Dec. 30, 1947. H. L. McFEATERS 2,433,781

ORE ROASTER

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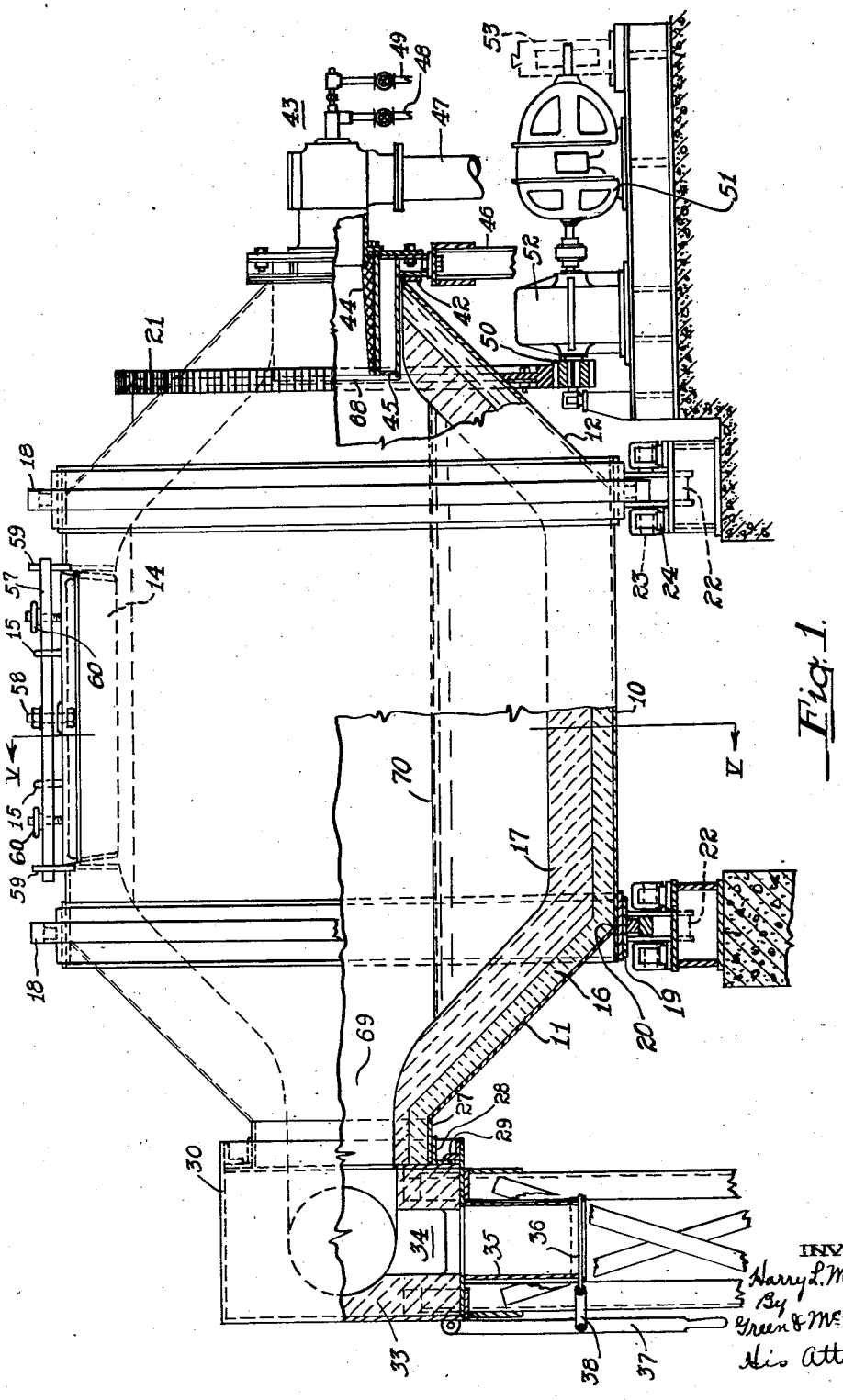


Fig. 1.

