

(No Model.)

2 Sheets—Sheet 1.

J. C. BECKFIELD.  
WATER HEATER.

No. 583,276.

Patented May 25, 1897.

FIG. 1.

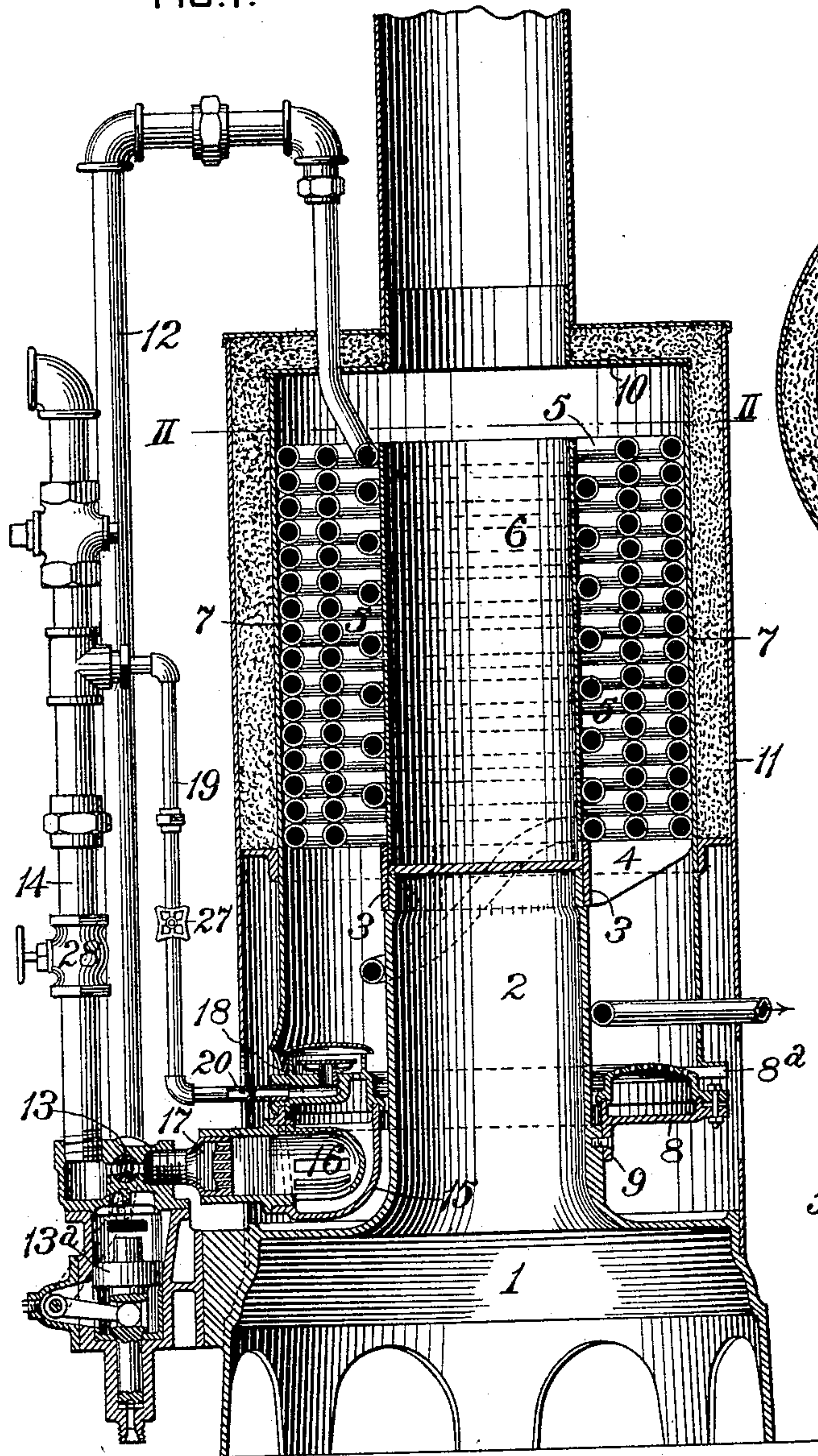


FIG. 2.

