No. 752,011. PATENTED FEB. 9, 1904.

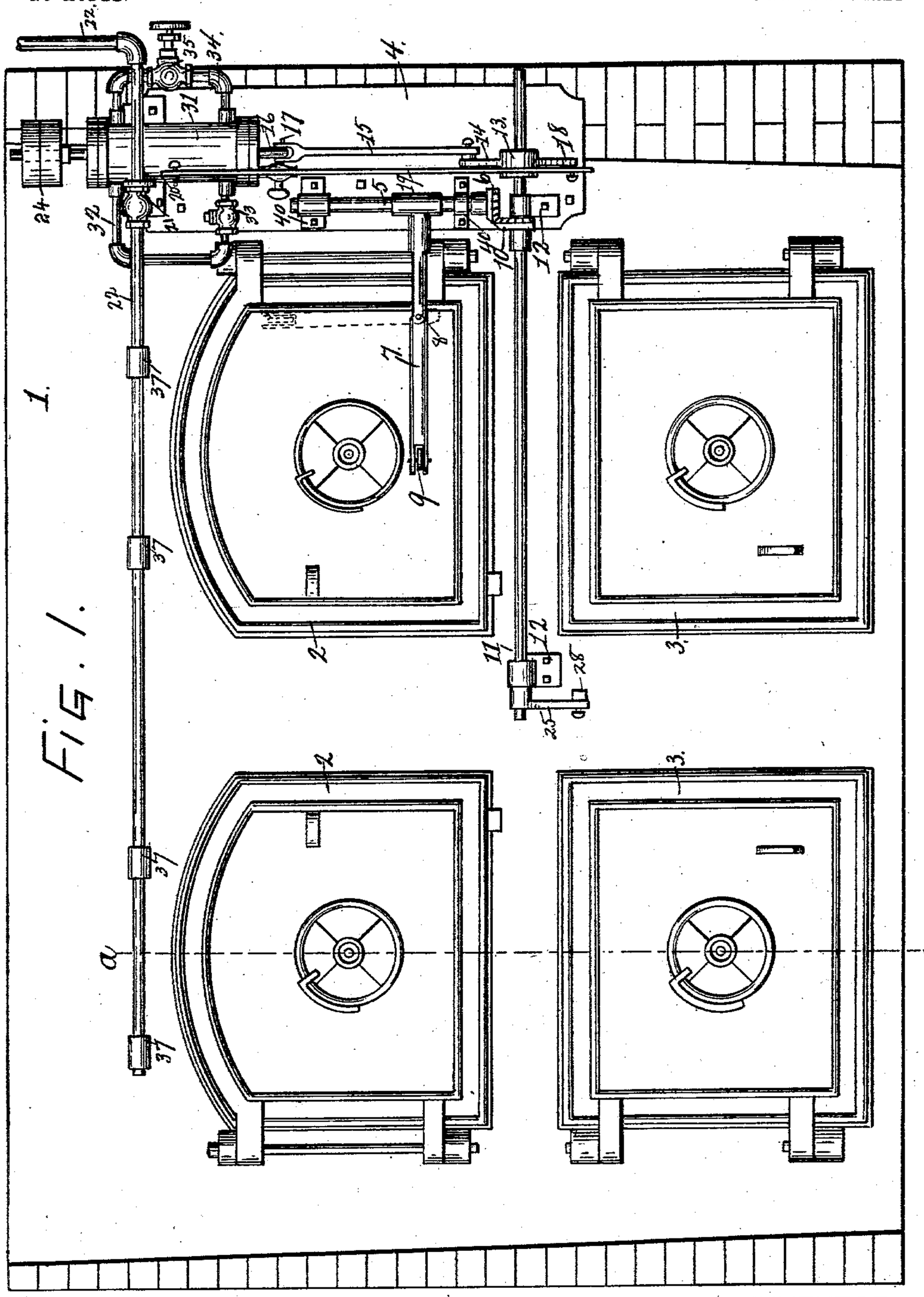
A. H. THAYER.

AUTOMATIC DRAFT REGULATOR AND SMOKE PREVENTER FOR FURNACES.

APPLICATION FILED JAN. 22, 1903.

NO MODEL. 3 SHEETS—SHEET 1.

FIG. 1.



WITNESSES:

Harris R. Brown.

Jennie M. Harper.

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NO MODEL. 3 SHEETS—SHEET 2.

FIG. 2.

