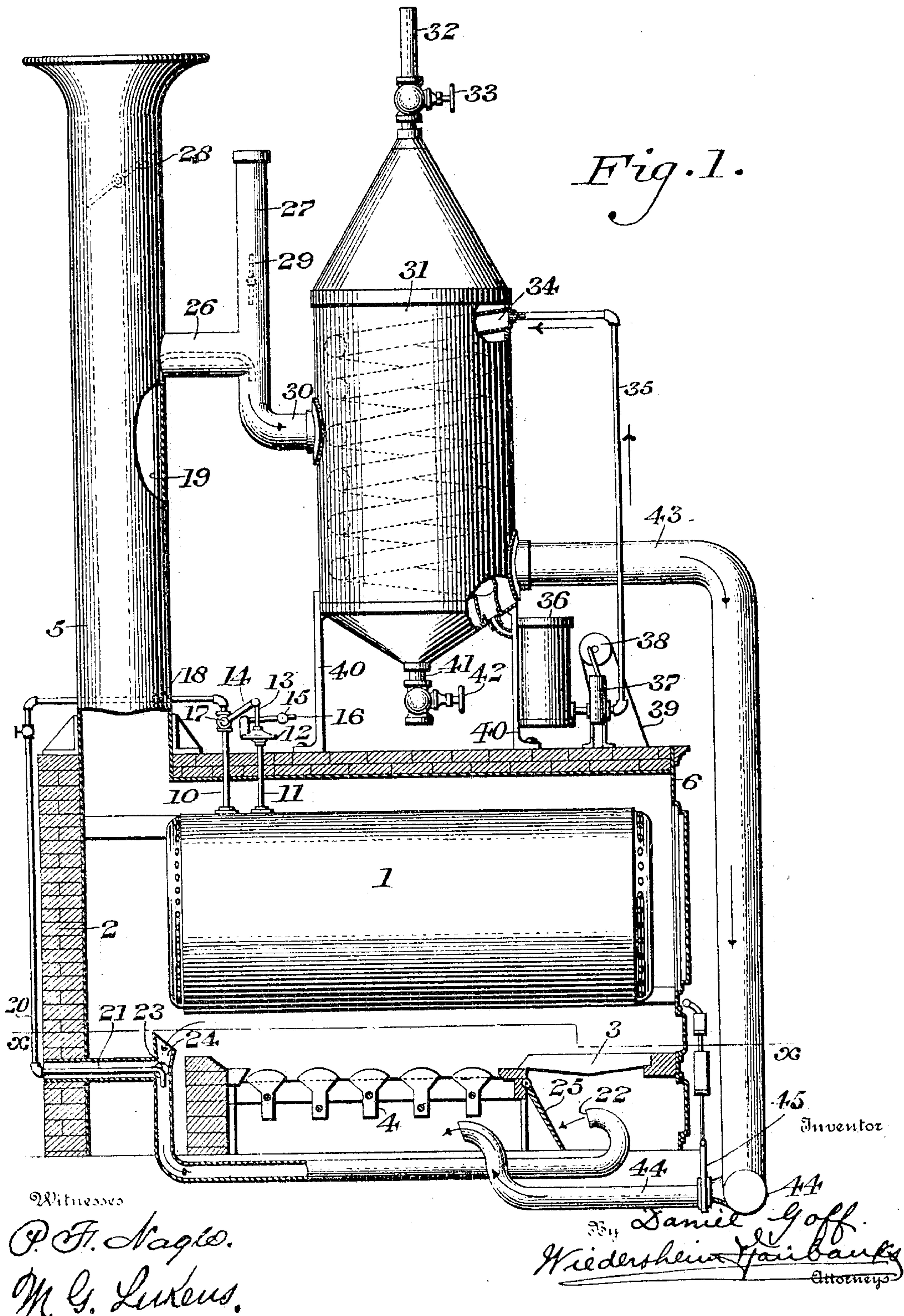


No. 798,896.

PATENTED SEPT. 5, 1905.

D. GOFF.
SMOKE AND GAS CONSUMER.
APPLICATION FILED AUG. 12, 1904.

3 SHEETS—SHEET 1.



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3 SHEETS—SHEET 2.