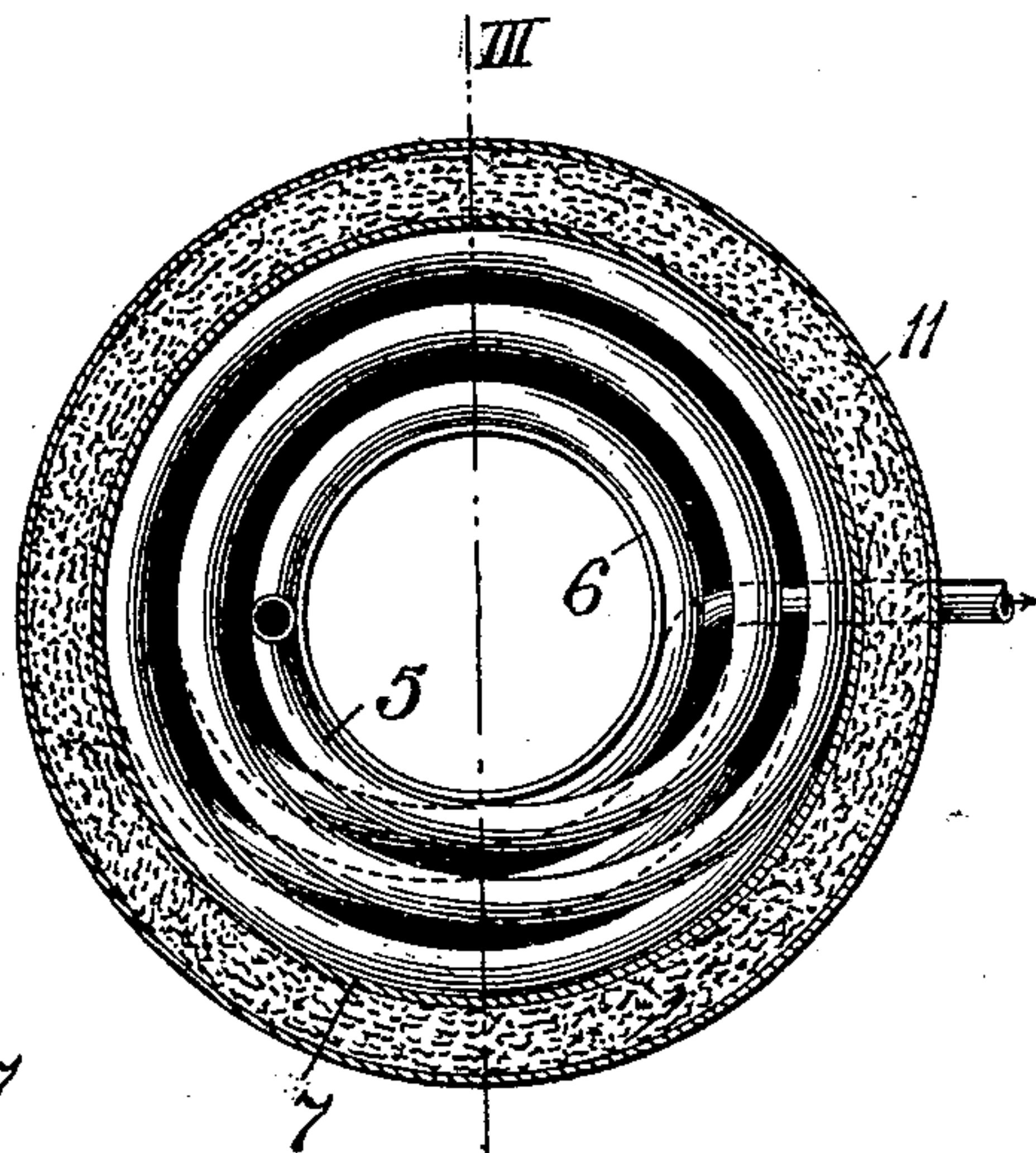
