

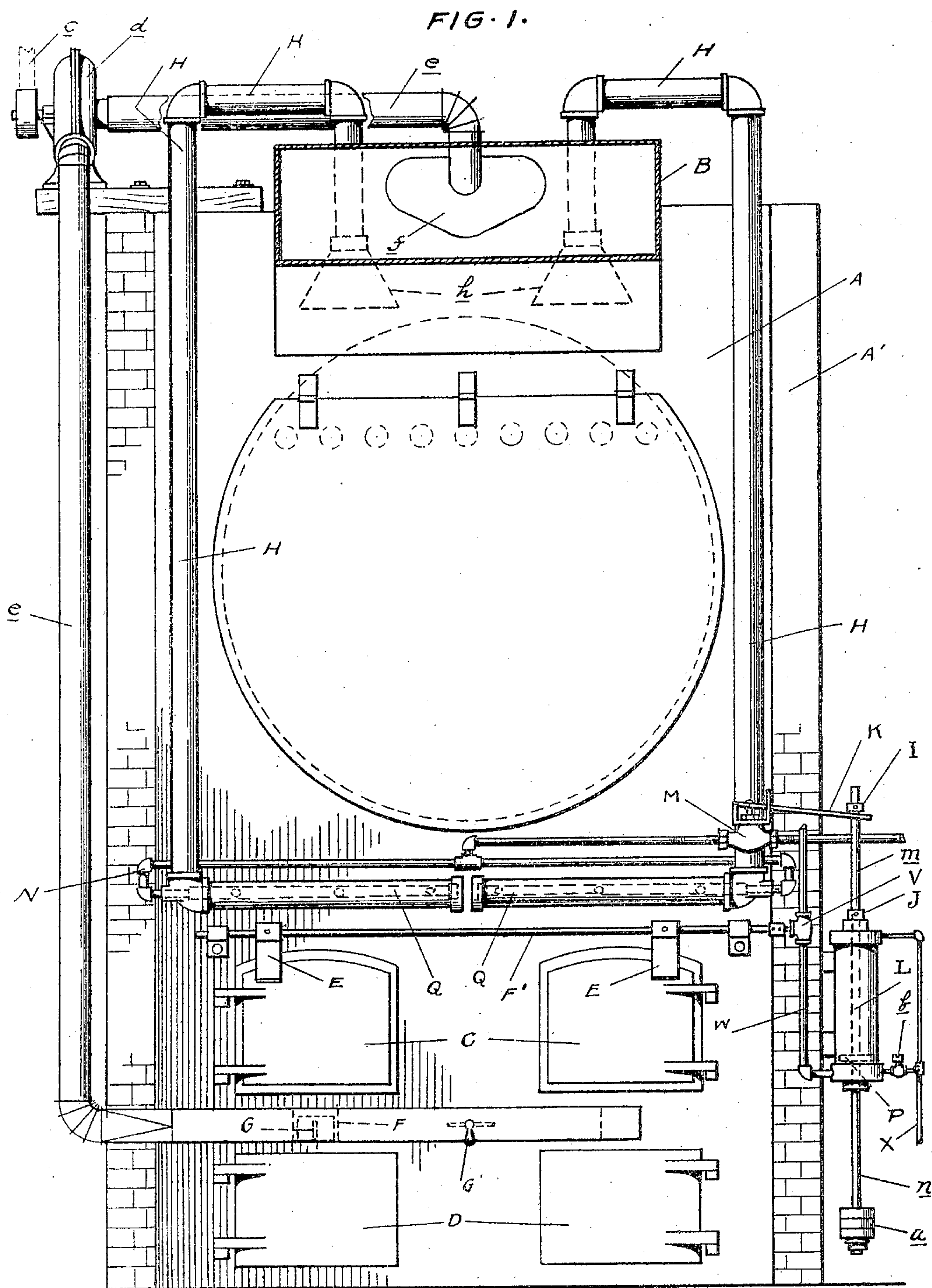
No. 798,232.

