

No. 698,202.

Patented Apr. 22, 1902.

J. HOWDEN.
STEAM SUPERHEATER.

(Application filed Oct. 31, 1901.)

(No Model.)

3 Sheets—Sheet 1.

Fig. 1.

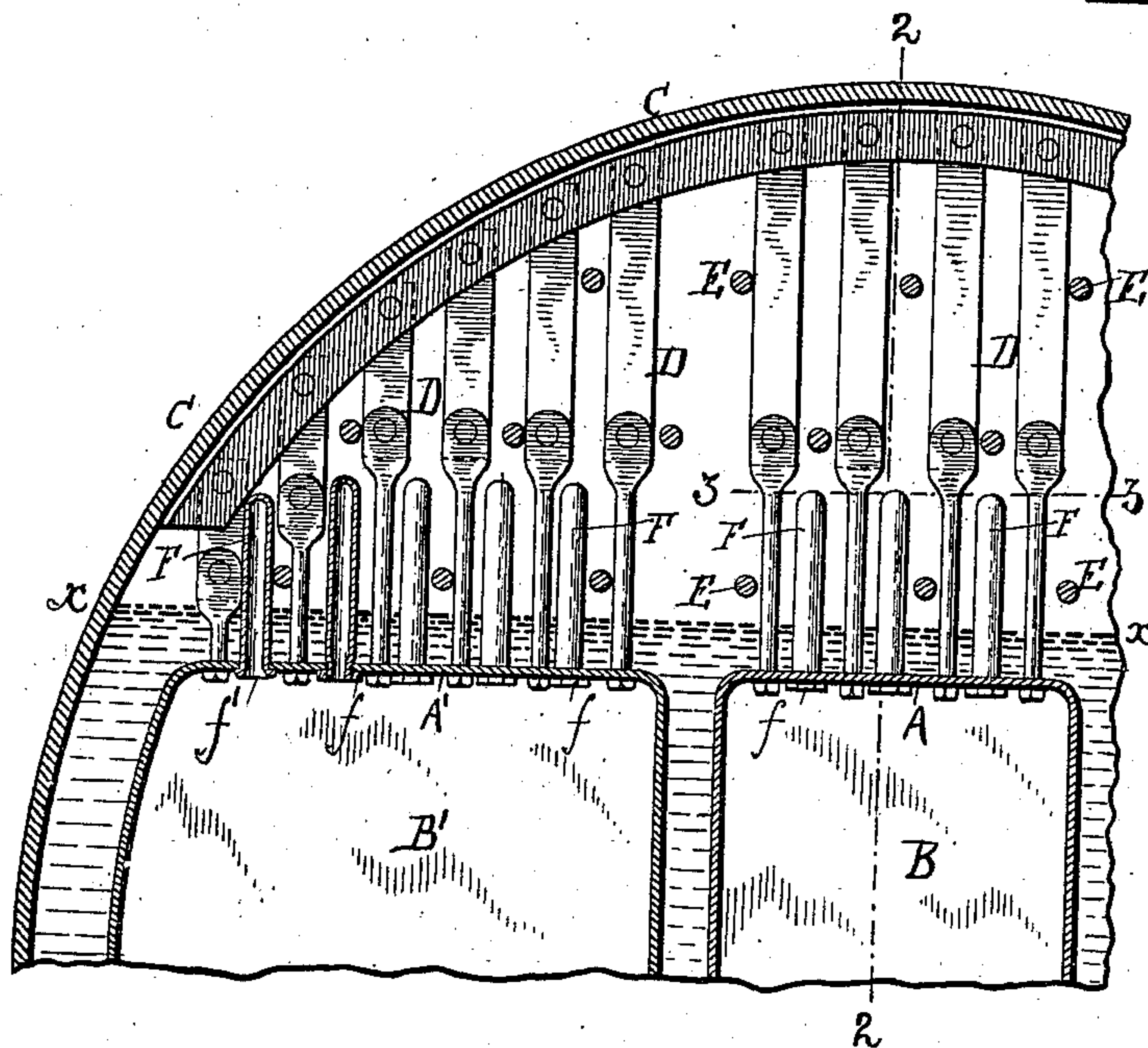


Fig. 2.