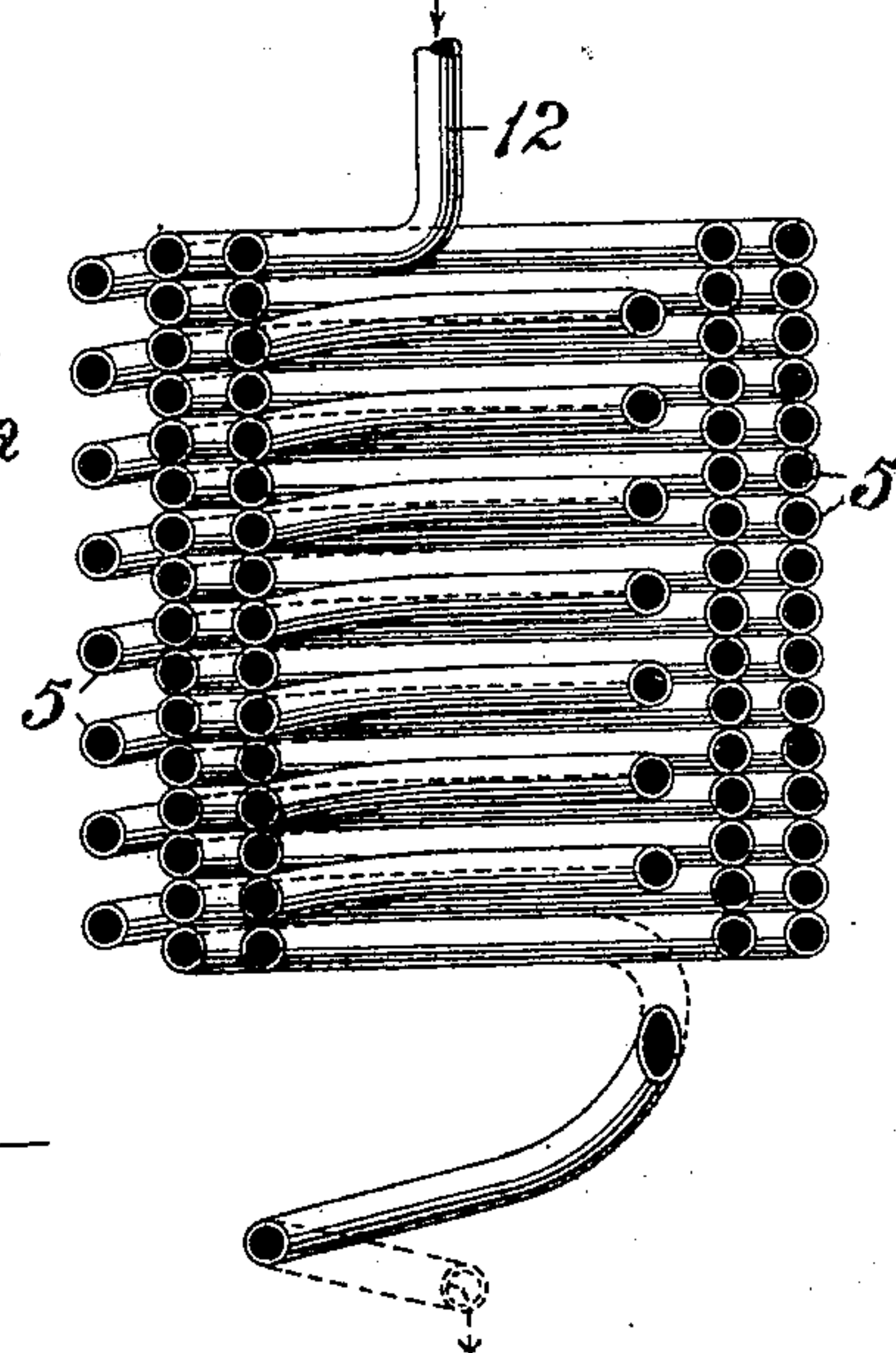