PATENTED AUG. 29, 1905.

D. D. THORP & C. & C. L. DREWYOUR.
SMOKE CONSUMER FOR FURNACES.

APPLICATION FILED FEB. 20, 1905.

2 SHEETS—SHEET 1.



WITNESSES

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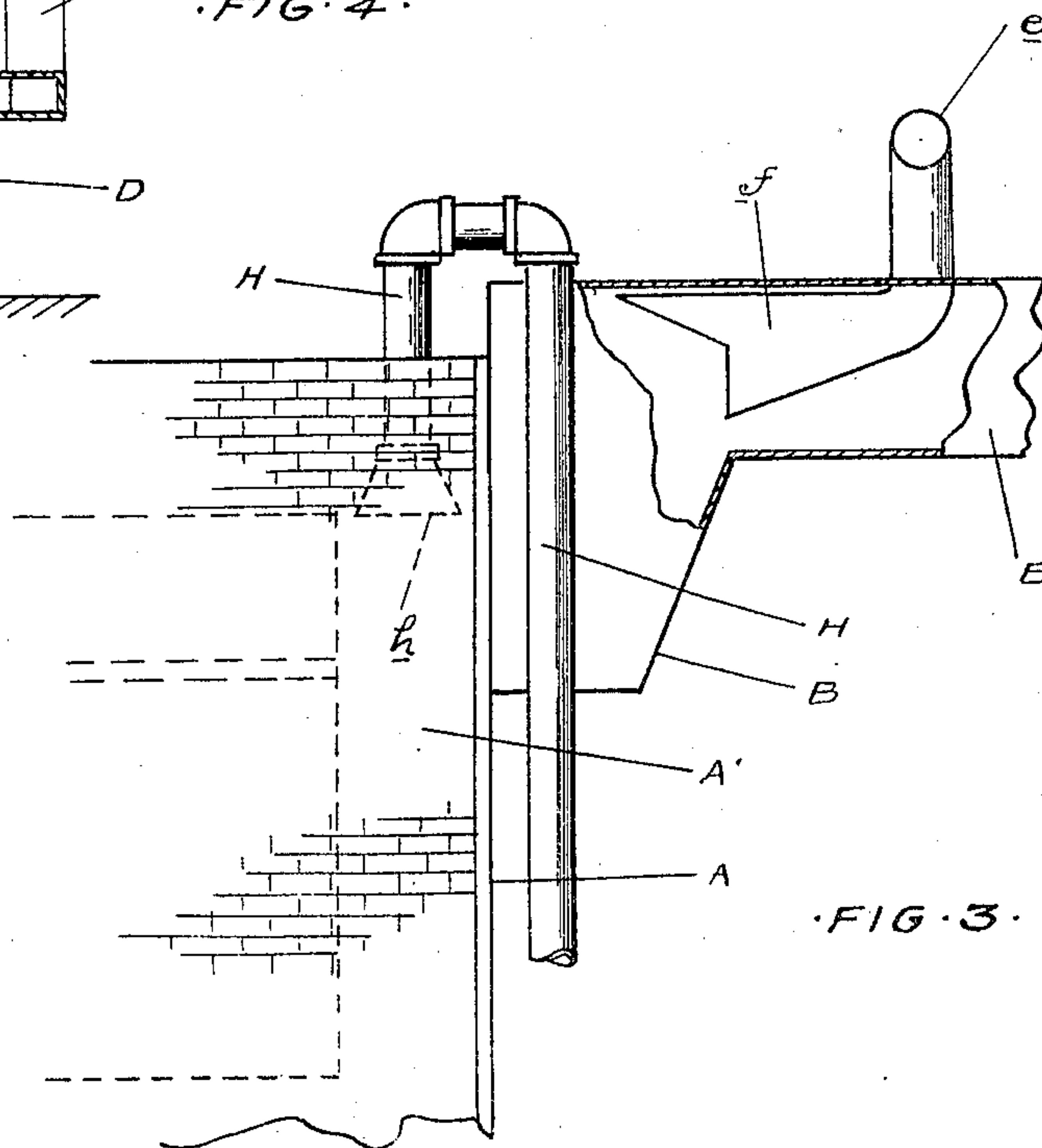