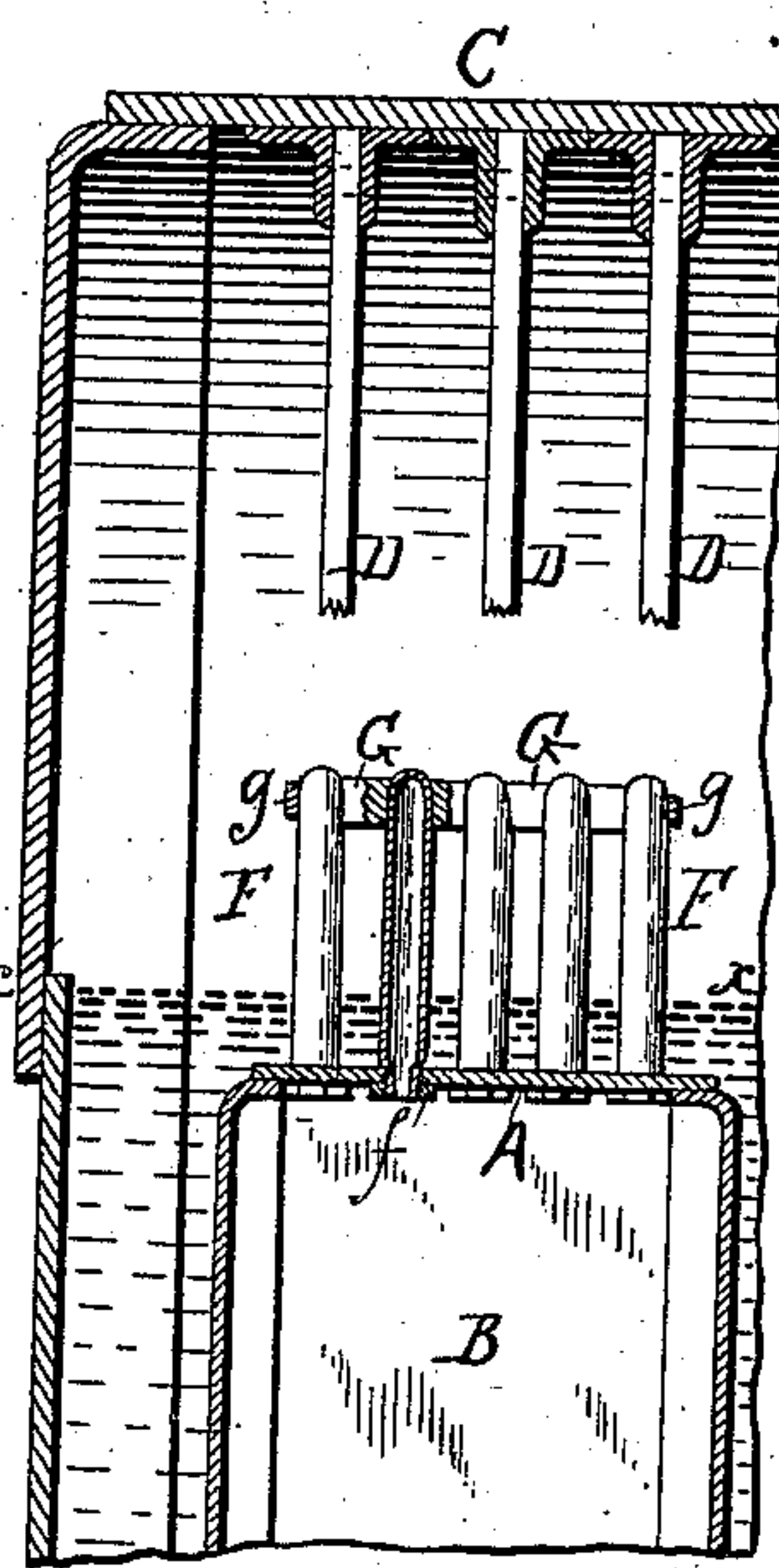


Fig. 3.