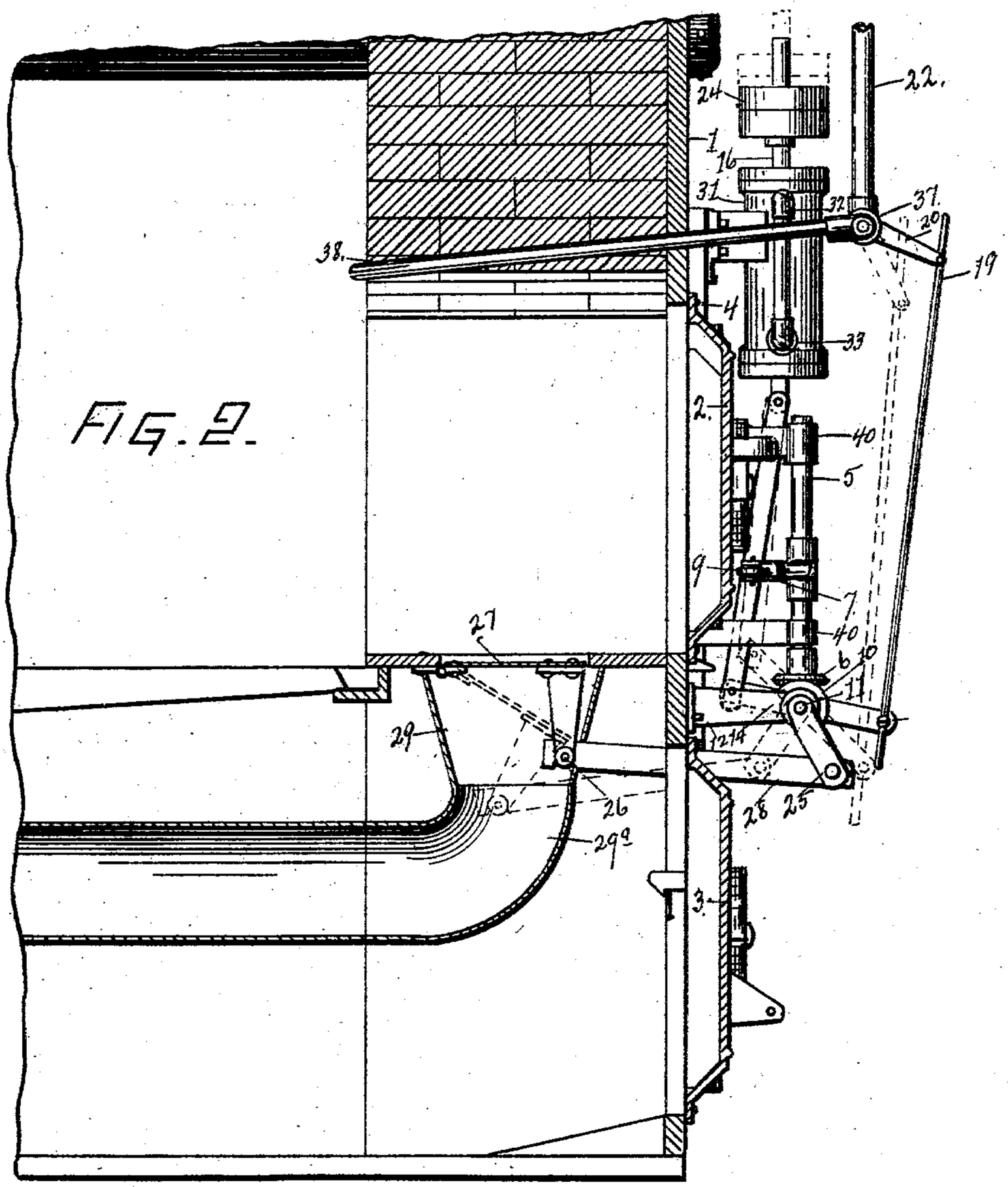

FIG. 3.

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NO MODEL. 3 SHEETS—SHEET 3.

FIG. 4.

