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ELECTRIC HEATER.  
APPLICATION FILED SEPT. 3, 1910.

Patented Feb. 28, 1911.

2 SHEETS—SHEET 1.

985,344.

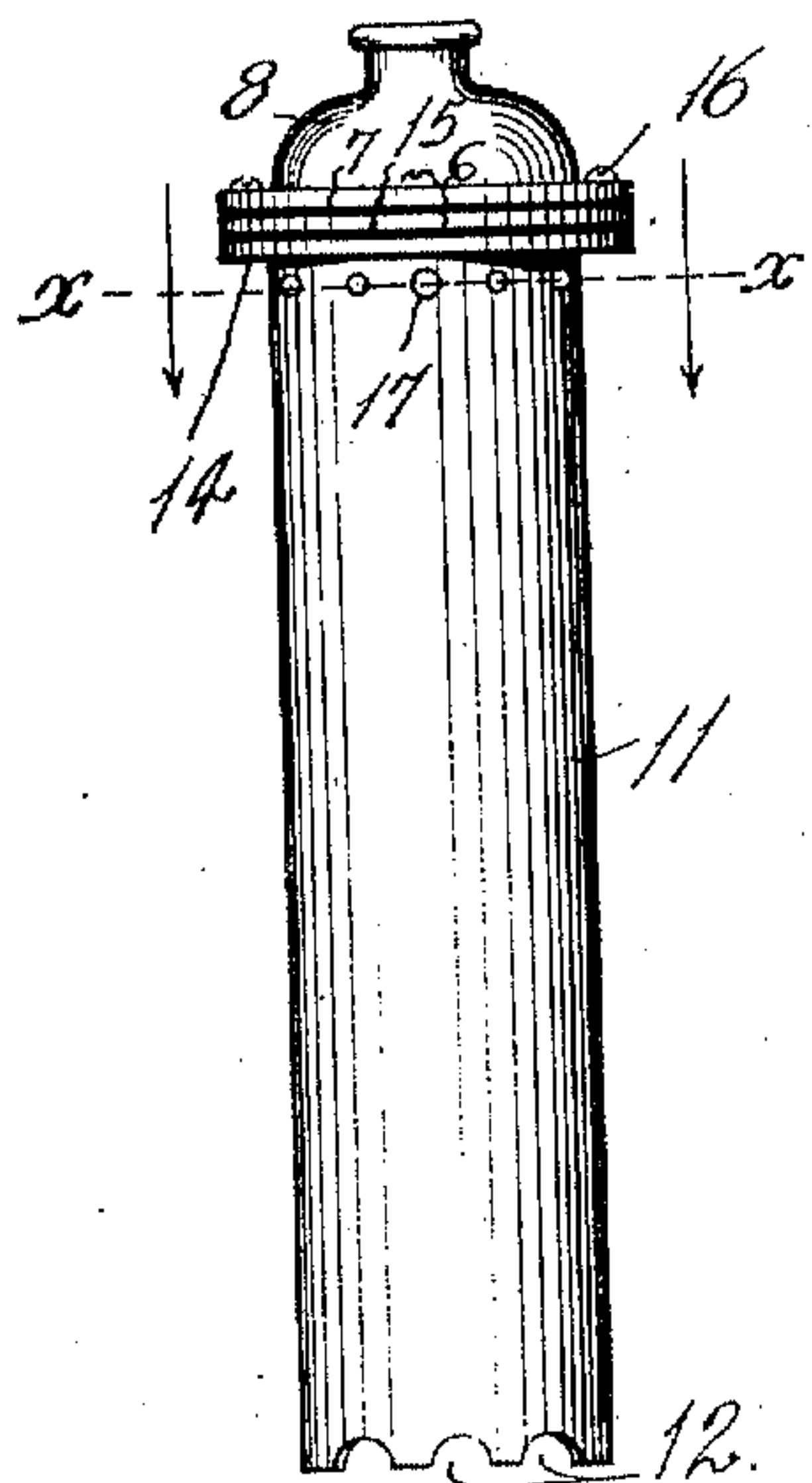


Fig. 1.

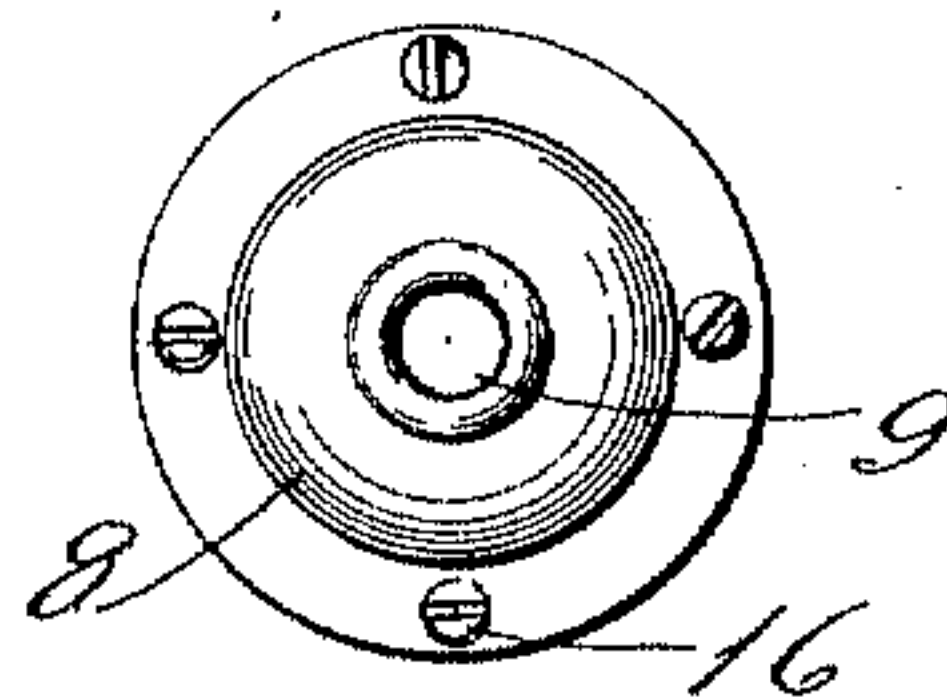


Fig. 2.