FIG. 3.



WITNESSES:

*Chas. F. Miller.*  
*Marshall A. Christy*

INVENTOR,

*John Charles Beckfield*  
*by Danvers S. Wolcott*

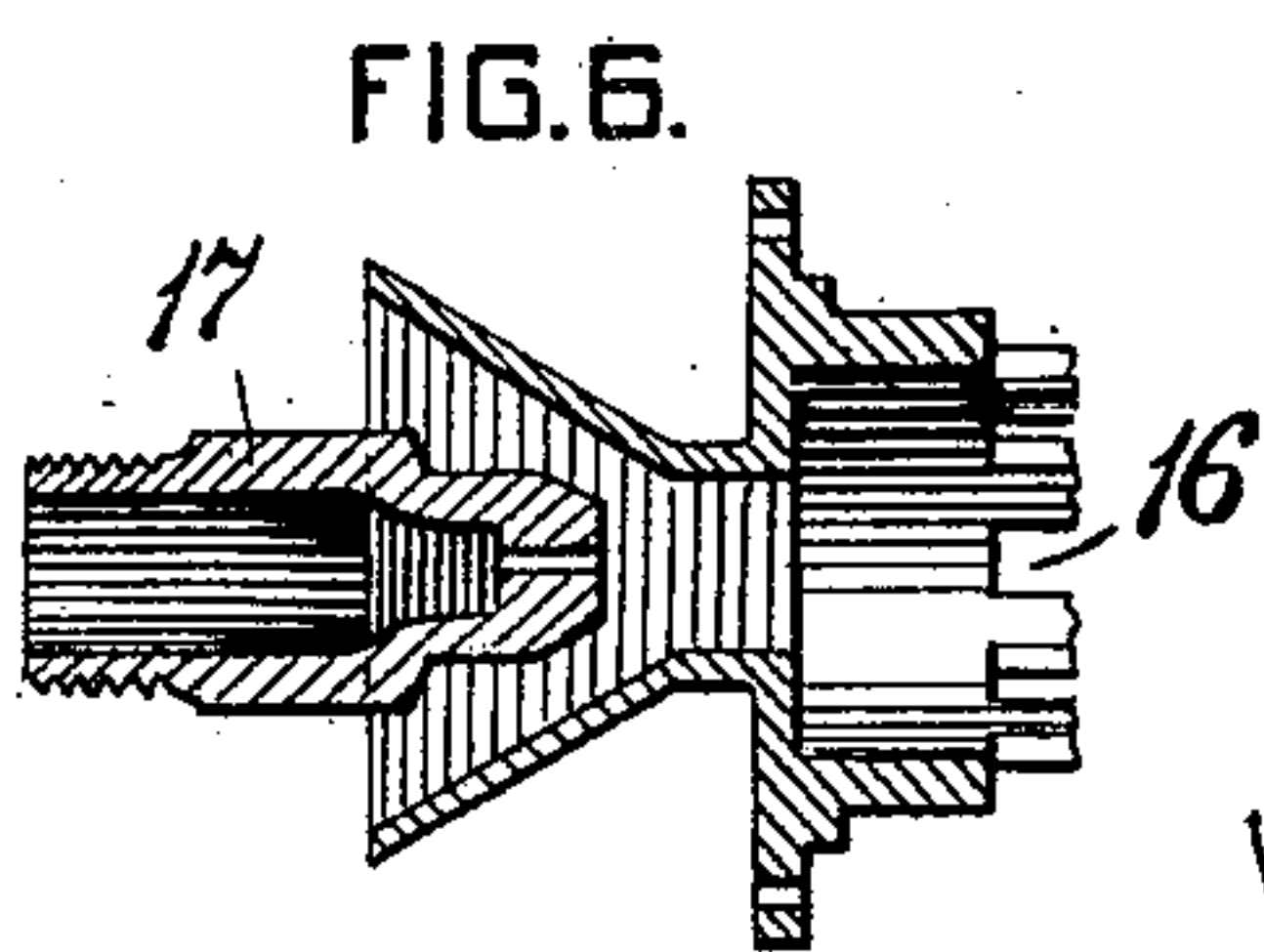
