No. 720,969. PATENTED FEB. 17, 1903.

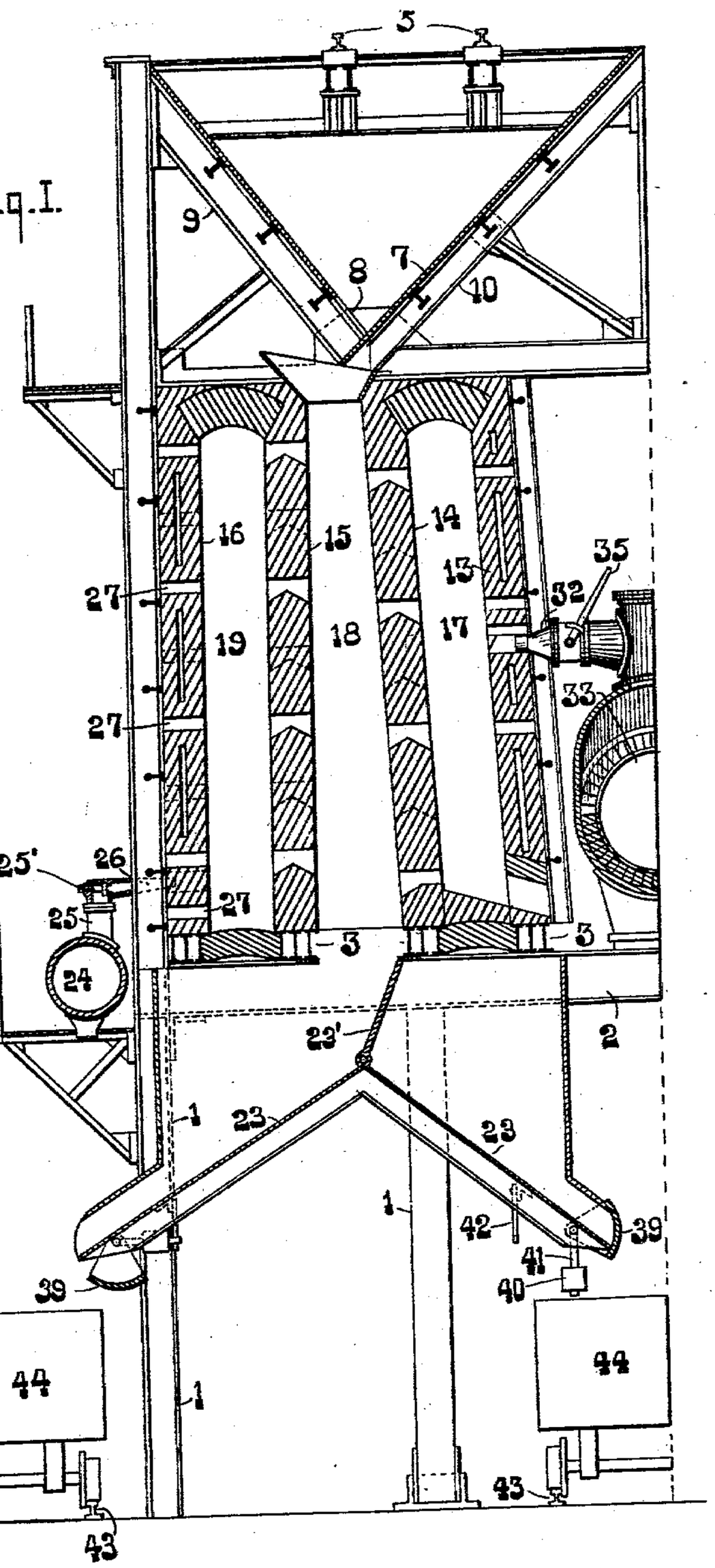
F. C. ROBERTS.

ORE ROASTER.

APPLICATION FILED APR. 1, 1902.

NO MODEL. 3 SHEETS—SHEET 1.

Fig. I.