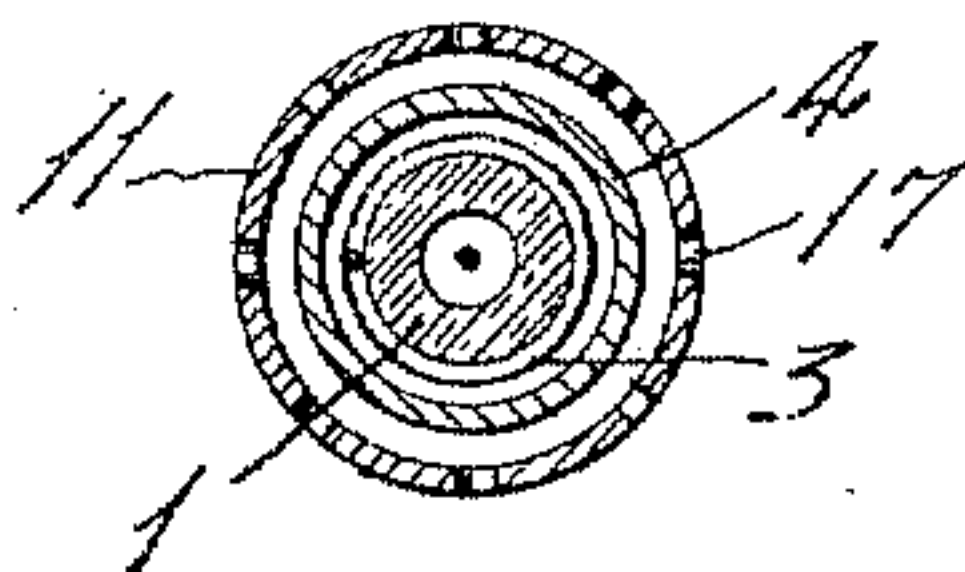


Fig. 4.

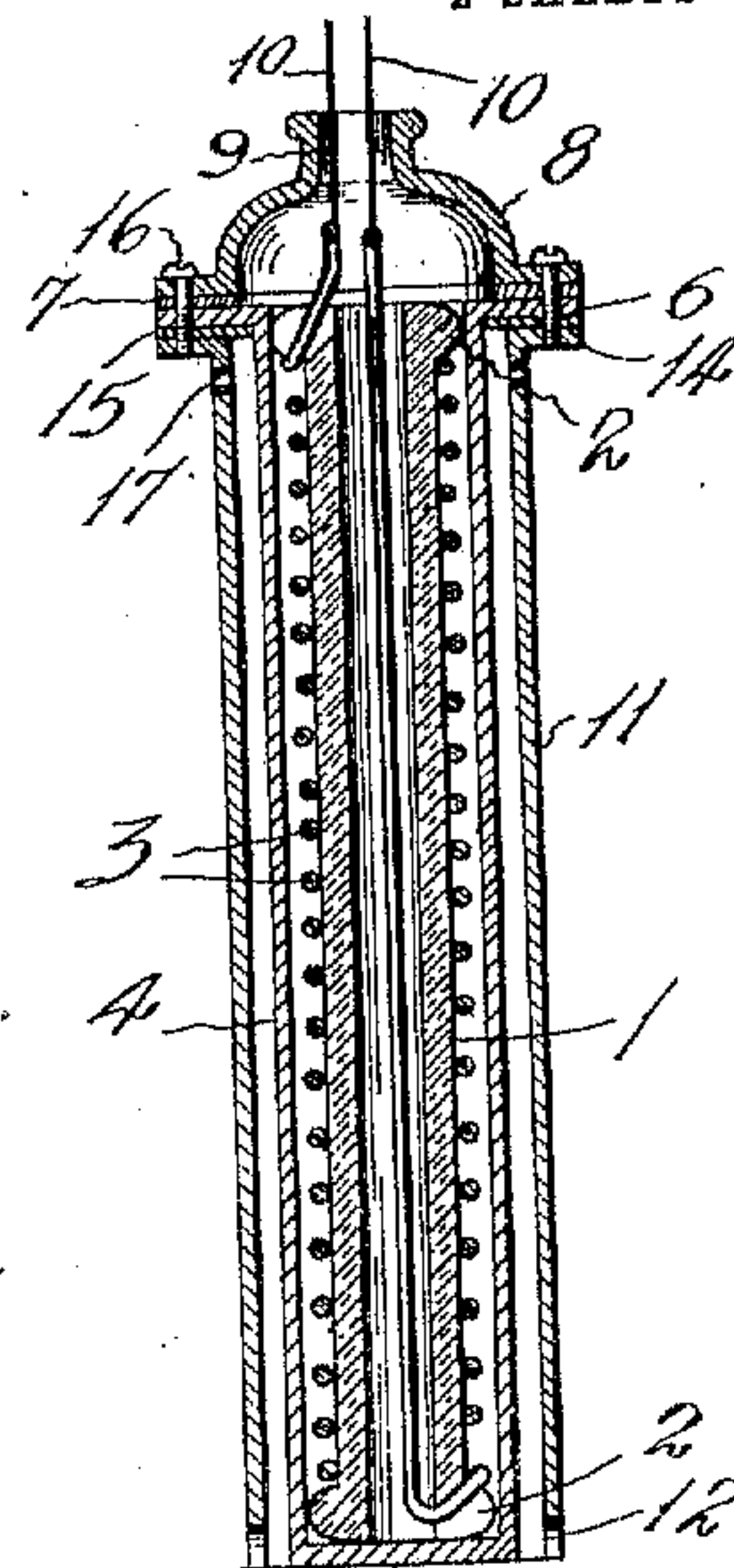


Fig. 3.