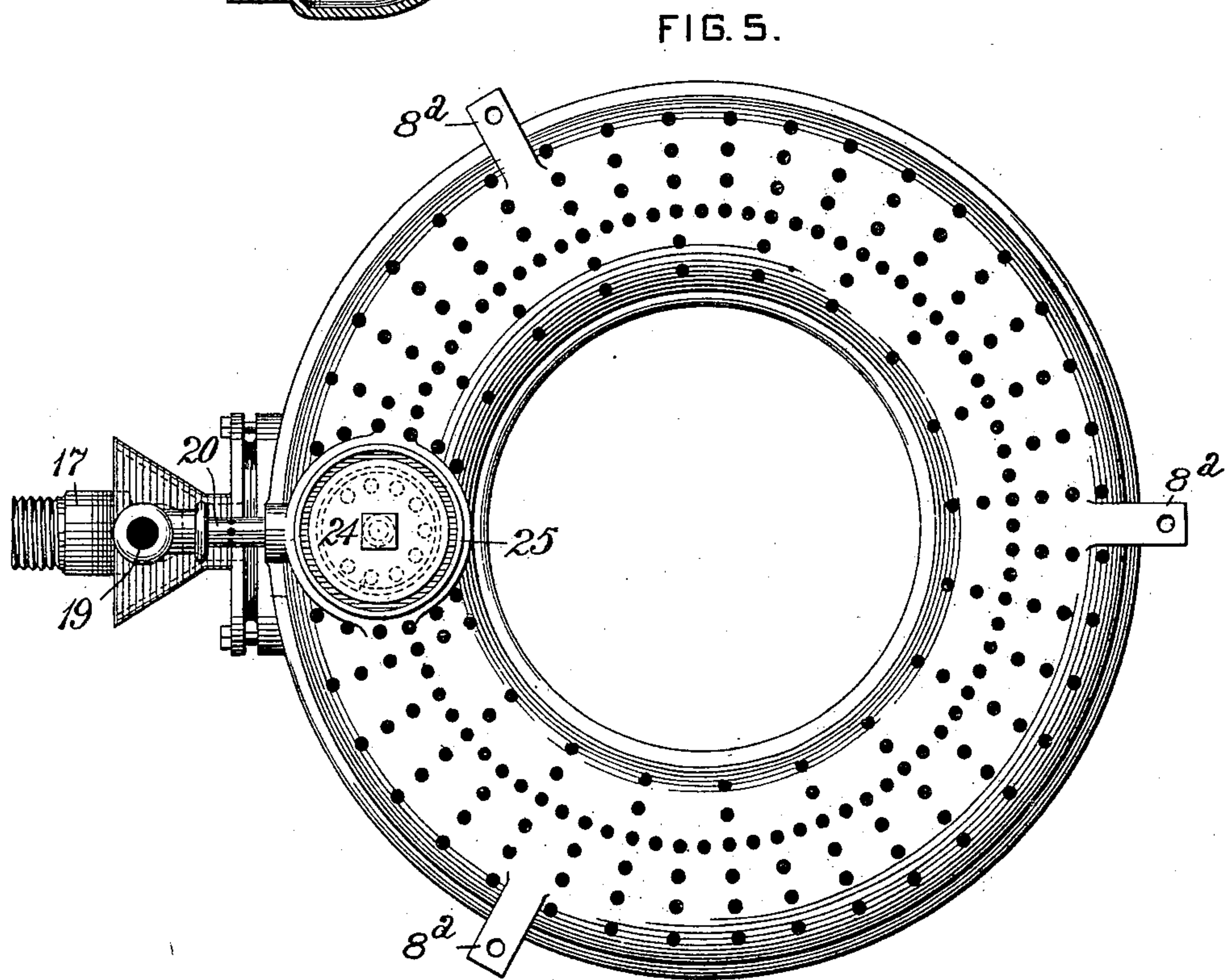
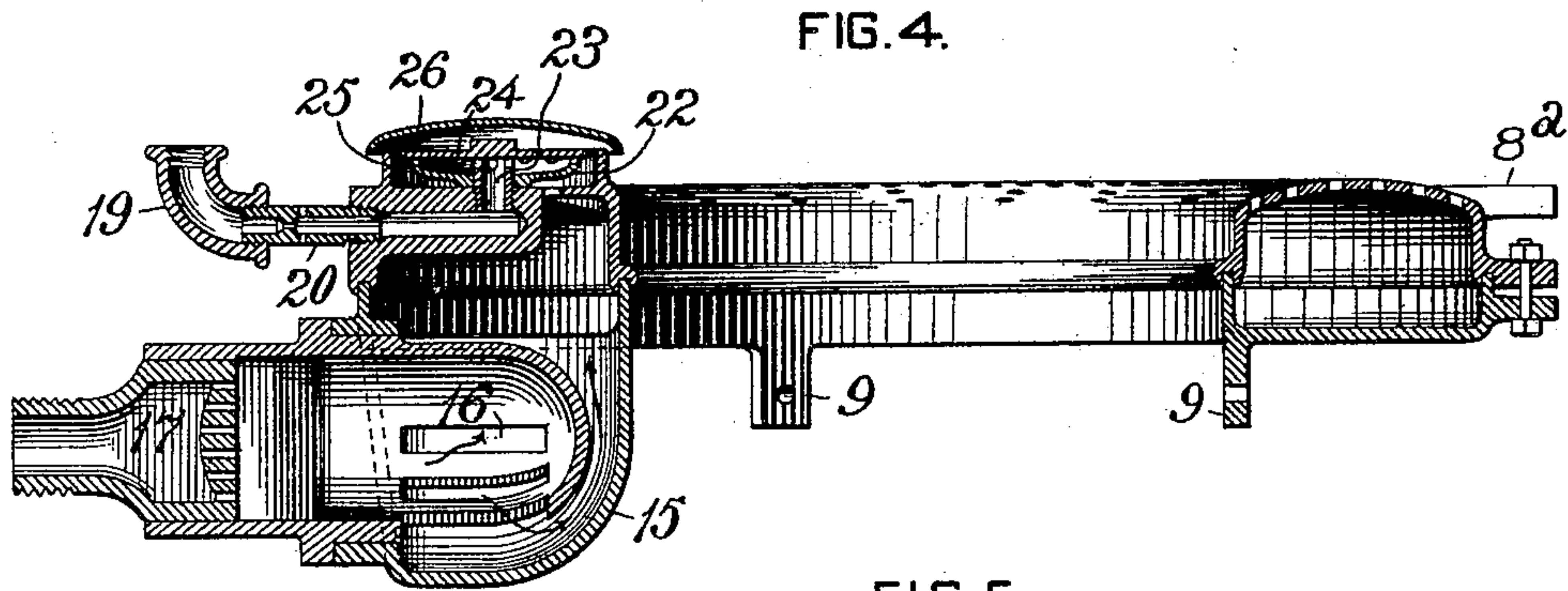
Att'y.