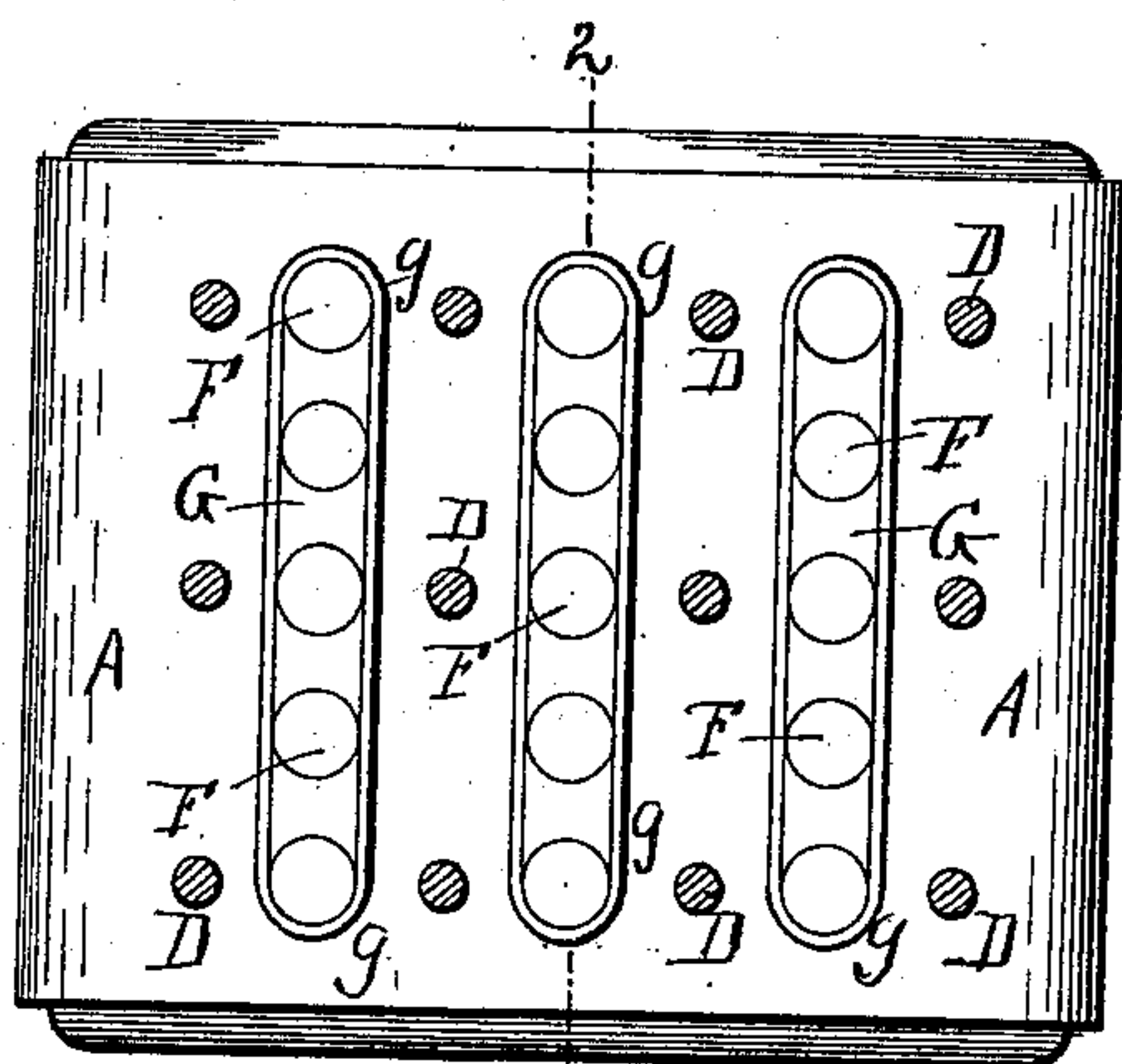
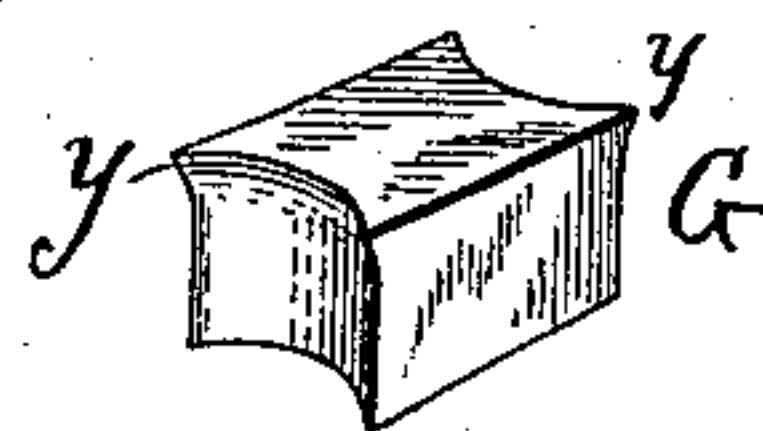


Fig. 4.



