

No. 641,460.

Patented Jan. 16, 1900.

H. B. MEECH.

FURNACE FOR ROASTING AND REDUCING ORES.

(Application filed Mar. 4, 1899.)

(No Model.)

4 Sheets—Sheet 1.

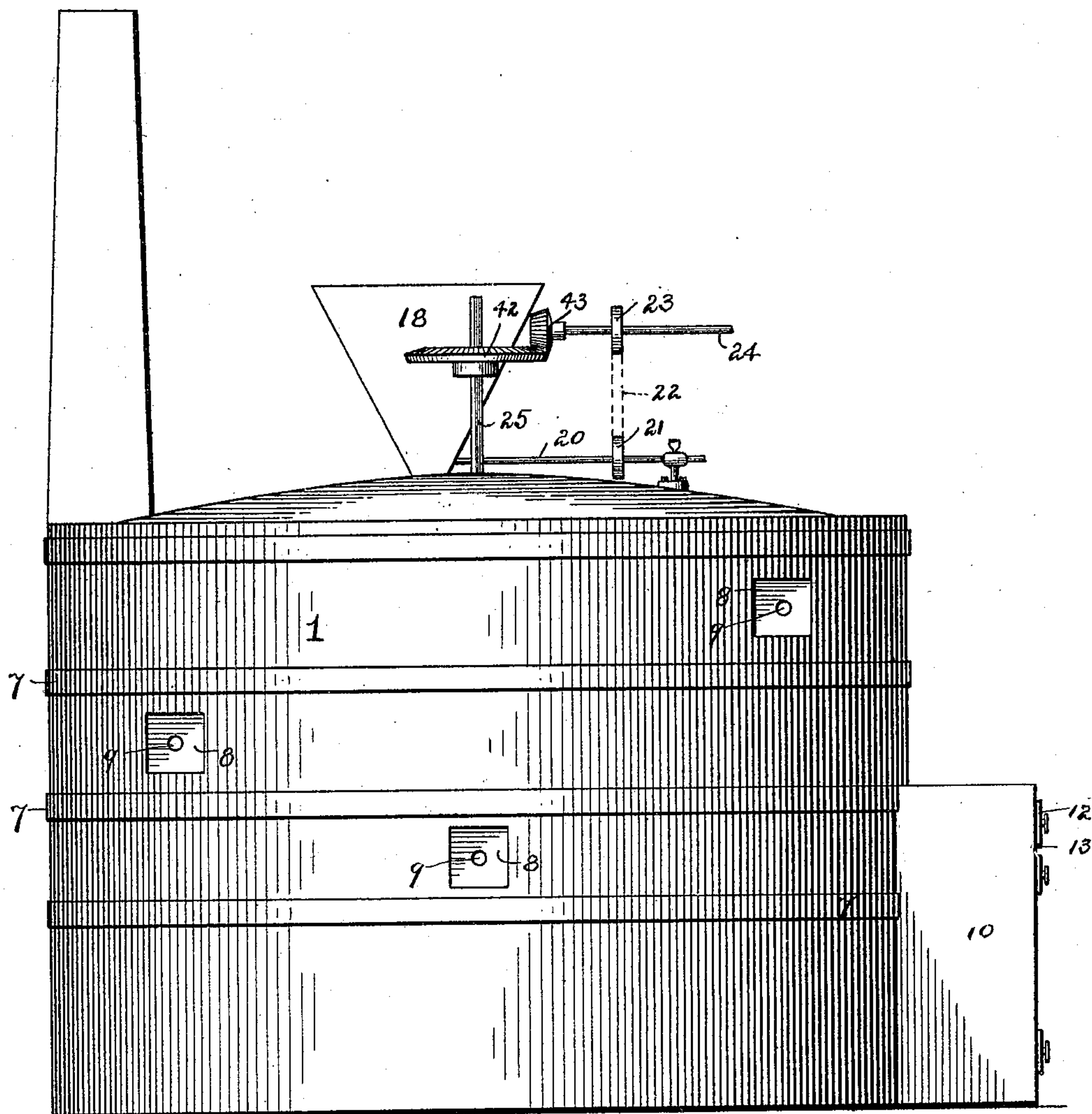


Fig. 1-

WITNESSES-

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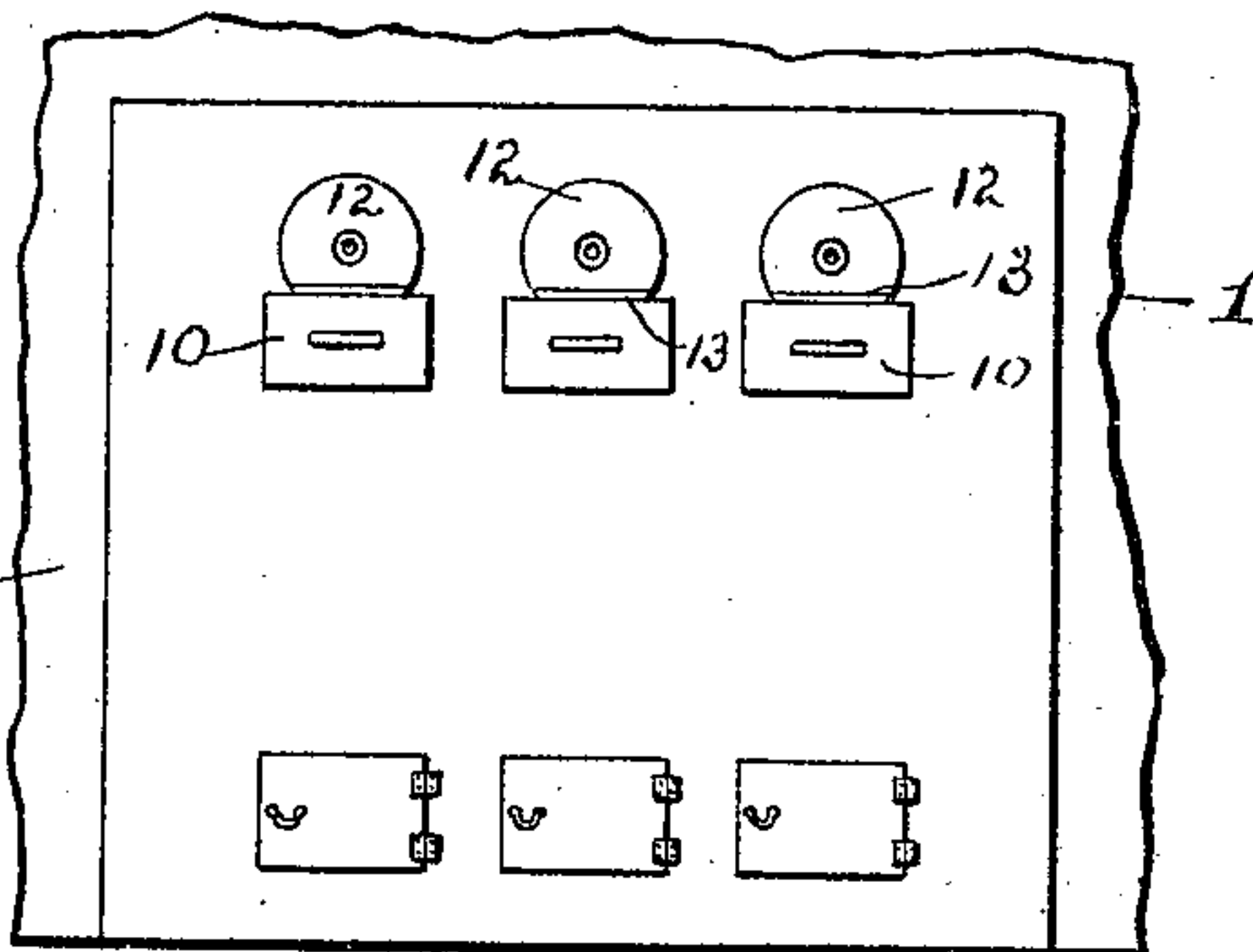
