

No. 616,485.

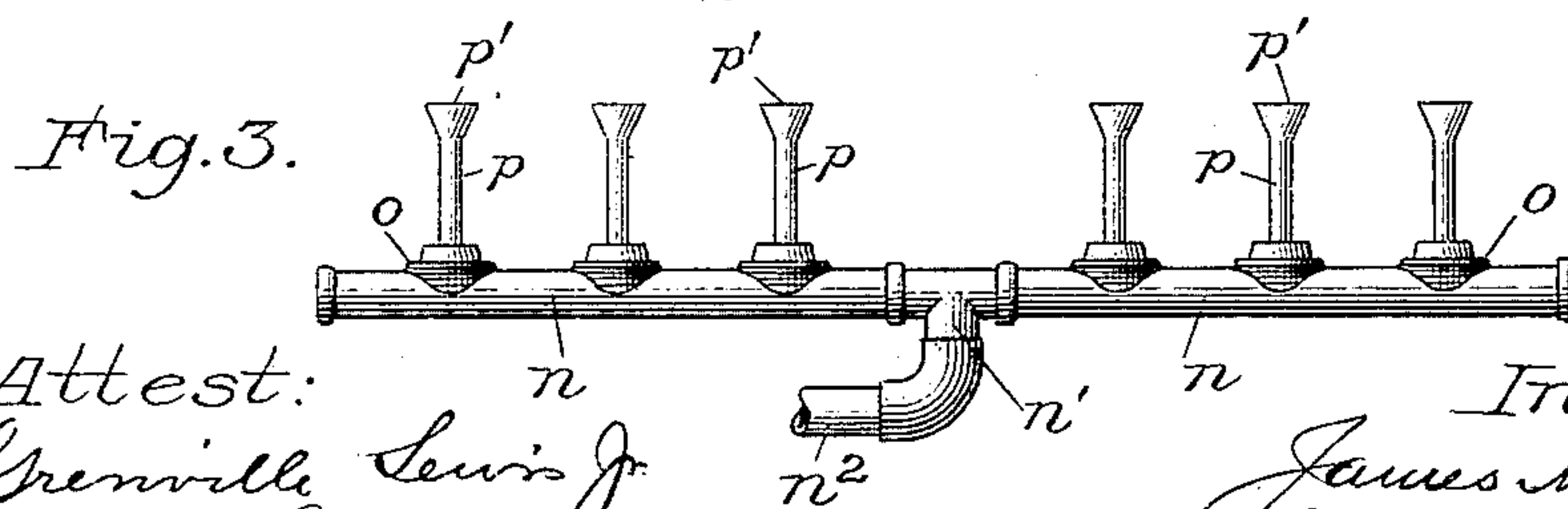
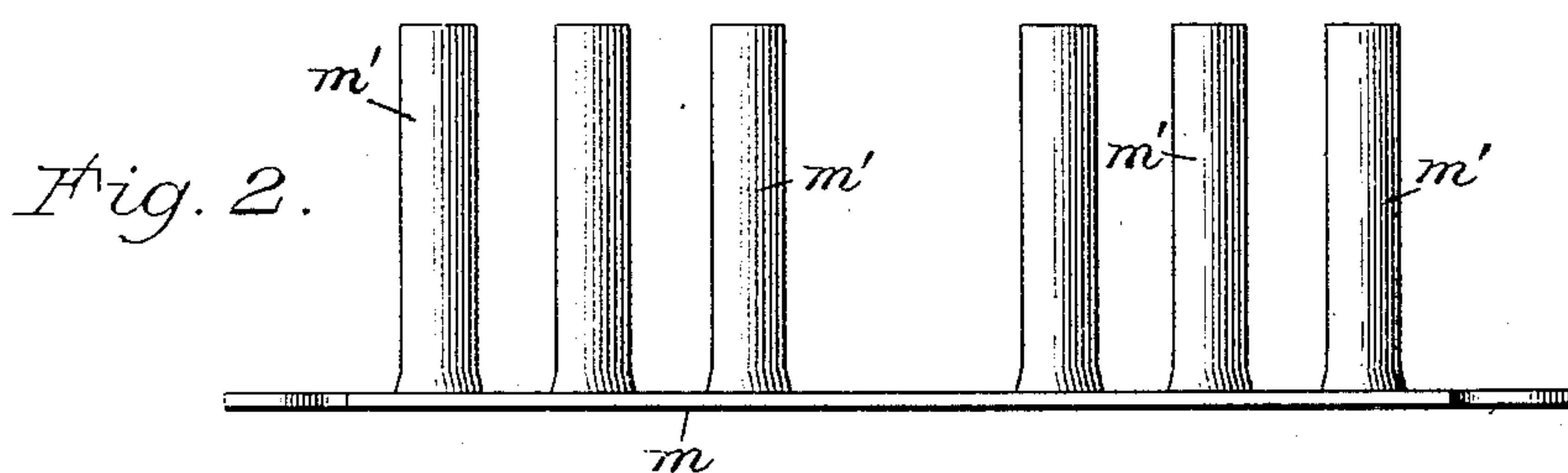
