

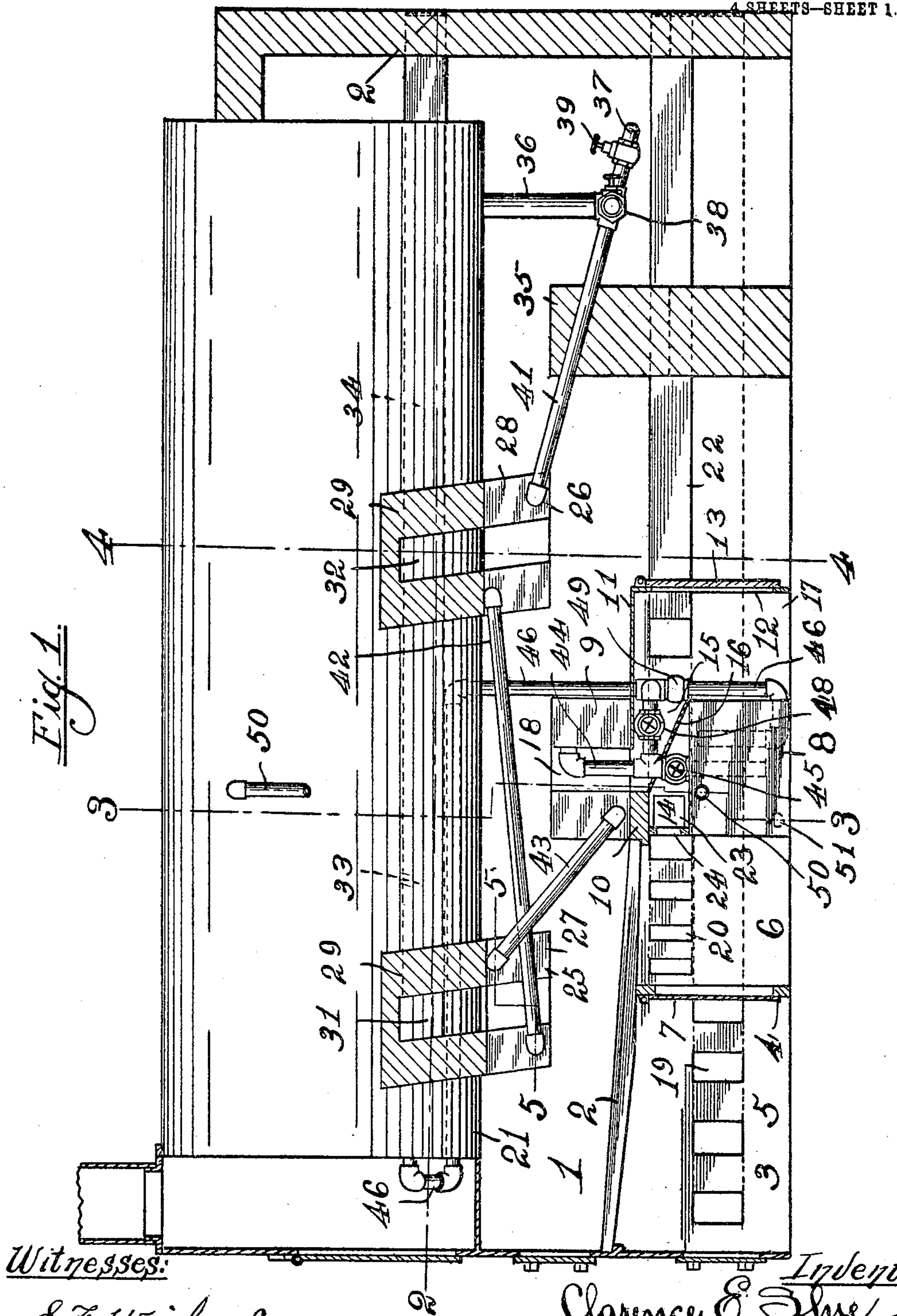
No. 800,949.

PATENTED OCT. 3, 1905.

C. E. SLYE.
SMOKE CONSUMING FURNACE.

APPLICATION FILED AUG. 29, 1904.

~~4 SHEETS~~—SHEET 1.



Witnesses:

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Inventory

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4 SHEETS—SHEET 2.