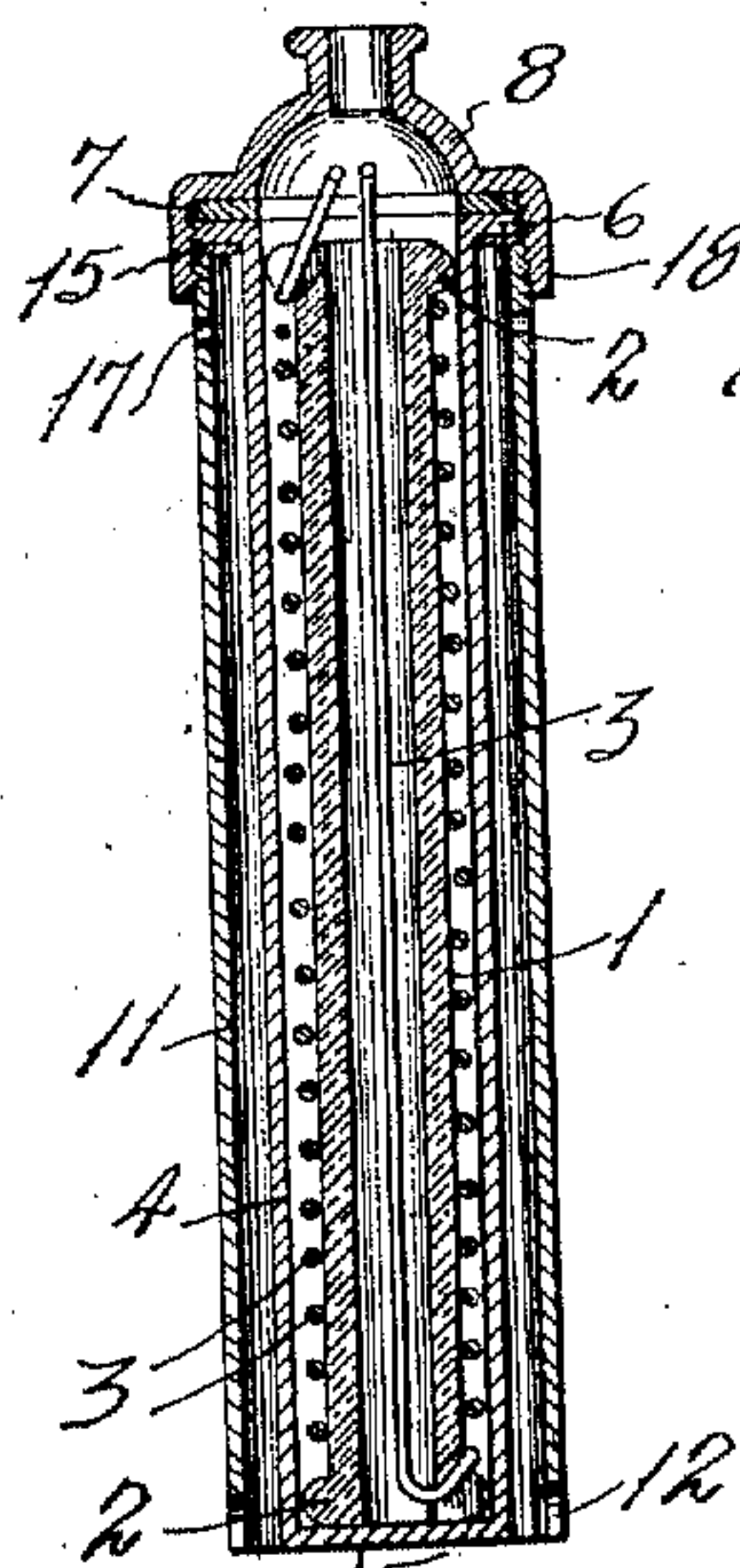


Fig. 5.

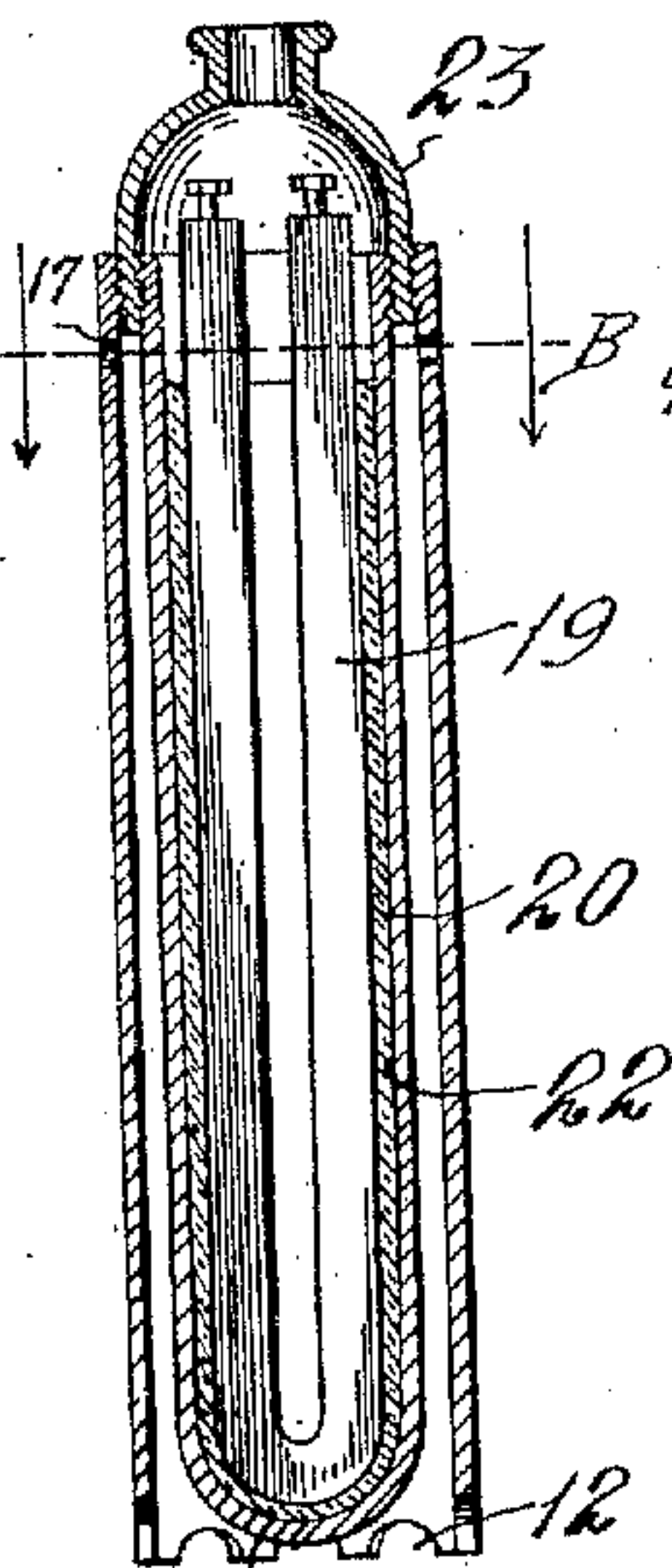


Fig. 6.