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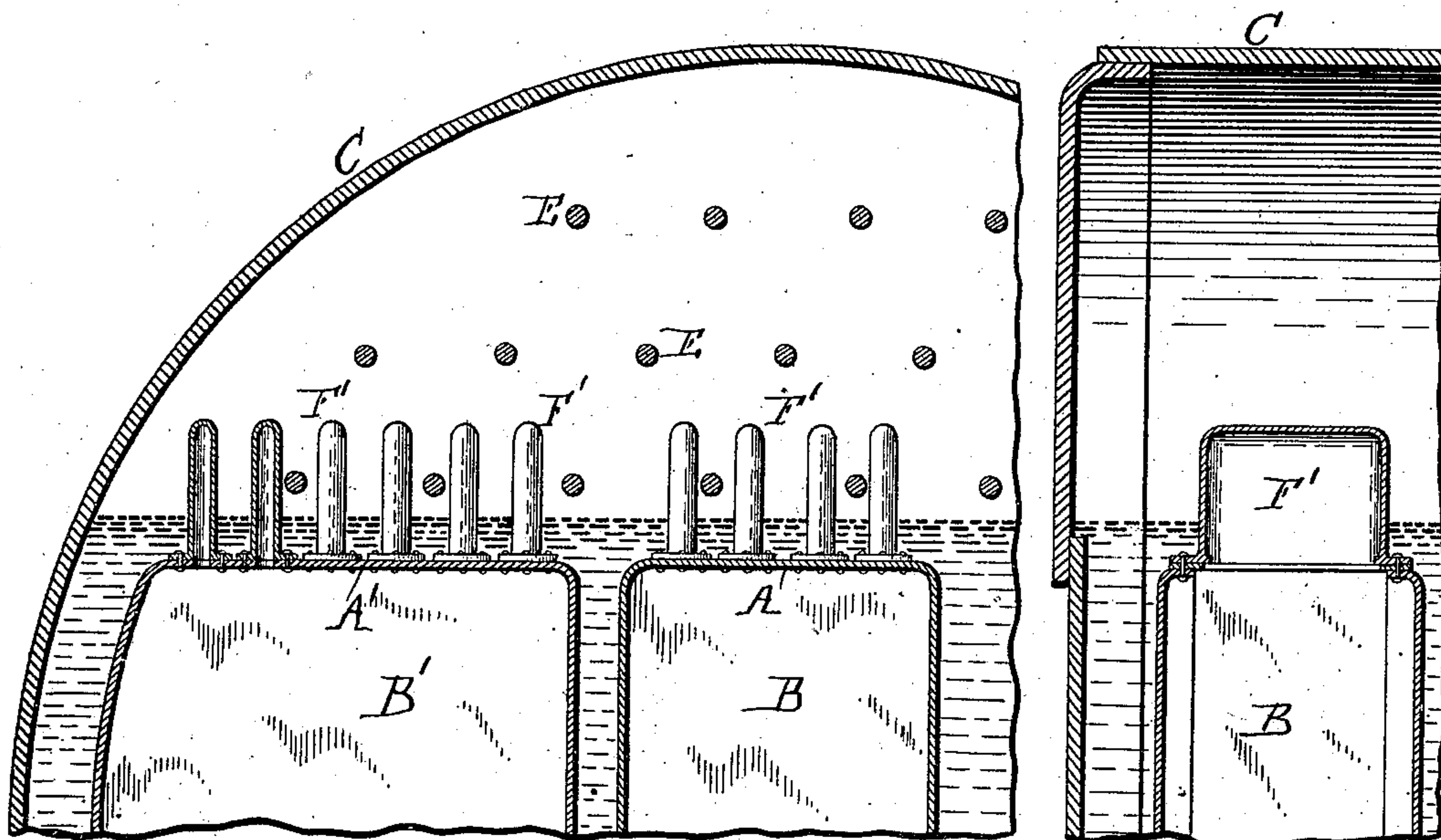


Fig. 5.

Fig. 6.