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ORE ROASTER

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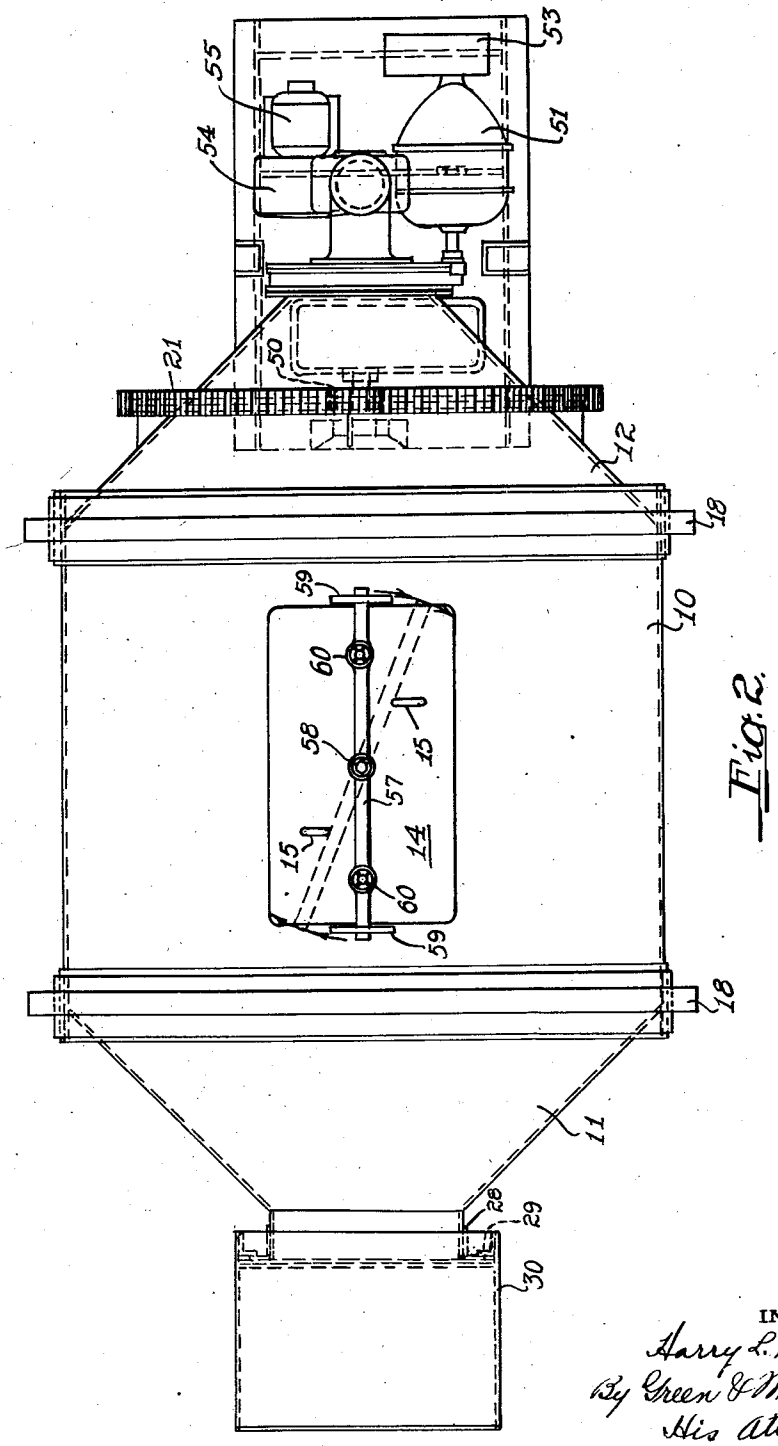


Fig. 2.