Fig. 2.

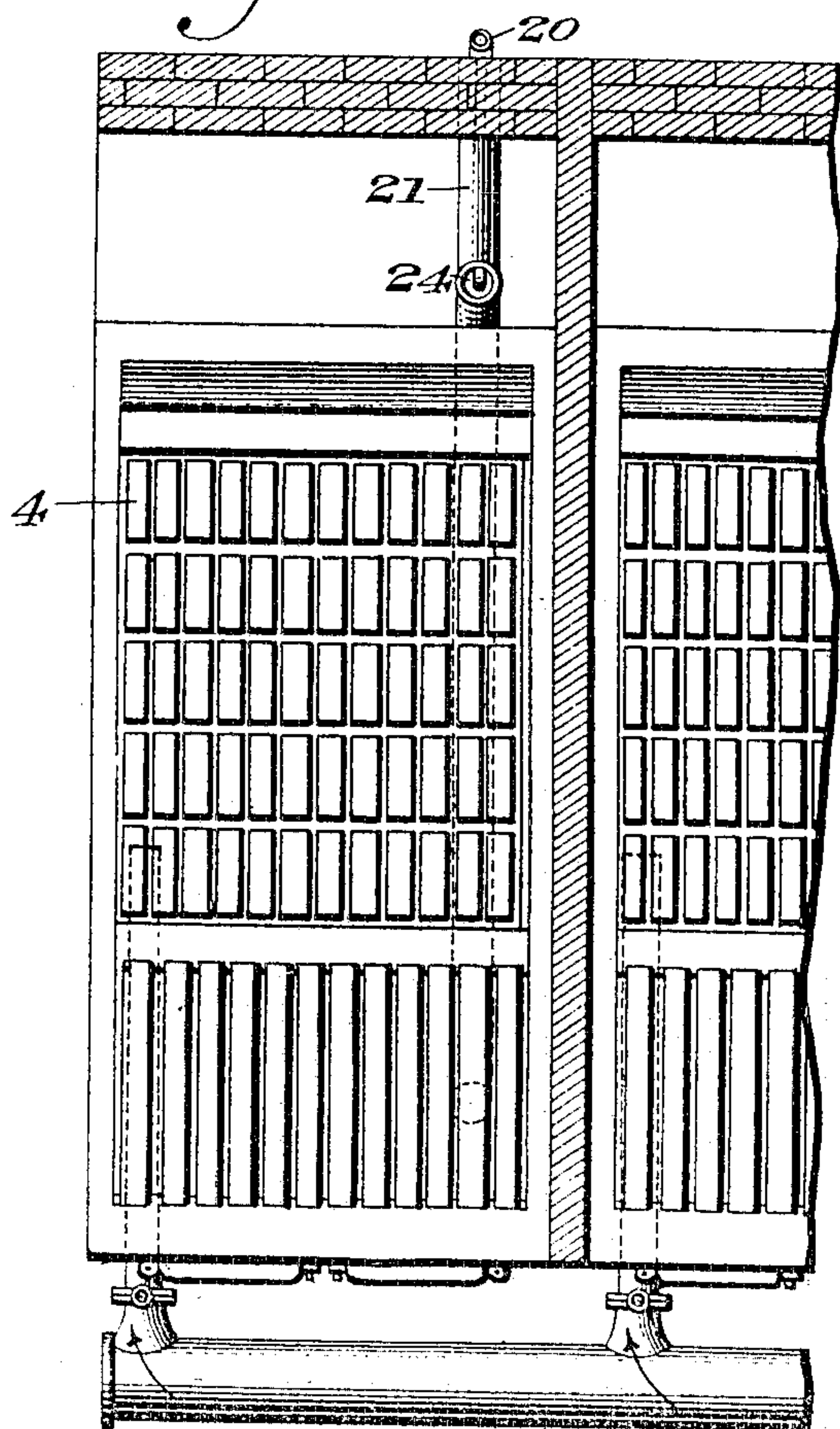


Fig. 4.