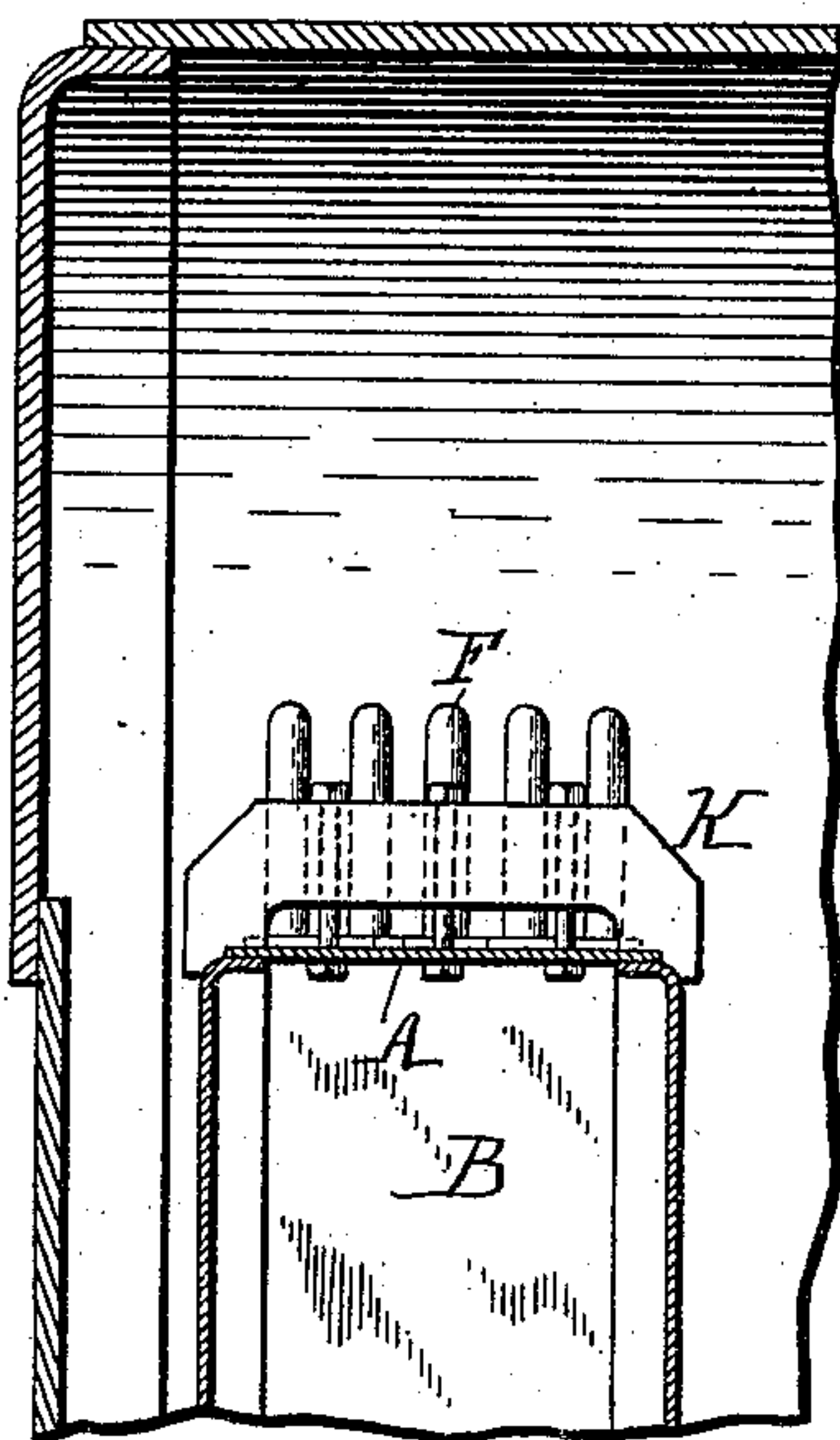


Fig. 9.

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3 Sheets—Sheet 3.

FIG. 8.