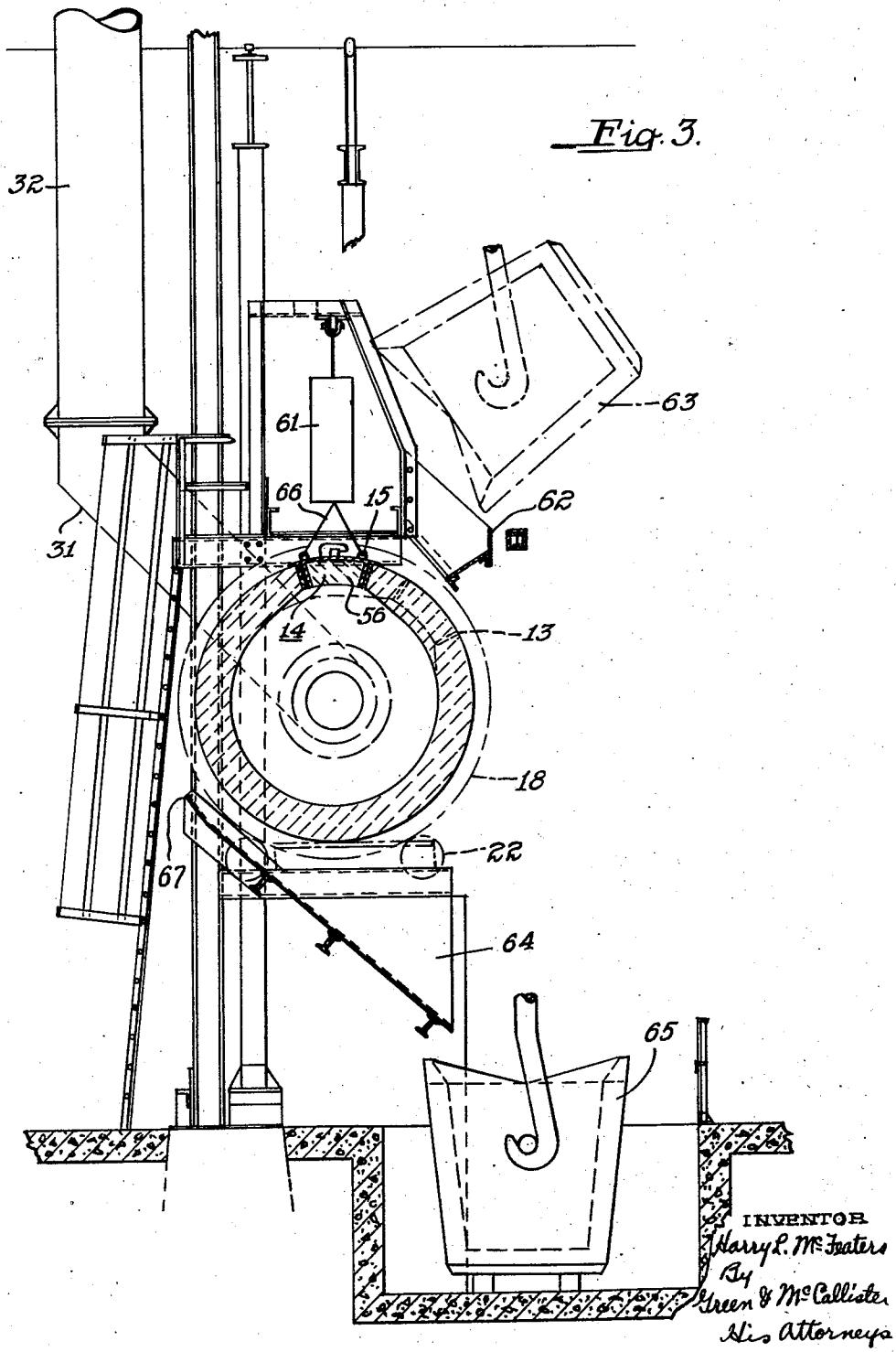
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ORE ROASTER

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Fig. 3.



