

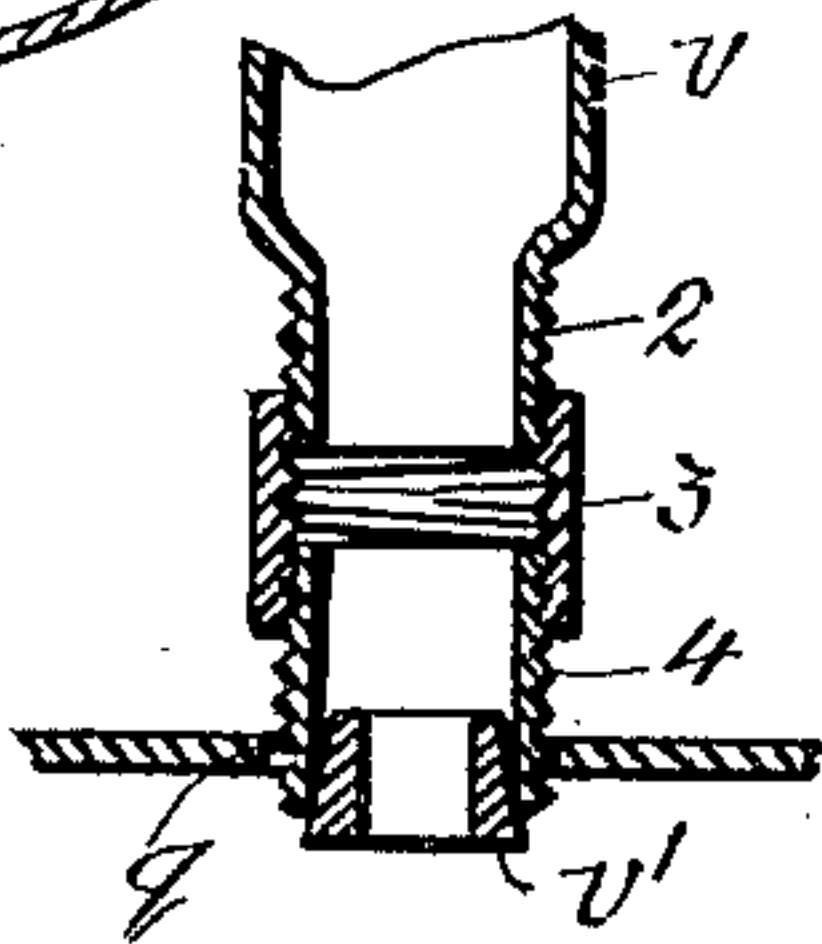