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# UNITED STATES PATENT OFFICE.

JOHN CHARLES BECKFIELD, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO  
THE BECKFIELD WATER HEATER COMPANY, OF SAME PLACE.

## WATER-HEATER.

SPECIFICATION forming part of Letters Patent No. 583,276, dated May 25, 1897.

Application filed September 15, 1896. Serial No. 605,856. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN CHARLES BECKFIELD, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered certain new and useful Improvements in Water-Heaters, of which improvements the following is a specification.

The invention described herein relates to certain improvements in water-heaters for domestic and other uses, and has for its object a construction and arrangement of coils of pipe whereby the coils are subjected at practically all points through their entire length to a high heat, thereby greatly increasing the heating efficiency.

In general terms the invention consists in the construction and combination substantially as hereinafter described and claimed.

In the accompanying drawings, forming a part of this specification, Figure 1 is a sectional elevation of my improved heater. Fig. 2 is a sectional plan view, the plane of section being indicated by the line II II, Fig. 1. Fig. 3 is a sectional elevation of the heating-coil, the plane of section being indicated by the line III III, Fig. 2. Fig. 4 is a sectional elevation of the burner. Fig. 5 is a top plan view of the same, and Fig. 6 is a sectional detail view of the mixer of the gas-burner.

The base 1 is formed with a central standard or support 2, preferably formed hollow, but closed at a suitable point to prevent any flow of air therethrough. On the upper end of the hollow support is fitted a frame, consisting of a ring or collar 3, provided with a series of radial wings 4, adapted to support the heating-coil 5. This coil is formed by bending a length of pipe (preferably formed of copper) spirally first in and then out, thereby producing two or more vertical series of coils, the coils of one series lying in one vertical plane, while the coils of the other series will be in planes approximately parallel to the plane of the first series. After the pipe has been bent in the manner described endwise pressure is applied thereto to force the adjacent coils of each series into or approximately into contact with each other, so that each vertical series will form a solid-walled cylinder, except where the pipe passes from one series to the next in or

out. The coil thus constructed is supported by the wings 4, as stated, and within the coil is placed a cylindrical shell 6, which is supported by the central standard 2, as shown in Fig. 1. Outside of the coil is placed a cylindrical shell 7, which extends down to and is supported by lugs 8<sup>a</sup>, projecting radially from the outer rim of the annular burner 8. This burner is arranged around the central post or standard and is provided with ears or lugs 9, whereby it can be attached to the standard. It will be observed that the burner is so located as regards the central post or standard that air can flow up between the post and burner; further, the shell 7 is so supported by the lugs 8<sup>a</sup> that air can flow in between the burner and the lower edge of the shell. The cylindrical shell 7 and the standard 2, with the shell 6, form a combustion-chamber having the burner 8 arranged at or near its lower end and the coil 5 in its upper portion. It will be observed that the cylindrical walls formed by the vertical series of coils divide the upper portion of the combustion-chamber into a series of annular flues, through which the products of combustion pass from end to end without liability of divergence, as the coils forming the walls of the flues are in such proximity as to practically prevent the flow of the products of combustion from one annular flue to another.

The upper end of the shell 7 is closed by a cap 10, having a flue-ferrule for connection with the chimney. A jacket 11 is arranged outside of the shell 7, between which and the jacket is placed non-conducting material to prevent loss of heat by radiation.

The supply-pipe 12 is preferably connected to the upper end of the coil 5, while the lower end of the latter is connected to the service-pipes of the house. As described in application Serial No. 565,843, filed on or about October 16, 1895, a movable abutment or piston 13<sup>a</sup> is arranged in the line of the water-supply pipe and adapted to be shifted by the flow of water therethrough. This movable abutment or piston is connected by suitable mechanism to a valve in the gas-supply pipe 14, which is connected to the mixer of the burner 8. As stated in the application referred to, the opening of a faucet in the house service-pipe will



so shift the abutment or piston that the latter will open the valve 13 and permit the flow of gas to the burner.

As shown in Figs. 4 and 5, the burner is made in the form of an annulus and divided horizontally into two sections for convenience of manufacture. The lower section of the burner is formed with an enlargement 15 for the reception of the mixer, which consists of a shell 16, having one end closed and having its side walls slitted for the escape of mingled gas and air, and having its opposite end partially closed by a nipple 17, having perforations in one end and its opposite end connected to the gas-supply pipe 14. As shown in Figs. 5 and 6, the outer end of the shell 16 is flared or enlarged, so as to form passages on opposite sides of the nipple 17 for the flow of air into the shell.