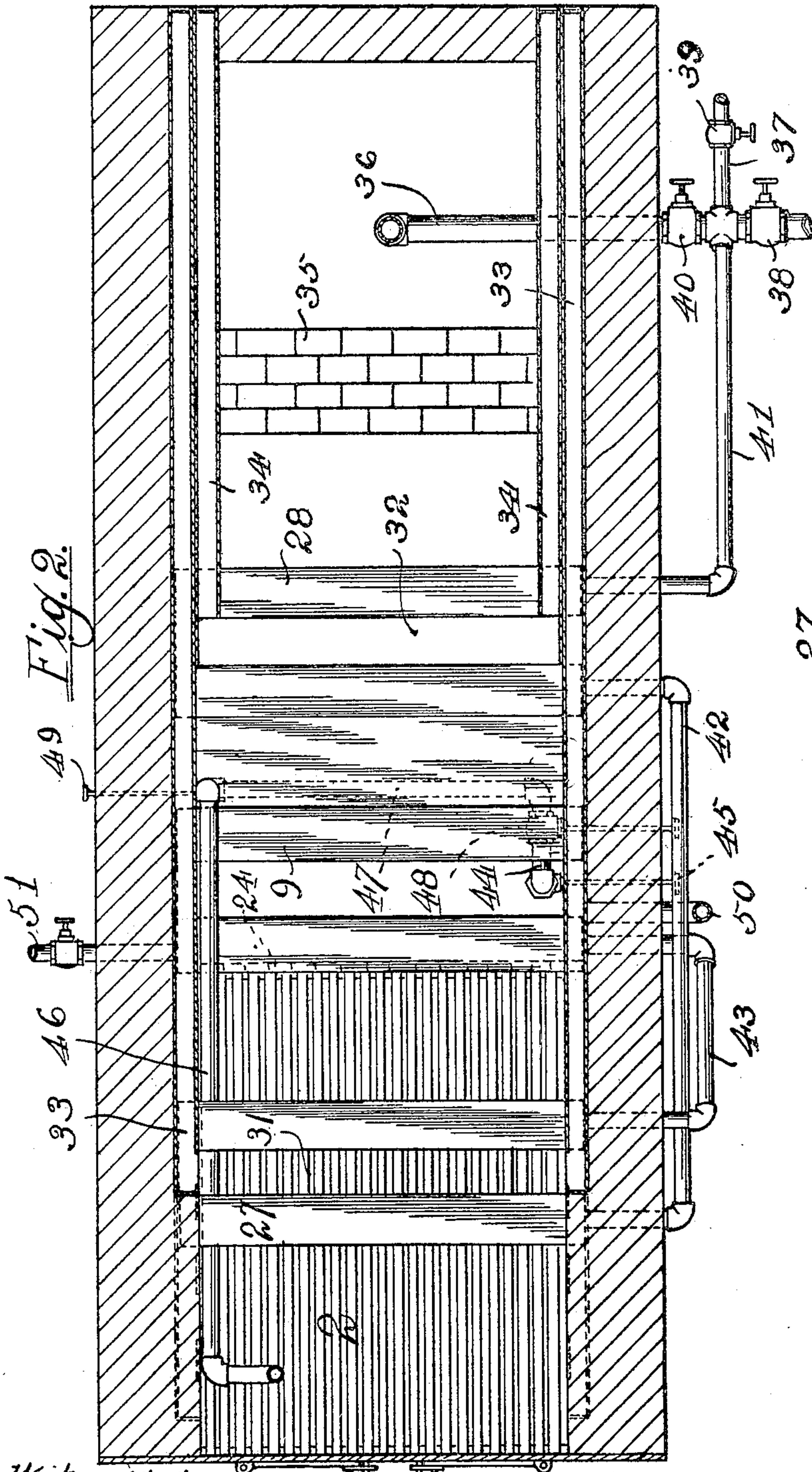


Fig. 2.

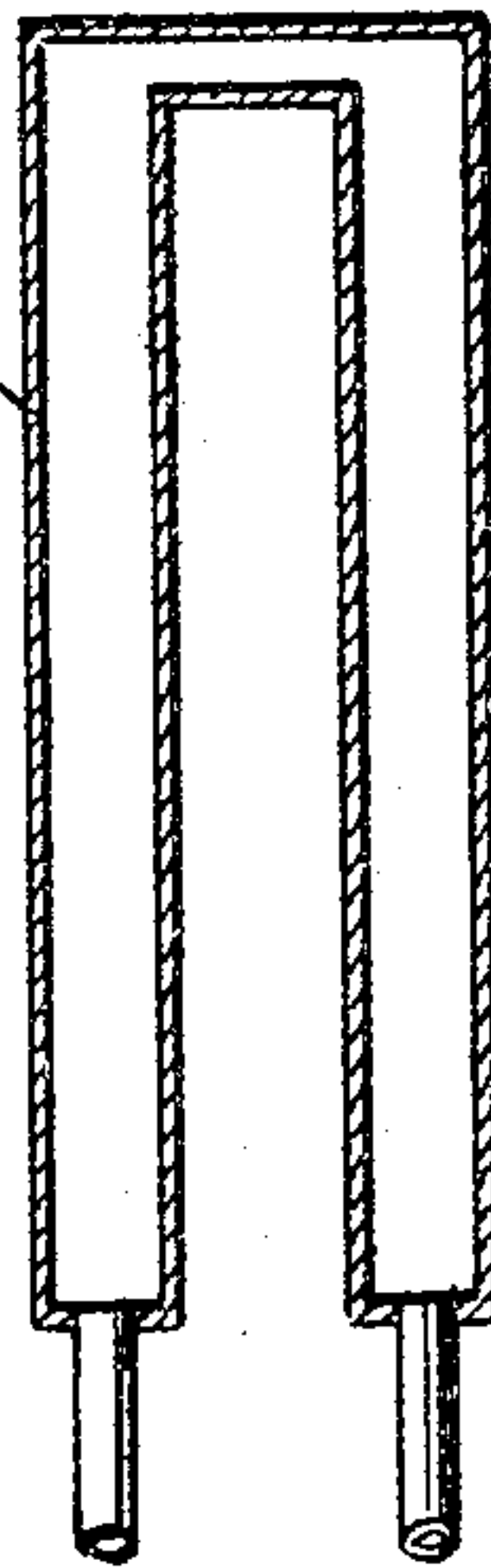


Fig. 5.