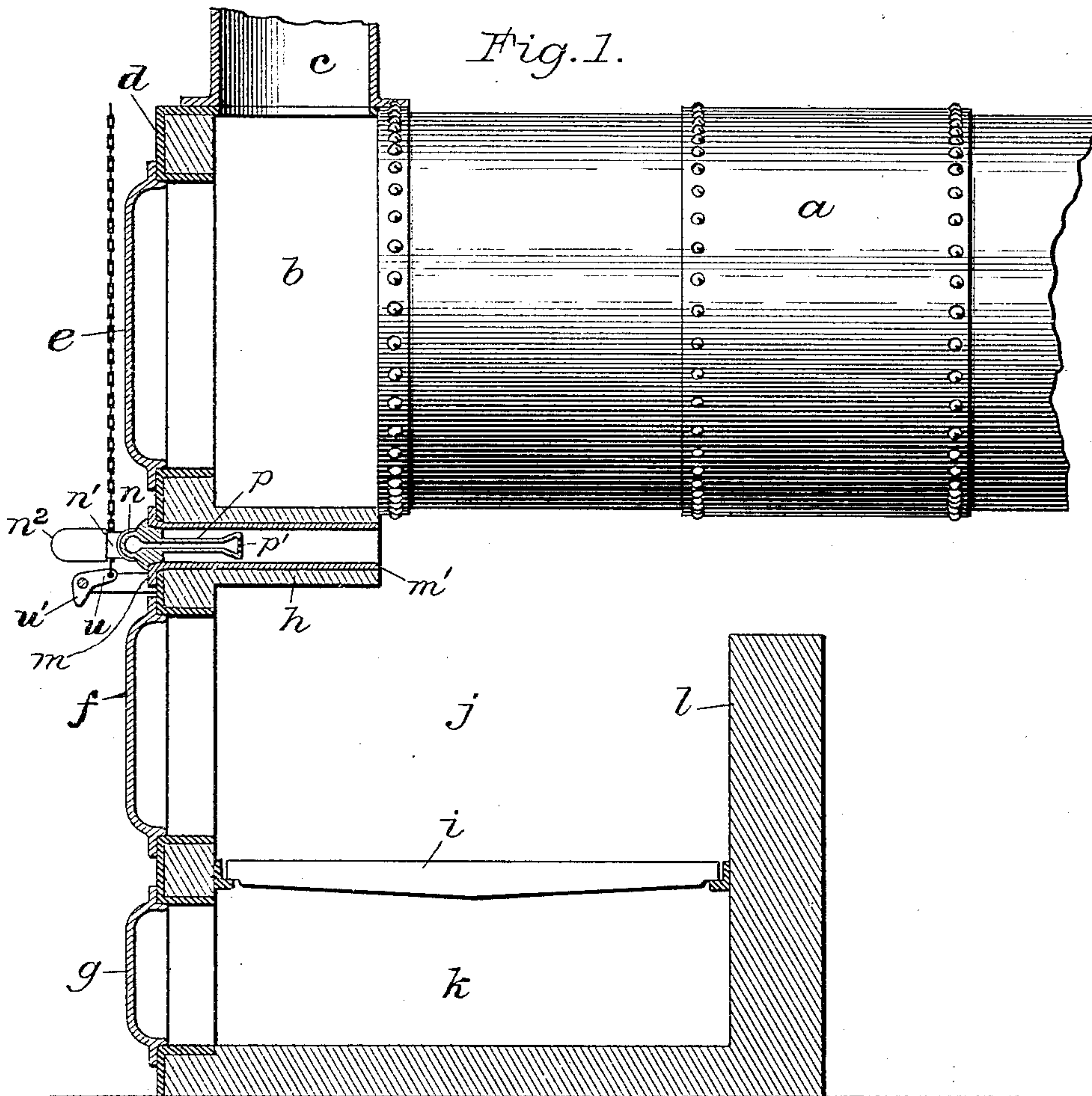
Patented Dec. 27, 1898.