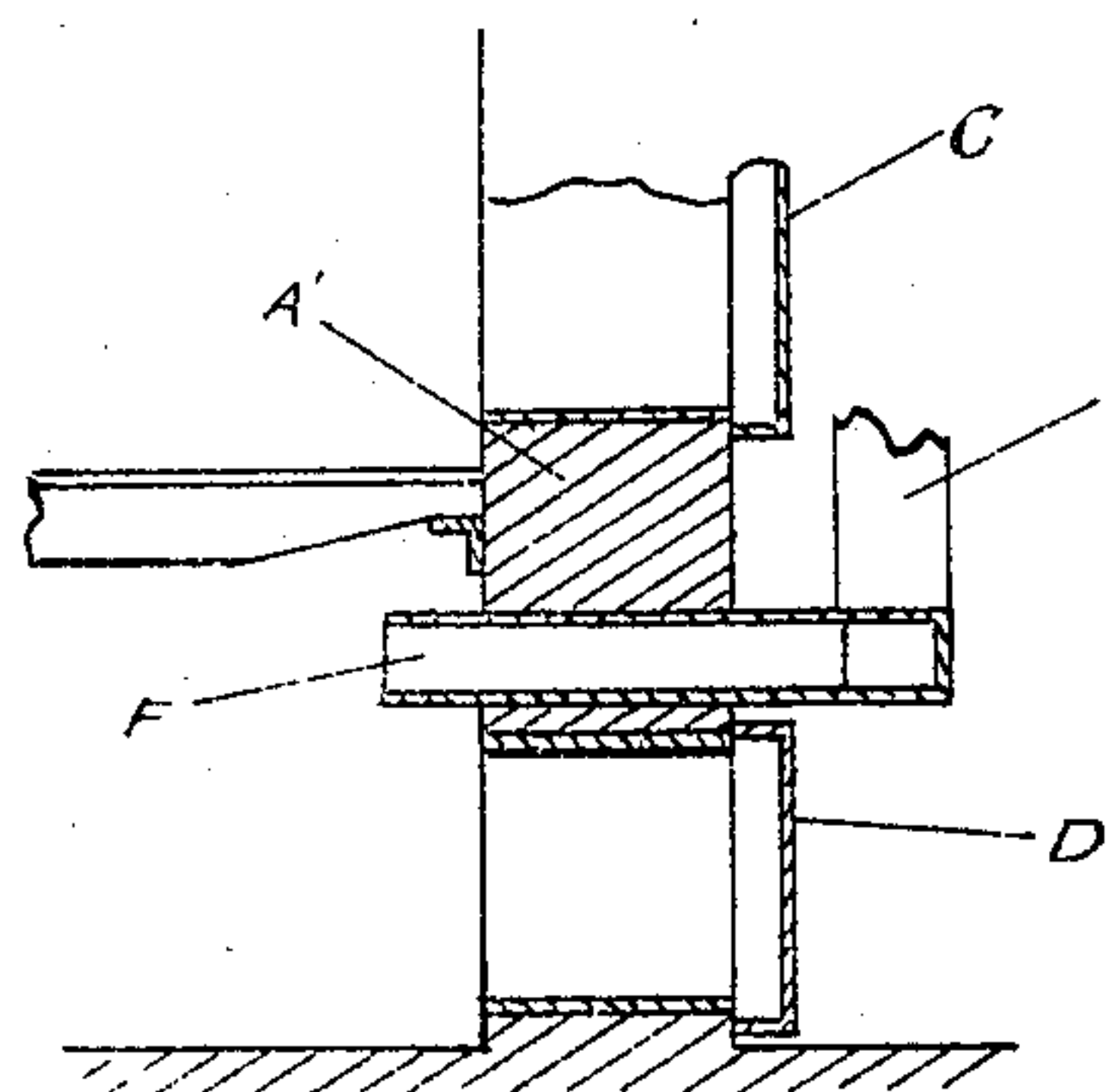
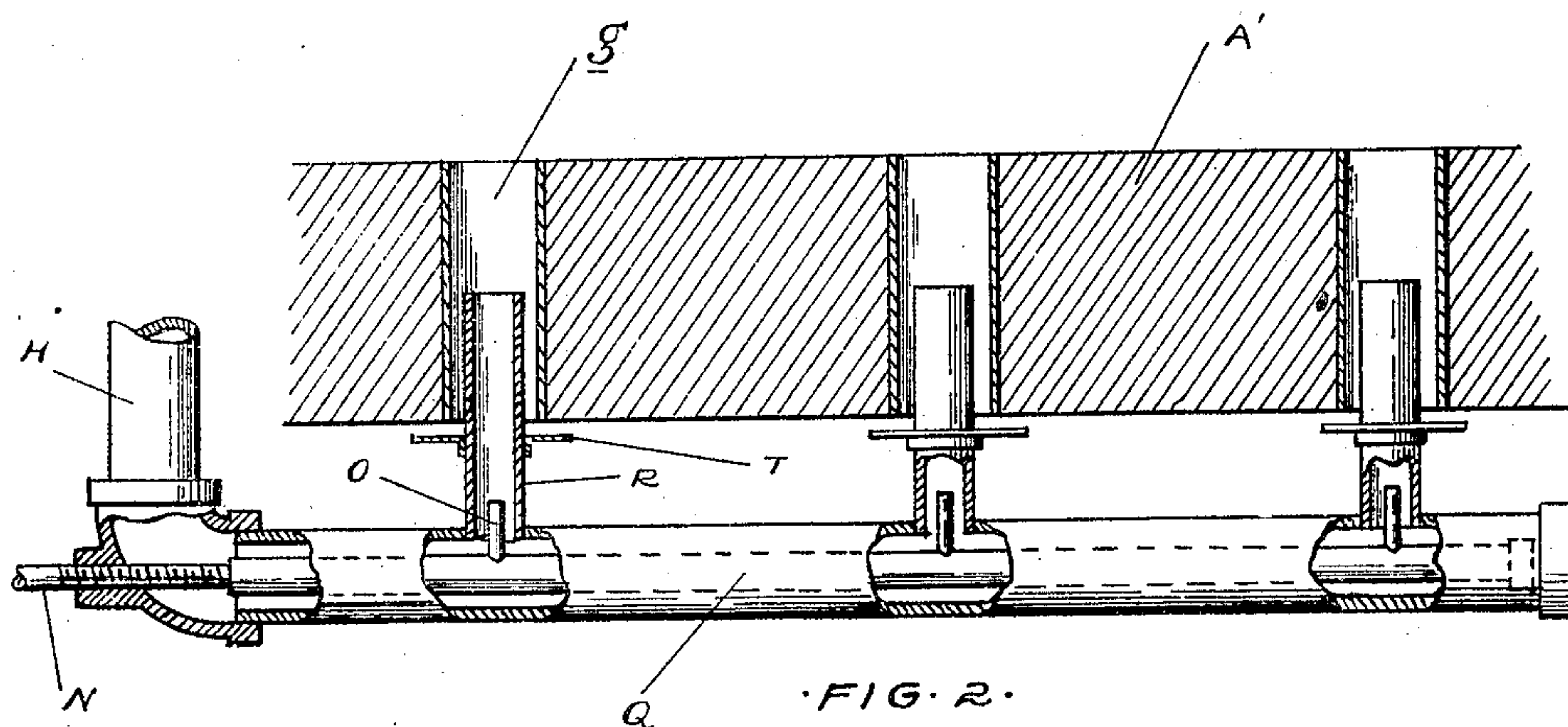
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WITNESSES