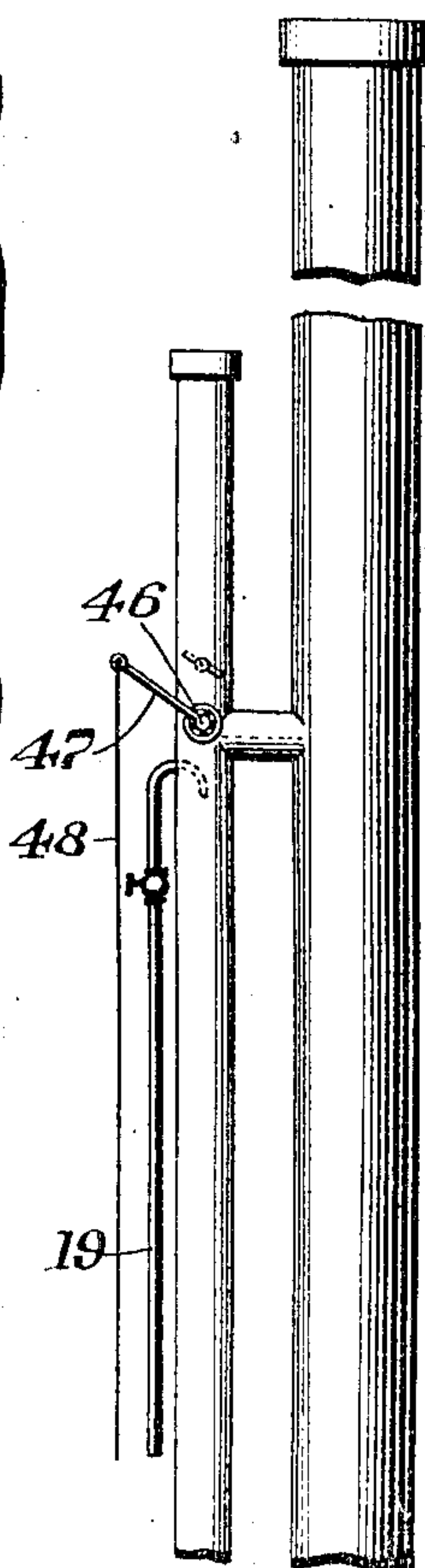


Fig. 5.

