulfur in the ore becomes more and more dilute, the temperature is prone to fall below what is desired.

It is the chief object of our improvement to provide a furnace of the class mentioned in which drafts of hot air over the hearths or through the ovens are arranged to transfer the heat from the upper hearths where there is an excess of heat to the lower ones in order to supply the heat deficiency found in them and maintain a more nearly uniform temperature throughout the entire furnace. We have attained this object in the furnace constructed as illustrated in the accompanying drawings in which—

Figure 1 is a side elevation, partly in vertical section, of a furnace containing our invention. Fig. 2 is a top or plan view of the same. Fig. 3 is a horizontal section taken at the line 3 3 of Fig. 4. Fig. 4 is a vertical section or rather three vertical sections, one of the upper part A being on the line A A of Fig. 6, one of the part B being on the line B B of Fig. 3, and one of part C being on the line C C of Fig. 6. Fig. 5 is a horizontal section on the line 5 5 of Fig. 4. Fig. 6 is a horizontal section on the line 6 6 of Fig. 4.

Like signs marked on the drawing indicate like parts throughout the several views.

The vertical shell 7 of the furnace is of brick work, and of any suitable size. It is preferably supported on a steel frame work for a foundation with driving gear 8. In the present instance six hearths 9 are provided, each consisting of an arch floor sup-

ported at its outer edge on the wall of the shell so as to sustain its weight and the weight of the ore passing on the hearths. A vertical rotary shaft 10 passes up through openings at the center of the hearths and is connected with the gear 8. The shaft has radial rakes 11 which are provided with teeth 11^a set inclined to the path of their travel when the shaft is rotated, and designed on some of the hearths to throw the ore outward to the periphery of the hearth and on others to pull it in to the center. The adaptation of the rakes is such, in the present instance, that ore fed into the upper hearth will be pulled to the center thereof and caused to fall down through central opening *a*, Fig. 4, on the next hearth below, where the rake is adapted to push the ore out to the periphery of the hearth, and cause it to fall through peripheral openings *b* on to the third hearth below and so on down through the furnace, causing its discharge at the bottom.

Each of the hearth arches, except the top and bottom ones, is provided with a low chamber 12 or 12^a which covers substantially the entire hearth area.

The shell walls are provided with down-flues 13 through which air from the outside is forced down on one side into the upper chamber 12 through which it circulates to the opposite side and thence passes down through flues 13^a into the next lower chamber 12 through which it passes in the opposite direction and so on down through all such chambers to and into the last one 12^a, as indicated by arrows showing direction of the air movement therein. Preferably said chambers have a partition 12^b by means of which the air may be made to circulate back and forth in each chamber before passing to the next one below.

The chambers 12 are heated by the burning of the ores on the hearths, and the air circulated through them is heated and passed finally into chamber 12^a which is the distributor of the hot air to the ovens or hearths below and above. For this purpose a series of up flues 14 is provided in the shell walls which communicate with said chamber 12^a and lead from it to the hearth below and to all the hearths above the chamber 12^a, short branch flues 14^a being provided through which the distributed hot air

passes directly into the ovens over all the hearths and thence up through the openings *a*, *b* and out through the gas exit 15.

5 A feed hopper 16 or box is provided which has a slide valve 17 operated by a rod 17^a having connection with an eccentric disk 18 of the shaft 10, whereby ore is fed upon the upper hearth from the hopper.

10 The shell is provided with openings having doors 20 for closing them at the points where the peripheral openings *b* are located, and air ports 21 with doors 22 for closing them are provided in conjunction with the up-flues 14 and their branches 14^a.

15 These are for inspecting the furnace and regulating the working of the same. The furnace can be fired with producer gas or in any of the well known ways.

20 By heating ingoing air currents in the chambers 12 of the hearth arches and distributing it in the ovens in the manner shown a more uniform temperature can be maintained throughout the entire furnace and on all the hearths than heretofore.

25 The furnace constructed as we have above described not only possesses comparatively higher efficiency for the treatment of all ordinarily workable grades of ore, but is particularly valuable for the treatment of the lower grades, and it has been successfully used for working ores of such low grade as to be thought not workable.

What we claim is:

35 1. In an ore roasting furnace of the class described, the combination with the shell of a series of superimposed chambered arches, a set of flues connecting said chambers of the arches with one another and with the outer atmosphere, and another set of 40 flues connecting one of said arch chambers with the several hearths, as and for the purpose specified.

45 2. In an ore roasting furnace of the class described, the combination with the shell of a series of superimposed ovens separated by chambered arches provided with openings for the passage of the ore, a set of flues in the shell for connecting the arch chambers with one another and with the outer atmosphere at the top, and another set of flues 50 in the shell for connecting one of said arch chambers with the several ovens, as and for the purpose specified.

55 3. In an ore roasting furnace of the class described, the combination with the shell of a series of superimposed ovens separated by chambered arches provided with openings for the passage of the ore, a series of

rotary rakes in said ovens and adapted to work the ore toward said openings, flues 60 connecting said arch chambers with one another and with the outer air, and flues connecting one of said chambers with the ovens, as specified.

4. In an ore roasting furnace of the class 65 described, the combination with the furnace shell of a series of superimposed chambered arches forming roasting ovens, the chambers of said arches being provided with central partitions 12^b, a flue connecting said cham- 70 bers of the arches with one another and with the outer atmosphere, and another flue connecting one of said arch chambers, 12^a, with the several ovens, as and for the purpose specified. 75

5. In an ore roasting furnace of the class described, the combination with the shell provided with down flues communicating with the outer air of a plurality of cham- 80 bered arches connected with said down flues and adapted to serve as roasting hearths, for heating air taken into such chambers and transferring it from the uppermost and middle portions of the furnace to the lower portion, as and for the purpose specified. 85

6. In an ore roasting furnace of the class described, the combination with the shell provided with up-flues of a plurality of superimposed ovens or hearths connected with said up-flues and a hot air chamber lo- 90 cated below the middle portion of the furnace and communicating with said up-flues for distributing hot air to the ovens below and above said hot air chamber, as specified.

7. In an ore roasting furnace of the class 95 described, the combination with the shell provided with a set of down-flues and a set of up-flues of a series of superimposed chambered arches adapted to serve as hearths, the chambers of said arches being connected 100 with one another and with the outer atmosphere by said down-flues, and the lowermost of said arch chambers being connected with all the hearths, as and for the purpose specified.

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WILLIAM H. FREELAND.

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