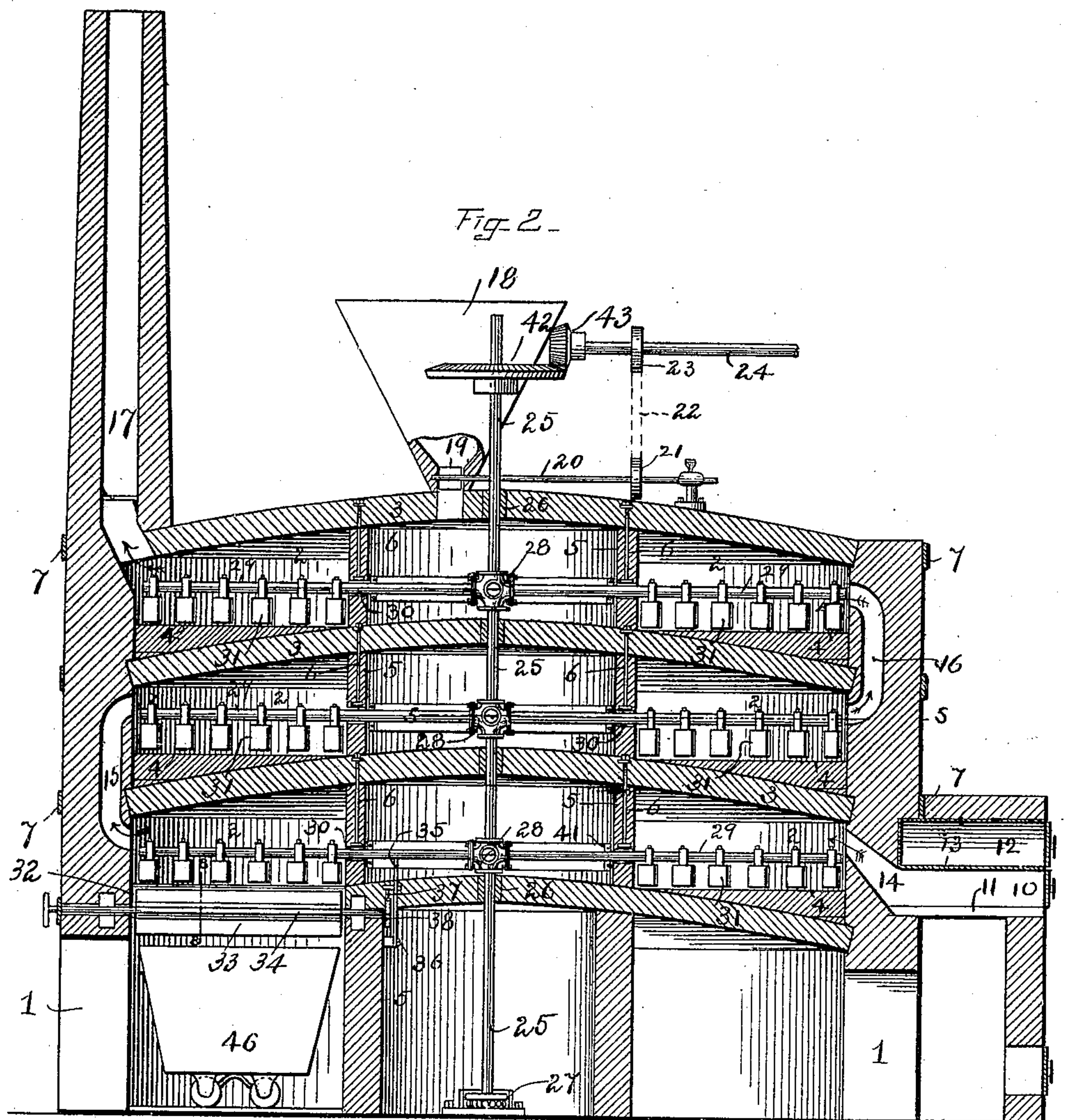
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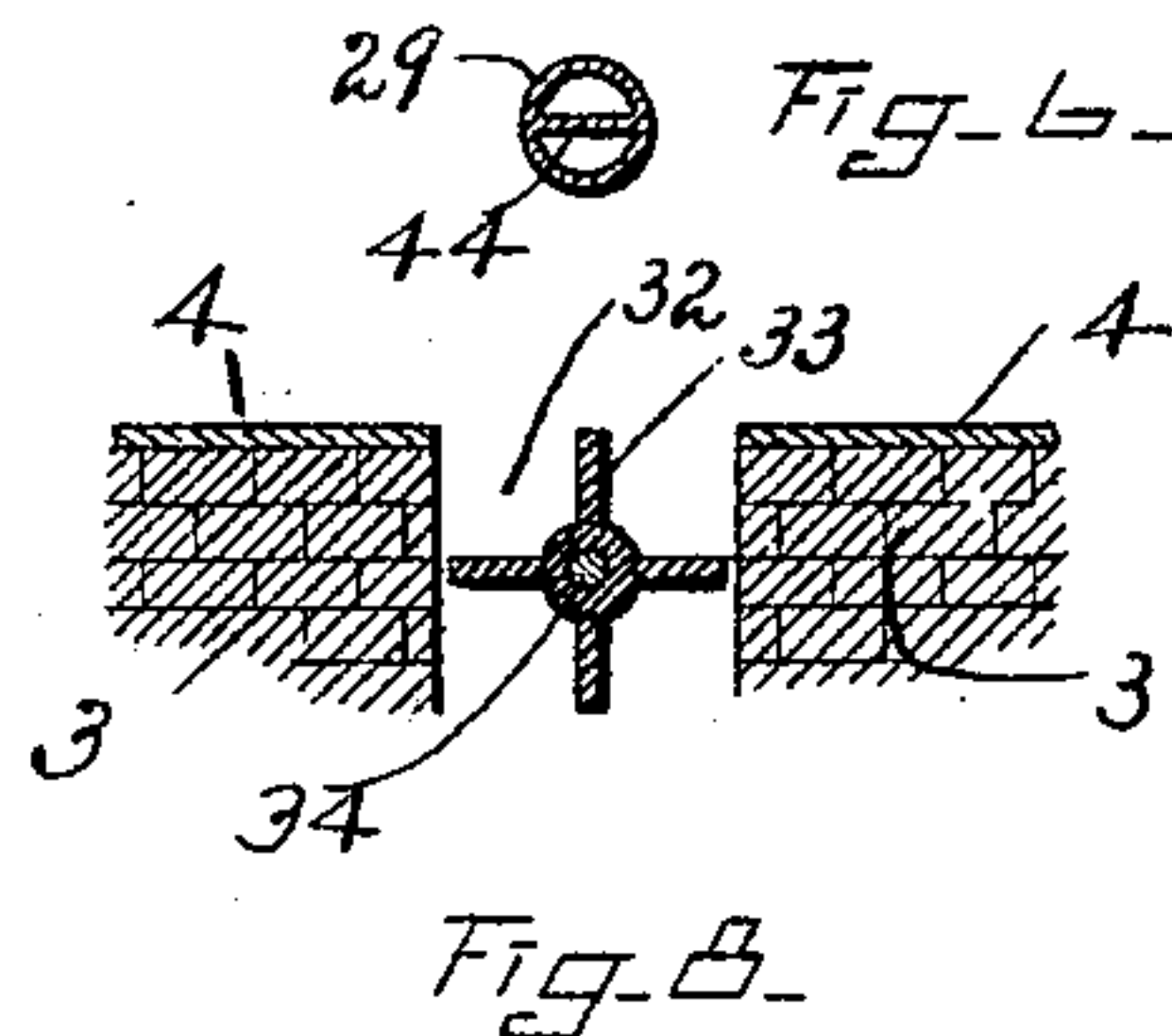
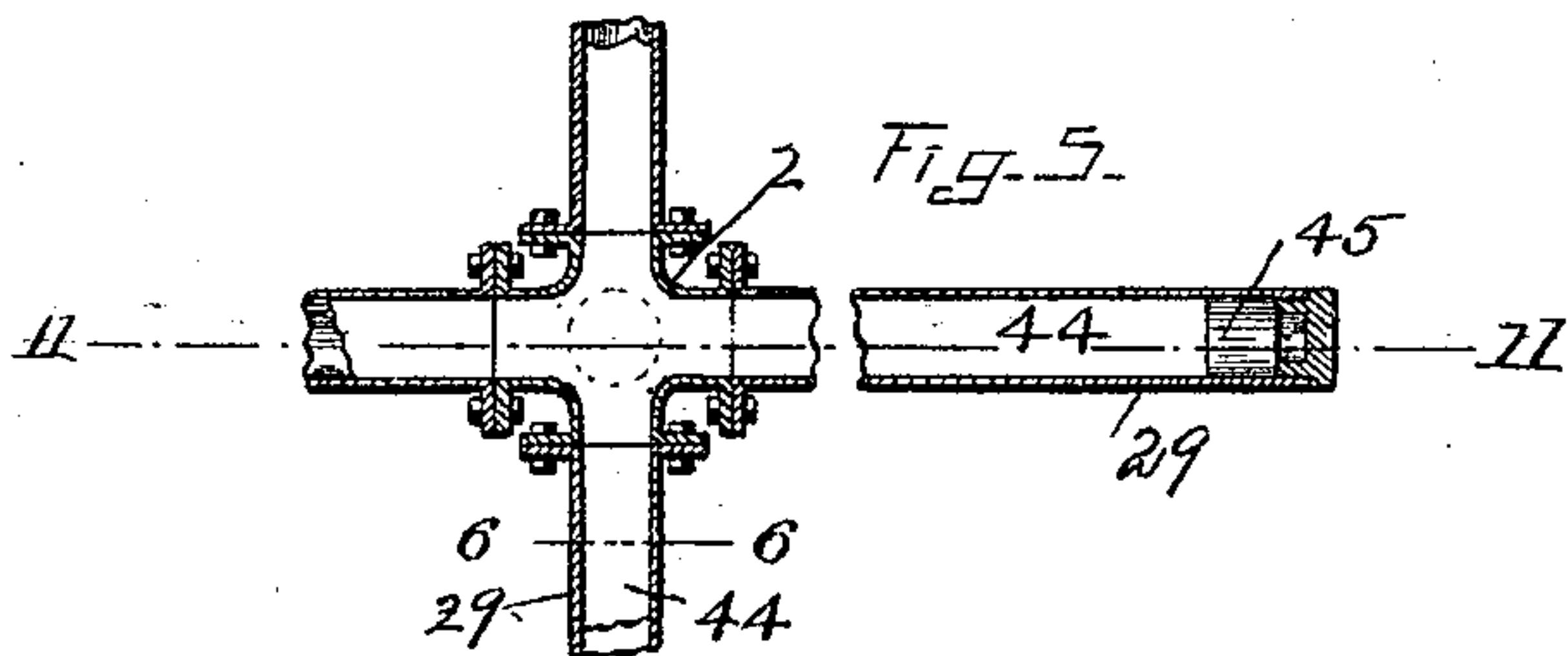