J. McDONALD & W. H. KLOCK.
SMOKE CONSUMER.

(Application filed Apr. 7, 1898.)

(No Model.)

2 Sheets—Sheet I.



Attest:
Grenville Lewis Jr.
Nellie Callahan

Inventors:
James McDonald
William H. Klock
by W. H. Finckel, atty.

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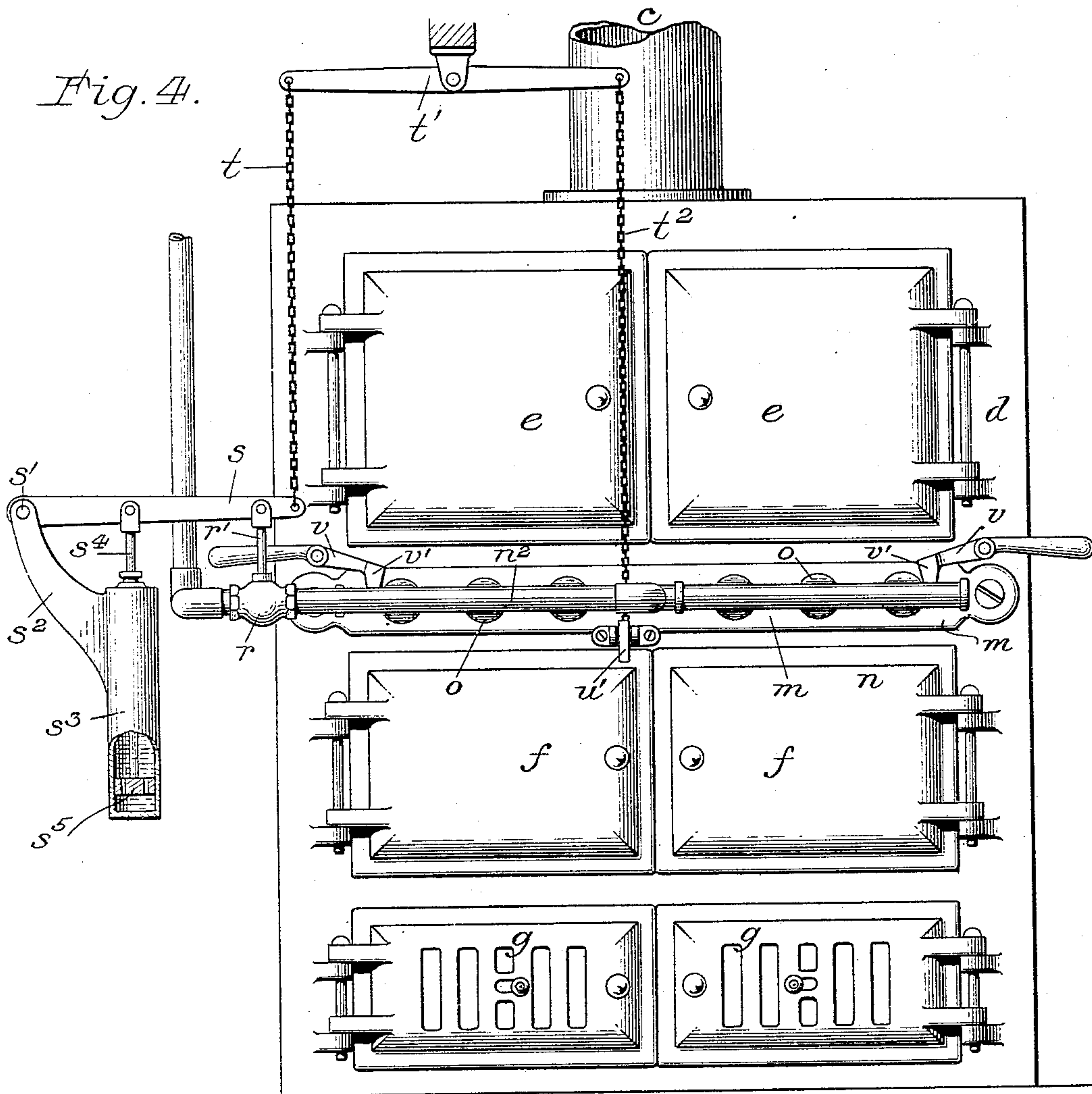


