

No. 660,085.

Patented Oct. 16, 1900.

F. WILD.

AUTOMATIC SMOKELESS FURNACE.

(Application filed Mar. 31, 1899.)

(No Model.)

3 Sheets—Sheet 1.

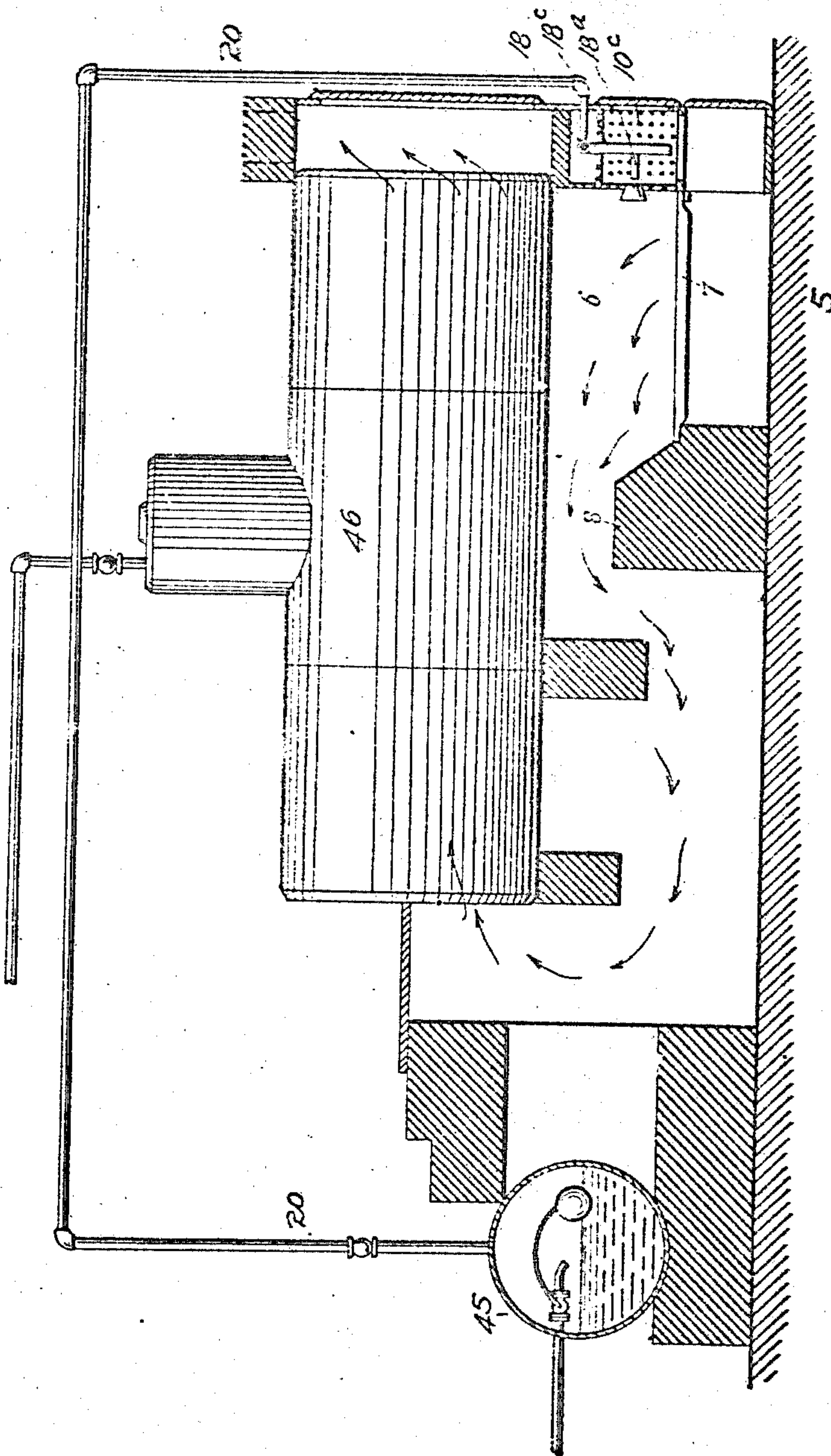


FIG. 1

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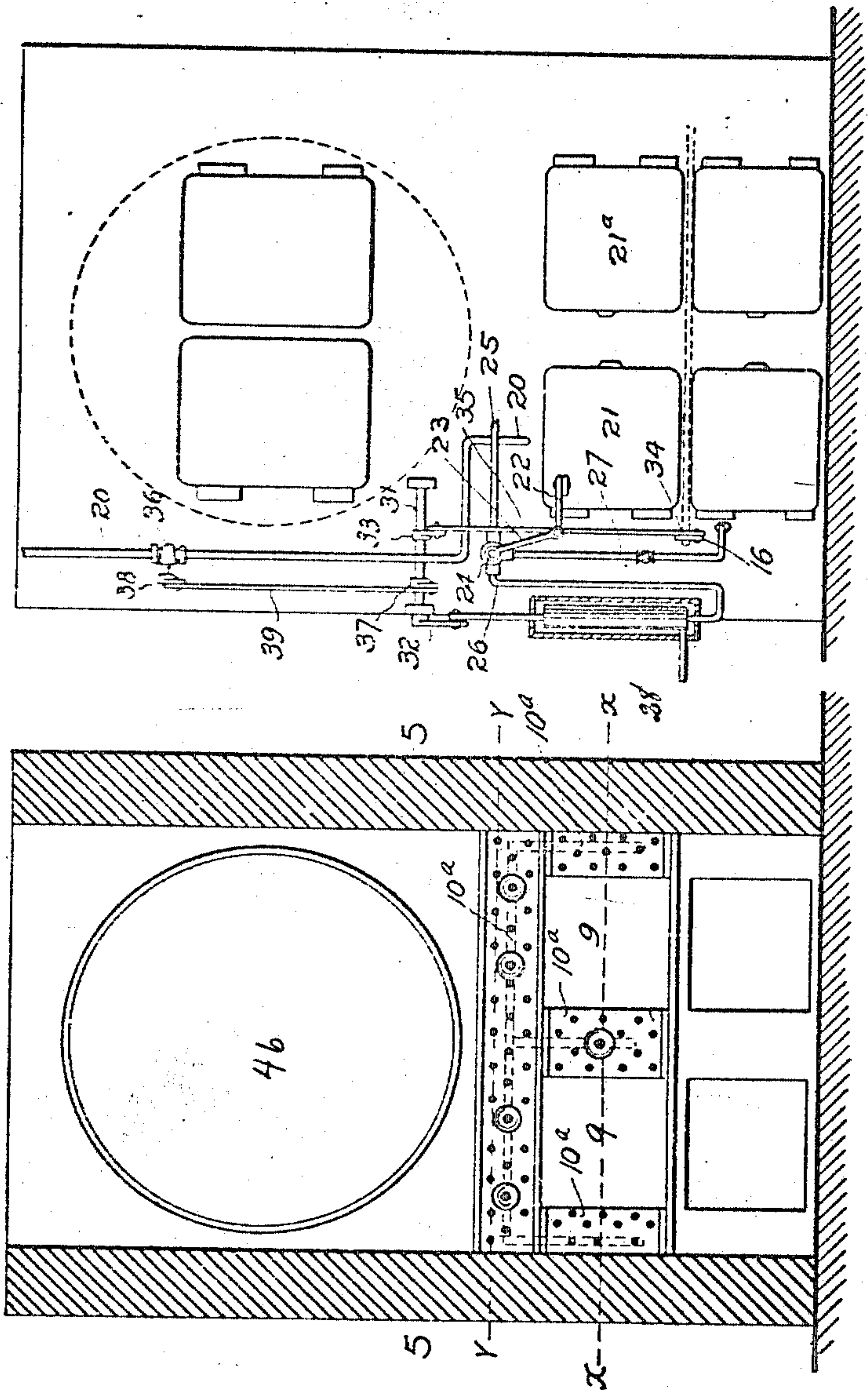


FIG. 3.