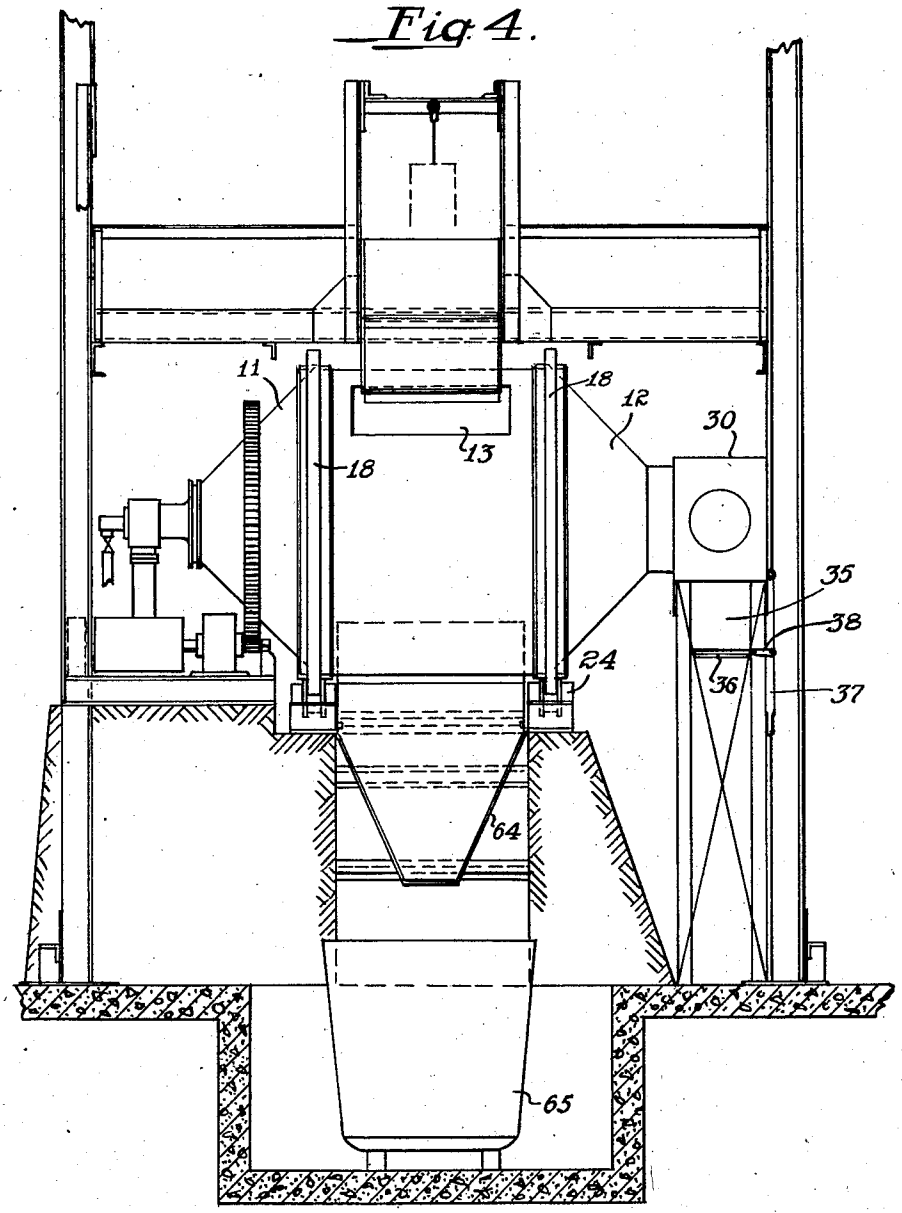
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ORE ROASTER

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Fig. 4.