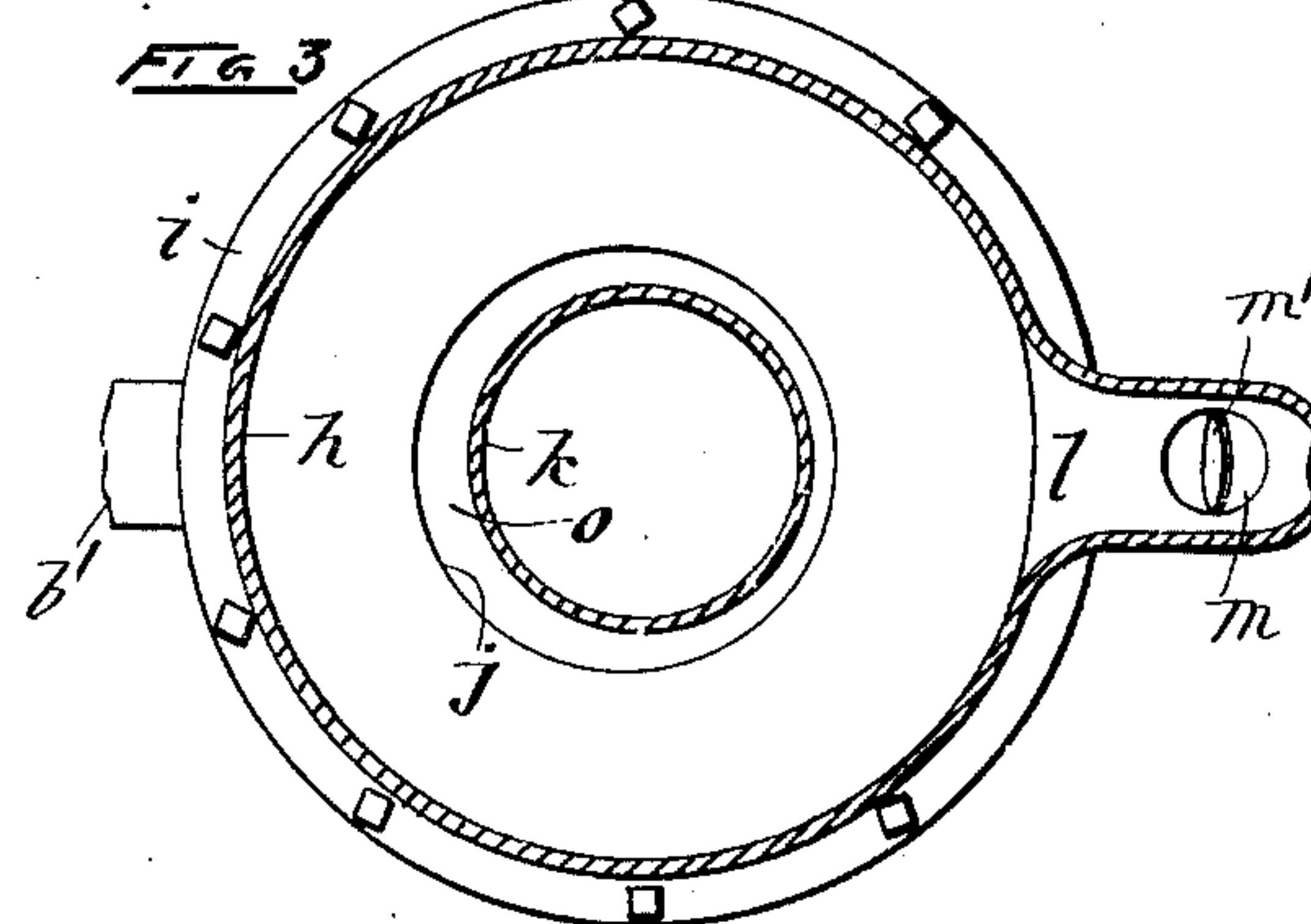
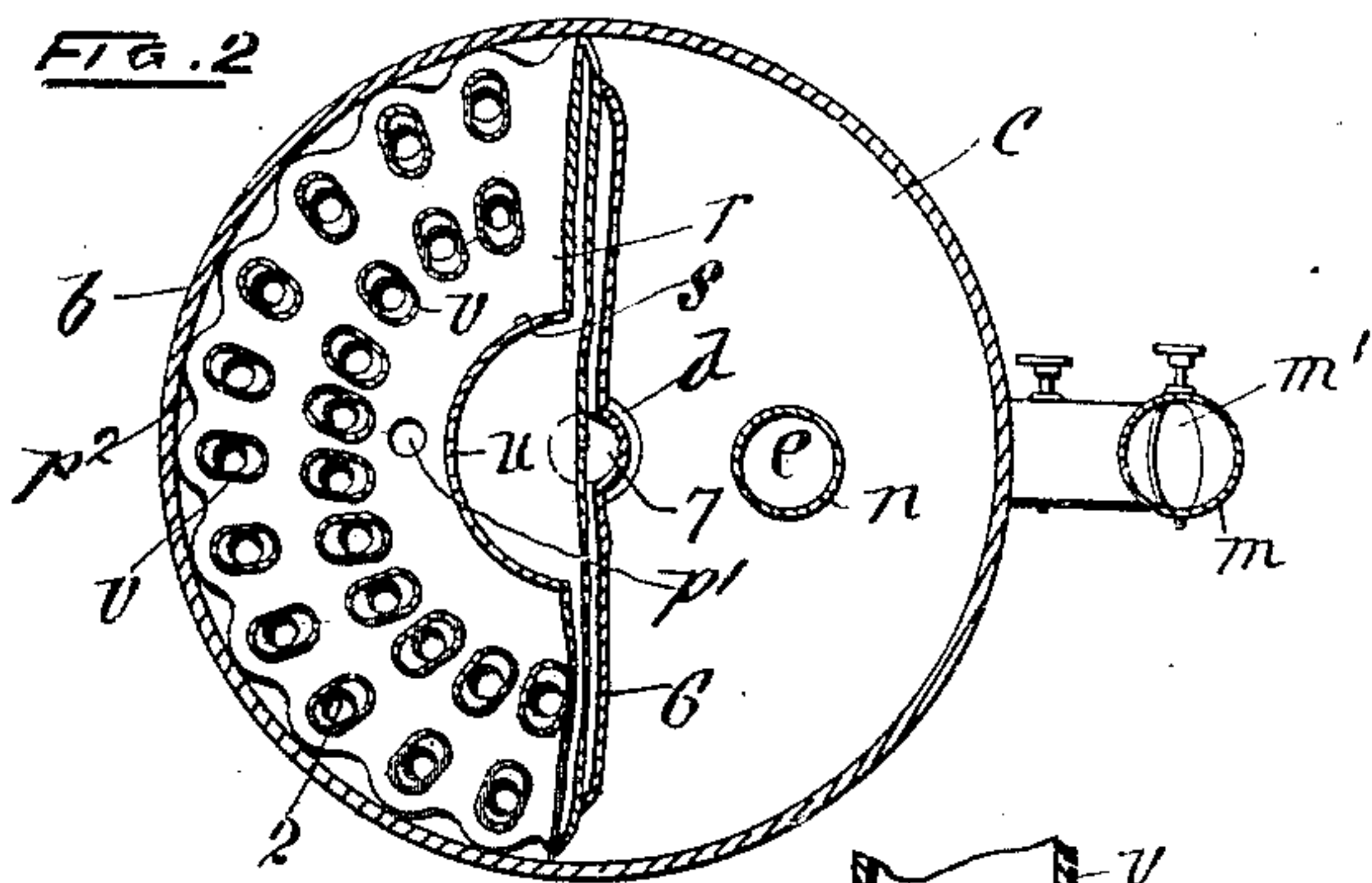