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UNITED STATES PATENT OFFICE.

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SMOKE-CONSUMER FOR FURNACES.

No. 798,232.

Specification of Letters Patent.

Patented Aug. 29, 1905.

Application filed February 20, 1905. Serial No. 246,613.

To all whom it may concern:

Be it known that we, DARIUS D. THORP, CHARLES DREWYOR, and CHARLES L. DREWYOR, citizens of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Smoke-Consumers for Furnaces, of which the following is a specification, reference being had therein to the accompanying drawings.

Our invention relates to new and useful improvements in smoke-consumers for furnaces, and particularly to means of forcing the products of combustion into the furnace in a highly-combustible condition.

Our invention consists in the means of mixing atmospheric air with the gases and other products of combustion and in the means of forcing them into the fire-box.

By our invention the steam-jets perform not only the function of drawing the gases and products of combustion from the smoke-box and forcing them into the fire-box, but the steam is also made to thoroughly saturate these gases and products of combustion, and thus force them into the fire-box in a highly-combustible condition. The means by which this result is obtained we have more fully herein-after described, and set forth in the claims.

In the drawings, Figure 1 is a view in elevation of the fire-box end of a boiler fitted with our invention. Fig. 2 is a plan view, partly in cross-section, of a portion of the wall of the fire-box, showing our invention. Fig. 3 is a side elevation of one end of the furnace and smoke-box, showing the conduits communicating with the smoke-box. Fig. 4 is a section in elevation of a portion of the fire-box end of the furnace, showing pipe through which the products of combustion are introduced beneath the grate-bars.

The objects of this invention are to consume and utilize the products of combustion when the fuel is coked and in normal condition and also to consume and utilize the gases and other products of combustion which are given off when fresh fuel is applied and for some moments thereafter.

A indicates the face of a boiler-furnace; A', the masonry part; B, the smoke-box, and B' the stack.

C indicates the fire-doors, and D the ash-doors, of the furnace.

e is a pipe having the funnel-shaped mouth *f* in the stack and opening toward the normal stack draft-current. The pipe *e* is carried across the top of the furnace, and at a convenient point we install the blower *d*, preferably of the rotary-fan type and driven from any convenient source of power through the belt-wheel *c*. The pipe *e* then extends downward and across the front of the furnace, and branches therefrom extend through the front into the ash-pit immediately below the fire-grate below each fire-door, as shown at F in Figs. 1 and 4. By an arrangement of dampers, as G, situated in the first branch of the pipe *e* and G', situated at any convenient point in the pipe past the first branch, we can direct the draft beneath either or both fire-doors.

In the drawings this invention is shown adapted to a furnace having two fire-doors; but it is obvious that by increasing the number of branches and dampers it may be adapted to any number of fire-doors.

When the blower *d* is in operation, part of the products of combustion are drawn from the stack through the pipe *e* and forced into the furnace below the grate-bars. The combustible portions of these products are thus consumed at the same time the draft in the furnace is increased, and much of the soot of the smoke is deposited on the coal and ashes, and thus prevented from going out the stack.

In the smoke-box of the furnace are the funnel-shaped mouths *h* of the pipes H. These pipes are adapted to convey part of the gases and products of combustion from the smoke-box and carry them to the front of the fire-box, where they are injected over the fire. In the face-plate and above the fire-doors is a series of apertures *g*, and the pipes H extend down on their respective sides of the furnace to a point in the plane of these apertures. The pipes are then elbowed, and to the elbow is attached the horizontal extension Q in front of the apertures on its side of the furnace. A short distance into each aperture extends a branch pipe or nipple R from Q. Through the elbows and concentric with the extensions Q of the pipes H extend the smaller pipes N, connected with the steam-space of the boiler, and extending into each branch of the pipes Q are the nipples O. Slidingly engaging each branch pipe R is an annular collar T, by which may be adjusted the amount of atmos-

pheric air admitted through the aperture around the pipe R. The operation of this is as follows: When the steam is turned on through the pipes N, it is forced through the jets O. The effect of this is to draw the products of combustion from the smoke-box and force them, mixed with steam from the jets and air, through the branch pipes R. The annular collars T are adjusted so that cold air is drawn in around these branch pipes to condense the steam. This mixture of the hot products of combustion, steam, and air is projected over the fire and tends to produce a smokeless combustion.