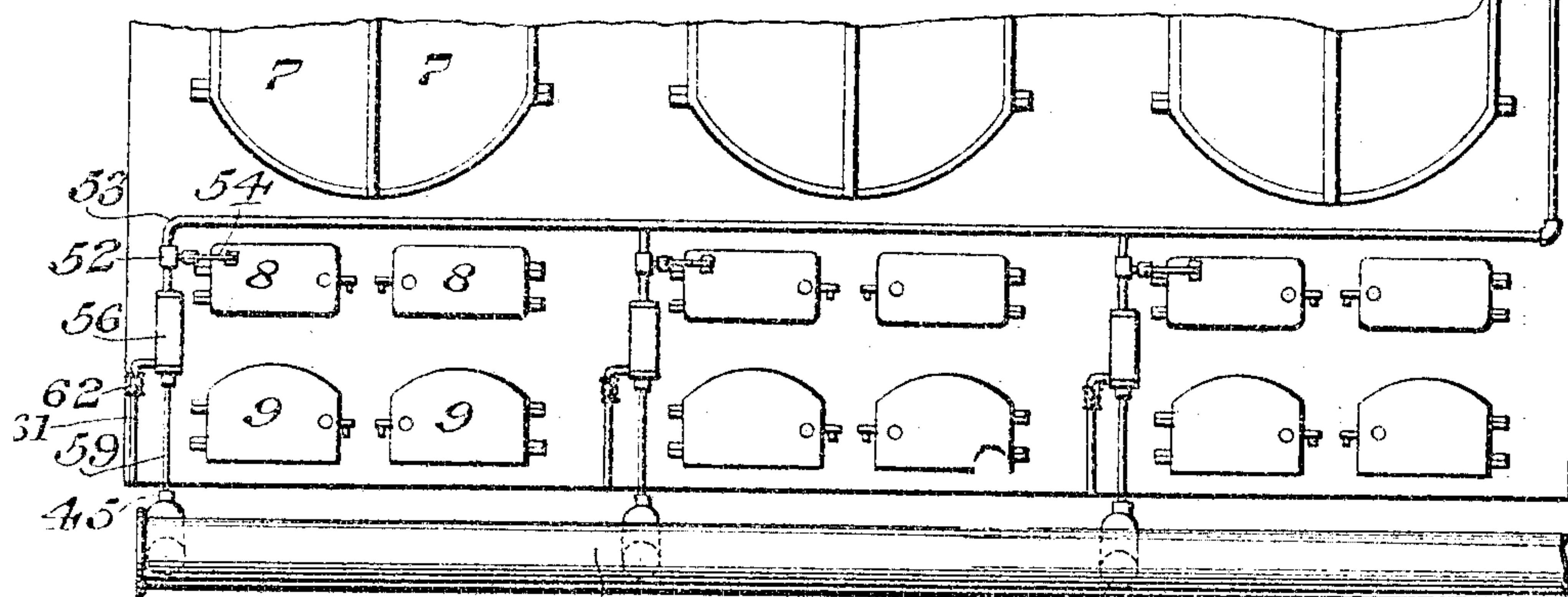
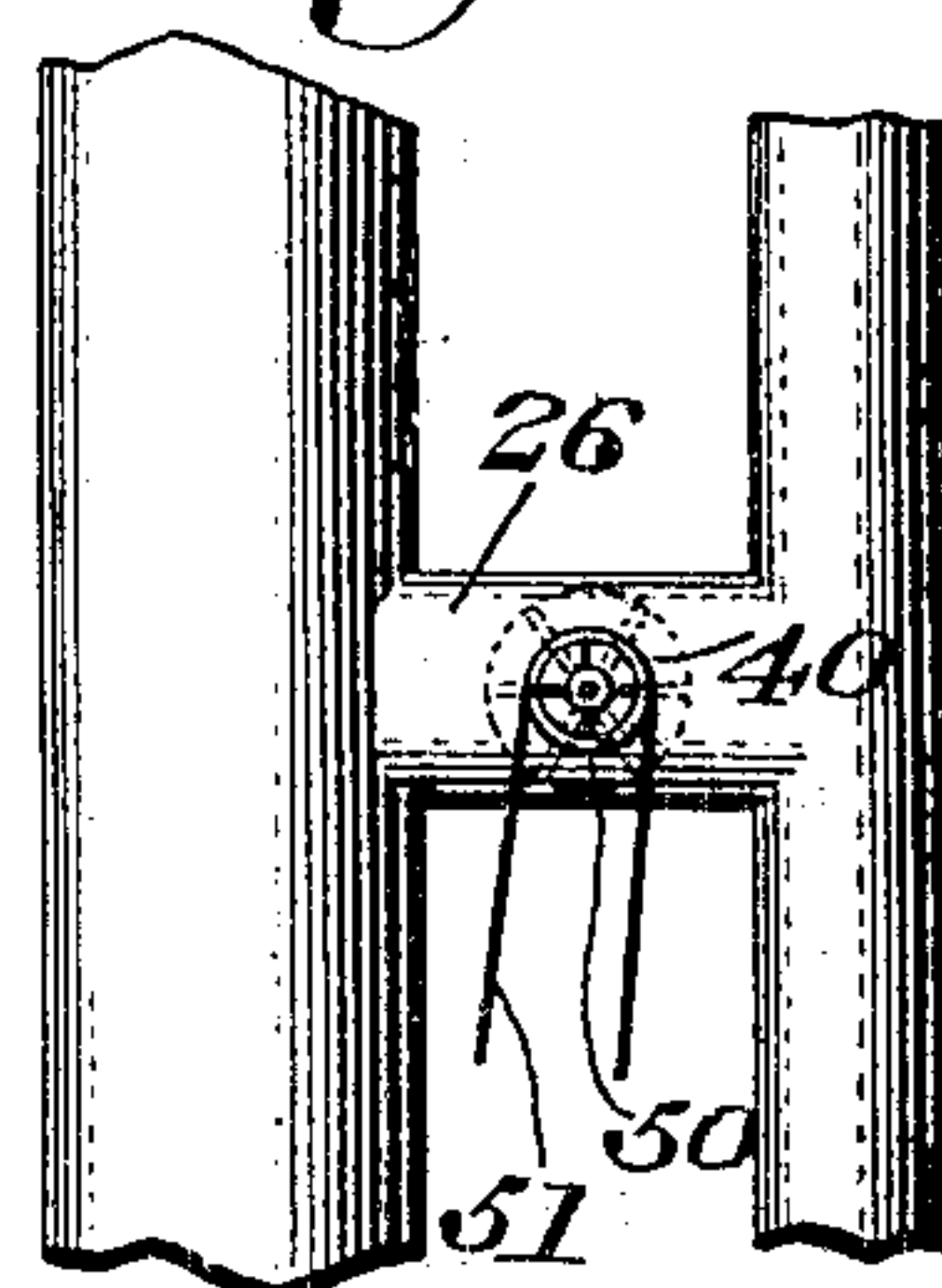


