

(No Model.)

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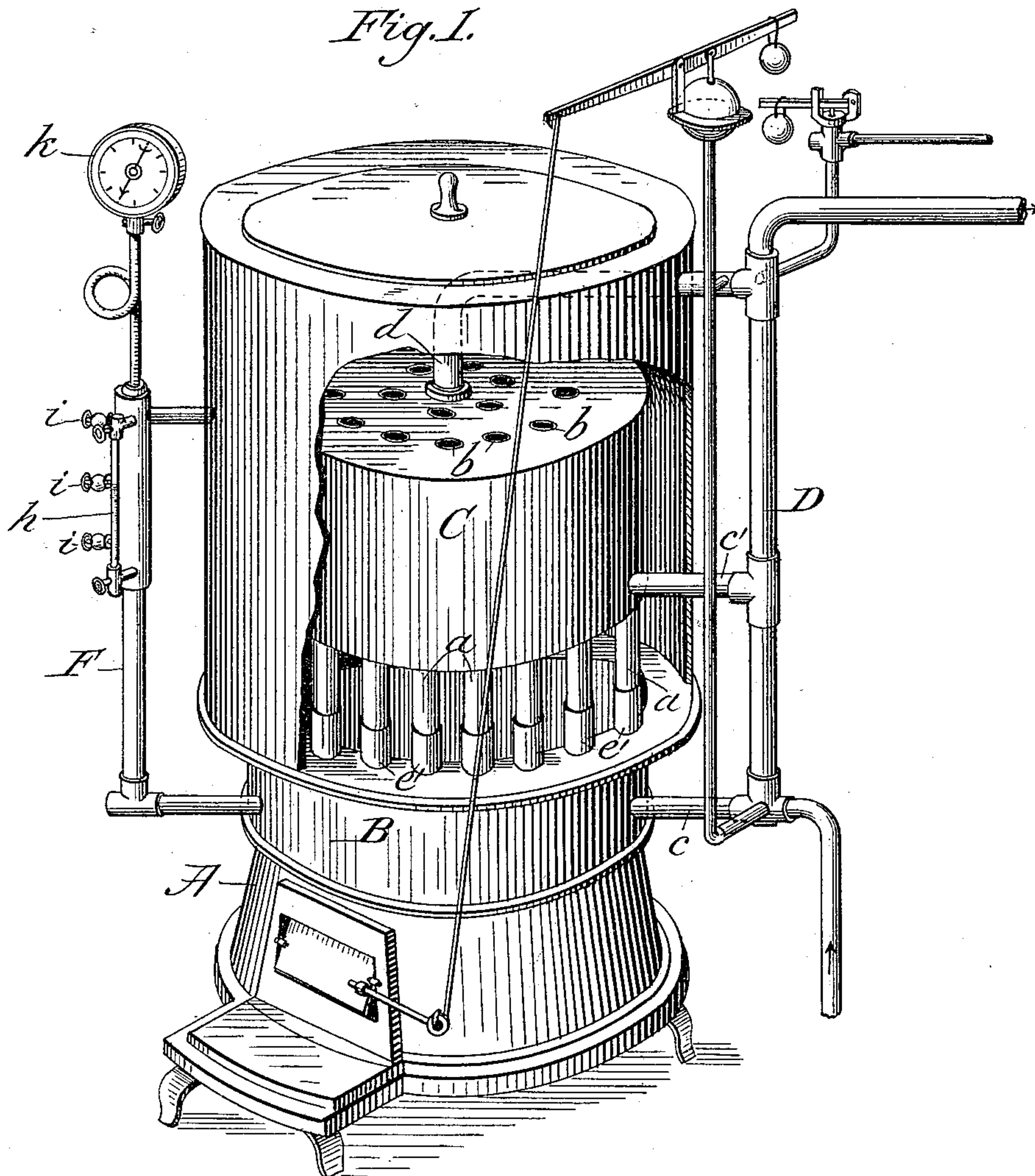
J. JOHNSON.

BOILER FOR STEAM HEATERS.