Fig. 5.

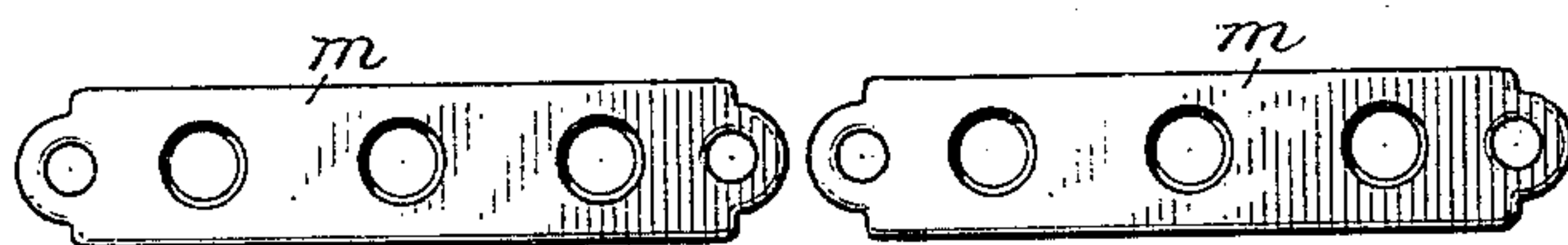
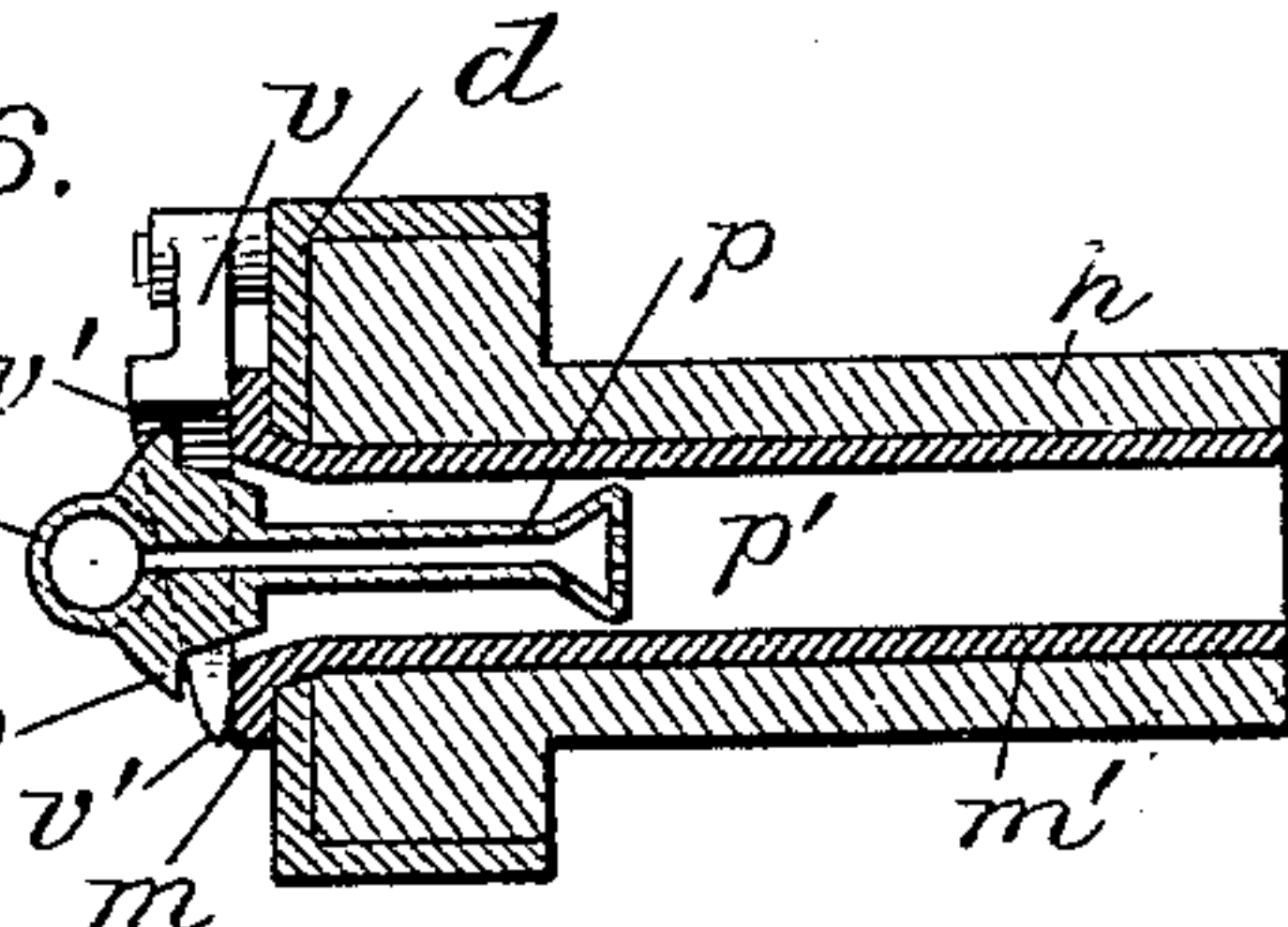