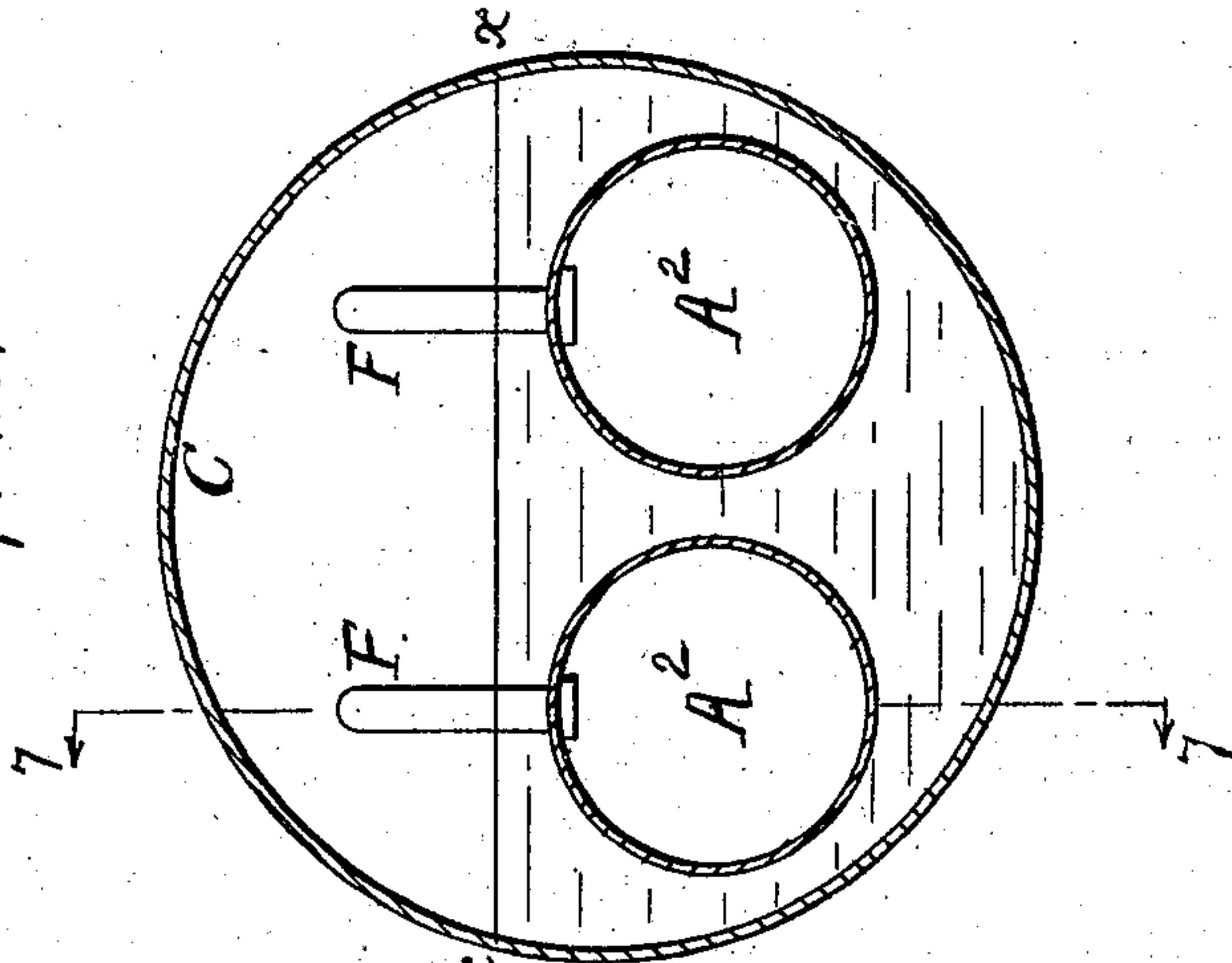
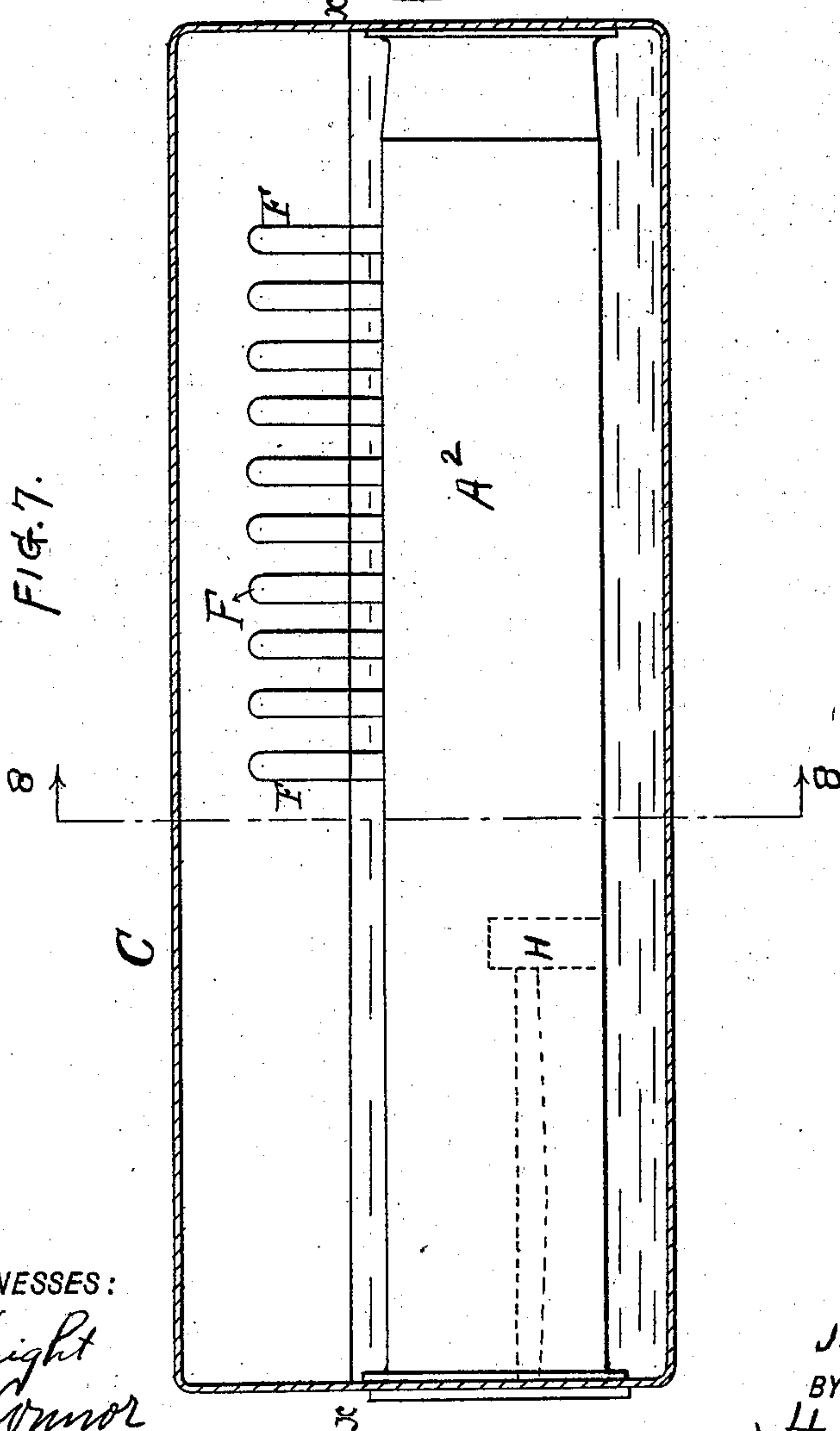