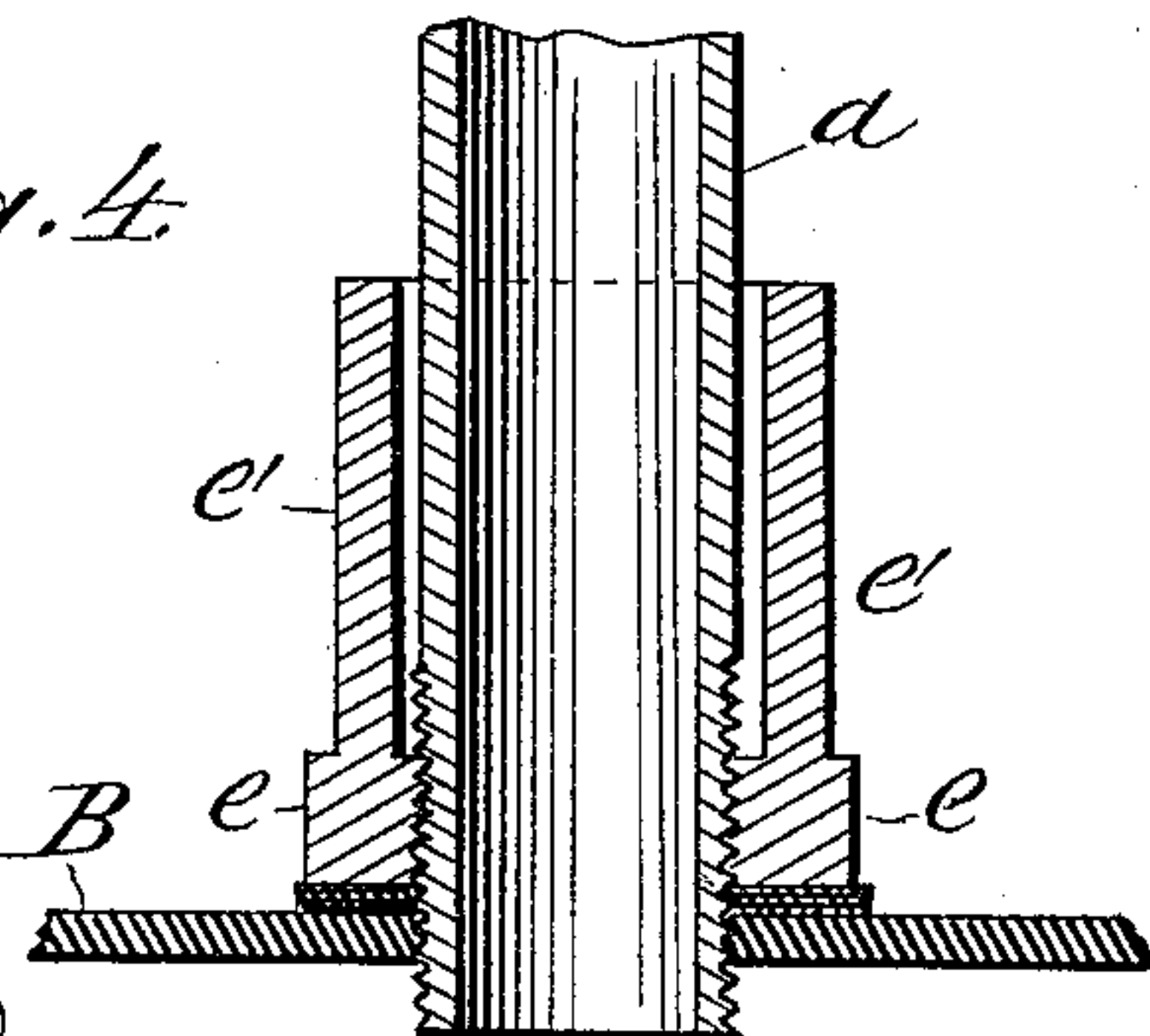
No. 338,670.

Patented Mar. 23, 1886.

*Fig. 1.*



*Fig. 4.*



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*per. J. B. Tasker*  
Atty.