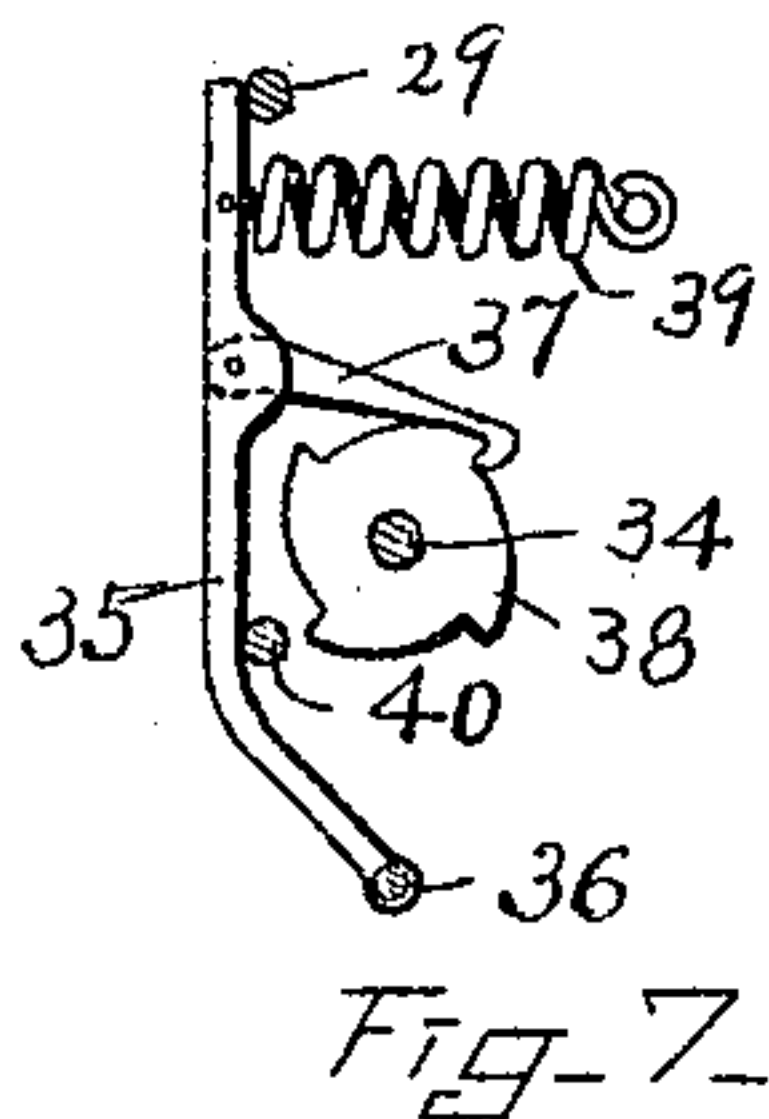
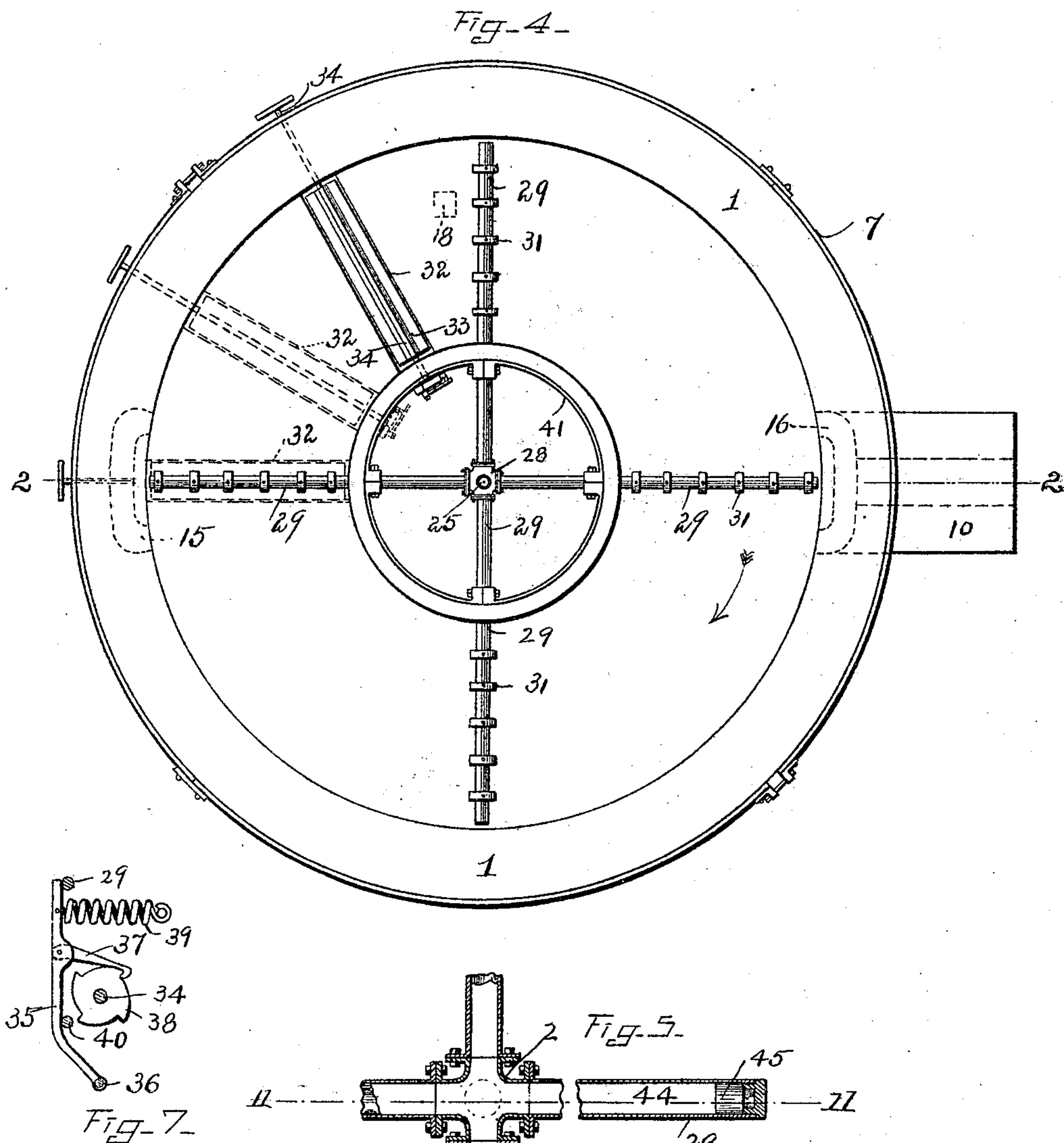
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**4 Sheets—Sheet 3.**