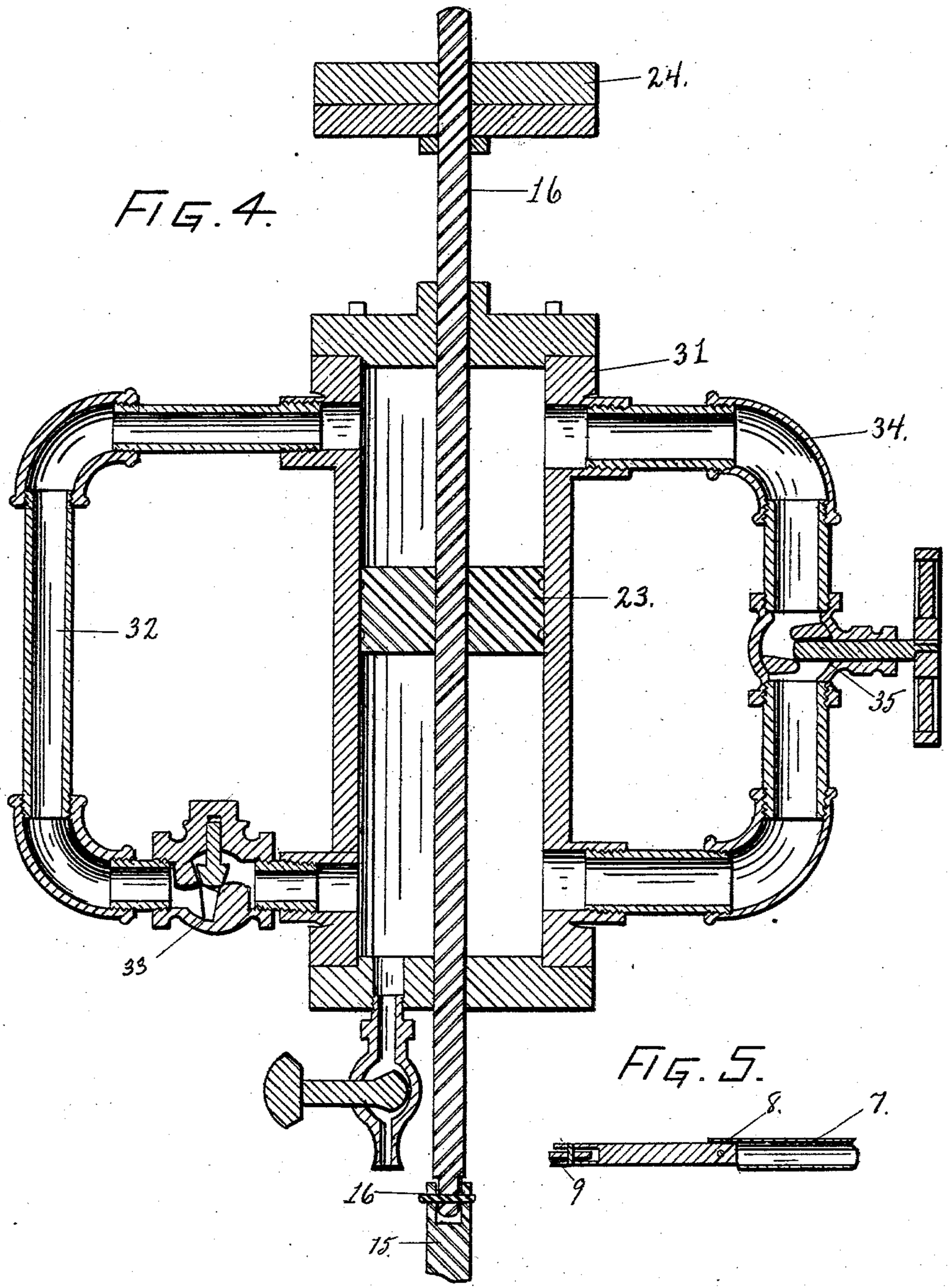

FIG. 5.

WITNESSES:

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No. 752,011. Patented February 9, 1904.

UNITED STATES PATENT OFFICE.

ADELBERT H. THAYER, OF JACKSON, MICHIGAN, ASSIGNOR TO JACKSON CUSHION SPRING COMPANY, OF JACKSON, MICHIGAN, A CORPORATION OF MICHIGAN.

AUTOMATIC DRAFT-REGULATOR AND SMOKE-PREVENTER FOR FURNACES.

SPECIFICATION forming part of Letters Patent No. 752,011, dated February 9, 1904.

Application filed January 22, 1903. Serial No. 140,125. (No model.)

To all whom it may concern:

Be it known that I, ADELBERT H. THAYER, a citizen of the United States, residing at the city of Jackson, in the county of Jackson and State of Michigan, have invented certain new and useful Improvements in Automatic Draft-Regulators and Smoke-Preventers for Furnaces, of which the following is a specification.

My invention relates to devices for controlling the draft for furnaces and for supplying additional oxygen to the fire to assist in combustion and to secure more efficient results from the fuel with less smoke and waste, and I accomplish this by automatically regulating the draft and the supply of oxygen through steam, as hereinafter more particularly described.