Fig. 3.

Witnesses

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3 SHEETS—SHEET 3.

Fig. 6.

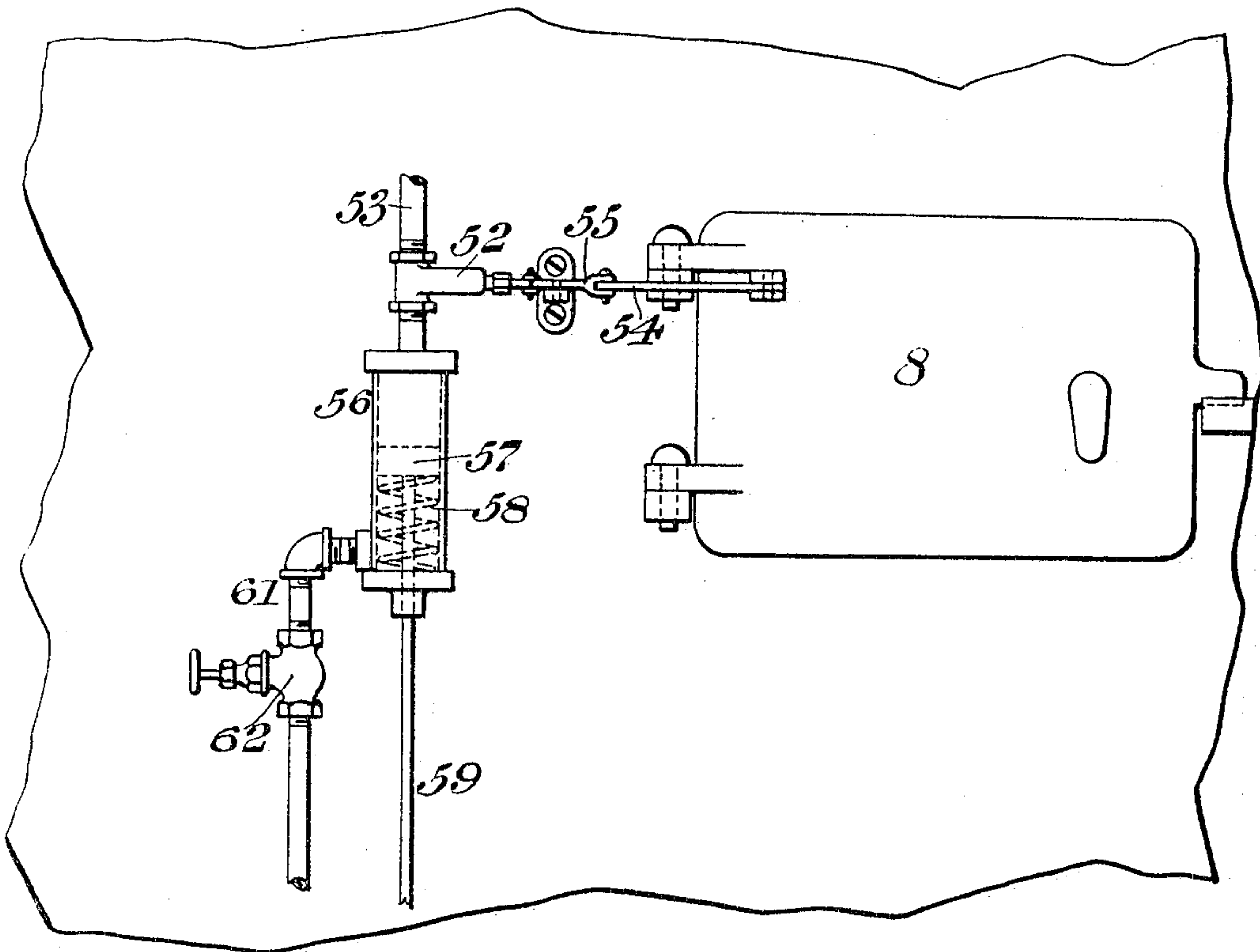
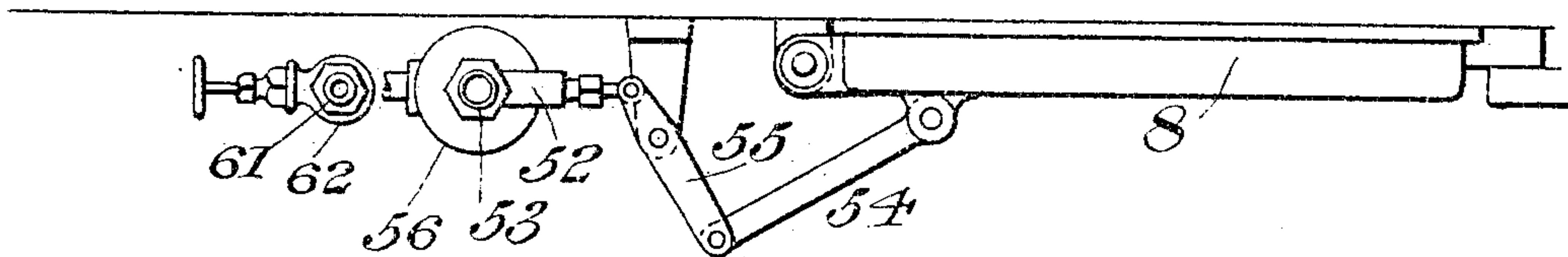