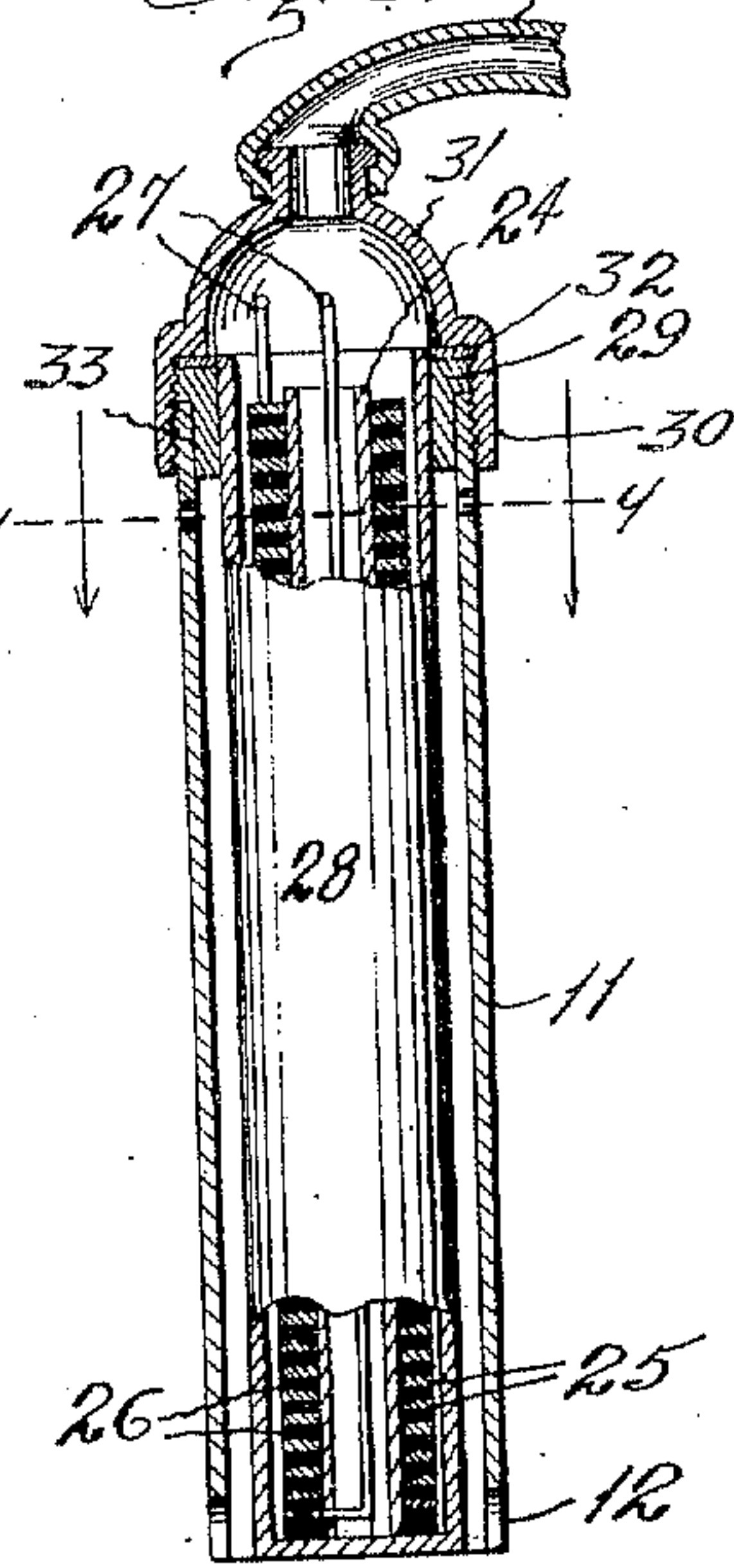


Fig. 8.



Fig. 7.

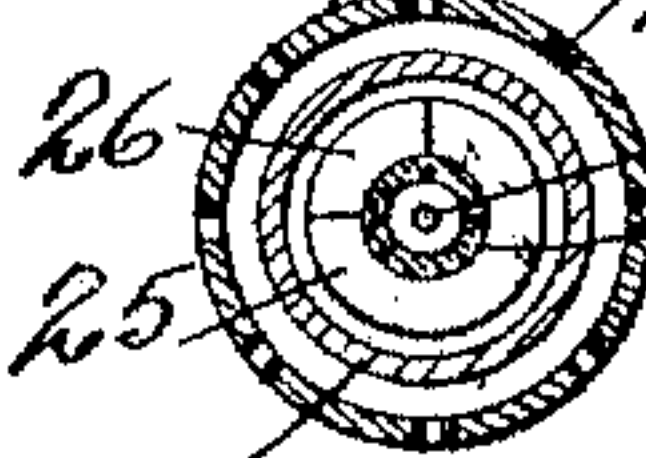


Fig. 9.