FIG. 2

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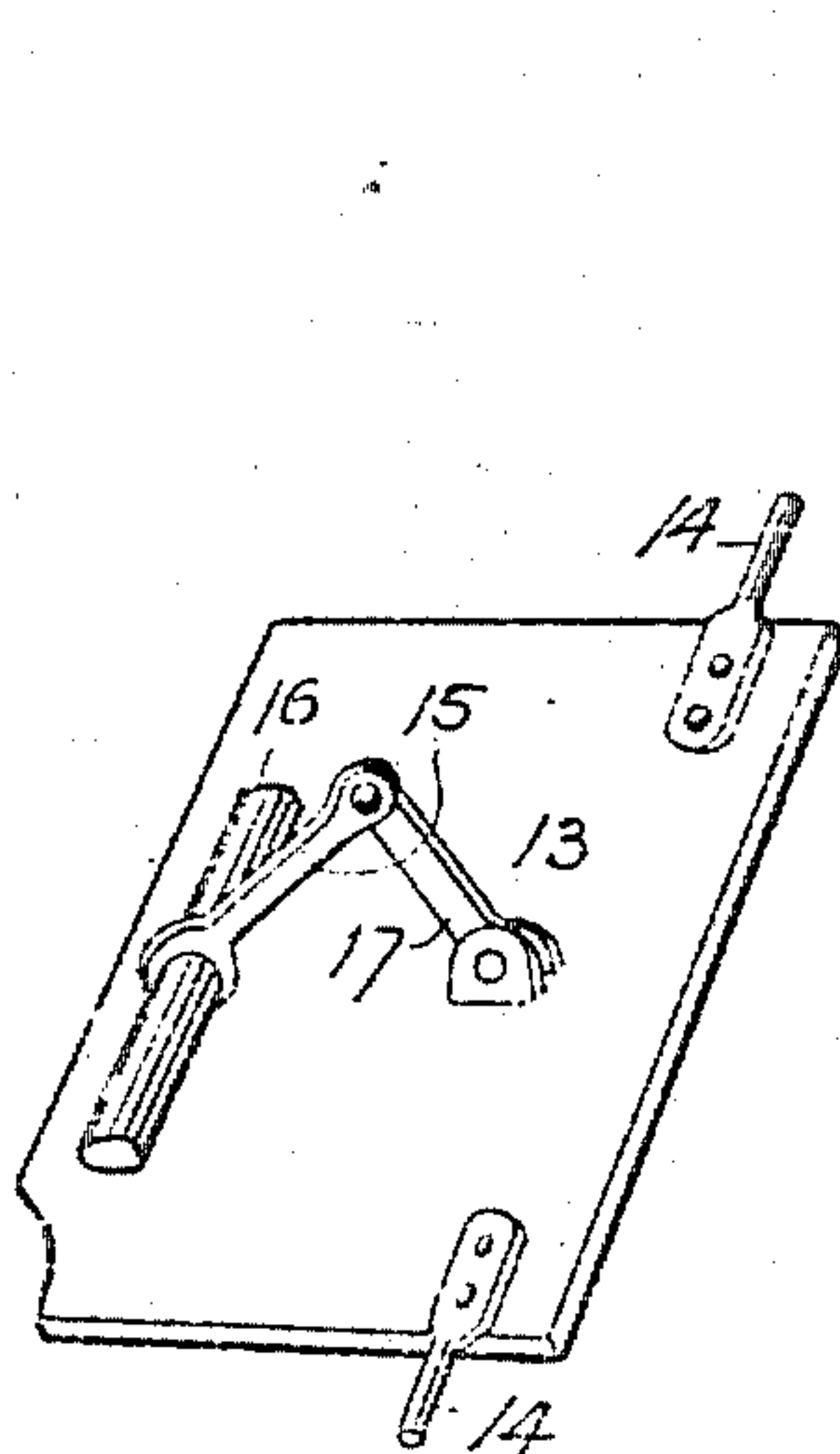


FIG. 8.