Fig. 6.



Attest:
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Inventors:
 James McDonald,
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UNITED STATES PATENT OFFICE.

JAMES McDONALD AND WILLIAM H. KLOCK, OF GLOVERSVILLE, NEW YORK.

SMOKE-CONSUMER.

SPECIFICATION forming part of Letters Patent No. 616,485, dated December 27, 1898.

Application filed April 7, 1898. Serial No. 676,805. (No model.)

To all whom it may concern:

Be it known that we, JAMES McDONALD and WILLIAM H. KLOCK, citizens of the United States, residing at Gloversville, in the county of Fulton and State of New York, have invented a certain new and useful Improvement in Smoke-Consumers, of which the following is a full, clear, and exact description.

The special object of this invention is to provide means for the consumption of the smoke arising from fires in the furnaces of steam-boilers, and more particularly in that class of steam-boilers known as "stationary," and our invention relates more particularly to that class of smoke-consumers which act directly upon the fire.

There is a class of stationary boilers in which the setting is provided with an iron front, which contains the doors for access to the smoke-box at the front of the boiler, ordinarily called the "flue-caps," "doors for the fire-box," and "doors for the ash-pit." Our invention has been applied to a plant of this description by making appropriate holes in the iron front between the flue-caps and the fire-box doors and in the brickwork usually found at this point, so that the apparatus may act directly over the fire.

Our invention consists of a group or groups of air-tubes fixedly arranged in holes in the iron front and the brickwork and a movable group of steam-jet tubes having a central steam-supply and arranged within the air-tubes and capable of movement to close such air-tubes and to open them, all as we will proceed now more particularly to describe and finally claim.

In the accompanying drawings, illustrating our invention, in the several views of which like parts are similarly designated, Figure 1 is a vertical section and partial elevation of sufficient of a stationary steam-boiler plant to illustrate our invention. Fig. 2 is a plan view of one form of air-tubes. Fig. 3 is a plan view of the steam-jet tubes. Fig. 4 is a front elevation of a stationary steam plant, such as is shown in Fig. 1, with the dash-pot broken out to expose its interior. Fig. 5 is a front elevation of another form of air-tubes, and Fig. 6 is a sectional detail showing the steam-jet tubes moved out to open the air-tubes.