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4 SHEETS—SHEET 3.

Fig. 3.

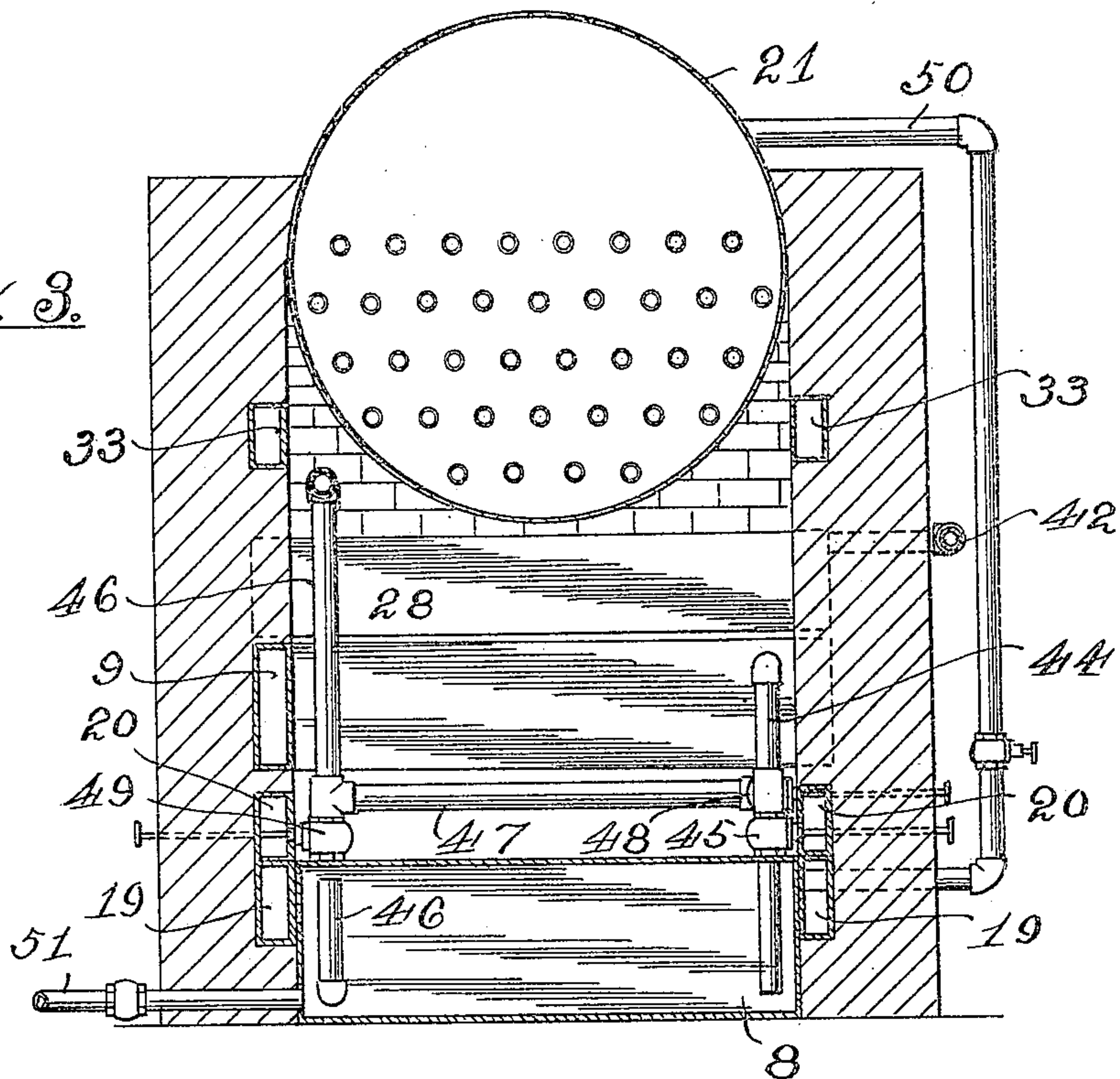
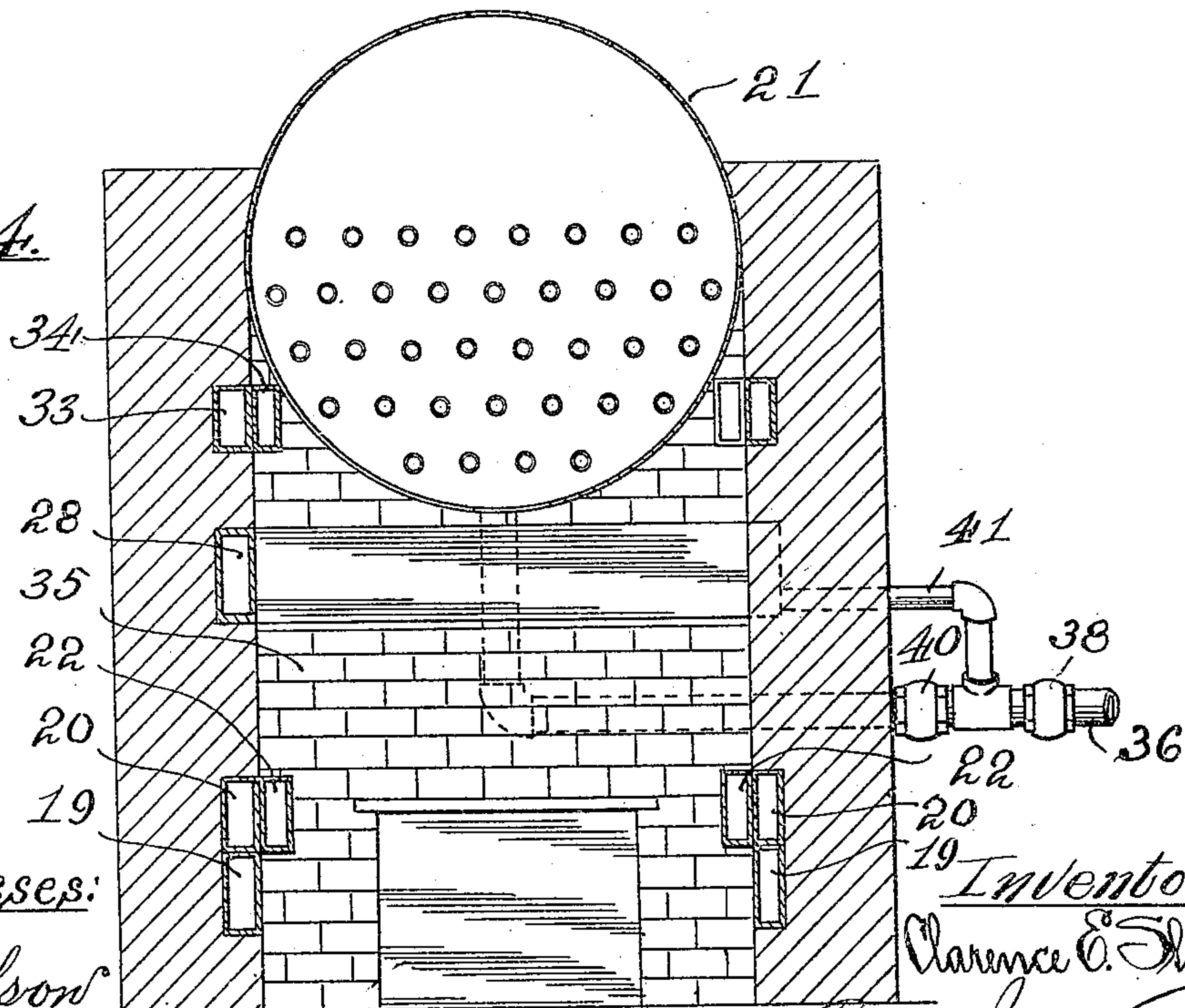