The burner for the pilot-light is formed on the upper section of the annular or main burner, and consists of a passage 18 in the wall of the upper section, forming a mixing-chamber, which is connected to the branch gas-pipe 19 by a nipple 20, having a contracted passage for the gas, and provided with perforations for the inflow of air, as shown in Figs. 4 and 5. The burner proper consists of a concavo-convex disk 22, fitting around the upper end of a nipple 23, connected to the mixing-chamber, and a flat disk or spreader 24, resting on the edges of the disk 22 and the upper end of the nipple, whose edges, and also those of the disk 22, are notched for the escape of gas and air. This burner is arranged within an annular rim 25, formed on the upper section of the main burner, and above the recess thus formed is placed a concavo-convex disk 26, the edges of which project slightly beyond and below the edge of the rim. The purpose of this construction is to deflect the flame down onto the main burner, and also to protect the flame of the pilot-light from currents of air, it being understood that combustion occurs within the chamber or recess formed by the rim 25 and its covering plate or disk. As shown in Figs. 1 and 4, the wall of the main burner, which forms the bottom of the combustion-chamber of the pilot-light, is perforated, so as to allow air to pass through the mixer of the main burner into such chamber to support combustion and also to allow mixed gas and air to flow through the chamber when the valve of the main burner is opened. As shown in Fig. 1, the branch pipe 19 for the pilot-light is provided with a regulating-valve 27, and is connected to the main supply-pipe 14 outside of the valve 28, regulating the flow of gas to the main burner.

It is characteristic of the form or construction of the heating-coil and its arrangement within the combustion-chamber that the products of combustion are brought into contact with approximately all parts of the coil regardless of the location of chimney or escape-flue with relation thereto.

It is also characteristic of the improvement that the flues formed by the coils are approximately equal in transverse dimensions, so that the resistance to the flow of the products of combustion through said flues will be approximately the same, and by reason of the proximity or practical contact of adjacent coils forming the several walls of the flues the products of combustion having entered either one of the flues will be compelled to continue through said flue to its upper end and cannot be caused to move transversely from one flue to an adjacent flue even if the draft in one flue be stronger than in the others.

I claim herein as my invention—

1. A heater for water consisting of a pipe arranged in two or more vertical series of coils, forming a continuous passage for water, the series of coils being separated from each other, and the adjacent coils of each series in or approximately in contact, thereby forming one or more annular flues or passages for the products of combustion, said flue or flues forming a continuation of the combustion-chamber, substantially as set forth.

2. In a heater for water, the combination of an annular combustion-chamber, a length of pipe arranged in said chamber in two or more vertical series of coils, so as to form a continuous water-passage and forming one or more annular flues for the products of combustion, and a burner located in the combustion-chamber, substantially as set forth.

3. A heater for water consisting of a pipe arranged in two or more vertical coils, separated from each other horizontally an approximately equal distance and having the coils of one series connected to the corresponding coils of adjacent series, and the adjacent coils of each series being in or approximately in contact, thereby forming one or more annular flues or passages for the products of combustion, substantially as set forth.

4. In a water-heater the combination of a base having a central post or standard forming the inner wall of the combustion-chamber, an annular burner supported by the post or standard, a shell supported by the burner and forming the outer wall of the combustion-chamber, and a coil of pipe arranged in the combustion-chamber, substantially as set forth.

5. In a heater for water, the combination of a main burner, a valve controlling the flow of gas to the main burner, and a burner for the pilot-light having a limited, independent supply-pipe and communicating with the main burner, substantially as set forth.

In testimony whereof I have hereunto set my hand.

JOHN CHARLES BECKFIELD.

Witnesses:

DARWIN S. WOLCOTT,  
M. S. MURPHY.