WITNESSES:

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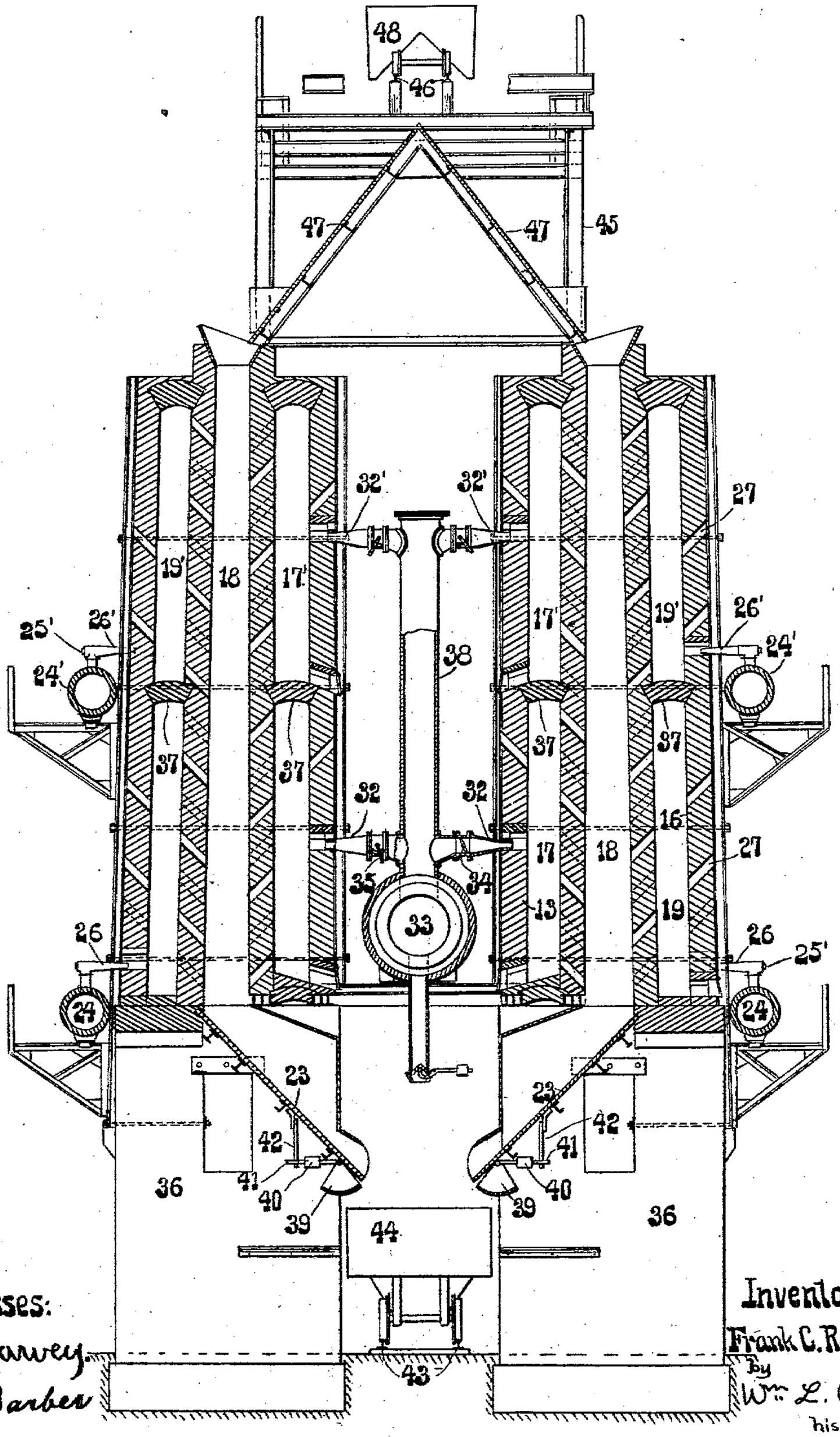
NO MODEL. 3 SHEETS—SHEET 2.

Fig. II.



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NO MODEL. 3 SHEETS—SHEET 3.