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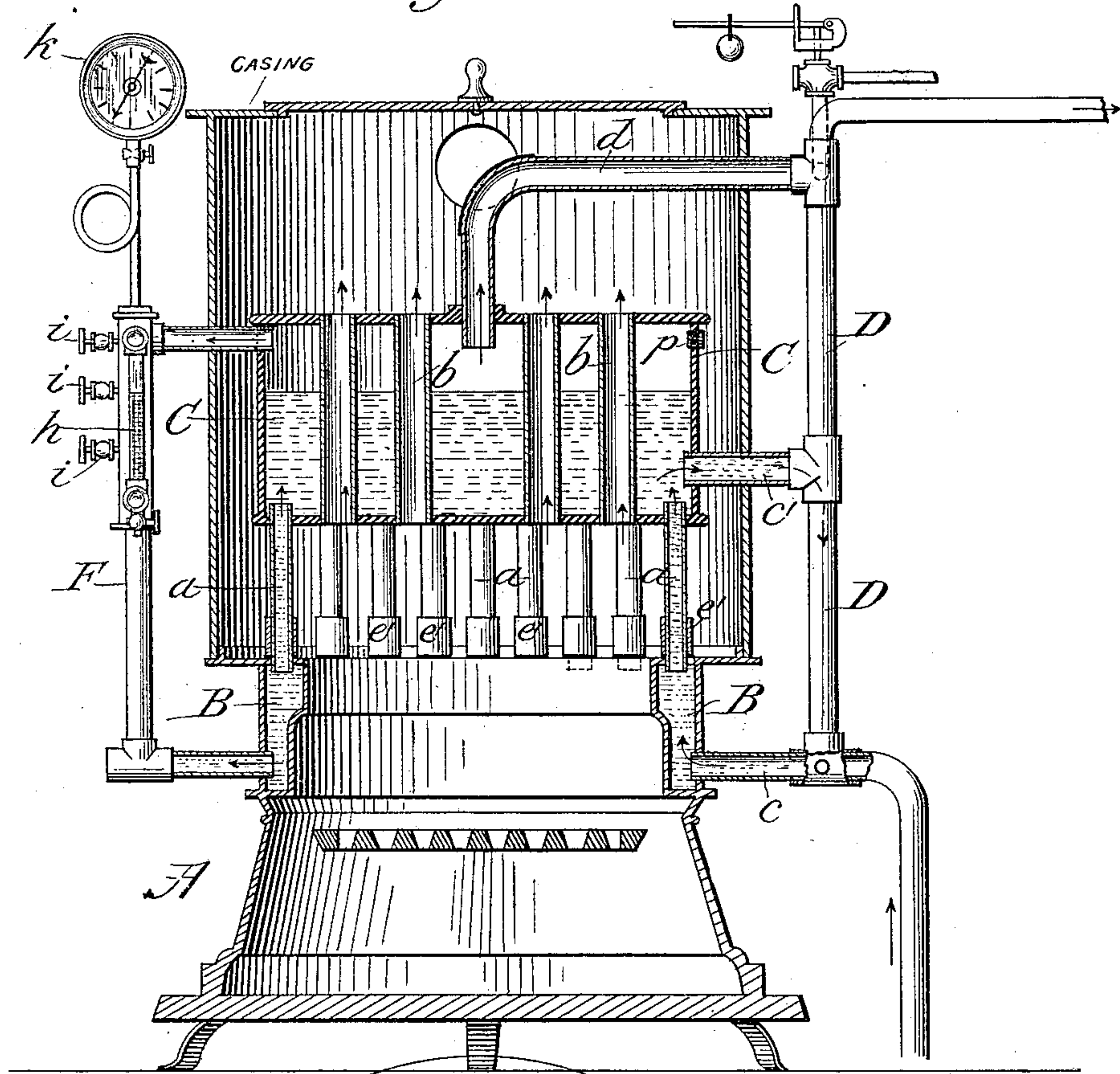
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