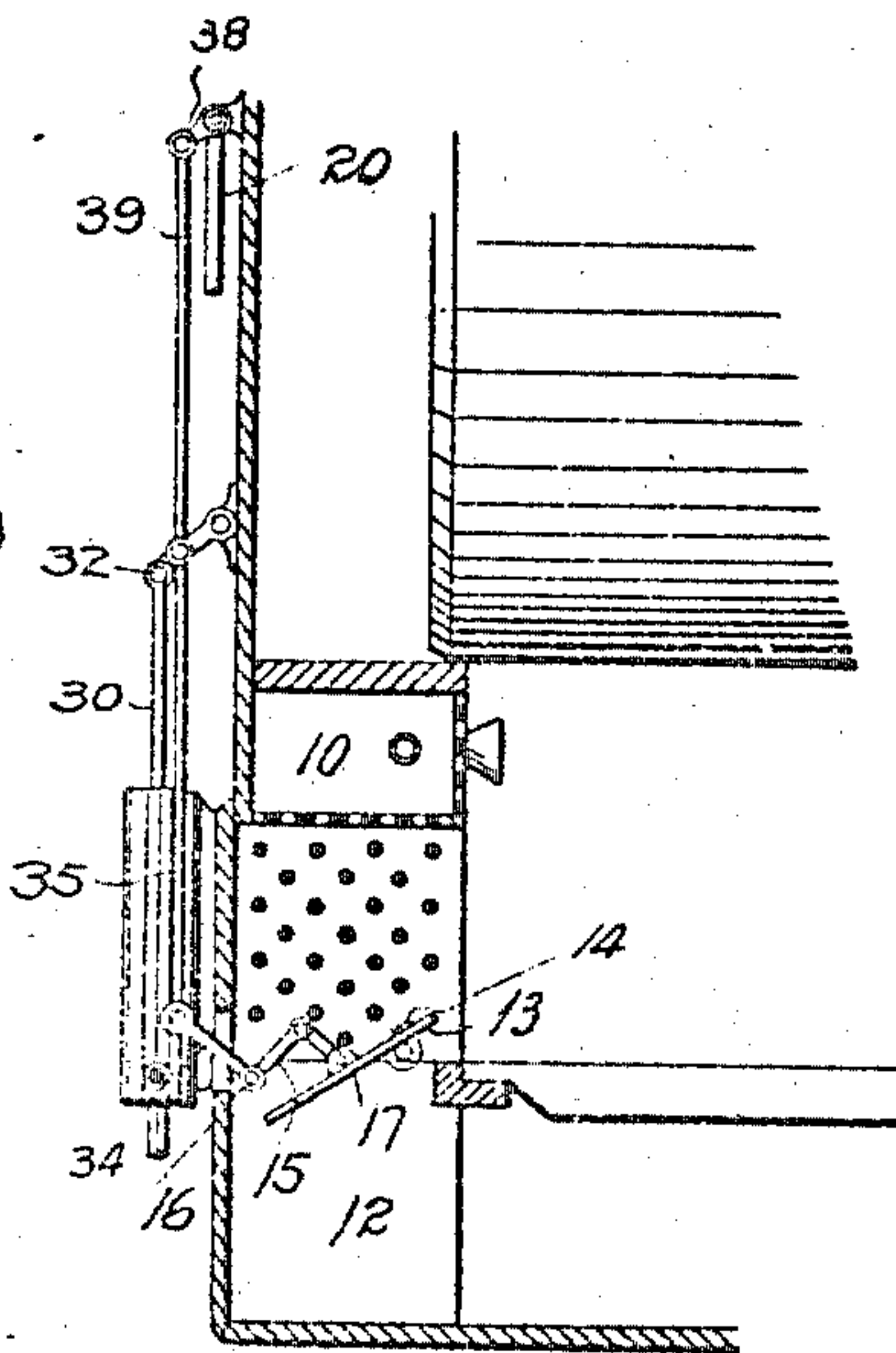


FIG. 6.