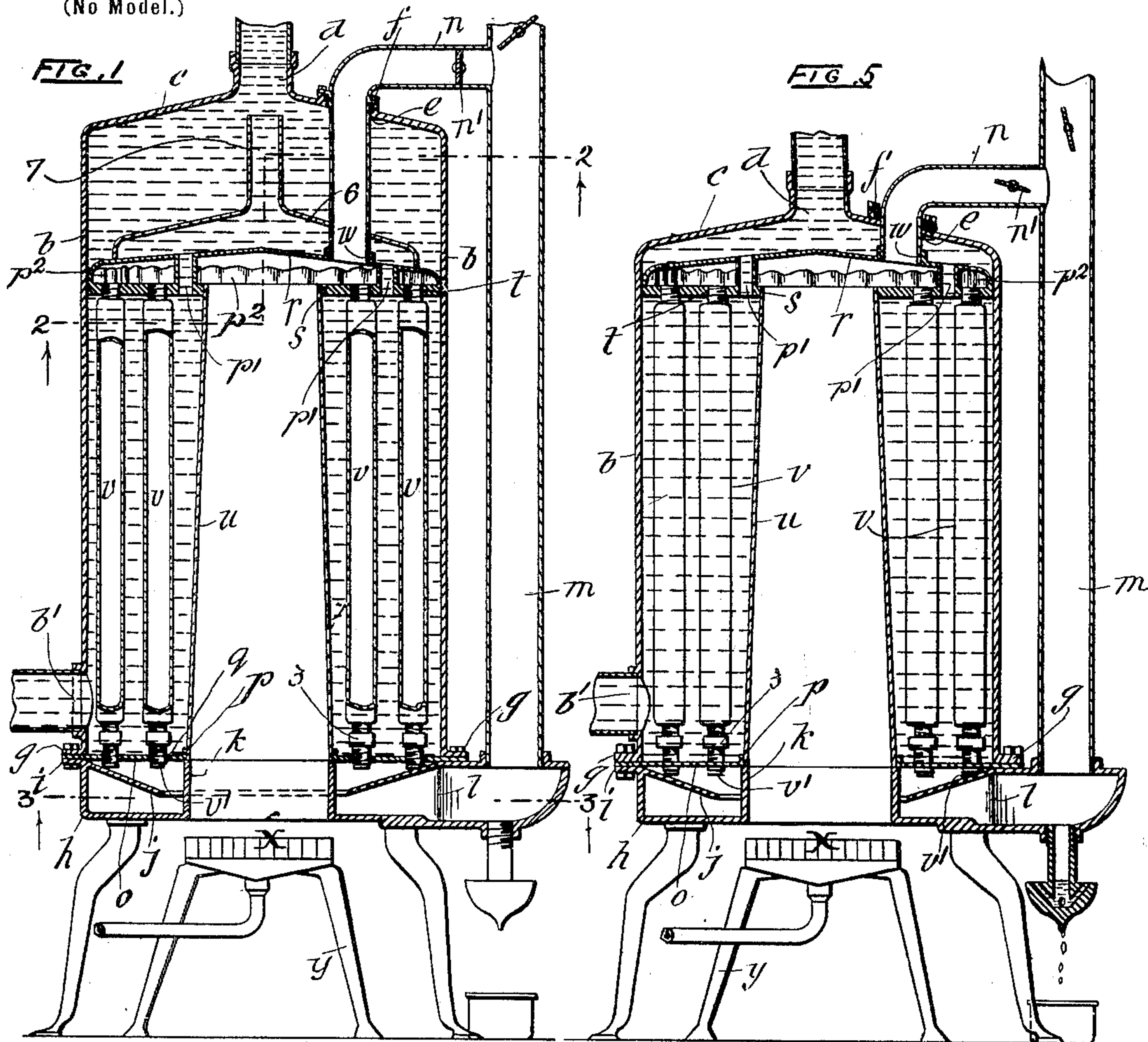
No. 657,794.