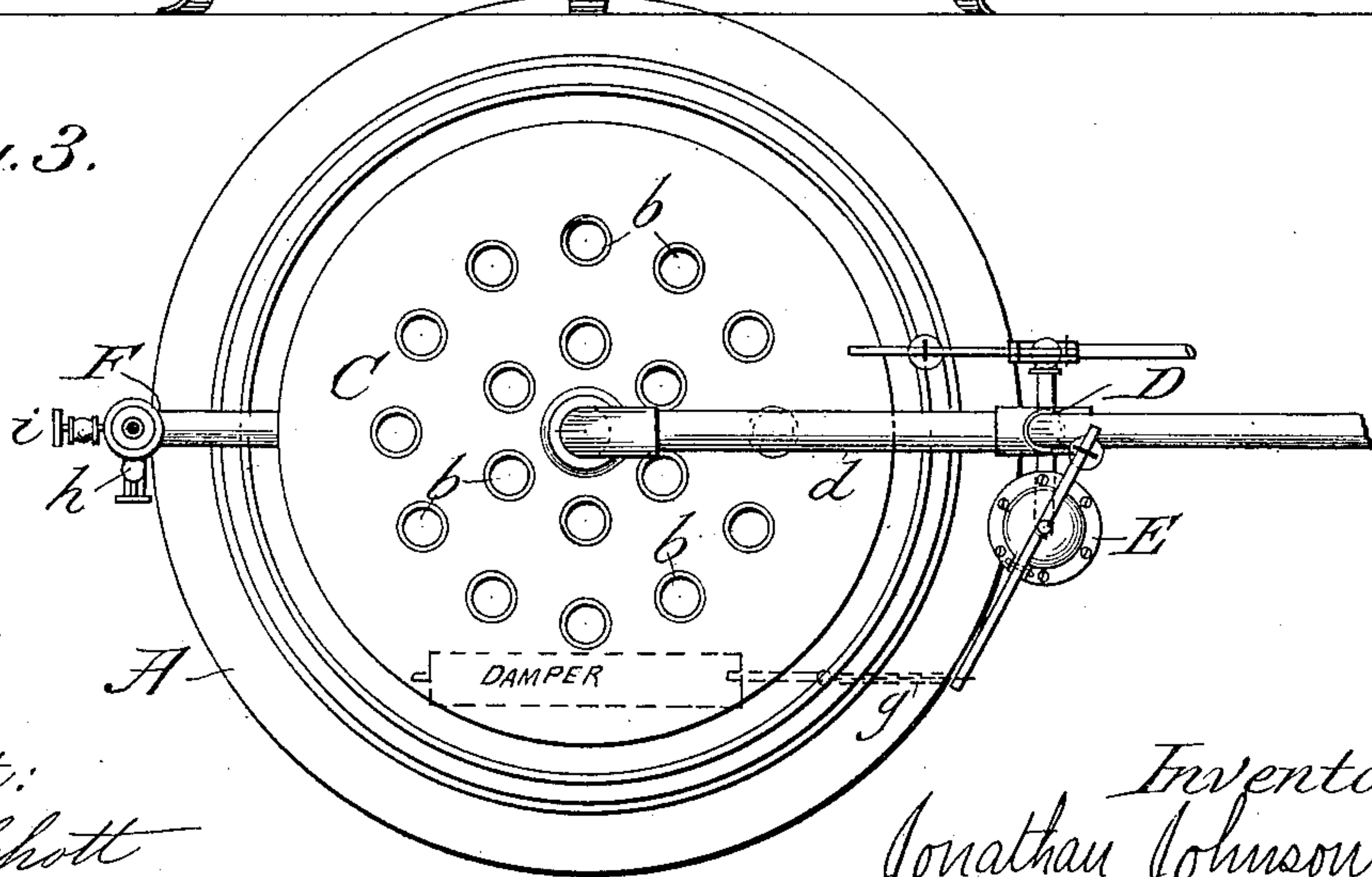
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*Fig. 2.*