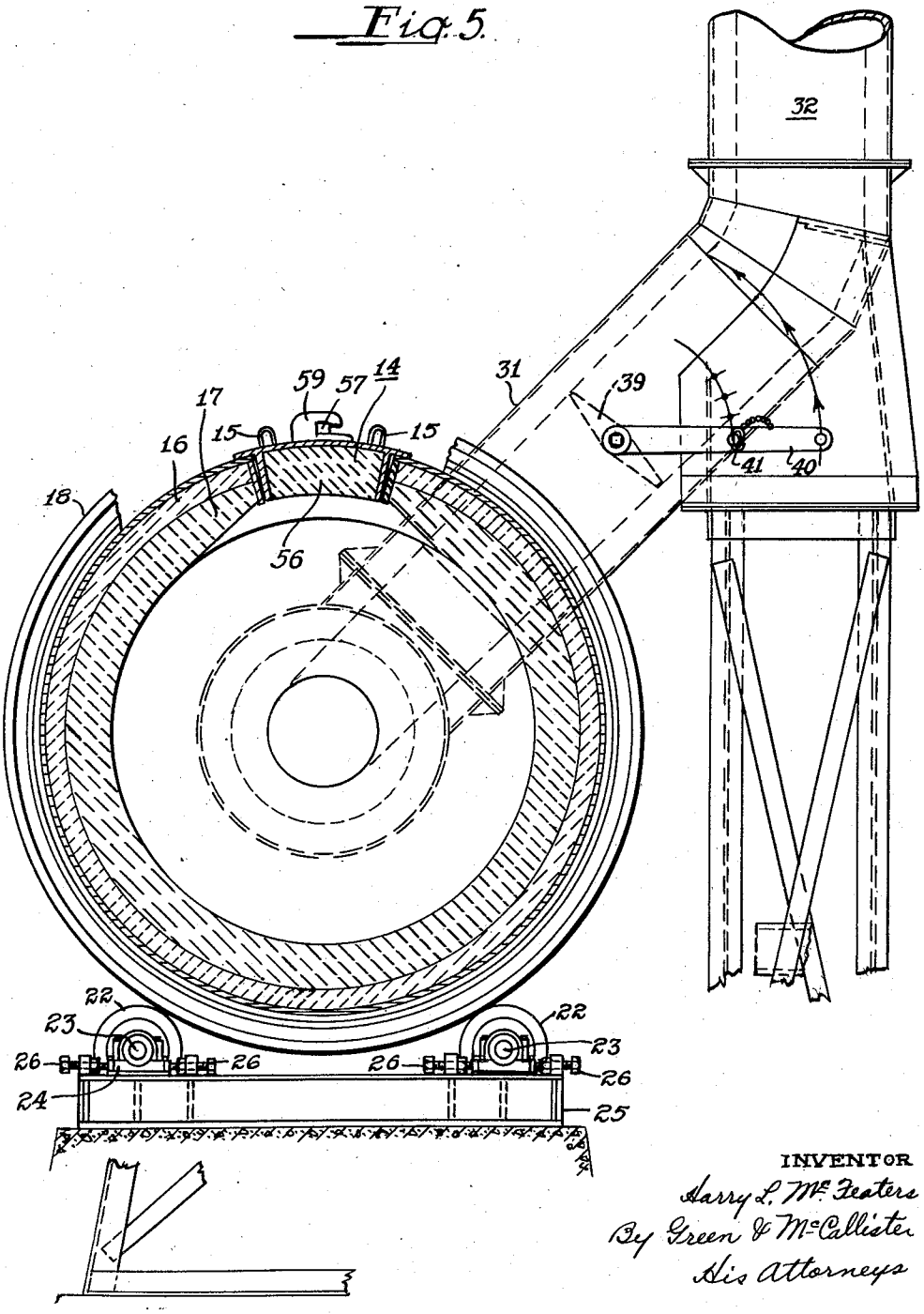
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Fig. 5.