The boiler *a* may be of the ordinary fire-tube variety, set in any ordinary way and having a smoke-box *b* at its front end and a smoke-stack *c*. *d* is the ordinary iron front applied to the ordinary masonry and having the flue-caps or doors *e*, the fire-box doors *f*, and the ash-pit doors *g*. *h* is a wall of brickwork or masonry extending transversely, *i* designates the grate-bars in the fire-box *j*, *k* is the ash-pit, and *l* the bridge-wall, all substantially as usual.

In carrying out our invention we make a casting of suitable metal having a front plate *m*, which is supplied with a series or group or groups of tubes *m'*. Holes are made in the iron front and in the brickwork *h* to receive these tubes *m'*, so that they may be distributed over the width of the fire-box. The front plate *m*, with its tubes *m'*, may be bolted or otherwise secured to the iron front, as indicated in Fig. 4, so as to furnish air-passages leading from outside of the boiler plant to the interior of the fire-box and above the fire in it. The outer ends of the tubes *m'* are flared or made bell-mouthed, as indicated more particularly in Figs. 1, 2, and 6. The air-tubes may be made in a single casting with their front plate, as shown in Fig. 2, or they may be made in two castings, as shown in Fig. 5, in order to accommodate the construction of the iron front of the fire-box.

The steam-jet tubes comprise a main *n*, having a nipple or union *n'*, arranged substantially midway of its ends and adapted to receive a steam-supply pipe *n*². This main *n* is supplied with the bosses *o* of size sufficient to close the external openings of the air-tubes.

p are the jet-tubes proper, having flared ends *p'*, which are perforated, as shown in Figs. 1 and 6, for the escape of the steam into the air-tubes and thence into the fire.

We prefer to make in a single casting the main *n*, its bosses *o*, and the jet-tubes *p*, and we have found copper an excellent material for this purpose, because of its non-oxidizing properties, although we do not limit our invention to making this steam-jet apparatus in one piece or of any particular material or substance.

The steam-supply pipe *n*² may receive steam from the dome or any other portion of the

boiler by suitable connections, and in order to control the supply of steam we provide a valve r , such as a globe-valve, having a reciprocating instead of a screw-threaded rotary stem r' , and in order to make automatic the supply of steam we attach the stem r' to a lever s , which is pivoted at s' to a bracket s^2 , secured to a dash-pot s^3 of the ordinary oil variety. The lever s has pivoted to it the stem s^4 of the dash-pot piston s^5 . A chain or other connection t leads from the lever s to an overhead lever t' , and the other end of this lever t' has a depending chain or other connector t^2 , which is connected with a trip-lever u , the other arm of which lever u' is in the path of movement of the fire-box door, so that upon the opening of the fire-box door for firing or supplying fuel to the fire-box the trip-lever will be actuated and the lever s will be raised so as to open the valve for the supply of steam, and as said valve is opened the dash-pot piston will be raised, and the valve will be held open until the dash-pot piston is caused to descend and carry with it the lever s , and so close the valve. Any other automatic or even a hand-operated device may be used for controlling the supply of steam to the steam-jet tubes during firing and for a limited period after the fire-box doors are closed. We do not limit our invention to any apparatus of these kinds and have shown this one form simply in illustration of this portion of our invention, the essential feature of which is in this particular a steam-supply-controlling device which will admit steam during the firing operation and for a short period thereafter.

The steam-jet-tube device may be moved into and out from the air-tubes by any suitable mechanism. One form of such mechanism is shown as comprising two levers v , arranged at opposite sides of the iron front and having wedge-shaped ends v' , which are adapted to be projected between the front plate of the air-tubes and the main, as shown in Fig. 6, in order to push out the said steam-jet-tube device to open the air-tubes for the admission of air when steam is being supplied, and such outward movement of the steam-jet tubes is effected by these levers against the resilience or torsion of the steam-pipe connections, and this capacity of steam-pipe connections may be relied upon to return the steam-jet-tube device into the air-tubes and close their openings when the levers are retracted. Of course we do not limit our invention to any particular construction or devices for thus operating the steam-pipe tubes, our invention in this particular comprising any suitable mechanism, automatic or otherwise, for this purpose.