Patented Sept. 11, 1900.

T. P. SHAW.
WATER HEATER.

(Application filed Nov. 2, 1899.)

(No Model.)



Witnesses
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FIG. 4

By

his

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UNITED STATES PATENT OFFICE.

THOMAS PATTON SHAW, OF MONTREAL, CANADA.

WATER-HEATER.

SPECIFICATION forming part of Letters Patent No. 657,794, dated September 11, 1900.

Application filed November 2, 1899. Serial No. 735,605. (No model.)

To all whom it may concern:

Be it known that I, THOMAS PATTON SHAW, of the city of Montreal, in the district of Montreal and Province of Quebec, Canada, have
5 invented certain new and useful Improvements in Water-Heaters; and I do hereby declare that the following is a full, clear, and exact description of the same.

My invention relates particularly to heaters for heating water for domestic use, although the principal features thereof are applicable to advantage to the construction of the furnaces of hot-water systems for heating buildings; and the object of the invention is to simplify the construction and increase the efficiency of hot-water heaters generally. For full comprehension, however, of my invention reference must be had to the accompanying drawings, forming a part of
15 this specification, in which like symbols indicate the same parts, and wherein—

Figure 1 is a longitudinal vertical sectional view of my improved water-heater. Figs. 2 and 3 are transverse sectional views taken on
25 lines 2 2 and 3 3, Fig. 1. Fig. 4 is a detail view of the connection of the tubes with their carrying parts; and Fig. 5 is a similar view to Fig. 1, but with my invention applied to the construction of a furnace.

30 The casing is in the form of a drum *b*, having its top *c* closed and of conical form and having a central opening *d*, with which the flow-pipe communicates, while a second opening *e*, formed with a stuffing-box *f*, is located
35 adjacent to said central opening, and an opening *b'* is provided near the lower end of its body, through which the feed-water enters. The lower end of the drum is flanged, as at *g*, and has a casting *h* of annular dish form
40 bolted thereto through a flange *i*. A diaphragm *j* of truncated conical form is secured at its periphery to the top of said casting and has its central opening of greater diameter than that of the inner divisional wall *k* of
45 the casting and arranged eccentrically thereof. An opening *l* at one end side of said casting is connected by a pipe *m* to the chimney, and a branch *n*, extending from said
50 pipe, is taken downwardly through the stuffing-box *f* to the interior of the casing, as will be presently alluded to, said main and branch

pipes being furnished with dampers *m'* and *n'*, respectively.

A flat annular diaphragm *O* has its periphery located between the flanges upon the lower and upper edges of the drum and bottom casting, respectively, the edge of the opening *p* in the diaphragm corresponding to that of the central opening in the casting, with which opening it registers, the edge thereof resting
55 upon the upper edge of said wall *k*, while a series of circular openings *q* are cut through said diaphragm.

A hollow head *r*, provided with vertical tubular passages *p'*, is located within and a short distance from the upper end of the casing and has in its bottom a central flanged opening *s* of less diameter than the opening
65 *p* and a series of circular openings *t*, corresponding to the openings *q*, while the periphery thereto is corrugated, as at *p*².