After a fire has coked there is comparatively little smoke or other products of combustion carried to the stack, and at that time the pipe *e* is alone sufficient to carry them back for consumption. Therefore it is only necessary to use the steam-jets and the pipe H when the furnace is being fired and for some moments thereafter, for, as is well known, a great amount of gas is generated when fresh fuel is introduced. Our invention is arranged to operate the steam-jets automatically at such times.

W is a water-pipe connecting with any suitable water-supply and fitted with the valve V. This valve is so situated that its stem F may be extended and journaled on the face-plate of the furnace just above the fire-doors. In the line of movement of each fire-door hangs a flap E, secured to an extension of the valve F, so that the opening of either door will open the valve V. This permits the flow of water into the lower end of the water-cylinder L. This water-cylinder is of the usual construction, inclosing a piston F, having a downwardly-extending rod *n*, bearing the weights *a*, and the upwardly-extending rod *m* at suitable points, on which are secured the collars I and J. At a suitable point in the steam-pipe is the valve M, actuated by a lever K, extending into the line of movement of the collars I and J on the piston-rod *m*. The introduction of water into the cylinder through the pipe W raises the piston until the collar J strikes the valve-lever K and opens the steam-valve. When the fire-doors are closed, the weight of the flaps E closes the water-valve and the weights *a* draw down the piston, forcing out the water from the lower end of the cylinder through the outflow-pipe X. The adjustment of the valve *b* in this outflow-pipe regulates the length of time required for the piston to descend until the collar I engages the lever K and closes the steam-valve M. By this means the steam-jets are automatically turned on a short time after the fire-doors are opened, and the steam-jets continue to operate for a length of time deter-

mined by the adjustment of the outflow-valve from the water-cylinder.

What we claim as our invention is—

1. In a smoke-consumer, the combination with conduits communicating with the smoke-box, having openings discharging into the fire-box, and means for injecting steam into the conduits adjacent to their discharge-openings, of means of drawing cold air into the fire-box and mixing said cold air therein with the discharge from the conduits.

2. In a smoke-consumer, the combination with conduits communicating with the smoke-box, arms opening from said conduits, steam-jets discharging therethrough into the fire-box, and means of drawing cold air into the fire-box around said arms, for the purpose described.

3. In a smoke-consumer, the combination with conduits communicating with the smoke-box, arms on said conduits, passing loosely through ports in the walls of the fire-box and discharging therein, means for injecting steam into said arms, and means of regulating the amount of cold air drawn into the fire-box through said ports around said arms, for the purpose described.

4. In a smoke-consumer, the combination with conduits communicating with the smoke-box, arms passing with intervening space through ports in the walls of the fire-box and discharging therein, means of injecting steam into the conduits adjacent to their discharge-openings and drawing cold air through said intervening space, and annular flanges slidably fitted around said arms and adapted to regulate the amount of cold air taken into the fire-box.

5. In a smoke-consumer, the combination with a conduit having a blower therein, adapted to draw products of combustion from the smoke-box and project them into the ash-pit above the doors thereof, of supplementary conduits having steam-jets therein adapted to act for a predetermined time to draw products of combustion from the smoke-box and discharge the same into the fire-box above the doors thereof, said jets drawing a predetermined amount of cold air into said fire-box around said conduits to mix therein with the discharge of said conduits, for the purpose described.

In testimony whereof we affix our signatures in presence of two witnesses.

DARIUS D. THORP.
CHARLES DREWYOUR.
CHARLES L. DREWYOUR.

Witnesses:

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F. J. CUSHING.