The special advantages of my improvements are, first, the air supplied to the combustion-chamber is warmed before entering the fire-box, and hence aids the combustion without lowering the temperature; second, the improved nozzle which I employ sprays the steam over the surface of the fire more evenly than those heretofore employed; third, the automatic device for opening the draft and steam jets and for closing them makes the operation of the device efficient irrespective of whether the fireman is careless or not, other benefits and advantages being apparent from the following description.

In the drawings forming part of this specification, and in which like numerals of reference refer to similar parts, Figure 1 is a front elevation showing the lower portion of a boiler-front and the automatic draft-regulator in position thereon. Fig. 2 is a section on the line *a b* of Fig. 1. Fig. 3 is a section view of one of the steam-jets, showing the construction to spray the steam over the surface of the fire-box. Fig. 4 is a section view of the oil-cylinder and connections, showing the construction of the parts. Fig. 5 is a section view of the arm operated by the fire-box door, showing the joint therein for permitting it to be turned up out of the way.

In the drawings forming part of this specification, 1 represents the lower portion of a boiler-front, and 2 2 represent the fire-box doors through which fuel is fed to the fire. The doors 3 3 open into the ash-pit. I have attached to the said boiler-front for convenience the plate 4, which is substantially rectangular, and to this are attached most of the parts forming my device. The upright shaft 5 is mounted in bearings formed in the brackets 40 40, attached to said plate 4, and has at its lower extremity a bevel gear-wheel. At its middle portion an arm 7 extends out horizontally into the path of the right-hand fire-box door and terminates in a fork, between the prongs of which I have supported the wheel 9. This wheel 9 at the end of the arm presses against the door whenever it is opened and the arm is moved outwardly in a circular direction, revolving the shaft 5. At a middle point in said arm 7 I have made a knuckle-joint 8, which permits the extremity to be raised, as shown in dotted lines, Fig. 1, for convenience in disconnecting the said arm from operation with said door. The horizontal shaft 11 is mounted in bearings in the brackets 12 12 and supports the bevel gear-wheel 10 in mesh with the gear-wheel 6 aforesaid. At the right-hand end of said shaft 11 I have attached a double arm 13, one end, 14, thereof being connected with the piston-rod 16 by means of the rod 15 at the joint 17, and the other end, 18, of said double arm being connected by means of the rod 19 with the lever 20, operating the valve 21 in the steam-pipe 22. By this construction whenever the fire-box door is opened to renew the fire the arm 7 is turned outwardly, revolving the shaft 5, to which it is attached, and this in turn revolves the shaft 11 through the bevel gear-wheels, and when this shaft is revolved the double arm pulls down the lever 20, operating the valve 21 aforesaid, permitting steam to pass through said valve and into the fire-box through the steam-jets 38 38 38 38, connected with said steam-pipe at 37 37 37 37, arranged, preferably, with two over each fire-box door. At the same time the other end 14 of said double arm 13 raises the piston-

rod 16 and the piston 23 and the weights 24, mounted upon the upper end of said piston-rod. To regulate the speed with which the valve 21 is closed, the cylinder 31 is filled with oil and also has a pipe upon one side, as 32, leading the oil from a point above the cylinder to a point below the cylinder. This pipe has a check-valve 33 therein, which permits the oil to pass from above the piston to the portion below the piston whenever the piston is raised, as above described, but preventing the oil from returning by the same pipe whenever the weights 24 push the piston down and compress the oil in the lower portion of the cylinder. At the other side of the cylinder I have arranged a second pipe, also connecting the portion of the cylinder above the piston with the portion below the piston, being number 34, and in this pipe I have placed the adjustable valve 35, which may be opened to any desired extent to permit the oil to return from below the piston to the portion above the piston whenever the pressure of the piston and weights force the oil from below the piston through this valve to the portion above the piston. By this means the time in which the piston can descend may be regulated by adjusting the valve 35, so as to make the length of time required for the piston to descend to its initial position to be longer or shorter, as desired, and as the lever of the valve 21 cannot close said valve until the piston has again descended the said valve 21 remains open until the piston again reaches its initial position, thus giving the operator means for adjusting the device to supply steam to the fire-box any desired length of time after each fresh lot of fuel is put therein.

At the left-hand end of the shaft 11 I have attached the arm 25, which is connected by means of a connecting-rod 28 with the rod 26, attached to the dampers 27, arranged, as shown, in the dead-plate with one damper beneath each fire-box door. By this construction whenever the fire-box door is opened by means of the arm 7 and the shafts 5 and 11 the said dampers 27 are opened and remain open as long as the piston remains elevated in the said cylinder, as aforesaid. As the cylinder descends the shaft 11 gradually returns to its initial position and the dampers 27 are gradually closed. About these dampers I have placed a box 29, which has pipes extending to the rear portion of the ash-pit underneath the fire-box, with openings at the rear ends thereof through which air is drawn into said pipes and through said dampers to said fire-box. The object of said pipes and said box is to superheat the air entering the fire-box through said dampers by forcing it to pass backward through said ash-pit and forward again within said pipes, thus doubly heating said air before it enters the fire-box, greatly increasing the combustion in said fire-box, and preventing the boiler and fire from being cooled off or deadened, as would occur if the air were admitted direct to said fire-box.