*Fig. 3.*



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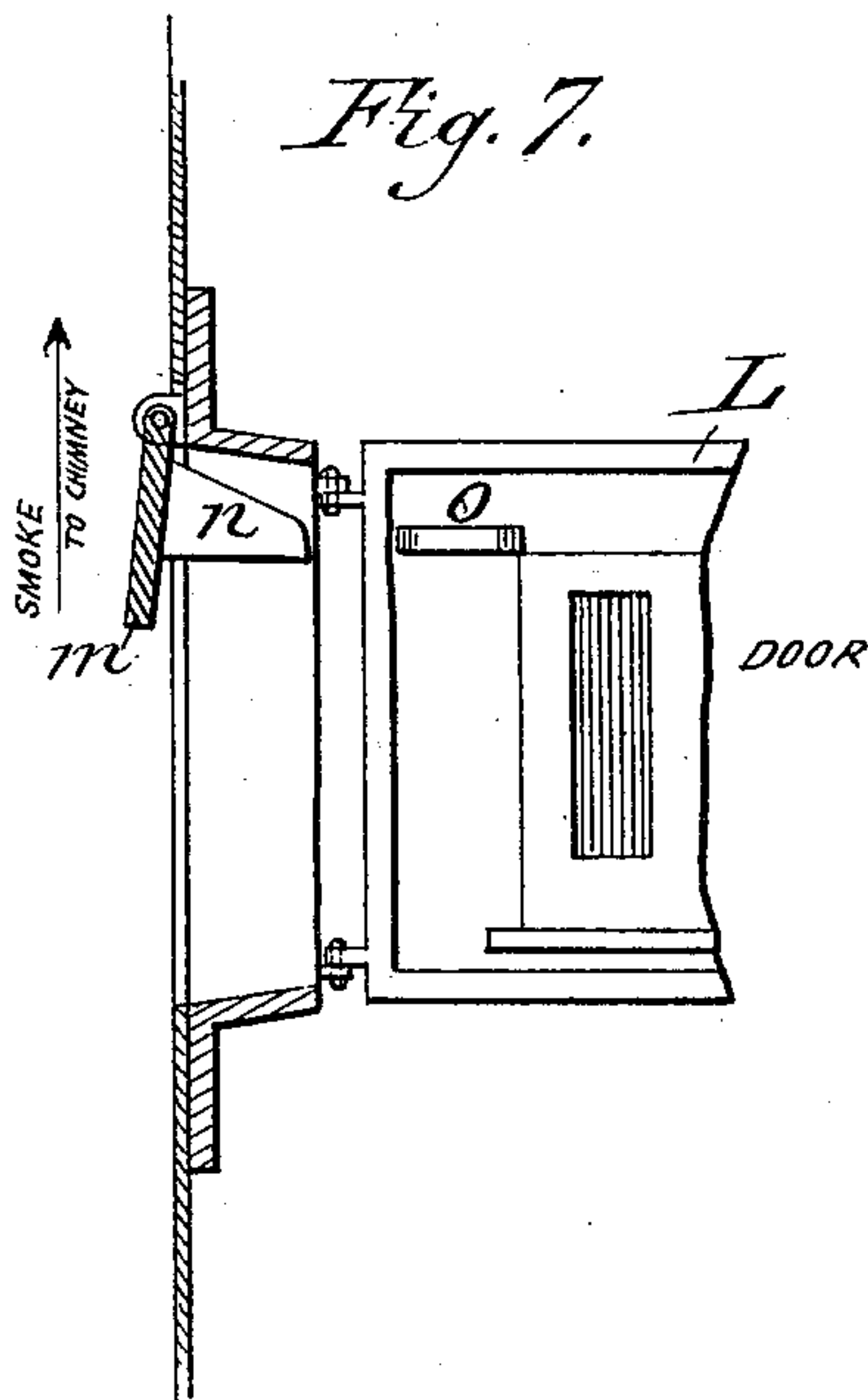
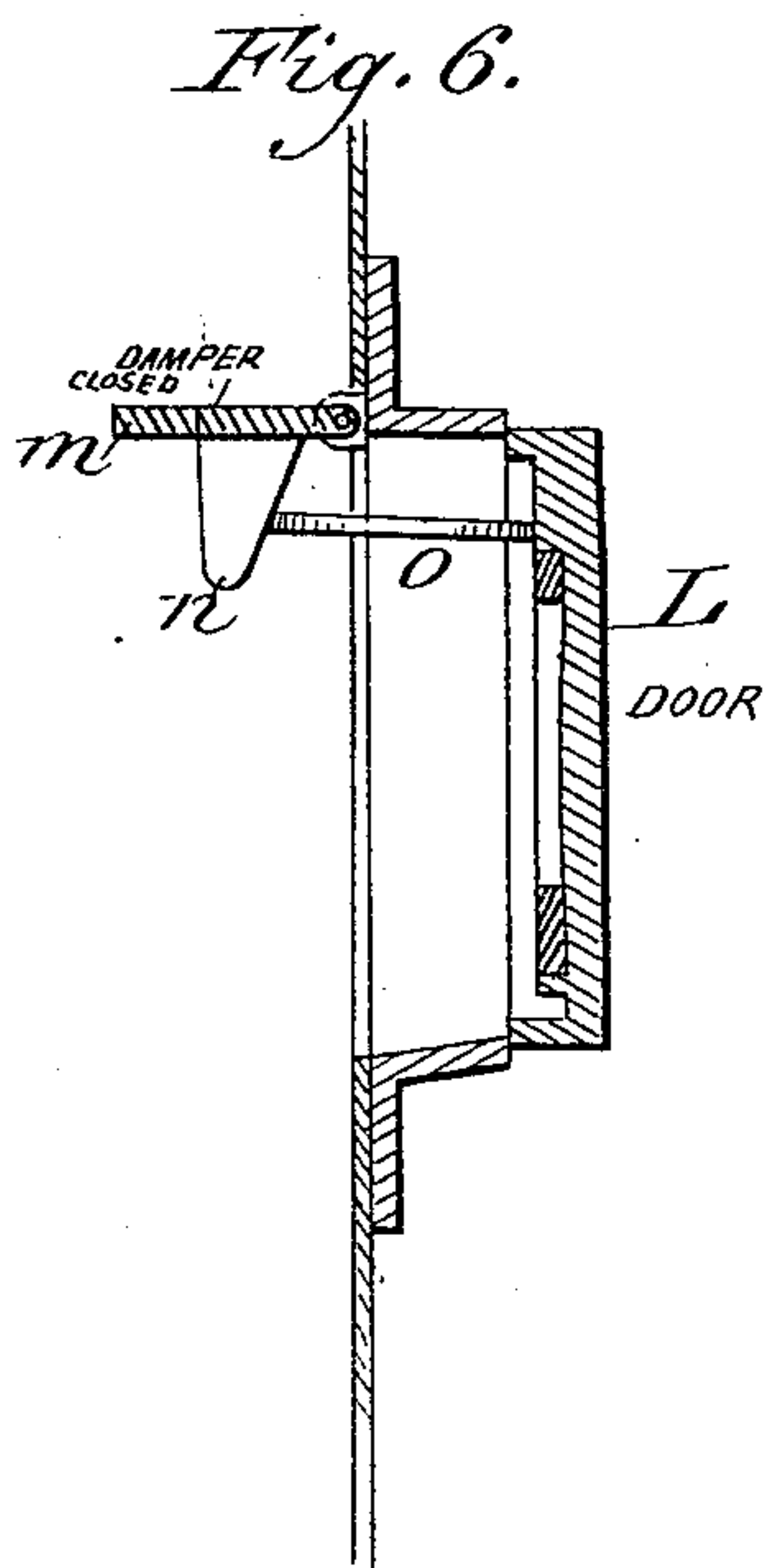