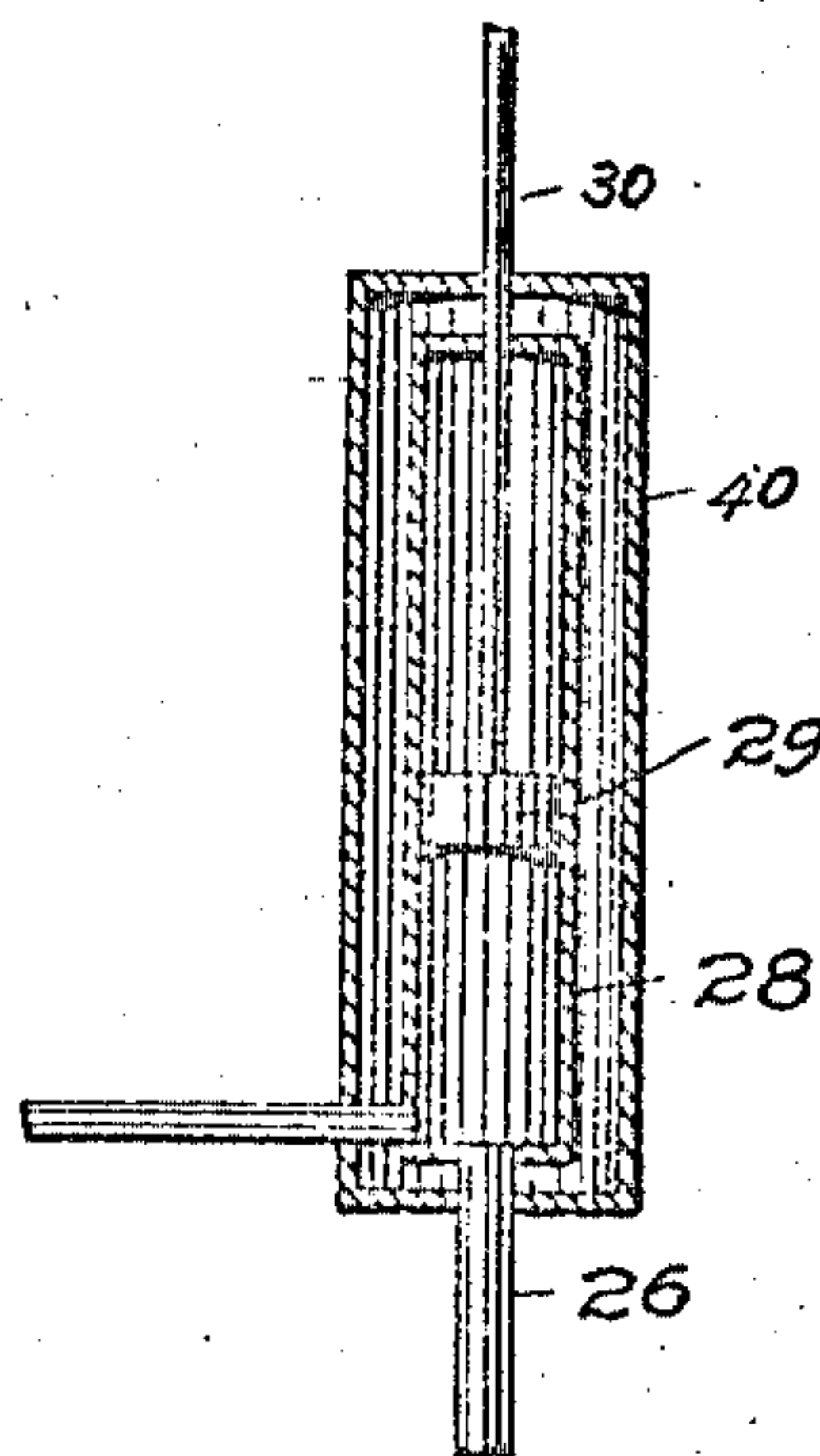


FIG. 7.