WITNESSES.

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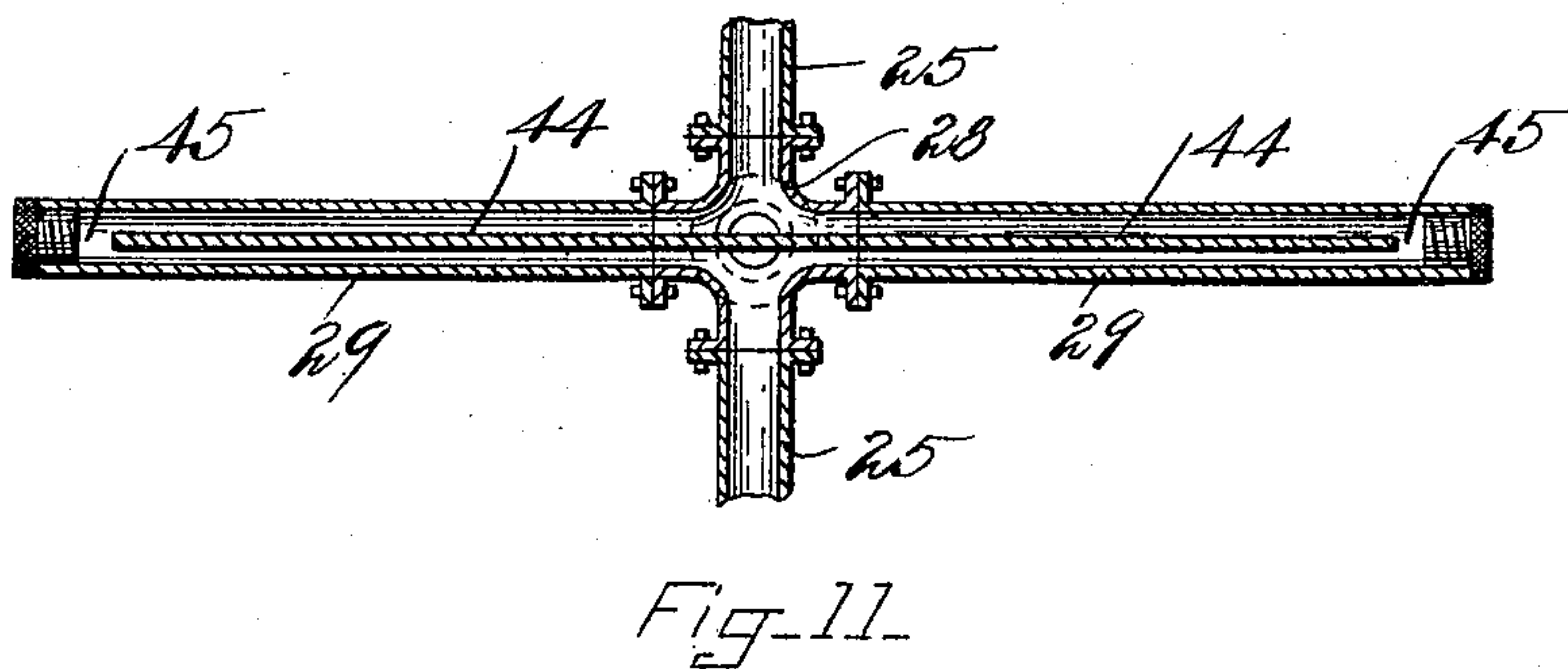
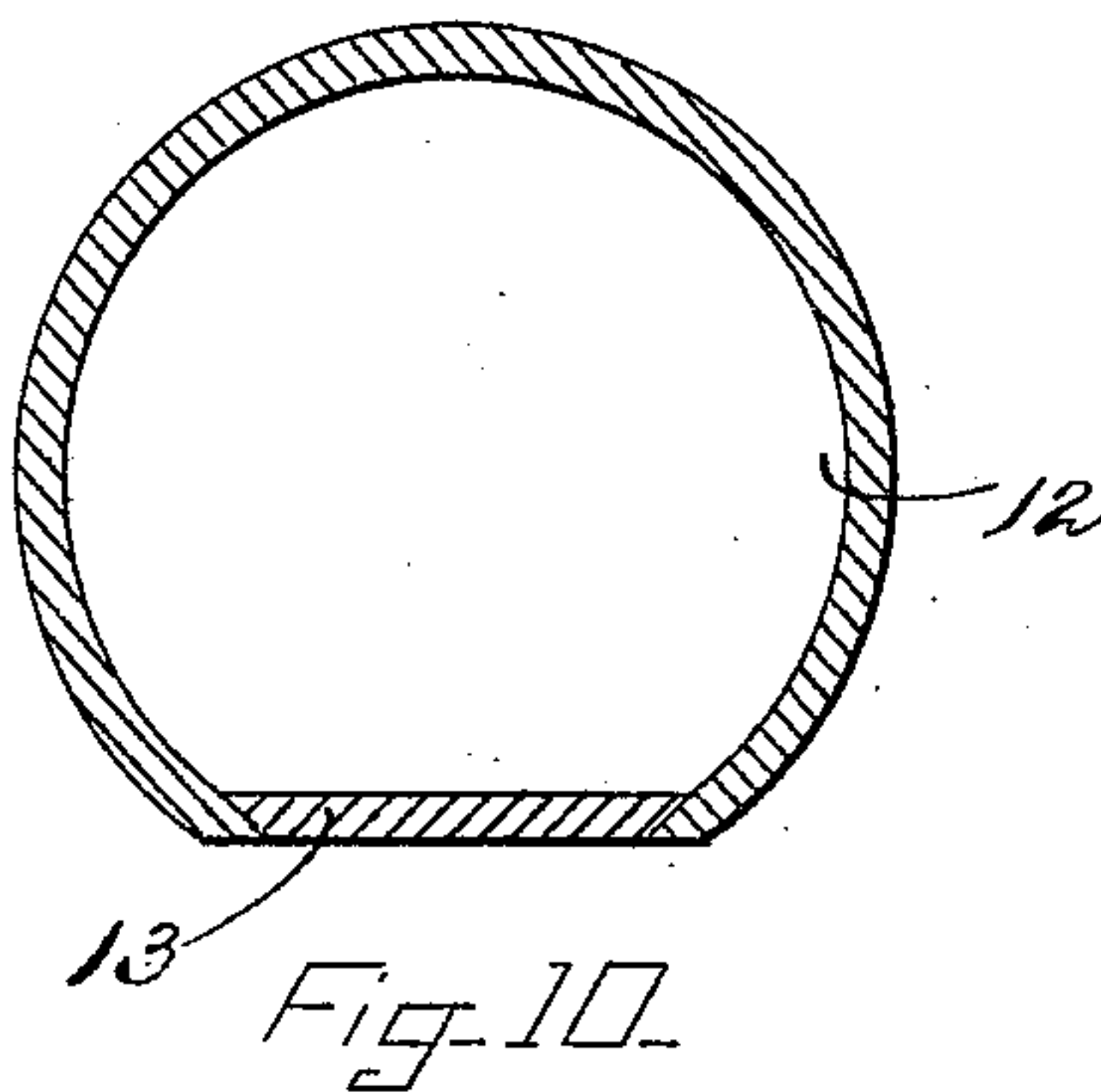