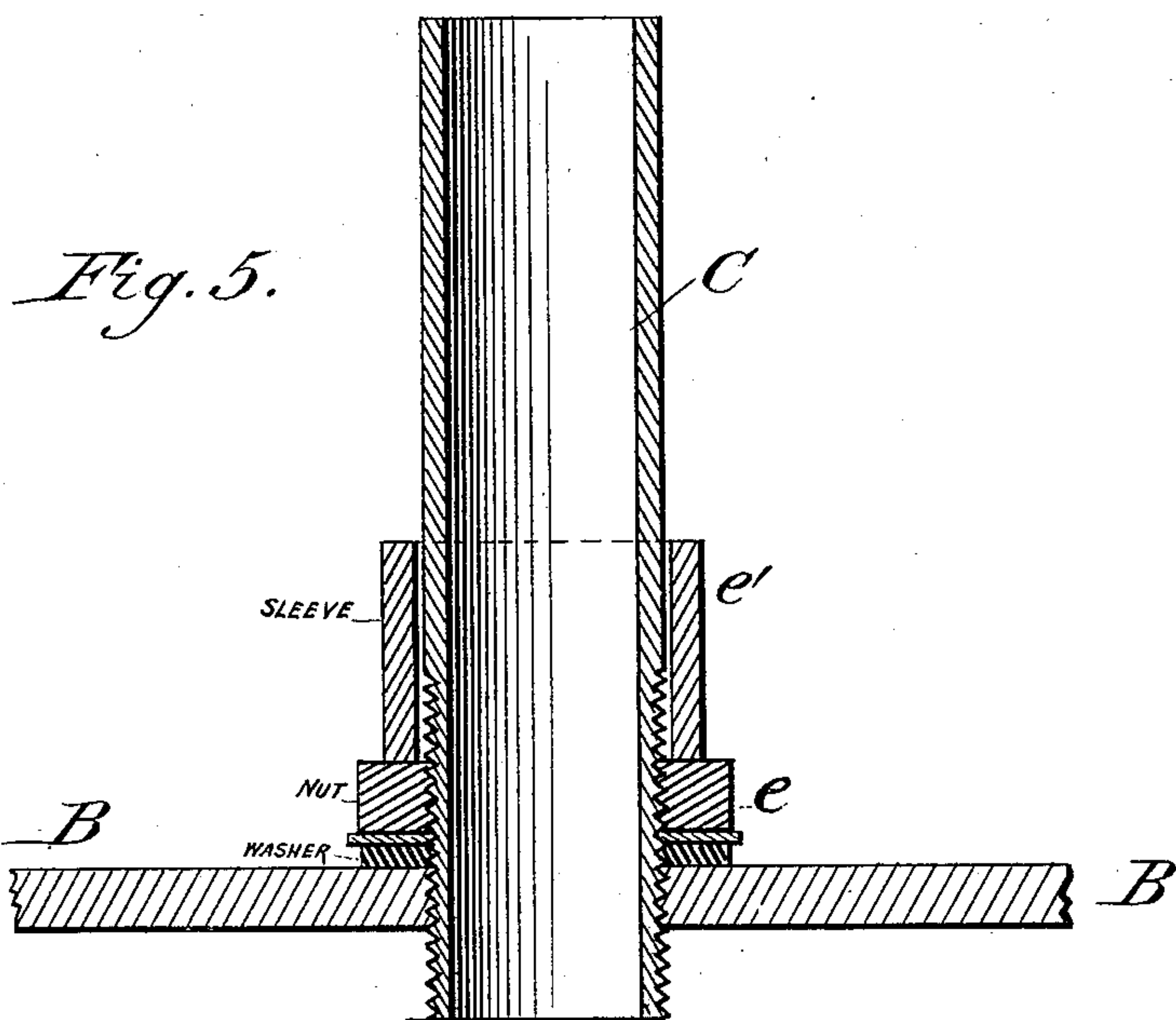
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# UNITED STATES PATENT OFFICE.