FIG. 4

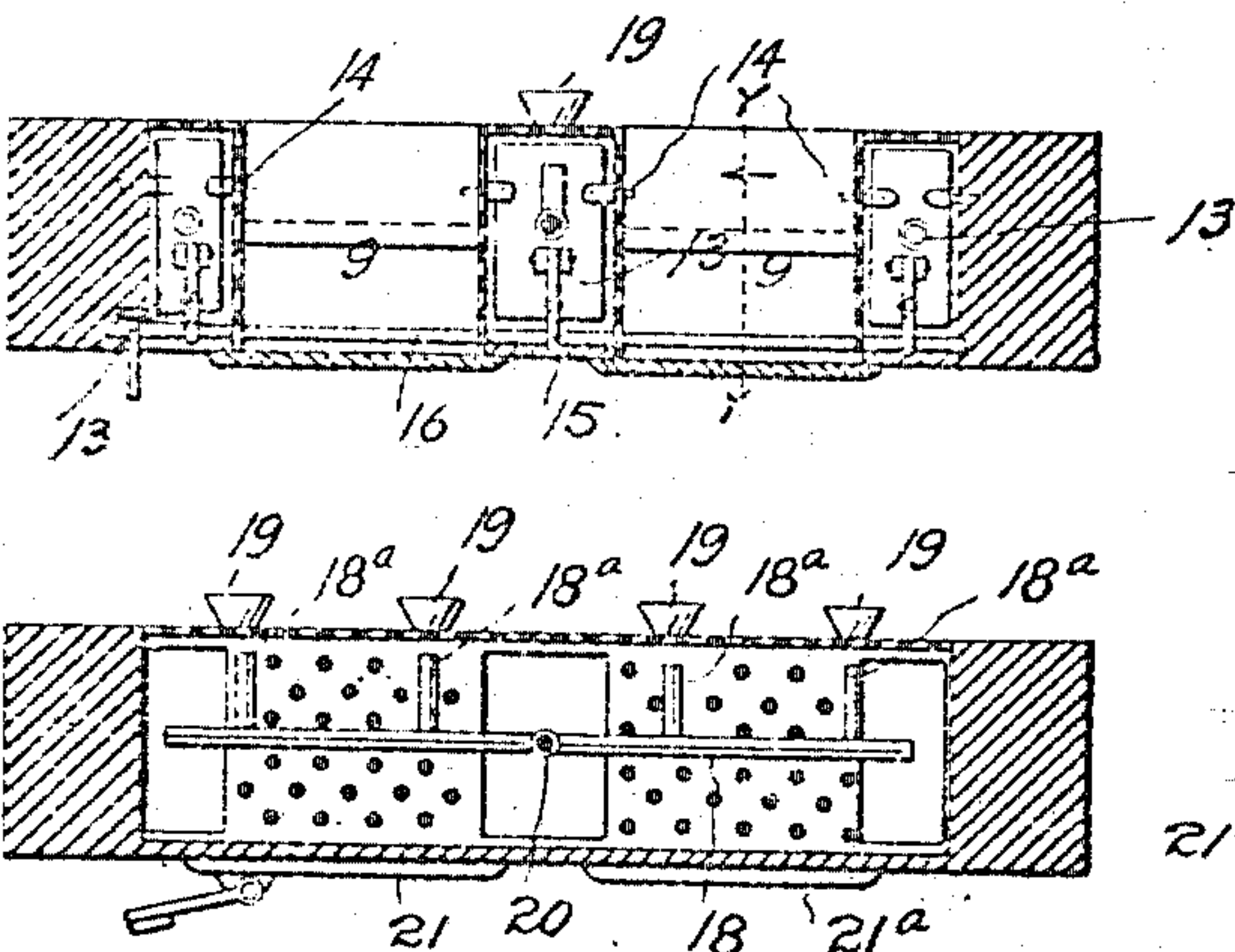


FIG. 5

FIG. 10



FIG. 9

Witnesses

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*[Signature]*



# UNITED STATES PATENT OFFICE.

FRED WILD, OF DENVER, COLORADO.

## AUTOMATIC SMOKELESS FURNACE.

SPECIFICATION forming part of Letters Patent No. 660,085, dated October 16, 1900.

Application filed March 31, 1899. Serial No. 711,226. (No model.)

*To all whom it may concern:*

Be it known that I, FRED WILD, a citizen of the United States of America, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Automatic Smokeless Furnaces; and I do 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, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in smokeless furnaces of the class set forth in Letters Patent No. 492,175, issued to me February 21, 1893.

My present invention may be considered an improvement on the construction set forth in said patent. Hence the object sought by me in this improvement is substantially the same as set forth in my previous patent—namely, to provide an automatic smokeless furnace in which the chemical equivalents never vary and in which perfect combustion may be had under all circumstances, since it adapts itself to any coal, whether anthracite, lignite, semi-bituminous, fat bituminous, free-burning, caking, coking, or clinkering coal.

An important feature of my improvements consists in automatic means for regulating and controlling the supply of air and steam to the fire-box. By reason of these automatic devices the only attention the furnace needs is to keep it supplied with fuel. The door which closes the opening through which the fuel must pass to the fire-box is connected with these automatic devices in such a manner that the opening of the door actuates the automatic mechanism which governs the supply of air and steam to the fire-box, whereby these elements are delivered in such proportions as to result in perfect combustion, no matter what the kind or quality of coal and regardless of atmospheric changes and varying climatic conditions.