Fig. 7.



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UNITED STATES PATENT OFFICE.

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SMOKE AND GAS CONSUMER.

No. 798,896.

Specification of Letters Patent.

Patented Sept. 5, 1905.

Application filed August 12, 1904. Serial No. 220,514.

To all whom it may concern:

Be it known that I, DANIEL GOFF, a citizen of the United States, residing at Millville, in the county of Cumberland, State of New Jersey, have invented a new and useful Improvement in Smoke and Gas Consumers, of which the following is a specification.

My invention comprises a novel construction of smoke and gas consumers whereby great economy is effected and the injurious effect of the steam which I use to direct the gas and smoke is avoided.

Figure 1 is a side elevation, partly in section, of one form of my invention applied to a boiler and grate. Fig. 2 is a broken section on line *x x*, Fig. 1. Fig. 3 is a detail of a modified form of my invention. Fig. 4 is a detail of another modified form of my invention. Fig. 5 is a modified form showing another means by which the draft can be produced. Figs. 6 and 7 are an elevation and a plan, respectively, of my door draft-regulator.

Similar numerals of reference indicate corresponding parts in the figures.

Referring to the drawings describing one unit, 1 designates the boiler set within the usual brick walls 2 and provided with coking-grate 3 and shaking-grate 4 and chimney 5. In front of the boiler is the usual frame 6, having upper doors 7 7 and two sets of lower doors 8 8 and 9 9 above and below the lever of the coking-grates, respectively.