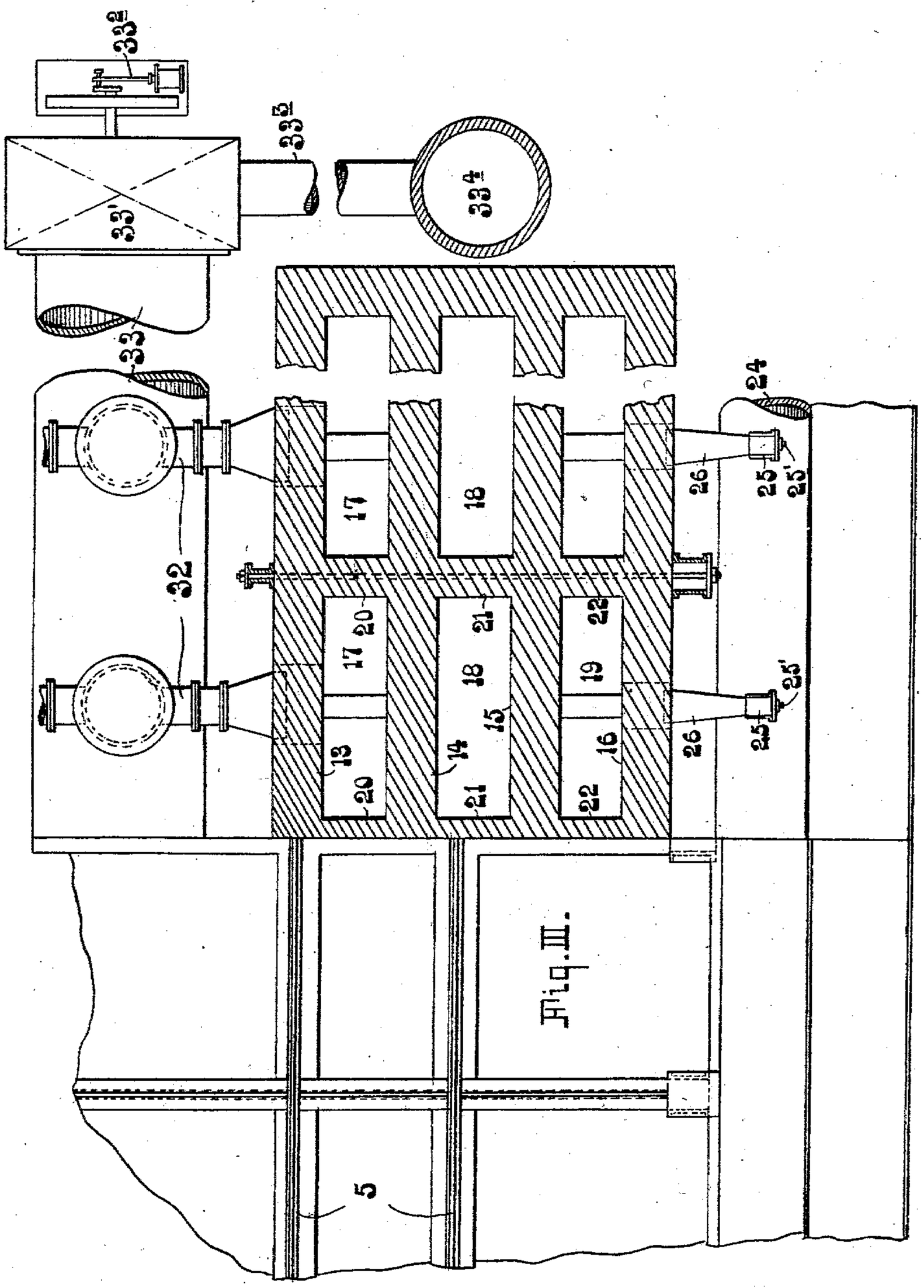

Fig. III.

WITNESSES

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UNITED STATES PATENT OFFICE.

FRANK C. ROBERTS, OF PHILADELPHIA, PENNSYLVANIA.

ORE-ROASTER.

SPECIFICATION forming part of Letters Patent No. 720,969, dated February 17, 1903.