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UNITED STATES PATENT OFFICE

2,433,781

ORE ROASTER

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Application September 24, 1943, Serial No. 503,607

5 Claims. (Cl. 266—20)

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This invention relates to ore roasters and one object of this invention is to produce an improved rotatable, internally fired ore roaster.

Another object is to produce a rotatable, horizontally disposed, internally fired ore roaster having a normally closed opening in one wall thereof which is of such size as to permit a relatively quick discharge of the roasted contents when the door is removed and the roaster rotated to discharge position, and a quick charging of the roaster when the same is rotated to charging position with the door removed.

Another object is to produce an active ore roaster of the rotatable, internally fired type, which is of such relatively great internal diameter as compared with its internal length, that the exposed surface of the material being roasted is relatively great.

A still further object is to produce a rotatable, horizontally disposed ore roaster of sturdy and improved construction.

A still further object is to produce an extremely efficient combination, comprising a rotatable, horizontally disposed, internally fired ore roaster having a relatively large, normally closed opening intermediate its ends for charging and discharging, a chute for guiding a full charge of material to be roasted into the roaster when the same is in charging position, another chute for conveying the entire contents of the roaster to a ladle or other receiving container when the roaster is rotated to discharge position with its door open.

These and other objects which will be apparent to those skilled in the ore roaster art, I attain by means of the elements and their coacting arrangement described in the specification and illustrated in the drawings accompanying the same and forming part of this application.

In the drawings:

Figure 1 is a view partially in side elevation and partially in section of an ore roaster embodying this invention;

Fig. 2 is a top plan view of the roaster of Fig. 1;

Fig. 3 is a somewhat diagrammatic view showing the roaster in transverse section on a reduced scale. This view illustrates more or less schematically the door raising and lowering mechanism, the chute for guiding the charge into the roaster, the chute for conveying the discharged roasted ore from the roaster to the receiving ladle or car, and the ladles or containers used for charging the roaster and for receiving the roasted charge.

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Fig. 4 is a front elevational view looking toward the left of Fig. 3; and

Fig. 5 is a transverse sectional view of the roaster, and illustrates the damper controlled connection between the exhaust end of the roaster and the stack.

The roaster of this application has an outer shell formed of relatively heavy steel plate sections welded together. The shell comprises a central cylindrical body portion 10, having a diameter that exceeds its length, and frusto-conical end portions 11 and 12 joined to the body portion and having their walls inclined to the horizontal axis of the body portion at an angle of approximately 45°. The outer ends of the frusto-conical end portion are open.

The cylindrical body portion is provided with a generally rectangular charge and discharge opening 13 (Fig. 4), which is normally closed by means of a door 14 having lifting lugs 15 cast thereon.

The shell is provided with an outer heat insulating lining 16 and an inner refractory lining 17, preferably formed of suitable fire brick. Each of these linings is of substantially uniform thickness throughout the shell body.

Encircling the roaster at each weld line between the central body portion 10 and end portions 11 and 12 is a ring-like member 18. Each of these members is preferably formed from locomotive tire steel and the shell beneath each of these ring-like members is encircled, and therefore reinforced, by several layers of steel plate as at 19. These encircling reinforcing plates extend inwardly beyond the lines of weld 20 and also out beyond the lines of weld so that they overlie and are spaced from the end portions 11 and 12 as shown in Fig. 1.

A ring gear 21 is mounted on and secured to end shell 12 and of course is concentrically arranged with relation to the outer bearing surfaces of ring members 18 which contact with spaced support rollers 22. There are two spaced rollers with which each ring member contacts, so that the roaster is supported for rotation on four rollers 22.

The roller shafts 23 are journaled for rotation within pillow blocks 24 which can be adjusted to, and set in adjusted position on slides 25 by means of adjusting screws 26.

End member 11 of the roaster terminates in a cylindrical sleeve-like portion 27, and secured to this portion is a sealing member 28 which is L-shaped in cross section and which co-operates with a stationary sealing member 29, also pref-

erably L-shaped in cross section. Member 29 is secured to a metal ring-like member 30 which forms part of the support for the stack connection 31; the stack being numbered 32.