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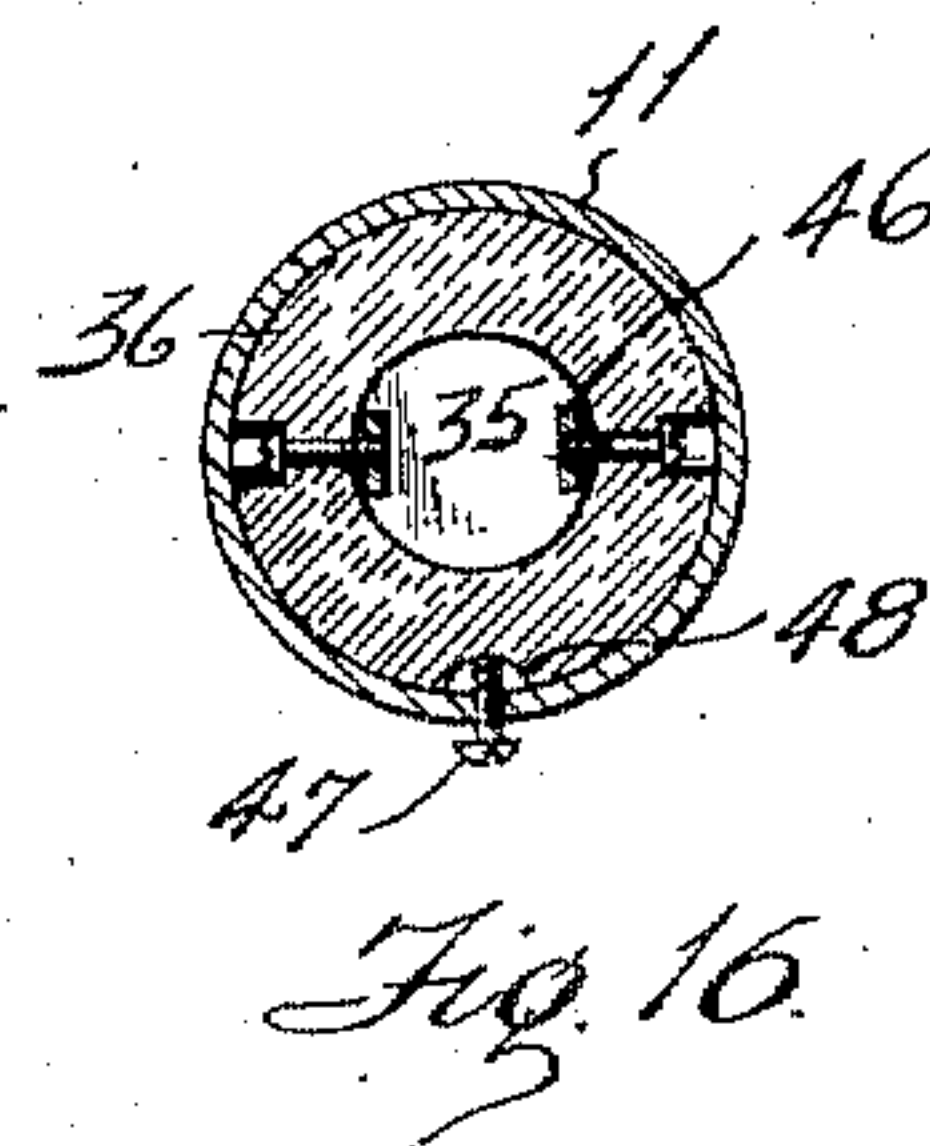
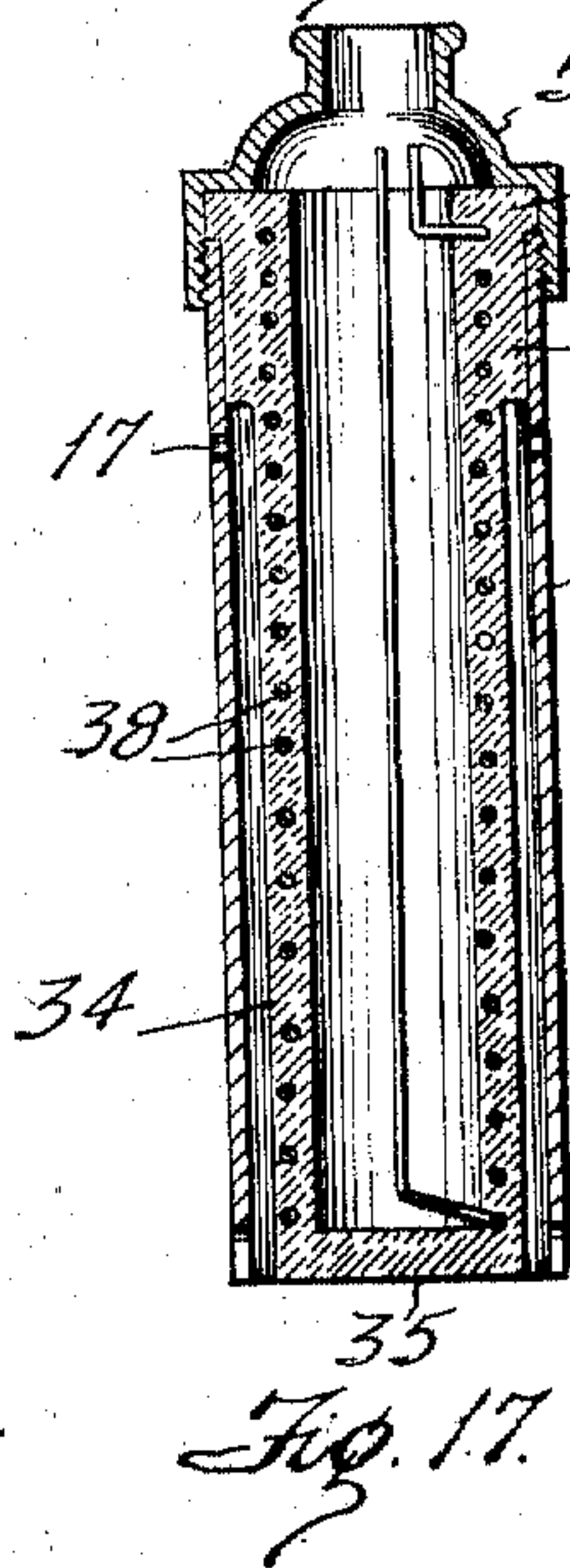
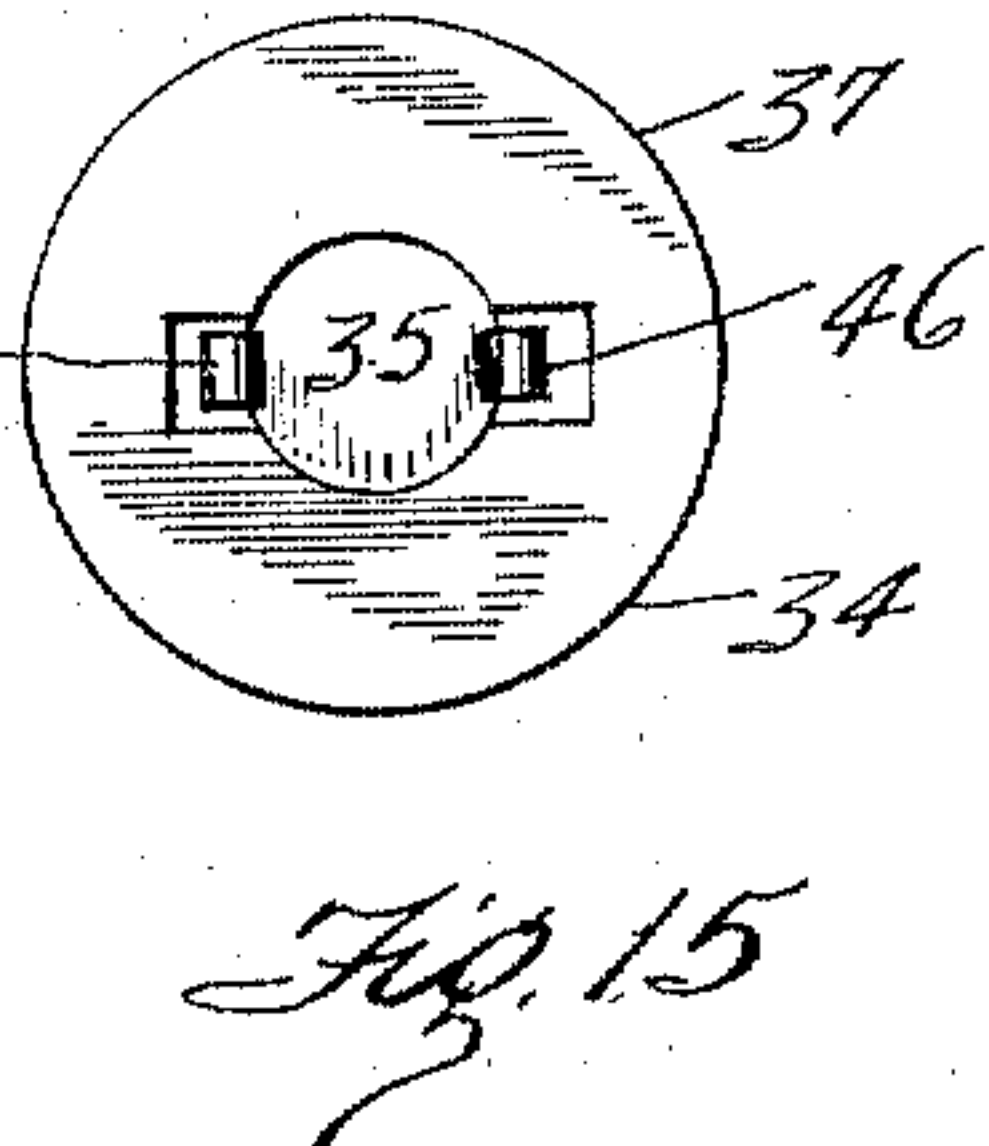