The operation is sufficiently indicated by the foregoing, but it may be summarized thus: The air-tubes and the steam-jet-tube device being in position and it being desired to fire the furnace, the furnace-doors are opened, the steam-jet tubes partly withdrawn or pro-

jected, as in Fig. 6, and steam admitted there-draws in a supply of air, and the two fluids to. Such steam escapes into the air-tubes and being commingled in a heated chamber—namely, that portion of the air-tubes beyond the steam-jet tubes and within the fire-box—are discharged into the zone of combustion and over the entire surface of the fire-box, assist in the perfecting of the combustion, and thus reduce, if not wholly remove, the smoke resulting from imperfect combustion.

There is a decided advantage in admitting the steam to the steam-jet tubes at a point essentially midway between the ends of the main, in that there is secured a more even distribution of the steam, and in addition the steam is supplied at substantially the same temperature to all of the jet-tubes, and with our apparatus thus constructed there is little or no condensation such as occurs in those smoke-consumers in which the steam is admitted at one end of the steam-main and is distributed thence to the several jet-tubes. There is also an advantage in using relatively long air-tubes projecting well into the furnace, so as to heat the air additionally to its steam heat before it is discharged into the fire-box.

By our construction of smoke-consumer we are enabled to apply it to steam plants already erected with a very slight alteration of the steam plant and without the necessity of tearing out and rebuilding any portion thereof, and hence plants may be supplied with our smoke-consumer with great economy.

Practical demonstrations of our invention have verified the assertions hereinabove made as to its economy of application and its efficiency in operation.

What we claim is—

1. A smoke-consumer for furnaces, comprising a stationary group or groups of tubes to admit air to the fire-box, and a group of steam-jet tubes movable within the air-tubes to admit air to and shut it off from the air-tubes, and a steam-supply connected to the jet-tubes about midway of their length, substantially as described.

2. A smoke-consumer for furnaces, comprising a stationary group or groups of tubes to admit air into the fire-box, and a group of steam-jet tubes movable within the air-tubes to admit air to and shut it off from the air-tubes, the air-tubes being fixed to the iron front of the furnace or boiler, and steam-jet tubes arranged to project into but not through said air-tubes, and a steam-supply connected to the steam-jet tubes about midway of their length, substantially as described.

3. A smoke-consumer for furnaces, comprising a group of air-tubes, fixed to the iron front of the plant and opening into the fire-box from the external atmosphere, a group of steam-jet tubes, movable within the air-tubes to admit air to and shut it off from the air-tubes, a steam-main to which said jet-tubes are applied, a steam-supply connected to the

main about midway of its length, means to control the admission of steam and air to the said tubes, and means to control the movement of the steam-jet tubes into and out from the air-tubes, substantially as described.

5 4. A smoke-consumer for furnaces, comprising a group or groups of tubes, opening from outside of the furnace into the fire-box, and fixedly applied to the iron front of the
10 plant, a group of steam-jet tubes, movable within the air-tubes to admit air to and shut it off from the air-tubes, a steam-main to

which said jet-tubes are applied, the said main having both of its ends closed, and a steam-supply connected to the main about midway of its length, substantially as described. 15

In testimony whereof we have hereunto set our hands this 4th day of April, A. D. 1898.

JAMES McDONALD.

WILLIAM H. KLOCK.

Witnesses:

FRANK BURTON,

FRED SPERBER.

It is hereby certified that in Letters Patent No. 616,485, granted December 27, 1898, upon the application of James McDonald and William H. Klock, of Gloversville, New York, for an improvement in "Smoke-Consumers" errors appears in the printed specification requiring correction, as follows: Lines 69 and 70, page 2, should be transposed—and in line 70, as now numbered, same page, strike out the period after the word "to" and insert a comma, begin the following word "Such" with a small "s" making a continuous sentence; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 10th day of January, A. D., 1899.

[SEAL.]

WEBSTER DAVIS,
Assistant Secretary of the Interior.

Countersigned:

C. H. DUELL,
Commissioner of Patents.