The stack connection support is lined with refractory material 33 and has an opening 34 in its bottom leading to a metal dust leg 35. This dust leg is provided with a sliding bottom or gate 36 which can be opened and closed by means of a hand lever 37 through a link connection 38.

Stack connection 31 is provided with a damper 39 which may be operated by a lever 40 arranged to be locked in adjusted position by means of a locking pin 41. End 12 of the roaster is provided with a depending annular sealing flange 42.

A burner, which as an entirety is numbered 43 is preferably a long flame emulsion type oil burner. This is provided with a burner block 44 which projects into the opening in end member 12 and terminates in line with the inner face of the fire brick refractory lining of such end member.

A hollow annular metallic member 45, forming a cooling water chamber, surrounds and forms a support for burner block 44. This is provided with a cooling water inlet and a cooling water outlet (not shown) by means of which cooling water is circulated through such chamber. Member 45 and therefore burner 43, is supported by a stationary support 46.

Air is supplied to the burner through an air pipe 47 while steam is supplied through a valve controlled pipe 48, and oil through a valve controlled pipe 49.

A pinion 50 meshes with ring gear 21 and is driven by an electric motor 51 through a suitable reduction gear 52. A magnetic brake 53 is used for stopping the motor and therefore the roaster when desired. A turbine type pressure blower 54 driven by an electric motor 55 is used for supplying air under pressure to the burner through air pipe 47.

The cast iron door 14 for closing charge and discharge opening 13 is lined with refractory material 56 and said door is provided with a locking bar 57 which is mounted for swinging movement about a pivot pin 58 bolted to the door casting at its center. This locking bar is adapted to be manually operated and swung to and from locking position beneath lugs 59 secured to the roaster shell at spaced positions adjacent the longitudinal center of the door. Bolts provided with hand wheels 60 at their upper ends are threaded through the locking bar and the bar is swung to position under lugs 59. These bolts may be used to lock the bar in position beneath the lugs.

The door may be raised from and lowered to position by means of a crane. I prefer however, to use an electric or air operated hoist 61 for that purpose.

A chute 62 secured in position above the roaster is so constructed and arranged as to be capable of guiding a full roaster charge of ore delivered to it by a ladle or other container 63.

Chute 64 positioned below the roaster is so constructed and arranged as to receive and guide the roasted charge from the roaster to a suitable ladle or other container 65, by means of which it may be carried to the furnace.

In Figure 3, hoist 61 is shown attached to the lifting lugs of the door by chains 66. After the door is unlocked (it being shown in locked position) and lifted clear of the roaster, the roaster is rotated in a clockwise direction until opening 13 is in position below chute 62 as shown by dotted lines. A charge sufficient to fill the roaster to the normal charge line is then dumped into chute 62 and by it delivered through opening 13 as a single charge.

After the roaster is charged, it is rotated counterclockwise until opening 13 is below the suspended door. The door is then lowered to position in the opening, unhooked from the hoist and latched. The roaster is then rotated either clockwise or counterclockwise as desired at a speed of about 5½ R. P. M. until the ore charge is completely roasted or calcined. Rotation is then stopped with the door directly below the hoist. The door is then unlatched and lifted clear of the roaster and the roaster is slowly rotated in a counterclockwise direction until opening 13 is at the bottom of the roaster. The roasted charge starts to discharge as soon as the down side of opening 13 passes top 67 of chute 64.

The entire contents will have been discharged by the time opening 13 reaches its extreme down position.

Since the opening 13 extends throughout substantially the full length of the refractory lining for the cylindrical body portion, it will be seen that when the roaster is rotated to discharge position with the door open, the inclination of the inner surfaces of the refractory lining of the frusto-conical end portions causes the roasted material not only to flow freely toward opening 13, but to in effect avalanche through such opening, thus facilitating a rapid discharge.