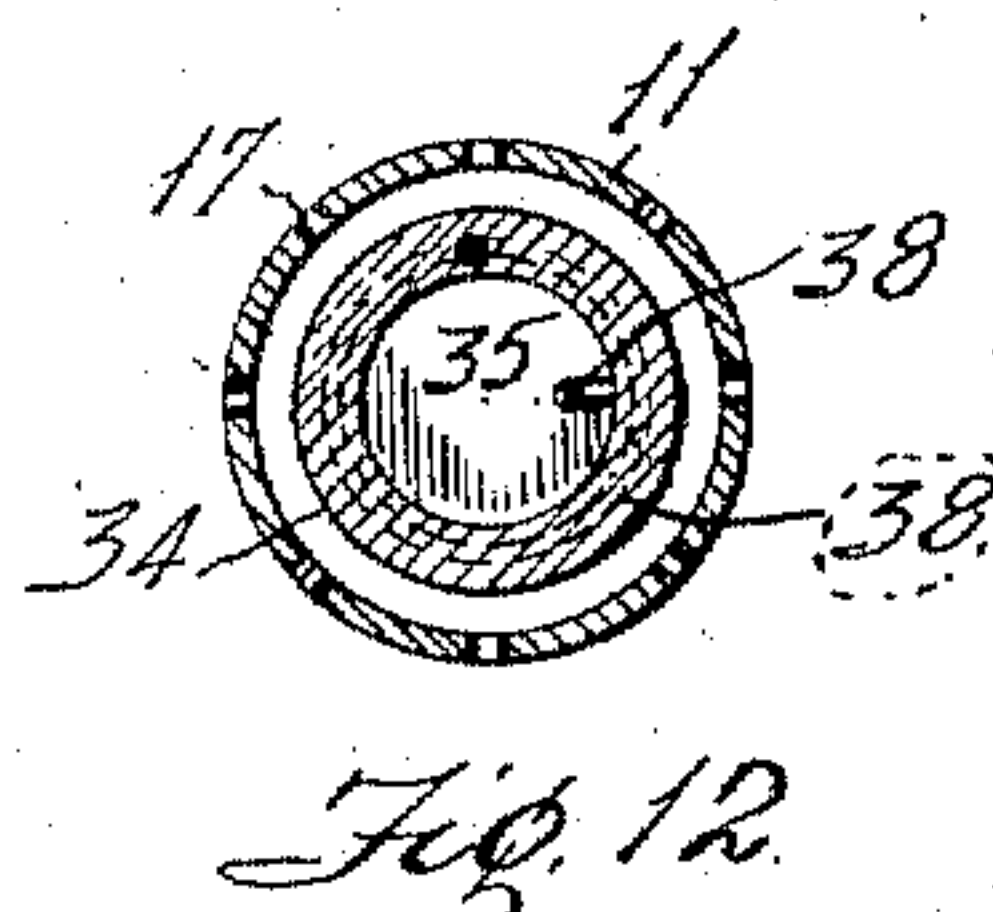
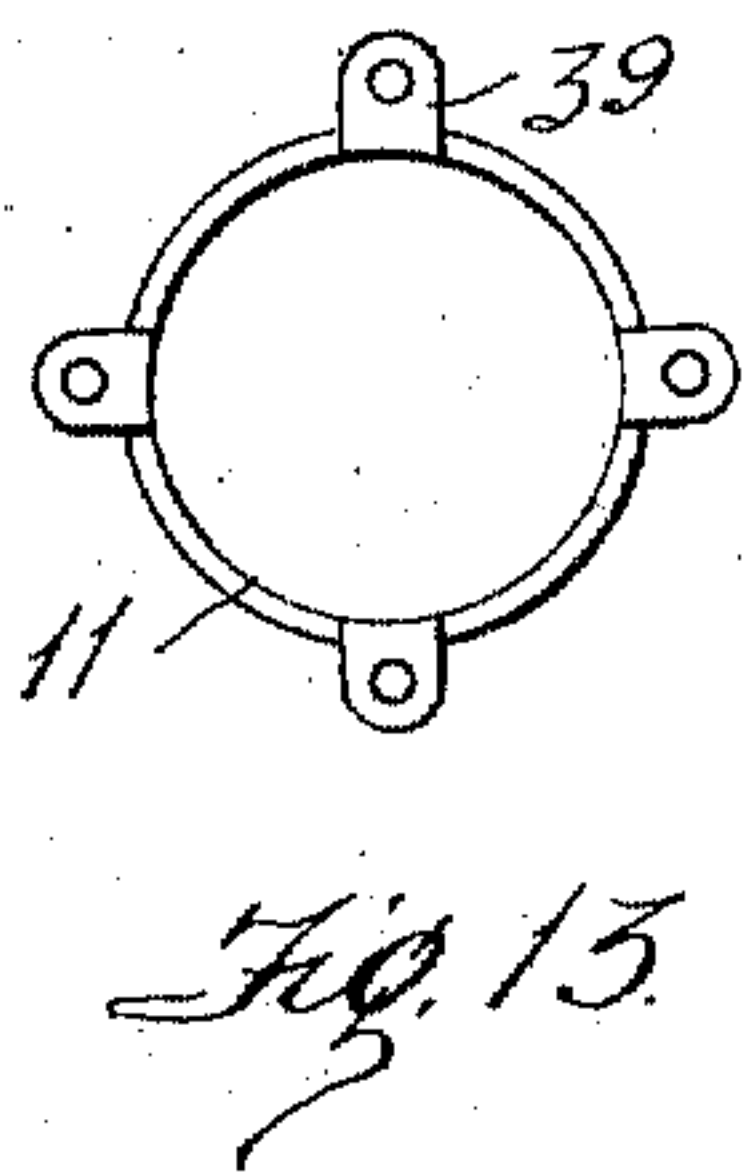
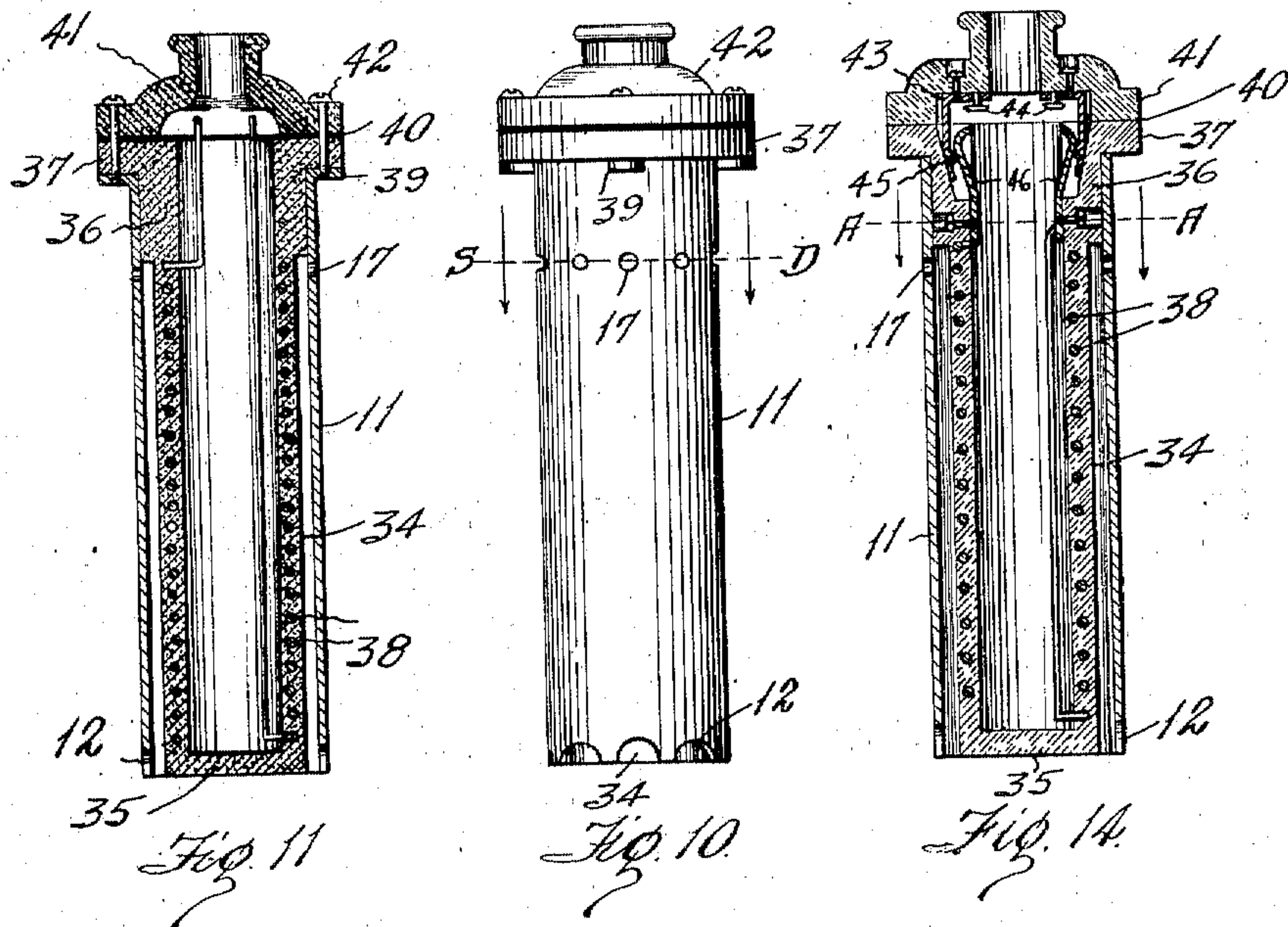
ELECTRIC HEATER