JONATHAN JOHNSON, OF LOWELL, MASSACHUSETTS.

## BOILER FOR STEAM-HEATERS.

SPECIFICATION forming part of Letters Patent No. 338,670, dated March 23, 1886.

Application filed June 18, 1885. Serial No. 169,064. (No model.)

*To all whom it may concern:*

Be it known that I, JONATHAN JOHNSON, a citizen of the United States, residing at Lowell, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Boilers for Steam-Heaters; 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 letters and figures of reference marked thereon, which form a part of this specification.

This invention relates to certain improvements in that class of boilers employed for heating purposes by either hot water or steam, and is an improvement on the boilers for which Letters Patent No. 274,785, dated March 27, 1883, and No. 264,835, dated September 19, 1882, have been granted.

The improvements relate, principally, to the dome or upper part of the boiler, which, instead of being simply a hollow ring or annulus, as in the above-named patents, which allowed the products of combustion to pass readily through it, imparting but a small portion of their heat to the water contained in the ring, in the present boiler consists of a hollow cylinder filled with vertical tubes, as in the ordinary tubular boiler, through which tubes the products of combustion must all pass on their way to the smoke-stack or chimney, and in their passage necessarily giving up a large portion of their heat to the water or steam within this portion of the boiler.

In order to insure a perfect circulation of water between this dome and the lower parts of the boiler or water-leg which surrounds the fire-pot, I have arranged circulating-pipes which connect the upper and lower parts of the boilers by a channel outside. Thus removed from the influence of the fire, and capable at all times of fulfilling its purpose by means of this outside circulation, the contents of the boiler are kept continually in motion, avoiding the danger from deposits of sediment and incrustation, so injurious to the boilers now in common use.

In addition to these improvements, I have devised a band or cover for the joints of the pipes exposed to the fire, which not only pro-

fects the screw-threads of said pipes from corrosion, but forms a lock-nut that prevents loosening of the connections by expansion and contraction or other means.

A further improvement is the escape-flue and damper connected with the feed-door, by means of which a direct draft is made from the door to the chimney when the door is open for the introduction of fuel, thus avoiding the nuisance caused by the exit of smoke or gas through the door when the latter is opened.

In the accompanying drawings, Figure 1 is a perspective view of the boiler, a portion of the casing being removed to show the internal arrangement of the parts. Fig. 2 is a vertical section showing the relative positions of the annulus which forms the water-leg surrounding the fire-pot and the tubular dome and their connecting-pipes. Fig. 3 is a top or plan view illustrating the arrangement of the tubes in the dome and the position of the circulating-pipes outside the casing. Fig. 4 is an enlarged sectional view of one of the connections of the circulating-pipes, illustrating the construction and arrangement in connection therewith of the chambered lock-nut or covering-band. Fig. 5 shows a modification of the nut, the sleeve being separate from the nut proper, but in contact therewith. Figs. 6 and 7 are enlarged sectional views showing the feed-door and damper opened.

In the drawings, A indicates the base upon which the boiler is placed, and which forms the ash-pit below the grates. This base may be of the same construction as those used with the boilers heretofore employed for heating purposes, and illustrated in the patents named. Supported by this base is the hollow annulus or water-leg B, preferably formed of cast metal, and of such height as to fully inclose the fuel, thus forming the fire-pot, which is protected from the injurious effect of the incandescent fuel by the continuous flow of water through it. The upper edge of the annulus B is pierced with a series of orifices, which receive the lower ends of the vertical tubes *a a*. These tubes support and are connected to the lower head of the tubular cylinder or dome C, the space within the tubes and between the dome and fuel forming a combustion-chamber of such size as to insure the thorough mixing and combustion of the gases



rising from the fuel. This dome C may be of cast or wrought metal, as preferred, but in either case is provided with a series of vertical tubes, *b b*, that connect its two heads, and through which the smoke and waste gases pass from the combustion-chamber to the chimney. It will be apparent that this construction affords a free passage for the water between the annulus B and the dome through the tubes *a a*, and also through the latter between the tubes *b b*.