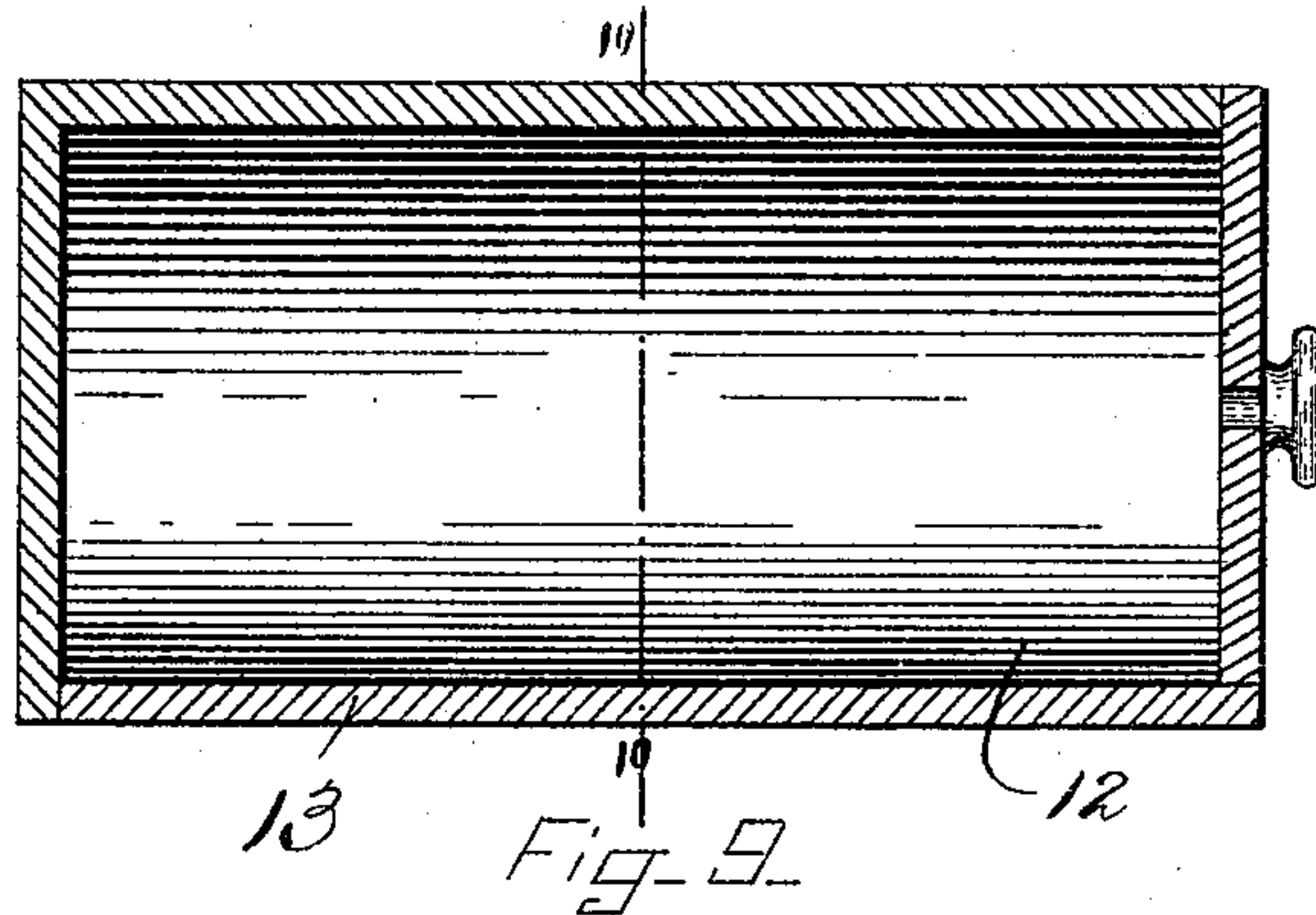
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(Application filed Mar. 4, 1899.)