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# UNITED STATES PATENT OFFICE.

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## ELECTRIC HEATER.

985,344.

Specification of Letters Patent.

Patented Feb. 28, 1911.

Application filed September 3, 1910. Serial No. 580,322.

*To all whom it may concern:*

Be it known that we, ARTHUR H. HARVIE and WILLIAM G. DAVIS, citizens of the United States, residing at Dallas, in the county of Dallas and State of Texas, have invented certain new and useful Improvements in Electric Heaters, of which the following is a specification.

This invention relates to new and useful improvements in electric heaters.

The object of the invention is to provide a heater embodying a heating element inclosed within a suitable structure whereby the element is protected and insulated from exterior fluids or body.

A further object resides in the provision of a wall or sleeve surrounding the structure which incloses the heating element so as to provide a comparatively narrow space therebetween, the sleeve having openings near its upper and lower end whereby fluids will be caused to enter the lower end of the sleeve and rise therein as heated. Also provision is made whereby a fluid entering the sleeve comparatively cold will be heated as it rises in the sleeve and ejected from the openings at the upper end of the sleeve, a circulation of the fluid in which the heater is immersed thus being had.

Finally the object of the invention is to provide means of the character described that will be strong, durable, efficient, and easy of operation, simple and comparatively inexpensive to construct, and also in which the several parts will not be likely to get out of working order.

Without limiting the invention except within the scope of the claims appended hereto, we have, in order to enable those skilled in the art to build a heater embodying this invention, shown several forms of the invention which are described in the following specification and illustrated in the accompanying drawings, wherein:

Figure 1. is an elevation of one form of the heater, Fig. 2. is a plan view of the same, Fig. 3. is a vertical section of the same, Fig. 4. is a horizontal cross sectional view on the line  $x-x$  of Fig. 1, Fig. 5. is a vertical sectional view of another form, Fig. 6. is a vertical sectional view of another form, Fig. 7. is a horizontal cross sectional view on the line B-B of Fig. 6, Fig. 8. is a vertical sectional view of still another form with a por-

tion in elevation, Fig. 9. is a horizontal cross sectional view on the line Y-Y of Fig. 8, Fig. 10. is a view in elevation of a modified form embodying a plastic structure surrounded by a metal sleeve, Fig. 11. is a vertical section of the same, Fig. 12. is a horizontal cross sectional view on the line S-D of Fig. 10, Fig. 13. is a plan view of the sleeve shown in Figs. 10 and 11, Fig. 14. is a vertical sectional view of a form similar to that shown in Fig. 11 and showing a particular form of electrical contacts and fastening, Fig. 15. is a plan view of the form shown in Fig. 14 with the cap removed, Fig. 16. is a horizontal cross sectional view on the line A-A of Fig. 14, and Fig. 17. is a vertical sectional view of another modification embodying a plastic structure.

In Figs. 1 to 5 of the drawings the numeral 1 designates a plastic core or spool which is preferably formed of porcelain although it is to be understood that the core need not necessarily be formed of plastic material and any suitable insulating material may be used. The spool is provided at each end with annular beads or flanges 2. A suitable resistance wire 3 is wound about the spool and one end of the wire carried up through the center of the spool so that both ends will terminate thereabove.

The spool and wire constitute a heating element and it is obvious that the heating element may be made in various forms. While the heating element is one of the necessary parts of the invention, its particular construction and form may be varied to such a degree as to leave the exact construction and form to the judgment of the builder and the purpose for which the heater is to be used. We have shown herein some of the many forms of heating elements which may be employed.

Referring to Figs. 1 to 4 inclusive it will be seen that the spool or heating element is inserted in a tubular casing or receptacle 4 having a bottom 5. The casing terminates at its upper end in an outwardly directed flange 6. A gasket 7 is placed on the flange and in turn receives the flanged portion of a cap 8 having an entrance 9 for electrical wires 10 which are suitably fastened to the ends of the resistance wire 3.

One of the particular and novel parts of this invention is a sleeve or jacket 11 which



is disposed about the casing 4 in concentric relation thereto. At the lower end of the sleeve, which terminates substantially flush with the bottom 5 of the casing, a plurality of openings 12 are formed. At its upper end the jacket has an outwardly directed flange 14 between which and the underside of the flange 6 a gasket 15 is interposed. The greatest diameters of the flanges 6 and 14, the gaskets 7 and 15 and the flanged portion of the cap 8 are equal and when assembled as shown in Figs. 1 and 3 will have their outer peripheries substantially flush, thus producing a neat appearance. The parts just described are fastened together by screws 16 having their lower ends engaging the flange 14 and permitting the parts to be drawn closely together and provide a water-tight joint.

Just below the flange 14 a plurality of holes 17 are formed in the sleeve. These holes are considerably smaller than the openings 12. It will be noted that the internal diameter of the jacket is greater than the external diameter of the casing 4 and a narrow annular space or passage is provided between the said parts.