I have not shown the usual connections for distribution of steam. These are well known. In addition to them and in forming my smoke and gas consumer I apply pipes 10 and 11 to the boiler at any suitable point or to an exhaust-steam reservoir. Pipe 11 leads to a diaphragm pressure-regulator 12, set to any pressure maintaining valve 17 in pipe 10 open until said pressure is reached, when it operates rod 13 and lever 14, overcoming the weight 15 as rod 13 lifts lever 16, to which it is secured for this purpose in any suitable manner. The valve 17 in pipe 10, which, as stated, is normally open, is thus closed when the pressure becomes excessive and the blast is unnecessary and again opened when needed. Pipe 10 branches at 18, having one branch 19 extending upwardly within the chimney, as seen in Fig. 1, or outside, as seen in Fig. 4, and branch 20 extending downwardly into a pipe 21. This leads under the boiler and for-

ward beneath the coking-grate, where it has an opening 22. This pipe is further provided at the rear end of the boiler with openings 23 and 24 beneath the boiler and just at the rear thereof, where the gas and smoke from the grates pass into the flue at the rear of the boiler leading to the chimney. Pipe 20 enters pipe 21 and extends beyond openings 23 and 24.

It will be evident that steam entering pipe 21 through it will create a draft in the direction of the arrows and will cause gas and smoke to enter from the flue-entrance with sufficient oxygen from the air to complete their combustion when passed through the grates. It will be evident that the amount of steam within the branch or the amount of air, gas, or smoke permitted to be carried along by it may be regulated in any suitable manner by valves or dampers. The damper 25 beneath the coking-grate permits the steam, smoke, and air carried by pipe 21 to be applied entirely under the coking-grate 3 or to be allowed to traverse in whole or in part the shaking-grates 4. It is operated by a lever. (Not shown.)

The branch 19, leading up the chimney, is diverted from the chimney at any suitable point through a branch 26 freely open to the chimney at one end thereof and opening into an auxiliary pipe 27 at the other end. This auxiliary pipe 27, as well as the chimney, is normally open to the atmosphere at their upper ends, but are provided with the usual dampers 28 and 29, by which the outward flow from the chimney or the inward flow through pipe 27 may be controlled. The pipe 19 extends downwardly from the junction of pipes 26 and 27, and the steam flowing therethrough causes a draft downwardly through pipe 27 and opening 30 thereof, drawing with it smoke and gas from the chimney and air from the upper part of pipe 27. This pipe also permits escape of excess gas to prevent back pressure. This latter pipe is attached, preferably near the center thereof, to a condenser and receiver 31, having an opening 32 controlled by valve 33, whereby the lighter incombustible gases may escape freely.

Within the condenser is arranged a coil 34 of pipe connected at its upper and lower extremities through pipe 35 with ammonia-tank

36 and pump 37, driven by means of crank 38 and belt 39 from any suitable source of power. (Notshown.) By means of this ammonia-circulation system the coils 34 are kept
 5 constantly cooled in a manner well known in the art of refrigerators, which it is deemed unnecessary to further explain.

The tank 31 is supported in any suitable manner from or adjacent to the boiler by
 10 means of standards 40. It has in the lower end a drip-outlet 41, controlled by valve 42. Through outlet-pipe 43, preferably connected near the lower end of the tank 31, pass the smoke and gas from the said tank below the
 15 boiler and thence through horizontal pipe 44, which is controlled by a valve 45, preferably of the gate type, to the terminus 44 of the pipe under the shaking-grates 4. The terminus of pipes 21 and 44 may be varied in
 20 any suitable manner as desired to accommodate them to the particular boilers or grates to which they are to be applied.

As shown in Fig. 4, the weighted damper 46 may be placed within the pipe 27 to control the admission of oxygen. This can be
 25 controlled by means of lever 47 and cord 48 from any suitable point. Pipe 19 is here external to the chimney.

In Fig. 5 I have shown a fan 49 inserted
 30 within pipe 26 and taking the place at that point of the steam-jet shown in Fig. 1. This fan may be driven in any suitable manner, as by means of pulley 50 and belt 51, from any suitable source of power. (Not shown.)