The invention will now be described in detail, reference being made to the accompanying drawings, in which is illustrated an embodiment thereof.

In the drawings, Figure 1 is a longitudinal section taken through my improved furnace. Fig. 2 is an inside view of the front of the furnace. Fig. 3 is an outside view of the same. Fig. 4 is a horizontal section taken on the line X X, Fig. 2. Fig. 5 is a similar section taken on the line Y Y, Fig. 2. Fig. 6 is a fragmentary section taken through the front part of the furnace, illustrating the automatic mechanism for controlling the supply of air and steam to the fire-box. Fig. 7 is a section taken through the water-cylinder. Fig. 8 is a detail view in perspective illustrating the damper located between the ash-pit and the air-chamber. Fig. 9 is a section taken on the line Y Y, Fig. 4. Fig. 10 is a section taken on the line Z Z, Fig. 9.

Similar reference characters indicating corresponding parts in these views, let the numeral 5 designate the outer walls of the furnace inclosing the fire-box 6, provided with the grate 7, one extremity of which rests upon the bridge-wall 8. In front of the fire-box and surrounding the fuel-openings 9 on three sides is an air-chamber 10, whose inner walls adjacent the fire-box and surrounding the openings 9 are perforated, as shown at 10<sup>a</sup> and 10<sup>c</sup>. Between this air-chamber 10 and the ash-pit 12 are located three dampers 13, supported by a common hinge pin or shaft 14, which is journaled in the furnace. These dampers are arranged to open and close in unison. Each of the dampers is connected with a crank-arm 15, fast on a rock-shaft 16, by a link 17, pivotally connected with a damper at one extremity and with the crank-arm at the opposite extremity. The dampers are opened and closed by the operation of the shaft 16 through the instrumentality of the automatic mechanism connected with one of the furnace-doors, as hereinafter explained.

In the upper part of the air-chamber 13 is located a horizontal steam-pipe 18, provided with branches 18<sup>c</sup>, having rearward extensions 18<sup>a</sup>, whose free open extremities are located directly opposite funnel-shaped mouths 19, surrounding the openings in the rear wall of the air-chamber and projecting into the fire-box or combustion-chamber. These mouths 19 may be termed "blowers," since the steam



is forced through them into the combustion-chamber. The horizontal pipe 18 is connected with a pipe 20, leading from the boiler or other source of steam-supply. To the front of the furnace are hinged two doors 21 and 21<sup>a</sup>, adapted to close the fuel-openings 9, leading to the fire-box. The door 21 is connected by a link 22 with a crank-arm 23, connected with a three-way valve 24, whose chamber communicates with three pipes 25, 26, and 27. The pipe 25 leads from a suitable water-supply source. (Not shown.) The pipe 27 is a waste-conduit, and the pipe 26 leads to the bottom of a cylinder 28, in which is located a piston 29, attached to one extremity of a rod 30. When the door 21 is closed, as shown in Fig. 2, the position of the valve 24 is such that the water from the pipe 25 cannot flow through the valve-chamber; but the chamber-passage connecting the pipes 26 and 27 is left open. When, however, the door 21 is open, the valve 24 is actuated sufficiently to open the passage connecting the pipes 25 and 26 and to close the waste-passage. Assuming that the piston 29 is in the lower part of the cylinder, the water enters the cylinder and raises the piston and turns a rock-shaft 31, which is provided with a crank-arm 32, connected with the piston-rod 30. The turning of the shaft 31 opens the dampers 13 through the instrumentality of a crank 33 on the shaft, a crank 34, attached to the rock-shaft 16, and a rod 35, connecting the two cranks. At the same time a valve 36 in the steam-pipe 20 is opened through the instrumentality of a crank 37 on the shaft 31, a crank 38, connected with the valve 36, and a rod 39, connecting the two cranks. The dampers 13 and the steam-pipe valve 36 being opened, a supply of steam and an increased volume of air are admitted to the fire-box commensurate with the increased demand for these elements incident to the fresh supply of fuel placed in the fire-box after the door 21 is opened, my object being to produce perfect combustion and avoid the waste of fuel evidenced by the clouds of black smoke escaping from stacks of furnaces under ordinary conditions, and also to avoid the extreme annoyance of this smoke, which is only unburned combustible fuel elements. As soon as the door 21 is closed the valve 24 is moved sufficiently to cut off communication between the pipes 25 and 26 and to open communication between the pipe 26 and the waste-pipe 27, through which the water in the cylinder will escape more or less slowly, as desired, since the passage of the water through the waste-pipe may be controlled at will by means of a valve or by regulating the size of the pipe. As the water escapes from the cylinder 28 the piston 29 will move downwardly by gravity and turn the rock-shaft 31, whereby the valve 36 and the dampers 13 are gradually closed through the medium of the connections heretofore described. Hence it will be readily understood that the supply of air and steam to the furnace may be continued as