Application filed April 1, 1902. Serial No. 100,917. (No model.)

To all whom it may concern:

Be it known that I, FRANK C. ROBERTS, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented or discovered new and useful Improvements in Ore-Roasters, of which the following is a specification.

In the accompanying drawings, which make part of this specification, Figure I represents a vertical cross-section of one-half of a roaster constructed in accordance with my invention, showing the same supported by a steel frame, which also supports the transfer-car tracks, the top and bottom chutes, and other accessories. This figure would have the general appearance of Fig. II if the right-hand side were present. Fig. II represents a modification of my invention wherein the chambers are divided into stories by horizontal partitions and supported by masonry. Fig. III represents a partial plan and a partial horizontal sectional view.

The objects of my invention are to provide a set of ore-roasting chambers into which the ore can be dumped from cars evenly and with the least possible special construction of tracks and furnaces, to arrange the ovens so that gas can be fed and the waste products carried off by the least possible number of conduits, and to arrange the burners so that not only can cars dump into them, but that cars may carry off the roasted ore with the greatest economy of space and time.

In the form of my invention shown in Fig. I the furnaces are supported on a steel framework composed in part of the posts 1 1 and beams 2 and 3. The furnace consists of two sets of chambers or structures, placed side by side, having a space between them, occupied by the stack-flue. It is obvious, however, that a single set or row of structures may be used. Above the furnaces and supported on a truss secured to the steel framework are railways running longitudinally of the furnaces and so located that a supply of ore may be dumped into ore-bins 7, whose outlets 8 lead to the ore-chambers of the roasters. The bin-floors are laid on the downwardly-inclined braces 9 and 10 of the truss. Each structure is composed of longitudinal walls 13, 14, 15, and 16, divided into pockets or chambers 17, 18, and 19 by cross-walls 20, 21, and 22, as shown in Fig. III. The pockets 18 are the roasting or ore chambers, having open tops to receive ore from the bins. Their bottoms open downwardly into bins 23, which may discharge in only one way, as shown in Fig. II, or in both directions, as shown in Fig. I. In the latter case the roasted ore slides down the inclined floors and into cars 44 on the tracks 43. The bins may be closed by pivoted doors 39, operated by weights 40 on the arms 41, secured to the rock-shafts, on which the doors are fixed. When it is desired to hold the doors open, the arm 41 may be supported by the catches 42. A gate 23′ is pivoted at the angle of the bin-floor for turning the roasted ore to either side of the bin or to either car. If desired, the bins may be constructed to discharge only toward the inside track, as shown in Fig. II, or only toward the outside track. Connected with each chamber 19 is a flat nozzle 26 of a branch pipe 25, each branch pipe being fed with gas from gas-mains 24, lying at the outer sides of the structures. The flow of gas to each nozzle is regulated by a valve 25′, as shown in Fig. I. Connected with each chamber 17 is a branch pipe 32, leading to a common stack flue or pipe 33. Each branch pipe is controlled by a damper 34, operated by lever 35. The chimney-flue 33 is preferably connected with one or more fans 33′, which discharge the products of combustion into a chimney, usually not high, and thence into the air. In Fig. III, I have shown the fan 33′ connected to one end of the flue 33. The fan is driven by engine 33^2, and the gases are driven by the fan through flue 33^3, which leads to the stack 33^4. By increasing or decreasing the speed of the fan the amount of draft may be varied to suit the conditions. In addition the draft obtained from a fan is very much greater than can be obtained from a chimney alone.