35 In operation the steam-jet is started automatically by opening of valve 27, when the requisite pressure exists, above which pressure the steam can be spared, but below which it is considered to be needed. The
 40 draft caused by the jet draws the smoke and gas with sufficient air to insure their proper combustion down through pipes 21 and 43 and applies the combustion mixture beneath the boilers. The steam is condensed in con-
 45 denser 31, so that the gaseous mixture passing through pipe 43 is free from steam, while that admitted through pipe 21 may contain steam. It will be evident that the steam in this pipe may also be condensed in the same
 50 manner. The pipe 21 and its steam-jet are provided for use in case of insufficient draft, but can be used regularly with the full advantages of my system if a condenser be inserted therein. The condenser not only re-
 55 moves the steam, but purifies the gas. When the door 8 is opened, Figs. 6 and 7, gate-valve 52 in steam-pipe 53 is opened by rod 54 and lever 55, admitting steam to cylinder 56 against piston 57, normally pressed upwardly
 60 by spring 58, partially cutting off the gas therein. This may also be applied to pipe 21, if desired. Pipe 61 and valve 62 permit drip from cylinder 56 of such steam or water as passes the piston, which then slowly moves
 65 upwardly. Closure of the gate-valve 52 when

making a fresh fire under that boiler distributes the gas so cut off among the other grates whose fires are less supplied with gas, causing thereby better combustion.

It will be evident that various changes may
 70 be made by those skilled in the art which may come within the scope of my invention, and I do not, therefore, desire to be limited in every instance to the exact construction herein shown and described. 75

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

1. In a smoke and gas consumer, a boiler, a
 80 fire-box, a chimney, a branch from said chimney controllably open to the atmosphere, a steam connection to said branch, automatic means for admitting or restricting the admission of steam thereto, a condenser connected
 85 with said branch and connections between said condenser and the under part of the fire-box.

2. In a smoke and gas consumer, a boiler, a fire-box, a chimney, a branch from said chimney, a condenser connected to said branch,
 90 means for cooling and purifying fluid in said condenser, means for admitting the cooled and purified fluid beneath the fire-box, a steam connection to said branch, a passage for forcing smoke and gas back beneath the fire-box
 95 before it has reached the chimney, a connection from said boiler to said passage and automatic means for controlling the admission of steam to said connections.

3. In a smoke and gas consumer, a boiler, a fire-box, a chimney, a condenser, a branch
 100 from said chimney, an auxiliary chimney connected to said branch intermediate the ends of said auxiliary chimney, one of said ends controllably open to the atmosphere, the other
 105 of said ends communicating with said condenser, a steam-pipe connection discharging into said auxiliary chimney, a condenser-pipe leading from said condenser to the under part of the fire-box, and automatic means for controlling the fluid for said steam-pipe connection. 110

4. In a smoke and gas consumer, a boiler, a fire-box, a chimney, a branch from said chimney, suction-producing means for said branch,
 115 an auxiliary chimney connected to said branch intermediate its length, one end of said auxiliary chimney controllably open to the atmosphere, the other end communicating with said condenser, a passage for forcing smoke and gas back beneath the fire-box before it has
 120 reached the chimney, a connection from said boiler to said passage, means for automatically controlling the admission of steam thereto, and a condenser-pipe leading from said condenser to the under part of the fire-box. 125

5. In a smoke and gas consumer, a boiler, a fire-box, a chimney, a branch therefrom, an auxiliary chimney suitably connected with said branch, a condenser in suitable connection with said auxiliary chimney, one end of 130

the latter controllably open to the atmosphere, a steam-pipe connection for producing a suction in said main and auxiliary chimneys and discharging into the latter, a condenser-
5 pipe leading from said condenser to the under part of the fire-box and automatic means for controlling the fluid for said steam-pipe connection.

10 6. In a smoke and gas consumer, a boiler, a fire-box, a chimney, a branch therefrom, a condenser, an auxiliary chimney suitably connected to said branch, one end of said chimney controllably open to the atmosphere, the other end communicating with said condenser,

means for automatically producing a suction 15 in said chimneys and said branch, a passage for forcing smoke and gas back beneath the fire-box before it has reached the chimney, a connection from said boiler to said passage, means for automatically controlling the ad- 20 mission of steam thereto, and a pipe leading from said condenser to the under part of the fire-box.

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