FIG. 7.



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UNITED STATES PATENT OFFICE.

JAMES HOWDEN, OF GLASGOW, SCOTLAND.

STEAM-SUPERHEATER.

SPECIFICATION forming part of Letters Patent No. 698,202, dated April 22, 1902.

Application filed October 31, 1901. Serial No. 80,682. (No model.)

To all whom it may concern:

Be it known that I, JAMES HOWDEN, a subject of the King of Great Britain and Ireland, residing in Glasgow, county of Lanark, Scotland, have invented Improvements in Steam-Superheaters, of which the following is a specification.

The object of my invention is to insure the superheating of steam in a safe and simple manner by means of the fire-gases while in connection with the main structure of the boiler and to do away with the trouble and danger arising from the employment of the usual superheating means external to the boiler and in which thin tubes exposed to the heat of waste gases, cocks, valves, and numerous joints are commonly found. The common forms of superheaters are also objectionable because of the extra space they require and because of their short life.

I accomplish my object and secure a simple, effective, and durable superheating means by affixing to the top plates of the combustion-chamber of a stationary, marine, or locomotive boiler of the fire-tube or flue type pockets open at their lower ends to the combustion-chamber, but closed above and projecting above the water-level into the steam-space, as hereinafter described.

In the accompanying drawings, Figure 1 is a transverse section of a part of a boiler sufficient to show my invention. Fig. 2 is a section on the line 2 2, Figs. 1 and 3. Fig. 3 is a sectional plan view of part of Fig. 1 on the line 3 3, Fig. 1. Fig. 4 is a perspective view of a spacing-piece hereinafter referred to. Figs. 5 and 6 are views similar to Figs. 1 and 2, of a modification. Fig. 7 is a longitudinal section of another type of boiler embodying my invention; and Fig. 8 is a transverse section on the line 8 8, Fig. 7. Fig. 9 is a view of another modification.

Referring to Figs. 1 to 4, A A' are the top plates of the combustion-chambers B B', which may be of any suitable construction and stayed in any suitable manner. In the figures referred to the fire-boxes are shown as stayed from the shell C of the boiler by vertical suspension straps and bolts D D. Longitudinal stay-rods E are also shown in Fig. 1; but I wish it to be understood that any convenient staying means may be used.