Fig. 4.



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4 SHEETS—SHEET 4.

Fig. 6.

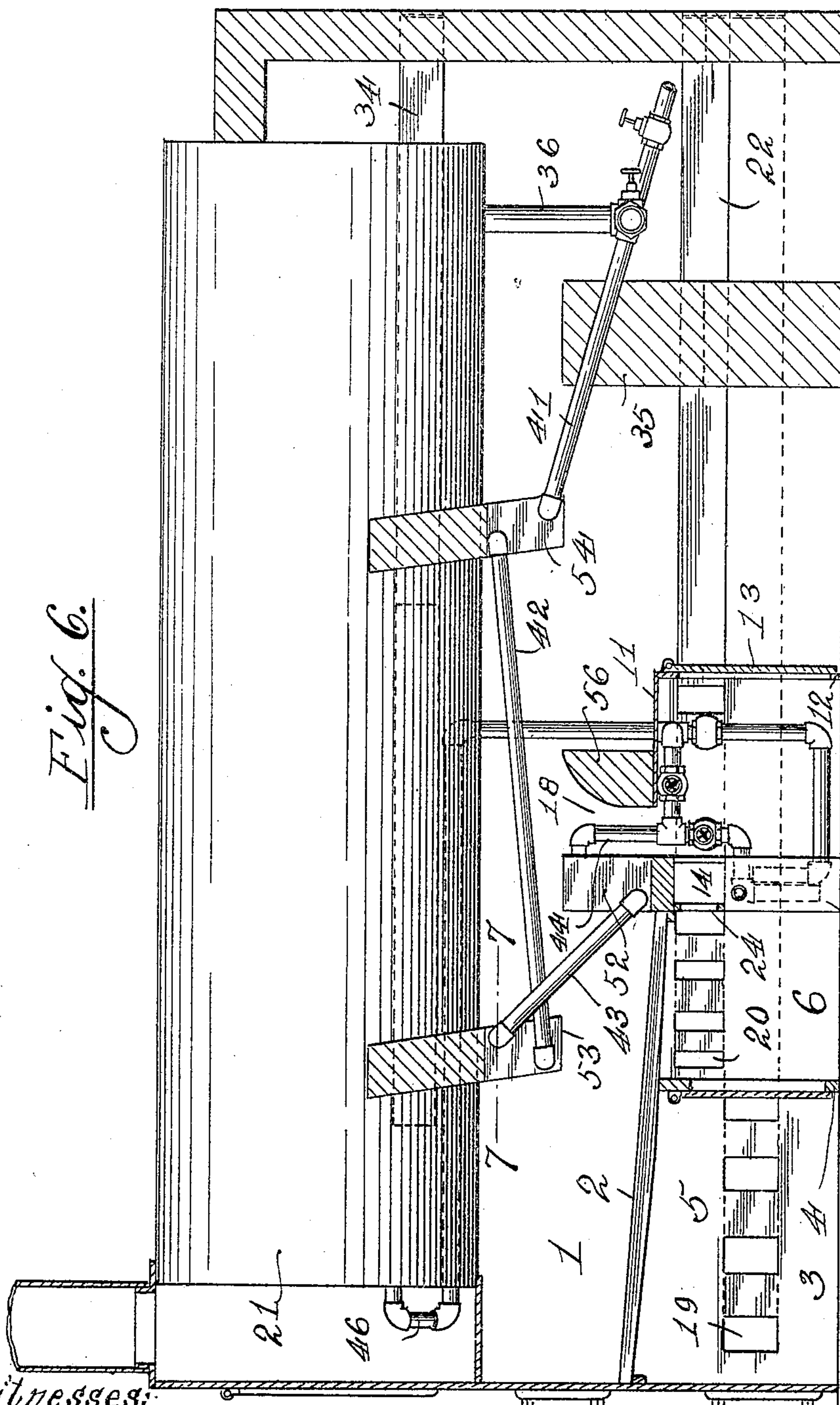
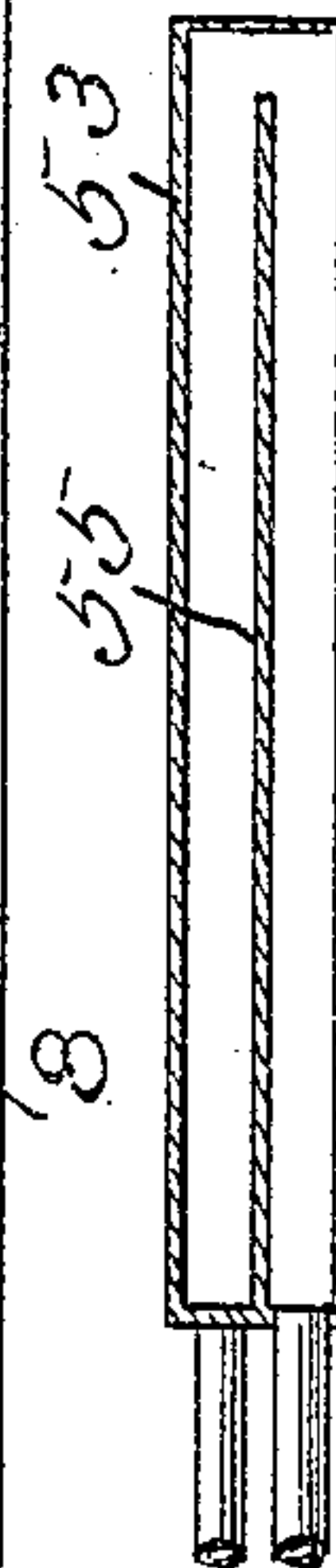


Fig. 7.



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UNITED STATES PATENT OFFICE.

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SMOKE-CONSUMING FURNACE.

No. 800,949.

Specification of Letters Patent.

Patented Oct. 3, 1905.

Application filed August 29, 1904. Serial No. 222,663.

To all whom it may concern:

Be it known that I, CLARENCE E. SLYE, a citizen of the United States, residing at Sandwich, in the county of Dekalb and State of Illinois, have invented certain new and useful Improvements in Smoke-Consuming Furnaces; and I do hereby 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.

My invention relates to a novel construction in a smoke-consuming furnace, the object being to provide a simple, efficient, and durable device of this character particularly adapted for boilers; and it consists in the features of construction and combinations of parts hereinafter fully described and claimed.

In the accompanying drawings, illustrating my invention, Figure 1 is a view of a boiler-furnace constructed in accordance with my invention, one of the side walls being removed. Fig. 2 is a plan section of the same on the line 2 2 of Fig. 1, the boiler being omitted. Figs. 3 and 4 are vertical transverse sections of the same on the lines 3 3 and 4 4, respectively, of Fig. 1. Fig. 5 is a detail section of one of the baffle-wall water-drums on the line 5 5 of Fig. 1. Fig. 6 is a view similar to Fig. 1, showing a modified form of construction of my furnace. Fig. 7 is a detail plan section on the line 7 7 of Fig. 6.