(No Model.)

4 Sheets—Sheet 4.



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# UNITED STATES PATENT OFFICE.

HARRISON B. MEECH, OF DENVER, COLORADO.

## FURNACE FOR ROASTING AND REDUCING ORES.

SPECIFICATION forming part of Letters Patent No. 641,460, dated January 16, 1900.

Application filed March 4, 1899. Serial No. 707,799. (No model.)

*To all whom it may concern:*

Be it known that I, HARRISON B. MEECH, a citizen of the United States, residing at Denver, in the county of Arapahoe and State of Colorado, have invented new and useful Improvements in Cylindrical Furnaces, of which the following is a specification.

The object of my invention is to produce a cylindrical furnace for roasting and reducing ores and to so construct said furnace as to save labor, power, and fuel, to more perfectly roast and reduce the ores, and to save the gases and fumes that may arise in the first heating of the ores.

My invention consists in a furnace having two or more ovens, one above the other, each oven having a discharge-opening in the bottom or bed thereof, in combination with mechanism for stirring the ore in said ovens and in automatic mechanism whereby said ore is transferred from one oven to another.

My invention also consists in certain details of construction and arrangement of parts, as hereinafter described in the specification and particularly pointed out in the claims thereof.

In the drawings like numerals refer to like parts throughout the several views thereof.

Referring to the drawings, Figure 1 is a side elevation of my improved furnace. Fig. 2 is a vertical detail section, line 2 2, Fig. 4. Fig. 3 is a side elevation of a portion of the same, taken from the right of Fig. 2. Fig. 4 is a plan view of said furnace with the top removed. Fig. 5 is a section in detail of a portion of the shafting. Fig. 6 is a section, line 6 6, Fig. 5. Fig. 7 is a detail view of the feed-wheel-rotating mechanism. Fig. 8 is a cross-section of the feed-wheel, line 8 8, Fig. 2. Fig. 9 is an enlarged longitudinal section of one of the retorts. Fig. 10 is a transverse section, line 10 10, Fig. 9. Fig. 11 is a longitudinal section, line 11 11, Fig. 5.

In the drawings, 1 is the main outer wall of my improved furnace. Said wall is constructed of brick and of sufficient height and diameter to accommodate three cylindrical ovens 2 2. The top of each of the ovens 2 is formed by springing an arch 3, of brick, between the outer walls 1. The horizontal bed 4 of each

oven is formed on top of the arch below. The inner walls of the ovens are formed by a cylindrical partition 5, arranged about one-third of the distance from the center to the outer wall 1 of the furnace. The inner wall 5 of each oven is supported by tie-rods 6 from the arch above. The outer wall 1 is strengthened and tied together by cylindrical bands of iron 7, which take the thrust of the arches 3 3. Each oven is provided with an outside manhole or doorway 8, which may be constructed of iron or brick, as desired. A small opening 9 is provided in each door for a "peek-hole."

Outside the wall 1 I provide a furnace 10. The fire is kindled upon the grate-bars 11 of said furnace. Above the furnace 10 are retorts 12, which are filled with coal, and after the coal is reduced to coke by the heat of said fire the bottoms 13 of the retorts 12 are drawn out and the coke drops on the grate-bars 11. It will be seen that the bottoms 13 of the retorts 12 are beveled to fit the sides of said retorts at their bottom edges. The heated gases pass from the furnace 10 through the flue 14 around the bottom oven, thence through the flue 15 to the middle oven, thence through the flue 16 to the top oven, thence through the chimney-flue 17 to the outer air. It will thus be seen that the fire is applied first to the bottom oven and thence passes over the ore in each oven and out at the top. It will also be understood that the bottom oven will be the hottest and the top oven the coolest of the three.