A tapered tube *u* connects the openings *p* and *s*, and a series of tubes *v*, elliptical in cross-section and having round ends, connect the openings *q* and *t* together in a manner
75 to be presently described, while the top of the hollow head has an opening *w*, to the edge of which the end of the branch pipe *n* is connected. These tubes *v* are arranged with their major axes at an angle to the radii of
80 the central tube *u* in order to allow a greater number of them to be set in place between said tube and the surrounding casing and also to allow the heated gases to come into closer relationship with the sides of the tubes,
85 thereby allowing the gases to give up their heat more rapidly to the water surrounding them. These tubes are secured in place in the following manner: The round ends thereof are exteriorly screw-threaded, as at 2, and
90 are coupled by sleeves 3, having their interiors screw-threaded to short tubular sections 4, exteriorly screw-threaded and extended into the openings *q* in the diaphragm *O*. By connecting the tubes *v* in place in this manner the ends thereof or the tubes themselves
95 can be readily renewed without trouble and at very small cost.

In the tubular sections 4 are set nipples *v'*, preferably of slightly-conical form, and when
100 jammed into place serve the double purpose of expanding the lower ends of the tubes and

retaining them rigidly in place and at the same time cutting down the area of the passage through said lower ends. This sudden diminishment of the lower and exit ends of these passages has the effect of converting what would otherwise be a direct passing current into a vibratory current in said tubes, and thereby greatly increasing the heating efficiency of this portion of the heater.

10 A conical hood 6, formed with a central vertical tubular portion 7, is set upon the top of the head r and incloses the upper ends of the passages p' , the upper end of the tubular portion 7 extending to within close proximity 15 of the upper end of the casing.

The diaphragm O , head r , and tubes u and v constitute what I term the "interior heat-distributing section," and the function thereof is to present the greatest possible extent of heating-surface within a water-heater of given capacity, and, as shown in Fig. 5, this heat-distributing section can be applied with advantage and without departing from the spirit of my invention to the construction of furnaces for hot-water heating systems for buildings.

The heat-generator I prefer to use is a removable gas-burner x , supported in this instance upon legs y , and is located immediately beneath the lower end of the tube u , although, if desired, other burners may be used.

In order to clear the section h of water that will naturally collect owing to sweating of the pipes, I make a depression 8 in the floor of said section h and connect the end of the tubular portion 9 of a trap consisting of a block 10, having a central vertical passage 11, communicating with said tube 9, and a series of diagonal passages 12, communicating at their lower ends with the lower end of passage 11. It is obvious that any water tending to collect in the chamber h will find its way down the tube 9 and passage 11, flood the passages 12, overflow the edge, and run down the convex outside of the block and drip from the point 13, the water flooding the passage 11 and diagonal passages obviously serving as a trap to prevent the escapes of any gases from the chamber h .

The circuits through my improved heater are as follows: The cold water enters at b' and completely floods the interior of the drum from the diaphragm O upward and envelops the head r and the tubes u and v and the inside of the hood and fills the space above it and the house-pipes, while the heated gases rise from the burner x and pass upwardly through the tube u , through the head r either directly through the branch pipe n to the chimney connection, if the damper n' be closed, or from the head, as will generally be the case, downwardly through the elliptical tubes v , around the diaphragm j , and through the pipe m to the chimney connection. The hood has the effect of directing the heated water directly from the heat-distributing sec-

tion through the body of colder water directly to the mouth of the flow-pipe, thus enabling hot water to be supplied within a few minutes. 70

My object in arranging the opening through the diaphragm 1 eccentrically of the wall k is to provide a greater draft area at the side opposite to the chimney connection than adjacent thereto in order to equalize the draft, which is naturally stronger near said chimney connection. 75

It is obvious that any expansion or contraction of the parts within the casing will be accommodated by the yielding connection between the interior and exterior parts provided by the stuffing-box f . Under certain conditions the branch pipe n and stuffing-box can be dispensed with—as, for instance, when the draft is of sufficient strength to fulfil all requirements. 85

My object in making the tube u tapered is to increase the direct heating near the upper part of the heater.