The consumption of smoke which consists largely of combustible gases can be accomplished only by the admixture of oxygen therewith while such gases are sufficiently hot to ignite, such oxygen being most conveniently introduced by admission of air. To accomplish the proper admixture of such air with the smoke at a point sufficiently near the point of greatest heat in the furnace as to assure ignition requires the introduction into the path of the hot gases or smoke of devices for retarding their passage, and thus agitating same, so that air admitted at the point of agitation will be enabled to intermingle with such smoke or gases and the latter consumed. The retarding of such hot gases requires the use of suitable baffle-walls, and these when built in the ordinary manner break down very easily by reason of the fact that they are subjected to intense heat.

My present invention relates more particularly to the construction and utility of the

baffle-walls as a supplemental means for heating the water in the boiler and the feed-water introduced into the latter, as well as a means for introducing air at the proper points for its admixture with the smoke or gases.

My invention consists, further, in so constructing the furnace that the air introduced therein at various points will be heated before its contact with the fuel and smoke or gases and in so arranging the air-distributing means as to insure uniformity and sufficiency of such air.

To these and other ends my furnace comprises the firing-chamber 1, containing the grate 2, beneath which is the ash-pit 3, which is divided by a lateral wall 4 into two compartments 5 and 6, there being a large opening in said wall 4, which is controlled by a suitable gate 7, which is capable of being adjusted to various positions in any suitable manner.

In place of the ordinary bridge-wall generally used I provide a mud-drum 8, which forms the inner end wall of the ash-pit, or, more properly, of the compartment 6 thereof, and above said mud-drum I provide a U-shaped horizontally-disposed water-drum 9, which is suitably supported upon a bar 10, upon which one arm of said drum 9 rests, and by a plate 11, upon which the other arm rests, said plate 11 being extended rearwardly and supported at its rear edge upon a vertical partition-wall 12, the latter being provided with one or more openings controlled by a suitable gate or gates 13. The said mud-drum 8 and drum 9 are substantially equal in width, and between the upper wall of the former and the bottom of the latter or its supports spaces 14 and 15 are provided, which form air-flues, as hereinafter described. An inclined plate 16 rests at its rear end upon the rear upper corner of the mud-drum 8 and at its forward end is supported on a level with the lower end of the bar 10 and cuts off communication between the compartment 6 of the ash-pit and the chamber or lateral air-flue 17 formed between the rear wall of the drum 8 and the plate 11 and the wall 12, and at the same time forms a deflecting-plate to cause ashes which may find their way into the opening or lateral flue 18 between the arms of the drum 9 to be deposited in said chamber 17. The said compartments 5 and 6 of the ash-pit communicate with air-flues 19 and 20, respectively,

which are formed, preferably, in the walls or setting supporting the boiler 21 and extending to the rear ends thereof. Flues 22, built inwardly of and parallel with the flues 20, communicate with the lateral flue or chamber 17, and openings 23 are provided to establish communication between said flues 20 and the lateral flue or space 14, which in turn communicates with the chamber 6 of the ash-pit through the foraminated wall 24. The areas of said respective flues 19, 20, and 22 and the number, size, and location of the openings establishing communication between said flues and the lateral flues and compartments may be adjusted to suit conditions and suitable dampers provided in said flues to control the same, as indicated in Fig. 1. Substantially over the middle of said grate 2 and substantially an equal distance back of the drum 9 I support baffle-walls 25 and 26, each of which comprises a U-shaped water-drum 27 and 28, respectively, upon which brick walls 29 are supported, which fill the entire spaces between the upper walls of said drums and the lower part of the boiler, said walls 29 being hollow to provide air-flues 31 and 32, which communicate with the spaces between the arms of said drums 27 and 28 and at their ends with the forward ends of flues 33 and 34, which extend to the rear end of the boiler-setting and there admit air. The said baffle-walls are preferably inclined rearwardly, so that smoke or gases impinging against the front faces of same will be deflected downwardly and rearwardly.

So far as the smoke-consuming means are concerned I have completed my description, and I will now proceed to describe the operation thereof.

Smoke or gases produced in stoking and until the volatile constituents of the coal have been substantially exhausted pass upwardly and toward the bridge-wall or drum 9. During their passage they are partially deflected downwardly by the baffle-wall 26 and partly admixed with the air entering the furnace through the flues 33 and 31. The main body of the fire in the furnace is maintained on the forward part of the grate over the compartment 5 of the ash-pit 3, and by reason of the pitch of the grate toward the rear a fire, mainly of live coal, is maintained over the compartment 6 of said ash-pit, this portion of the fire requiring relatively less air. A sufficient volume of air is introduced into and uniformly distributed throughout said compartment 6 of said ash-pit to provide a surplus of oxygen—that is, more than enough to maintain the coals on this portion of the grate incandescent. The surplus of air thus introduced passes through the bed of coal and is intensely heated thereby and passing upwardly mingles with the smoke or gases in their passage. By the drum 9 such commingled