A simple and efficient manner of making my improved superheating-pockets is to use strong tubes F of suitable diameter and to fit them into the tops of the combustion-chambers in any suitable way, these tubes being open at their lower ends to the combustion-chambers, but closed at their upper ends, where they project a suitable distance above the water-level x into the steam-space of the boiler. The tubes may be affixed in place in the tops of the combustion-chambers in any convenient way—as, for instance, by screw-nuts f , as illustrated at the right of Fig. 1 and in Fig. 2, or by expanding the open ends of the tubes into place in the well-known way of fixing boiler-tubes in the tube-sheets, such construction being illustrated at f' at the left of Fig. 1. When the boiler is at work, the radiant heat from the combustion-chamber passes upward into the interior of these heating tubes or pockets F, and the parts of these heating-pockets which pass through the water above the top plates of the combustion-chambers act as water-heating surfaces and add to the evaporating power of the boiler, while the heat in the tops of the pockets above the water-level gives the required superheating effect upon the steam. As no currents of gases pass through these pockets, they are preserved from the deteriorating effects of fire-gases, and as the radiant heat in the pockets is somewhat reduced in temperature by having to first pass through the parts of the pockets surrounded by the water below the water-level of the boiler the temperature of the parts of the pockets in the steam-space is never excessive. The constant renewal also of the saturated steam over and around the superheating-pockets while steam is being generated in the boiler keeps the rest of the upper parts of the pockets not greatly above the temperature of the superheated steam taken from the boiler.

Another advantage of my construction of superheater is that in the event of the stoppage of the withdrawal of steam from the boiler these superheating-pockets being in contact with the whole volume of the steam as well as with the water of the boiler cannot be easily overheated or very quickly raised above the desired normal temperature of the superheated steam, as is the case with super-

heaters detached from the boiler and furnished with small tubes.

When my superheating-pockets are made in the form of tubes, as described, although placed singly, they can be utilized entirely or in part as girder-stays for the flat tops of the combustion-chambers. The tendency of the interior pressure of the boiler would be to bend downward the flat plates of the combustion-chamber and so cause the rows of heating-tubes to come closer to each other at their upper ends. To prevent this collapsing tendency, spacing-pieces of metal G, Fig. 4, may be fitted between adjacent tubes near the upper ends of the latter, as shown in Fig. 2 and on the right of Fig. 3. The spacing-pieces G, as shown in Fig. 4, have their ends suitably curved to fit the tubes and have sufficient overhang at the upper edges *y* to be supported by the curved tops of the tubes. By means of these spacing-pieces each row of tubes becomes a stay-girder. A securing strengthening-band *g* may be put around the tubes and space-pieces, as seen in Figs. 2 and 3. The ordinary plate stay-girders K may be used in conjunction with these tubes, if desired, as shown, for instance, in Fig. 9.

Another form of my superheating-pockets is illustrated in Figs. 5 and 6, such pockets in this case taking the form of strong flat box-like vessels F', extending in length, Fig. 6, nearly the width of the flat top of the combustion-chamber taken lengthwise of the boiler. Each box F' extends, like the tubes F, several inches above the highest water-level of the boiler. These boxes are preferably fixed by flanges riveted to the top plates of the combustion-chambers. The boxes may be made of steel or other metal casting or welded or stamped plates and of a section as thick as is necessary for the maximum pressure of steam. These boxes F' at the same time that they form superheating-pockets act as girder-stays for the tops of the combustion-chambers; but where desired the ordinary girder-stays may be used in conjunction with them.

In applying my invention to a flue-boiler of, say, the Galloway or Lancashire type I prefer to make the superheating-pockets of

tubes, as in Figs. 1, 2, and 3, and to fix the tubes F to the tops of the flues or combustion-chambers A² back of the bridge-walls H, as indicated in Figs. 7 and 8.

I claim as my invention—

1. The combination of the combustion-chamber of a steam-boiler, with superheating-pockets projecting from the top of the combustion-chamber up into the steam-space of the boiler, substantially as described.

2. The combination of the combustion-chamber of a steam-boiler with superheating-pockets fitted to the top plates of the combustion-chamber, and open at their lower ends to said combustion-chamber and closed at their upper ends, which project into the steam-space of the boiler.

3. The combination of the combustion-chamber of a steam-boiler with superheating-tubes fitted to the top plates of the combustion-chamber, and projecting at their upper ends into the steam-space, said tubes being closed at their upper ends, but open at their lower ends to the combustion-chamber.

4. The combination of the combustion-chamber of a steam-boiler with superheating-pockets fitted to the top plates of the combustion-chamber and forming girder-stays therefor, substantially as described.

5. The combination of the combustion-chamber of a steam-boiler, with superheating-tubes fitted to the top plates of the combustion-chamber and projecting into the steam-space of the boiler with spacing-pieces between the tubes of a row, as and for the purpose described.

6. The combination of the combustion-chamber of a steam-boiler with superheating-tubes fitted to the top plates of the combustion-chamber, and projecting into the steam-space of the boiler, with spacing-pieces between the tubes of a row and a strap embracing the tubes, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JAMES HOWDEN.

Witnesses:

HUBERT HOWSON,
F. WARREN WRIGHT.