In constructing a furnace according to my invention the hood is dispensed with and the hollow head located near the upper end of the casing. (See Fig. 5.) This is done for the reason that it is not necessary to store a body of hot water, as is the case in a water-heater for domestic purposes, because in heating buildings it is necessary that the water immediately it is heated should flow from the furnace to the coils or radiators distributed throughout the building. 100

What I claim is as follows:

1. A water-heater consisting of a casing having an exit-port at its upper end; a diaphragm cutting off the lower portion of said casing; a hollow head located within said casing a short distance from the top thereof, and having a series of vertical passages there-through; said head extending entirely across the casing and having its periphery corrugated; a tubular connection extending from the lower end of the interior of the casing to an opening in the bottom of said hollow head; and a series of pipes connecting openings in said diaphragm to corresponding openings in the bottom of said head; substantially as described and for the purpose set forth. 105

2. A water-heater consisting of a casing having exit and inlet ports; a diaphragm cutting off the lower portion of said casing, said lower portion being of annular dish form; a hollow head located within said casing near the top thereof; a tubular connection extending from an opening in said lower portion to a central opening in the bottom of said hollow head; a series of pipes elliptical in cross-section and connecting a series of openings in said diaphragm to corresponding openings in the bottom of said head, said elliptical pipes being arranged with their major axes at an angle to the radii of said central tubular section; substantially as described and for the purpose set forth. 125

3. A water-heater consisting of a casing having exit and inlet ports; a diaphragm cut-

ting off the lower portion of said casing said lower portion being of annular dish form; a hollow head located within said casing near the top thereof; a tubular connection extending from an opening in said lower portion to a central opening in the bottom of said hollow head; a series of pipes connecting a series of openings in said diaphragm to corresponding openings in the bottom of said head, a series of nipples located in the exit ends of said pipes; substantially as described and for the purpose set forth.

4. A water-heater consisting of a casing having exit and inlet ports; a diaphragm cutting off the lower portion of said casing said lower portion being of annular dish form; a hollow head located within said casing near the top thereof; a tubular connection extending from an opening in said lower portion to a central opening in the bottom of said hollow head; a series of pipes elliptical in cross-section and connecting a series of openings in said diaphragm to corresponding openings in the bottom of said head, said elliptical pipes being arranged with their major axes at an angle to the radii of said central tubular section; a series of nipples located in the exit ends of said pipes; a pipe connected to the edge of an opening in the upper side of said head and extending through an opening in the top of the casing to the chimney connection; substantially as described and for the purpose set forth.

5. A water-heater consisting of a casing having flow and return connections; a diaphragm cutting off the lower portion of said casing; said lower portion being of annular dish form; an annular diaphragm connected at its outer edge to the top of said lower portion and downwardly inclined toward its center; a pipe leading from said lower portion to the chimney connection; a hollow head located within said casing near the top thereof, a tubular connection extending from an opening in said lower portion to a central opening in the bottom of said hollow head; a series of pipes elliptical in cross-section and connecting a series of openings in said diaphragm to corresponding openings in the bottom of said head, said elliptical pipes being arranged with

their major axes at an angle to the radii of said central tubular section; a branch connected to the edge of an opening in the upper side of said head and extending through an opening in the top of the casing to the said first-mentioned pipe; and a stuffing-box carried by said opening in the casing, substantially as described and for the purpose set forth.

6. A water-heater consisting of a casing having flow and return connections; a diaphragm cutting off the lower portion of said casing; said lower portion being of annular dish form; a pipe leading from the said portion to the chimney connection; a hollow head located within said casing near the top thereof, a tubular connection extending from an opening in said lower portion to a central opening in the bottom of said hollow head; a series of pipes elliptical in cross-section and connecting a series of openings in said diaphragm to corresponding openings in the bottom of said head, said elliptical pipes being arranged with their major axes at an angle to the radii of said central tubular section; a stuffing-box carried in an opening in the casing; a branch pipe connected to the edge of an opening in the upper side of said head and extending through said stuffing-box to the said first-mentioned pipe; an annular diaphragm connected at its outer edge to the top of said bottom portion and downwardly inclined toward its center; the opening through said diaphragm being eccentric of and encircling said central tube, substantially as described and for the purpose set forth.

7. A water-heater having a heat-distributing device located in its interior a short distance from the upper end thereof and a hood having an opening in its upper end for conducting the heated water from within close proximity to said heat-distributing device to the upper end of said heater.

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

THOMAS PATTON SHAW.

Witnesses:

WILLIAM P. McFEAT,
FREDERICK J. SEARS.