air and gases, which latter are now for the main part consumed, are deflected upwardly and in passing over said drum 9 are further admixed with hot air, such air being heated during its passage through the flues 22, and after passing over said drum 9 said gases are again deflected downwardly by the baffle-wall 27 and still further admixed with air admitted through the flues 34 and 32, so that any combustible gases remaining are consumed before the passage of the products of combustion through the boiler-flues. Beyond the baffle-wall 29 a second bridge-wall 35 of brick is provided, which serves to deflect the hot products of combustion upwardly to impinge against the boiler. The said drums 9, 27, and 28 while serving as bridge and baffle walls, respectively, are utilized as auxiliary means for heating water, which in turn serves to prevent said members from becoming overheated, and thus burning out and collapsing, and I am further enabled by their use and the use of the mud-drum 8 to prevent to a large extent the deposit of lime and the like mineral and other impurities carried by the water from being deposited in the boiler. It is well known that such mineral constituents and impurities are deposited mostly at the point of least circulation or agitation of water in the boiler, and most generally the mineral constituents solidify and are precipitated when the temperature of the water reaches the boiling-point or somewhat above the same, so that as a rule while the boiler is in full operation the water in the hottest portion of same has been freed of such impurities, while that in the part more distant from the firing-chamber deposits such impurities in that portion of the boiler. The fresh or feed water is therefore generally introduced in the cooler portion of the boiler, so as to be freed of such impurities before it reaches the hotter portions. To the blow-off pipe 36, therefore, the feed-water pipe 37 is connected, such pipe 36 having a valve 38 interposed beyond the point of connection of the pipe 37 therewith and the latter having a valve 39 interposed therein.

In addition to the valve 38, interposed beyond the point of connection of the pipe 37 with the pipe 36, I provide a valve 40 in the latter nearer its point of connection with the bottom of the boiler, and opposite or adjacent the point of connection of said pipe 37 therewith I connect a pipe 41, which extends to the free end of the rear arm of the drum 28, adjacent the lower end of the latter. From the upper portion of the free end of the forward arm of said drum 28 a pipe 42 extends to the lower portion of the free end of the forward arm of the drum 27. From the upper portion of the free end of the rearward arm of said drum 27 a pipe 43 extends to the lower portion of the free end of the forward arm of the bridge-drum 9, and from a point

adjacent the upper portion of the free end of the rear arm of the latter a pipe 44 extends downwardly to the lower portion of said mud-drum 8, said pipe 44 passing through the upper wall of said mud-drum and having a valve 45 interposed therein. An outlet-pipe 46, having its mouth in the upper portion of said mud-drum at its other end, leaves the latter through the lower portion of the rear wall and extends upwardly and then forward to the front end of the boiler.

A cross connection is made, by means of a pipe 47, having a valve 48 interposed therein, between the pipe 44 above the valve 45 therein and the pipe 46 above a valve 49, interposed therein, the stems of said valves 45, 47, and 49 extending through the side walls of the furnace or setting. By means of said cross connection the water may be made to by-pass the mud-drum, so as to enable the latter to be cleaned, this being preferably accomplished by means of steam introduced into said mud-drum through the pipe 50 to eject the impurities from a valve-controlled blow-off 51. By means of the said connections water is taken from the cooler portion of the boiler or from the feed-water pipe 37 and caused to circulate through the said drums 27, 28, and 9 and during its passage to attain a temperature at which the mineral constituents are most readily precipitated. Such water flows very rapidly through said drums, the cross-sectional area of the passages of which are substantially equal to that of the pipes 41 42 43, &c., and through said pipes, so that no precipitates can readily lodge in the latter, but are carried into the mud-drum. The flow through the latter is very slow, and consequently all impurities and precipitates will be deposited therein, and the now thoroughly heated water will pass into the hottest or front portion of the boiler.

In Fig. 6 I have shown a slight modification, the operation of which is identical with that of the construction shown in Figs. 1 to 5, inclusive, such modification consisting, mainly, in substituting for the drums 9, 27, and 28 (which I term "double" drums) the single drums 52, 53, and 54, each of which is, however, substantially U-shaped, inasmuch as there is interposed in each of said drums a partition-wall 55, which extends from one end thereof to a point adjacent its other end, as shown in Fig. 7. Instead of forming double or hollow baffle-walls in which flues are formed the fresh air is introduced in from each baffle-wall or drum; but the operation and effect remains the same. In place of the rear arm of the drum 9 a brick bridge-wall 56 is built upon the plate 11.

By means of my construction the combustible gases are completely consumed and pass in a direction substantially opposite to that in which the water flows through the baffle and bridge walls in passing from the rear end

portion of the boiler to the forward end of same, which is conducive to the production of the best results.

I claim as my invention—

1. In a smoke-consuming furnace, the combination with the firing-chamber, of the ash-pit below the same divided laterally into two chambers each having air-inlets, a bridge-wall having formed therein horizontal and vertical air-flues, independent air-inlets communicating with said horizontal and vertical air-flues respectively, said horizontal air-flue communicating with the rearward chamber of said ash-pit, a baffle-wall in the upper portion of said firing-chamber, and air-inlets adjacent same.