In the construction of the jets 38 I employ a pipe having a plug brazed in the end thereof. After the pipe has been closed by said plug it is drilled out from the inside to the shape shown in Fig. 3, forming a cone-shaped cavity at the lower extremity thereof, and the end is then cut with a slot to just cut into the apex of the cone-shaped cavity inside. By this construction when steam is forced through said jet it is sprayed out in the shape of a fan and spreads over a much wider surface of the fire than would occur with the style of jets formerly employed for this purpose, and thus the four jets, shown very perfectly, spray the entire surface of the fire and greatly aid the combustion by supplying additional oxygen to the combustion-chamber.

I have designed my said device to be operated automatically after the fire-box door is opened to renew the fire, and thus requires no additional attention or thought on the part of the fireman, and the effectiveness of the device is not reduced by carelessness or neglect on the part of the fireman. The operation of my device is as follows, viz: Whenever the fire-box door is opened in the process of firing the boiler, the arm 7 in contact with said fire-box door is turned backward and revolves the shaft 5, which in turn revolves the shaft 11, and this, as above described, opens the dampers 27 and also opens the valve 21 in the steam-pipe and raises the piston and weights, forcing the oil from above the piston through the pipe 32 to a position below said piston. As soon as the fire-box door is closed the weights 24 press the piston downward against the oil beneath it and force this oil out through the pipe 34 and through the valve 35 to a position above the piston, and thus gradually permit the piston to again descend to its initial position. As the piston thus descends it turns the shaft 11 to turn backward to its starting position, which closes the dampers and the valve 21 and returns the arm 7 to a position in contact with the fire-box door and ready to be again operated thereby.

It is a well-known fact that when fuel is first thrown upon a fire the gas is driven off more rapidly than it is consumed and escapes in the form of smoke, which not only causes a nuisance, but also a considerable loss from the escape of combustible gases. The object of my said device is to supply automatically to the combustion-chamber at this especial time an increased amount of heated oxygen through the damper 27 and also heated oxygen through the steam-jets 38, which is sprayed directly into the fire, greatly aiding the combustion, and thus burning up the gases which would otherwise escape. By this arrangement I am able to prevent the issuing of smoke from the chimney and also the waste of the combustible gases and create a saving

in fuel, which has reached as high a saving as fifteen per cent. over furnaces not having my said improved device.

While I have shown my device as attached to an ordinary boiler, it is apparent that it is adaptable to any style of boiler or furnace in use, and the arrangement of the parts and the shapes may be varied to suit the style of furnace with which it is to be attached without in any manner departing from the spirit of my said invention.

Having thus described my said invention, what I claim, and desire to secure by Letters Patent, is the following:

1. In combination with a furnace, a steam-supply pipe, means in communication with the steam-supply pipe for injecting steam into the combustion-chamber of the furnace, a valve disposed in the line of the steam-supply pipe, a dead-plate having dampers arranged therein, air-conductors leading from the dead-plate, to the rear of the ash-pit, means for operating said valve and dampers to admit steam and air to the combustion-chamber simultaneously, and means constructed and arranged to regulate the closing of the dampers and shutting off of the injection of steam to the combustion-chamber simultaneously.

2. In a device of the class described, the combination with openings in the dead-plate, of dampers arranged in said openings; air-pipes leading from said openings to the rear of the ash-pit; means actuated by the fire-box door for opening said dampers whenever the fire-box door is opened; an actuating device for closing said dampers; and a retarding mechanism for regulating the duration of the time required by said actuating mechanism to close said dampers.

3. In combination with a furnace having a dead-plate, of dampers arranged in the dead-plate, air-conductors leading from the rear of the ash-pit to the dead-plate, means for injecting steam into the combustion-chamber of the furnace, means for admitting air and steam to the combustion-chamber simultaneously, and means for shutting off the admission of steam and air to the combustion-chamber simultaneously.

4. As a new article of manufacture, an injector comprising a tube provided with an external contracted end, a slot in said end of the tube, and the internal bore of the tube having a cone-shaped opening leading into said slot.

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Witnesses:
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