When the heater is placed in the liquid and current passed over the resistance wire 3, heat will be radiated, the jacket 4 and sleeve 11 will become extremely hot. That portion of the fluid which is standing in the passage between the casing and jacket, when heated and particularly to the point of boiling, will rise in the passage and escape through the openings 17. In fact the fluid will be ejected or sprayed through the openings 17 with considerable force and the action is very similar to that had in certain kinds of coffee percolators. It is obvious that as the water or other fluid in the passage rises and escapes its place is taken by water or fluid from the receptacle in which the heater is immersed, entrance being had through the openings 12. The fluid which enters the jacket through the openings 12 being taken from the lowest point has the lowest temperature and is displaced by the fluid ejected through the openings 17 whereby a constant circulation is had which will cause the fluid to be expeditiously heated.

In Fig. 5 the flange 14 is omitted while the flange 6 of the casing 4 has its outer periphery flush with the outer surface of the jacket 11. The outer periphery of the flange 6 and the adjacent end of the jacket are screw threaded so as to engage in the internally screw threaded flange 18 of the cap 8. The gaskets 7 and 15 are also employed in this form and it is obvious that the parts may be securely fastened together.

In Figs. 6 and 7 a heating element 19 composed of carbon and graphite is shown. This element is U-shaped with the extremities close together and directed upward. The

element is placed in a casing 20 which has a rounded bottom 21. In the casing a lining 22 of mica or other insulating material is disposed and holds the heating element out of contact with the casing. At its upper end the casing is screw threaded into a cap 23. The jacket 11 without the flange is screw threaded onto the cap 23 and the passage is provided between the jacket and the casing.

Figs. 8 and 9 illustrate a form comprising a tubular core 24 of insulating material about which strips of resistance material and insulating material 25 and 26 respectively are wound in alternate relation. Such an arrangement causes the individual coils of the resistance material to be insulated from each other. Terminal wires 27 are connected to opposite ends of the resistance material. The heating element is disposed in a casing 28 having a shouldered collar 29 surrounding its upper end. The collar is screw threaded into the depending flange 30 of a cap 31 and is drawn against a gasket 32 disposed in the cap. The collar below its shouldered portion is gradually contracted toward its lower end as indicated at 33 and receives the jacket 11 which is substantially the same form as is shown in Fig. 5 and is screw threaded at its upper end into the flange 30. The upper end of the jacket receives the portion 33 and a water-tight joint is provided when the jacket is drawn on the collar by its screw threaded engagement in the flange 30.

Figs. 10 to 13 inclusive show a form in which the heating element and the casing inclosing same are combined. In this form a tubular member 34 composed of plastic material such as porcelain is employed. This member has a bottom 35 and at its upper end a shouldered portion 36 and an outwardly directed flange 37. A suitable resistance wire 38 is embedded in the member being disposed in the form of a coil. The porcelain completely surrounds and conceals the coiled portions of the wire thus insulating and protecting the same. The terminals of the wire are carried up through the center of the member and suitably connected to electric wires supplying current. The member is surrounded by the jacket 11 which fits snugly about the shouldered portion 36 and is provided with outwardly directed ears 39 impinging the underside of the flange 37. The passage between the jacket and the member together with the openings 12 and holes 17 permits the circulation of the fluid the same as in the other form. A gasket or washer 40 is placed on the flange 37 and in turn receives the flanged portion of a porcelain cap 41. Screws 42 passed through the cap, the washer 40, the flange 37 and the ears 39 fasten the parts together whereby a tight joint is formed.

A slightly modified form is set forth in



Figs. 14 to 16 inclusive. Substantially the same porcelain member and resistance wire 34 and 38 respectively are employed. Substantially the same cap and washer 41 and 40 respectively are also employed. The main differences in this form are the fastening of the jacket, the fastening of the cap on the member and the manner of connecting the current supplying wires with the resistance wire. In the cap angular metal clips 43 are secured on each side and provided with binding posts 44 with which the current supplying wires are connected. The depending portions of the clips extend into the upper end of the member and are provided near their lower ends, each with an inwardly extending boss 45. Spring arms 46 secured in the member have connection with the wire 38 extend upward and are bent outward so that the bosses 45 will engage the same as shown in Fig. 14 and hold the cap and member 34 together. The cap and member may be readily separated by merely pulling the same apart. The jacket 11 is in the form of a straight tube and is fastened about the member by a screw 47 threaded in the jacket and engaging in a notch 48 of the portion 36 of the member.

Fig. 17 shows another porcelain form in which the member 34 has instead of the flange 37 a second shouldered portion 49 above the shouldered portion 36. The portion 49 has a projection equal to the thickness of the jacket 11 and fits snugly into the flanged portion 50 of a metal cap 51. The jacket has screw threaded engagement with the portion 50 and bears against the shoulder 49.

It is obvious that any of the several forms of heater herein shown may be immersed in a vessel containing a fluid or food and the same heated or cooked as the case may be. In the cooking of foods it will of course be a circulation of only the liquid portion. It is to be understood that the circulation is not depended upon for the entire heating as a great amount of heat will radiate from the heater and the metal parts will remain extremely hot for some time after the current is turned off.

When it is desired to completely submerge the heater a flexible hose 52 as shown in Fig. 8 may be engaged with the cap as shown in Fig. 8 and the current supplying wires passed through this hose. The hose should be long enough to extend above the level of the fluid in which the heater is submerged so as to prevent the fluid from entering the

cap. It might be well to mention that in every form the jacket and the cap are either insulated from or have no connection with the resistance wire or material nor can the fluid which is being heated come into contact with the resistance wire or material and become charged with electricity as is the case where the wire or resistance material is exposed to the fluid.

What we claim is:

1. In an electric fluid heater, a casing having a sealed bottom, an electrical resistance material disposed in the casing out of contact therewith, a jacket greater in diameter than the casing surrounding the same so that a vertical annular space is provided between the jacket and casing, the jacket having openings near its upper end and provided with larger openings at its lower end, the wall of the jacket being imperforate between the upper and lower openings, and a cap into which the jacket is inserted.

2. In an electric fluid heater, a casing having a sealed bottom, an electrical resistance material disposed in the casing out of contact therewith, a cylindrical jacket greater in diameter than the casing surrounding the same so that a vertical annular space is provided between the jacket and casing, the lower end of the jacket being entirely open and unobstructed, the jacket also having openings near its upper end and provided with larger openings at its lower end, the wall of the jacket being imperforate between the upper and lower openings, and a cap into which the jacket is inserted.

3. In an electric fluid heater, a casing having a sealed bottom, an electrical resistance material disposed in the casing out of contact therewith, a cylindrical jacket, greater in diameter than the casing, surrounding the same so that a vertical annular space is provided between the jacket and casing, the lower end of the jacket being entirely open and unobstructed, the jacket also having openings near its upper end and provided with notches in its extreme lower end, the wall of the jacket being imperforate between the openings and the notches, and a cap into which the jacket is inserted.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

ARTHUR H. HARVIE.  
WILLIAM G. DAVIS.

Witnesses:

L. E. NOACK,  
Z. M. DUCKWORTH.