long as may be required by virtue of my automatic mechanism. The cylinder 28, which is preferably composed of brass, is protected by an outer casing 40.

In Fig. 1 an auxiliary boiler 45 is shown for supplying the fire-box with steam by way of the pipe 20 when the furnace is used for purposes other than for steam generation in the regular boiler 46, also shown in Fig. 1.

The bottom wall separating each fuel-opening 9 from the ash-pit is composed of two parts A and B, the part B being movable and adapted to slide on the part A, leaving an opening leading to the ash-pit, through which clinkers or other material raked from the grate may pass to the ash-pit.

Having thus described my invention, what I claim is—

1. A furnace provided with an air-chamber located in front of the fire-box and having a perforated rear wall adjacent the fire-box and perforated walls surrounding the fuel-openings on three sides, and openings in the bottom of the air-chamber communicating with the ash-pit, in combination with dampers for controlling said openings.

2. A furnace provided with an air-chamber located in front of the fire-box and having a perforated rear wall adjacent the fire-box and perforated walls adjacent the fuel-openings, and openings in the bottom of the air-chamber communicating with the ash-pit, in combination with dampers controlling said openings, a door adapted to close one of the fuel-openings, and means operated from said door for automatically controlling said dampers.

3. A furnace provided with an air-chamber located in front of the fire-box and having perforated walls adjacent the fire-box and the fuel-opening, and a damper controlling an opening formed in the bottom of the air-chamber, in combination with a steam-pipe located in the said air-chamber and having branches directed toward openings formed in the rear wall of the air-chamber adjacent the fire-box.

4. A furnace provided with an air-chamber located in front of the fire-box and having perforated walls adjacent the fire-box and the fuel-opening, and a damper-controlled opening formed in the bottom of the air-chamber, in combination with a steam-pipe located in the said air-chamber and having branches directed toward openings formed in the rear wall of the air-chamber adjacent the fire-box, said openings being surrounded by funnel-shaped mouths.

5. A furnace provided with an air-chamber located in front of the fire-box and having perforated walls adjacent the fire-box and the fuel-opening, and a damper-controlled opening formed in the bottom wall thereof, in combination with a steam-pipe located in the said air-chamber having branches directed toward openings formed in the rear wall of the air-chamber adjacent the fire-box, a door controlling the opening to the fire-box, and means



operated from said door for automatically controlling the supply of steam to the fire-box through said steam-pipe.

6. A furnace provided with an air-chamber  
5 located in front of the fire-box and having openings in its wall communicating therewith and an opening in its bottom wall communicating with the ash-pit, in combination with a hinged damper controlling said opening, a  
o door adapted to close the fuel-opening to the fire-box, and means initially operated from the said door for controlling said damper, said means comprising a water-cylinder, a piston  
15 rod, a rock-shaft having a crank connected with said piston-rod, another rock-shaft con-

nected with the damper and provided with a crank, a rod connecting the crank on the last-named shaft with another crank on the first-named rock-shaft, a water-pipe communicat- 20 ing with the bottom of the piston-cylinder and provided with a three-way valve, a waste-pipe connected with the chamber of said valve, a crank-arm attached to the valve, and a link  
25 connecting the furnace-door with said arm.

In testimony whereof I affix my signature in presence of two witnesses.

FRED WILD.

Witnesses:

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NELLIE G. DANIELS.