In one roaster involving this invention and of six tons capacity, the internal diameter of the central body portion is about 9 feet 6 inches and the distance from the burner mouth 68 to the entrance 69 of the outlet passage is about 11 feet. The internal diameter, therefore, is relatively great as compared with the length of the roaster chamber. A charge line is indicated at 70 and is but slightly less in length than the distance between the burner mouth and the entrance to the outlet passage.

As the roaster rotates, the charge of course is carried by the advancing side and at its center will be slightly lower than indicated at 70. The exposed surface of the charge, due to the relatively great diameter of the central cylindrical portion, is relatively great and is, therefore, effectively heated by the burner flame traversing the roasting chamber from the burner outlet to the outlet port.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. An ore roaster mounted for rotation about a horizontal axis and comprising a central cylindrical body portion having a diameter which is at least equal to its length, frusto-conical end portions joined to the body portion, and each having its outer end open, a refractory lining for the cylindrical body portion and the frusto-conical end portions; said body portion being provided with a charge and discharge opening in its cylindrical wall having a length substantially equal to the distance between the refractory linings of the frusto-conical end portions, a door for closing said charge and discharge opening, and means for rotating the roaster about its horizontal axis; the angle between the inclined surfaces of the refractory linings of the frusto-conical end portions and the horizontal axis of the roaster being such that discharge of roasted material is facilitated.

2. An ore roaster mounted for rotation about a

horizontal axis and comprising a cylindrical body portion, frusto-conical end portions joined to such body portion and each having its outer end open, a refractory lining for such body portion and refractory linings for said frusto-conical end portions; said body portion being provided with a charge and discharge opening in its cylindrical wall having a length substantially equal to the distance between the refractory linings of the frusto-conical end portions, a door for closing such charge and discharge opening, means for rotating the roaster about its horizontal axis, a burner extending into the outer open end of one frusto-conical end portion, a stack connection engaging the open end of the other frusto-conical end portion, and a dust leg below such stack connection.

3. An ore roaster mounted for rotation about a horizontal axis and comprising a cylindrical body portion, frusto-conical end portions joined to such body portion and each having its outer end open, a refractory lining for such body portion, and refractory linings for said frusto-conical end portions; said body portion being provided with a charge and discharge opening in its cylindrical wall having a length substantially equal to the distance between the refractory linings of the frusto-conical end portions, a door for closing such charge and discharge opening, means for rotating the roaster about its horizontal axis, a water cooled burner extending into the open end of one such frusto-conical end portion, a seal between such burner and such end portion, a stack connection to the open end of the other frusto-conical end portion, a seal between such stack connection and such end portion, and a dust collector below such stack connection.

4. An ore roaster mounted for rotation about a horizontal axis and comprising a cylindrical body portion, frusto-conical end portions joined to such body portion and each having its outer end open, a refractory lining for such body portion and refractory linings for such end portions; said body portion being provided with a charge and discharge opening in its cylindrical wall having a length substantially equal to the distance between the refractory linings of the frusto-conical end portions, a door for closing such charge and discharge opening, means for rotating the roaster about its horizontal axis, a burner extending into the outer end of one frusto-conical end portion and a stack connection engaging the open end of the other frusto-conical end portion.

5. An ore roaster mounted for rotation about a horizontal axis and comprising a cylindrical body portion, frusto-conical end portions joined to such body portion and each having its outer end open, a refractory lining for such body portion, and refractory linings for said frusto-conical end portions; said body portion being provided with a charge and discharge opening in its cylindrical wall, having a length substantially equal to the distance between the refractory linings of the frusto-conical end portions, a door for closing such charge and discharge opening, means for rotating the roaster about its horizontal axis, a water cooled burner extending into the open end of one such frusto-conical end portion, a seal between such burner and such end portion, a stack connection to the open end of the other frusto-conical end portion, and a seal between such stack connection and such end portion.

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