In order to keep up a continuous circulation, thus avoiding the deposit of sediment in any part of the boiler, I provide one or more circulating-pipes, D, which are connected to the water-leg or annulus B and dome C by horizontal connections *c* and *c'*. These connecting pipes or tubes are of such length as to pass through the casing which surrounds the boiler, whether the same be of metal or brick, so as to bring the vertical pipes D outside the same. They are therefore beyond the direct action of the fire, and the water within them is comparatively quiet, its only movement being that produced by the steady downward flow caused by the rising of the water within the tubes *a*, which connect the water-leg with the dome, the place of which rising water is supplied by the downward flow above named. I also prefer to continue the pipe D upward and connect it by a pipe, *d*, with the top of the dome. By this means is afforded an escape downward through the pipe D for any water which may rise as foam with the steam when the boiler is used as a steam-heater, and the upper end of said pipe also forms a convenient place for the attachment of the safety-valve and the pipes which convey steam from the boiler to the radiators. As the joints of these various pipes where they are connected to the water-leg and dome are exposed more or less to the action of the fire, and are reduced in thickness by the cutting of the screw-threads upon them, it becomes necessary to provide some protection for them at these points, in order to secure them from speedy destruction by corrosion. This I accomplish by means of the chambered lock-nuts or sleeves *e*, the construction of which, as shown in Fig. 4, consists of a nut fitting the thread of the pipe upon which it is to be applied, and provided with an extension or sleeve, *e*, which is bored out or otherwise so enlarged as to pass over the outside of the thread and pipe. In using this protecting-sleeve it is first screwed onto the pipe, which is then screwed into an orifice prepared for its reception in the water-leg or dome, packing being interposed between the nut and boiler. The nut is then turned back until the packing is firmly compressed, thus making a perfectly-tight joint, while the extension or sleeve *e* covers that part of the screw-thread cut in the pipe which would otherwise be exposed.

In the modification shown in Fig. 5 of the drawings the sleeve *e* is shown as separate from the nut, but resting against it. This meth-

od of construction allows the nut to be screwed up without rotating the sleeve when the joint is tightened. The boiler is also provided with an automatically-operating feed-governor, E, connected with the boiler and water-supply by suitable pipes, said governor not only regulating the height of the water in the boiler, but may also, by means of the connection *g* with the damper which admits air below the grate, regulate said admission to correspond with the quantity of water to be evaporated, thus equalizing the amount of fuel consumed with the steam or heat required. An additional outside pipe, F, is connected at its lower end to the water-leg and at its upper to the dome above the water-line. As it is evident that the water within this pipe will always stand quietly at the same height as that within the boiler, not being disturbed by the frequently violent ebullition of the water in the latter, it follows that the pipe F forms a proper place for the attachment of the glass gage *h* and gage-cocks *i*, the readings from which when so placed being reliable. The upper part of this pipe F also forms the place of attachment of the steam-gage *k*, which is a necessary addition to all steam-heating apparatus.

When the apparatus is to be used as a hot-water heater, the plug *p* in the upper part of the dome is removed and the connection with the circulating-pipes made at that point, so as to give the full benefit of the heat obtained from the tubes *b* passing through the dome, which is, of course, full of water, as no steam-space is required.

Much difficulty has been experienced from the escape of smoke and gas into the room occupied by the heater when the feed-door was opened. To remedy this defect, I employ the devices shown in Fig. 6, in which it will be observed that a flue runs from the top of the door, opening directly to the smoke-chamber above the dome. This flue is closed by a damper, *m*, pivoted in the casing of the door-opening and provided with the triangular projection *n*, having an inclined edge, which comes in contact with the lug *o* upon the feed-door L when said door is closed, and which action raises and closes the damper. When the door is opened, the damper falls, opening the flue and allowing a direct flow of smoke or gas to the chimney from the combustion-chamber, thus preventing all possibility of its escape through the door L into the furnace-room.

The advantage of this apparatus may be summed up in the almost complete prevention of scale and deposit of sediment within the boiler owing to the perfect circulation which the great amount of heating-surface exposed to the fire causes, the heat in great part being taken up by the contents of the boiler, allowing but a small portion to escape up the chimney, thus insuring great economy in fuel; and, further, the protection afforded by the sleeved lock-nuts to the connecting pipes and joints at the points where they are most ex-



posed greatly increases the durability of the same, rendering frequent repairs unnecessary.

Having thus described my invention, I claim as new and desire to secure by Letters Patent 5 the following:

In a boiler for heating or power purposes, the combination of the annulus or water-leg B, tubular dome C, vertical tubes *a a*, and circulating-column D, connecting with the annulus or water-leg by a tube, *a*, and with the 10 tubular dome by tube *c*, entering below the

water-line and near the crown-sheet or lower head of dome C, whereby the circulation will remove all sediment to the lower part of the boiler, avoid incrustation, and generate more 15 steam, substantially as described.

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

JONATHAN JOHNSON.

Witnesses:

CHARLES H. HOWLAND,  
JOHN H. OATES.