2. In a smoke-consuming furnace, the combination with a firing-chamber, of a double bridge-wall at one end of same, containing a lateral air-flue open at its upper end, an ash-pit divided between its ends, and having its inner chamber communicating with said flue in said bridge-wall below the grate, of a baffle-wall in the upper portion of said firing-chamber, air-flues entering said firing-chamber at its sides adjacent the said baffle-wall, the latter being adapted to deflect the admitted air downwardly to commingle with the hot gases, air-flues entering the upper portion of said furnace rearwardly of said bridge-wall, and a second baffle-wall disposed in the path of the admitted air to deflect same downwardly.

3. A smoke-consuming furnace comprising in combination, a firing-chamber, an ash-pit below divided laterally into two compartments, a double bridge-wall having an air-space communicating with the inner chamber of said ash-pit and with air-supply flues, a lateral air-chamber behind said bridge-wall, flues communicating therewith, said bridge-wall having a vertically-disposed passage communicating with said air-flue and discharging from the upper end of said bridge-wall, air-flues communicating with said firing-chamber in its upper end and with the rear portion of said furnace and two baffle-walls disposed in said furnace and having lateral flues open at their lower ends and communicating with said air-flues.

4. In a smoke-consuming furnace, the combination with the firing-chamber and an ash-pit below the same divided laterally into two compartments, of a bridge-wall disposed at the inner end of the ash-pit and firing-chamber and comprising a mud-drum and a water-drum disposed above the same there being a vertical air-passage through said water-drum and between the latter and said mud-drum, air-flues communicating with the ends of said passages, a baffle-wall in the upper portion of said firing-chamber consisting of a water-drum and walls disposed above same and supported thereon, said baffle-wall having a lateral air-space open at its lower end, air-flues communicating with said air-space, and con-

nection between said mud and water drums and a source of supply of water.

5 5. In a smoke-consuming furnace, the combination with the firing-chamber and an ash-pit below the same divided laterally into two compartments, of a water-containing bridge-wall at one end of said firing-chamber and said ash-pit, and having air-passages discharging into one compartment of said ash-pit and
10 above said bridge-wall, an air-flue communicating with said air-passages, a baffle-wall in the upper portion of said firing-chamber comprising a water-containing support and a wall supported thereon, said support and wall having
15 a lateral air-space open at its lower end, air-flues communicating with said air-space, and connection between said bridge-wall and support for said baffle-wall and a source of supply of water.

20 6. A smoke-consuming furnace for boilers, comprising a firing-chamber, an ash-pit below the same divided laterally into two compartments, a bridge-wall at the inner end of said firing-chamber and ash-pit and comprising a
25 mud-drum and a water-drum disposed above the same, a baffle-wall disposed in the upper portion of said firing-chamber and comprising a water-drum and a wall supported thereon, said baffle-wall and bridge-wall being
30 adapted to cause the hot gases to travel in a zigzag direction toward the chimney-flue, lateral air-flues disposed above the grate and in the bridge-wall for supplying fresh air to be mixed with said hot gases, air-flues disposed
35 in the walls of the furnace and communicating with said lateral flues, and connection between said water-drums and mud-drum and the boiler.

40 7. A smoke-consuming furnace for boilers, comprising a firing-chamber, an ash-pit below the same divided laterally into two compartments, a bridge-wall at the inner end of said firing-chamber and ash-pit and comprising a mud-drum and a water-drum disposed above
45 the same, a baffle-wall disposed in the upper portion of said firing-chamber and comprising a water-drum and a wall supported thereon, a second baffle-wall disposed in the upper portion of the furnace behind the bridge-wall,
50 and comprising a water-drum and a wall supported thereon, lateral air-flues disposed above the grate and in the rear upper portion of said furnace and in said bridge-wall for sup-

plying fresh air to be mixed with said hot gases during their passage, air-flues disposed 55 at the sides of the furnace and communicating with said lateral flues, and connection between said mud-drum and water-drums and the boiler to maintain constant circulation in said drums. 60

8. The combination with a boiler, of a smoke-consuming furnace beneath the same comprising a firing-chamber provided in its upper end with a baffle-wall, having a water-containing support, a water-containing bridge-wall, a second baffle-wall beyond said bridge-wall, having a water-containing support, a plurality of air-flues communicating with said furnace adjacent said baffle and bridge walls and adapted to be deflected by the latter, a 70 mud-drum constituting a part of said bridge-wall, and connections between said water-containing supports of said baffle-walls, bridge-wall and mud-drum and said boiler to cause water to pass from the rear end portion of 75 the latter through said supports and said bridge-wall to the forward portion of the boiler.

9. The combination with a boiler, of a smoke-consuming furnace beneath the same 80 comprising a firing-chamber, provided in its upper end with a baffle-wall having a water-containing support, a water-containing bridge-wall, a second baffle-wall beyond said bridge-wall having a water-containing support, a 85 plurality of air-flues communicating with said furnace adjacent said baffle and bridge walls and adapted to be deflected by the latter, a mud-drum constituting a part of said bridge-wall, and connections between said water- 90 containing supports of said baffle-walls, bridge-wall and mud-drum and said boiler to cause water to pass from the rear end portion of the latter through said supports and said bridge-wall to the forward portion of the 95 boiler, a feed-water-supply pipe interposed in said connection at one point and valves controlling said connections and said feed-water pipe.

In testimony whereof I have signed my name 100 in presence of two subscribing witnesses.

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