The ore to be roasted is first crushed to pass through a four-mesh screen. It is then elevated to the hopper 18 on the top of the roasting-furnace 1. The ore is fed from the hopper 18 into the top oven by a rotary feed-wheel 19, said feed-wheel being fast to a shaft 20, which is rotated by a pulley 21, driven by a belt 22 from the pulley 23 on the main driving-shaft 24.

In the center of my roasting-furnace is a vertical hollow shaft 25. Said shaft has bearings 26 in each of the arches 3. At the bottom of the shaft 25 is a pedestal roller-bearing 27, which takes the weight of the shaft and of the parts attached thereto. The shaft



25 is made in four sections, each section being screwed into a hollow flanged center piece 28, Fig. 5. Each center piece 28 has four vertical flanges, to which are bolted the four horizontal hollow arms or shafts 29. Said arms 29 project outwardly from the central shaft 25 through a slot 30 in the cylindrical wall 5 into and across the ovens 2 and nearly to the outer wall 1 of the furnace. To each of the arms 29 is fastened a series of shovels or plows 31, which project downwardly therefrom to nearly touch the bottom of the oven, so that as said arms are rotated the ore is turned over and moved around the beds of the oven. In the bed of each oven is a radial opening 32, and in said opening is located a discharge-wheel 33. Said feed-wheel has four radial flanges, Fig. 8, extending throughout the length of the opening 32 and is fastened to a shaft 34. The shaft 34 is intermittently rotated by a pawl-and-ratchet motion, which is imparted thereto by the arms 29, which strike against a lever 35 as they rotate, said lever being pivoted at 36 to the inner side of the wall 5 and having a pawl 37 pivoted thereon, which engages a ratchet 38, fast to the shaft 34, so that as each arm passes the lever the discharge-wheel 33 is given a quarter-turn. A spring 39 brings the lever 35 back against a stop 40 as soon as the arm 29 clears the end of the lever 35. It will thus be seen that the openings 32 between the ovens are at all times closed to the passage of the heated gases, while constructed to permit the ores to be passed through said openings from one oven to another. I prefer to use the flanged wheel 33 for the purpose described; but I do not wish to be understood as limiting myself to any particular design or style of wheel, as any means by which the opening 32 can be closed to the passage of gases upward and allow the ores to feed through said opening comes within the spirit of my invention.

A cylindrical band of iron 41 is clamped to the arms 29 near the inner side of the wall 5 to close up the slot 30, through which said arms pass and revolve.

The shaft 25 is rotated by means of a bevel-gear 42 meshing with a bevel-gear 43 on the shaft 24.

The horizontal arms 29 and the center pieces 28 are hollow and have a horizontal longitudinal central partition 44 therein, by which they are each interiorly divided into two chambers. The horizontal arms 29 are closed at the outer end, and the partition 44 stops short of said outer end, leaving a connecting-opening 45 between the upper and lower sides of the partition at the outer end of each arm, the object being to introduce water at the top of the vertical shaft 25, which will pass down the upper section thereof, and then diverging through the upper half of each arm in the upper oven will pass through the openings 45 and return along the lower

side of said arms to the shaft 25, and thence in a similar manner through each of the arms and the vertical shaft 25 to the bottom of the furnace. In this manner the shafting 25 and arms 29 will be kept cool and the hot water as it comes from the furnace may be utilized as desired.

The operation of the furnace as a whole is as follows: The ore is fed to the upper oven, as described, from the hopper 18 and dropped upon the bed of said oven at the side of the opening 32. It is then carried slowly around the bed of the oven by the shovels in the direction of the arrow, Fig. 4, receiving the heat in said oven until it comes to the opening 32, where it drops into the discharge-wheel 33, and thence, as described, into the middle oven, where it is subject to greater heat, and is carried around to the opening 32 in the bed of the middle oven, and so on to the third or bottom oven, where the roasting is finished and the roasted ore is dropped into a car 46 below the opening 32 in the bed of the bottom oven.

In another application for Letters Patent, Serial No. 707,800, of even date herewith, I have shown and claimed an apparatus for utilizing the waste gases and fumes from the ores in combination with the herein-described roasting-furnace.

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

1. In a cylindrical roasting-furnace, an oven, a hollow vertical shaft in sections, joined together by center pieces, having horizontal arms fast thereto, said center pieces and arms each interiorly divided into two chambers by a horizontal partition therein.

2. In a cylindrical roasting-furnace, an oven, a hollow vertical shaft in sections joined together by center pieces, having horizontal arms fast thereto, said center pieces and arms each interiorly divided into two chambers by a horizontal partition therein, and an opening in each of the partitions in said arms, connecting said chambers.

3. In a cylindrical roasting-furnace, two or more ovens one above the other, each having an opening in the bottom or bed thereof, a flanged discharge-wheel located in each of said openings, and mechanism for rotating said discharge-wheel, in combination with a hollow vertical shaft in sections, joined together by center pieces, having horizontal arms fast thereto, said center pieces and arms each interiorly divided into two chambers by a horizontal partition therein, and mechanism for rotating said shaft.

4. In a cylindrical roasting-furnace, two or more ovens one above the other, each having an opening in the bottom or bed thereof, and a rotary, flanged, discharge-wheel located in each of said openings; in combination with a hollow vertical shaft in sections, joined together by center pieces having horizontal



arms fast thereto, said center pieces and arms  
each interiorly divided into two chambers by  
a horizontal partition therein, and mechanism  
for rotating said shaft, in combination with a  
5 pawl-and-ratchet mechanism connected to  
said discharge-wheel and actuated by said  
arms.

In testimony whereof I have hereunto set  
my hand in presence of two subscribing wit-  
nesses.

HARRISON B. MEECH.

Witnesses:

CHARLES S. GOODING,  
ARTHUR A. COBURN.