The operation is as follows: Cars on tracks 5 deliver ore to the bins 7, which conduct the ore to the roasting-chambers 18. Gas from nozzles 26 meets air fed through ports 27, combustion ensuing in chamber 19. The burning gases pass through the ports in walls 15 and through the ore-chambers 18 into waste-product chambers 17. The waste products

pass into the stack-flue 33 by way of branch pipes 32, the dampers 34 being regulated to give the proper draft. It will thus be seen that the process of roasting is under control by reason of the fact that the gas admitted to each chamber is controlled by valves 25′ and that the draft required is controlled by the speed of the fan as well as by the dampers 34, connected to each chamber. This is a matter of great importance, for the reason that in ordinary roasting it is impossible to exert any control over the process. In old-style roasting-furnaces coal is introduced in layers with the ore. The consequence is that the heat is not under control, a condition which leads to high heats in some parts, with resulting clinkers. In the old type of roasters it is impossible to use any fair proportion of fine ore, for the reason that the natural draft would not draw the products or combustion through the fine ore. In my roaster, however, the heat in any one chamber is under control by reason of the fact that the man in charge is able to determine at a glance by looking through the combustion-chamber as to whether or not the ore is too hot. If it is too hot, he can reduce the amount of gas passing to that particular chamber. Then, again, the draft being under control and capable of being varied in intensity makes it possible to roast a larger quantity of fine ore.

Referring to Fig. II, the furnaces are built on supports 36 36, of masonry, separated by a space occupied by transfer-cars. The furnaces have the same general construction as that shown in Fig. I, except that the combustion and waste-product chambers are made in two stories by the horizontal partitions 37. The reference-numerals are the same for the lower story as for the upper story, except in the latter prime-marks are used. The upper story is supplied with gas from two mains 24′, provided with nozzles 26′ and with branch waste-pipes 32′, leading to stack-flue 33 by way of the extension-flues 38. The chutes 23 are provided with pivoted doors 39, which under the influence of weights 40 on arm 41 are maintained closed. The doors are locked open by means of the arm 41 being supported by catches 42 or in any other suitable manner. Between the supports 36 36, of masonry, is located a track 43, running longitudinally between the furnace structures. Cars (one designated by 44) are run on the track to the chutes 23 and filled with roasted ore and transferred to the desired place. A steel framework 45 is supported on top of the furnace structures, and centrally thereof is a track 46. Two delivering-chutes 47 lead right and left from their upper meeting edges to the mouths of the roasting-chambers 18. Cars (one being shown and designated 48) deliver ore to the chutes. The operation of the two-storied furnace is the same as that of the single-storied one. Its use permits a larger quantity of gas being burned and tends to make the distribution of the gas in its flow through the ore more uniform.

It will be readily understood that the furnace shown in Fig. II may be provided with the bin and tracks shown in Fig. I instead of the one shown.

Having now described my invention, what I claim is—

1. An ore-roasting furnace, consisting of two structures side by side separated by a space, each structure containing a longitudinal series of roasting-chambers and means for supplying heat thereto, an ore-chute over each series of roasting-chambers, and a railway over each chute for delivery of ore to the chutes.

2. An ore-roasting furnace, consisting of two structures, side by side separated by a space, each structure containing a longitudinal series of roasting-chambers and means for supplying heat thereto, ore-chutes for the delivery of ore to the roasting-chambers, a track construction for the delivery of ore to the chutes, and a track in said space for the delivery of roasted ore to cars on said track.

3. An ore-roasting furnace, consisting of two parallel rectangular structures separated by a space, each structure containing a series of independent roasting-chambers, a series of independent combustion-chambers and a series of independent waste-product chambers therefor, chutes for delivering ore to the roasting-chambers, railway construction for the delivery of ore to the chutes, a second railway in said space, and chutes leading the roasted ore from the roasting-chambers to cars on said second railway.

4. An ore-roasting furnace, consisting of plural structures side by side separated by a space, each structure having a longitudinal series of roasting-chambers, a series of two-storied independent combustion and waste-product chambers supplying heat thereto, chutes, and railway construction above the structures for the delivery of ore to the chutes.

5. An ore-roasting furnace, consisting of two structures side by side separated by a space, each structure having a longitudinal series of roasting-chambers, means for supplying heat thereto and conveying the waste products therefrom, a railway in said space and along the outside of each structure and chutes provided with means controlling the discharge to cars on any of the tracks at will.

Signed at Philadelphia, Pennsylvania, this 24th day of March, 1902.

FRANK C. ROBERTS.

Witnesses:
L. KRYDER LOCHMAN,
J. DONALDSON PAXTON.