

No. 661,042.

Patented Nov. 6, 1900.

D. B. CUMMING.
FEED WATER HEATER.

(Application filed Apr. 16, 1900.)

(No Model.)

2 Sheets—Sheet 1.

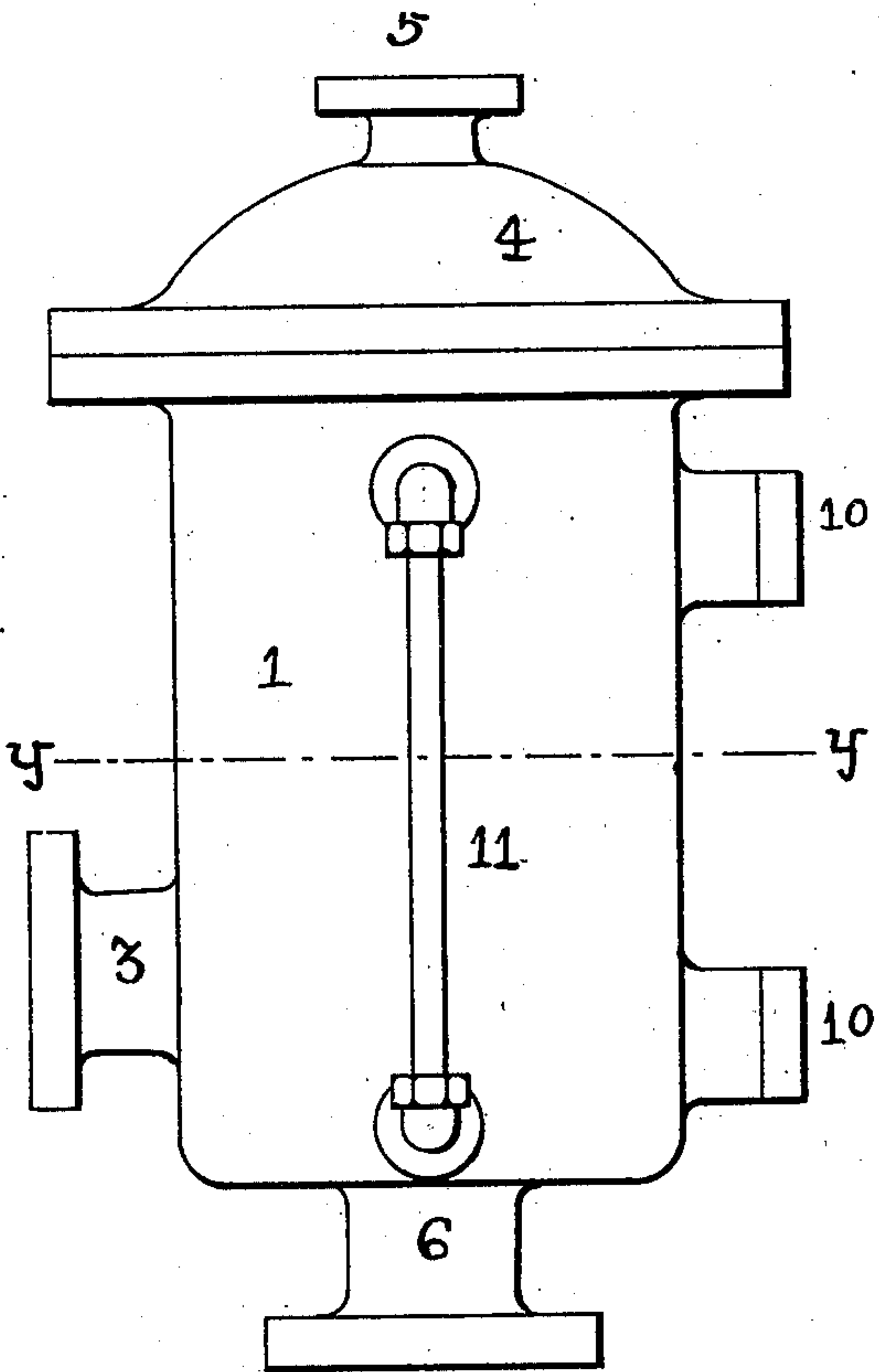


Fig 1

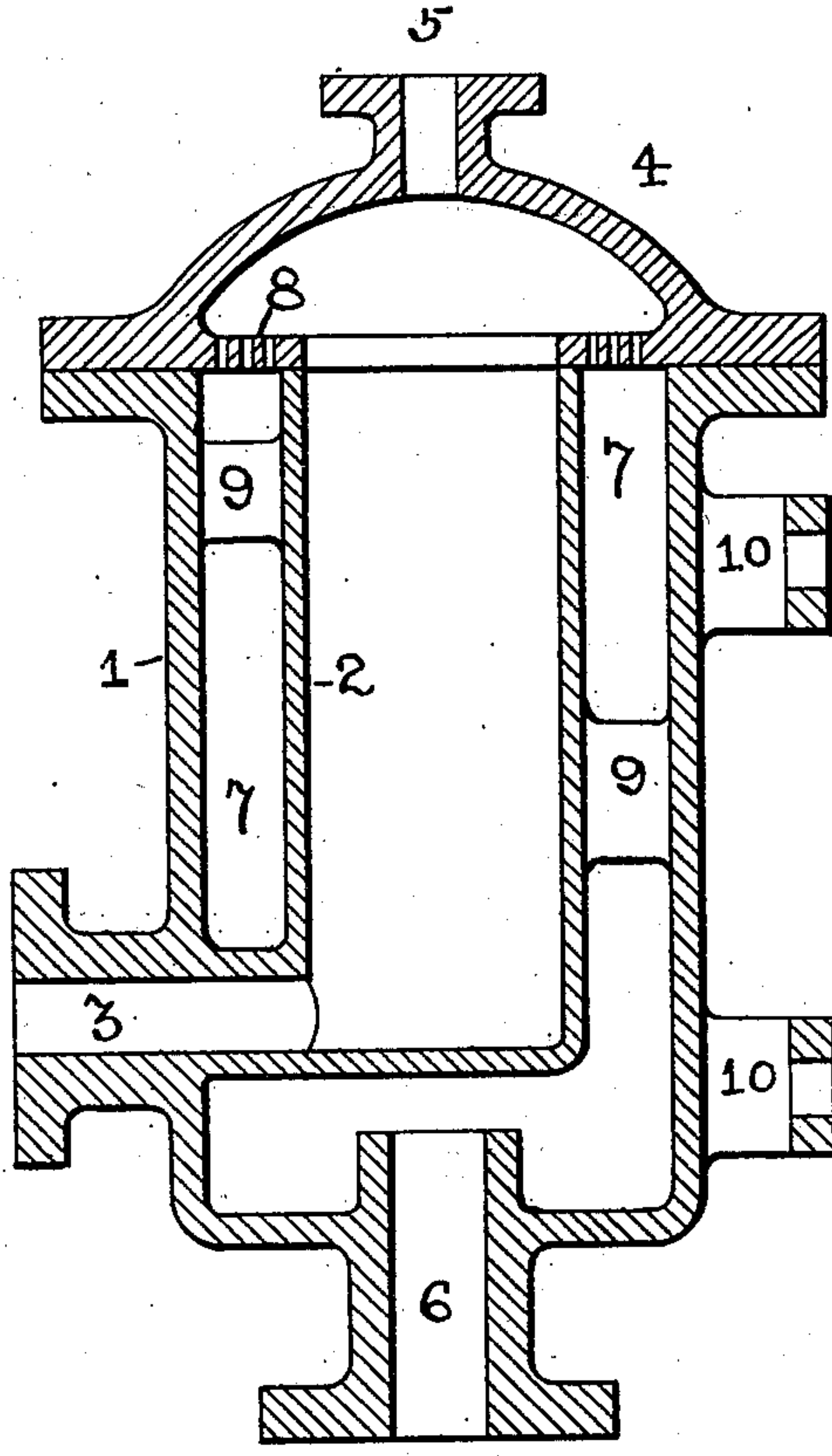


Fig 2

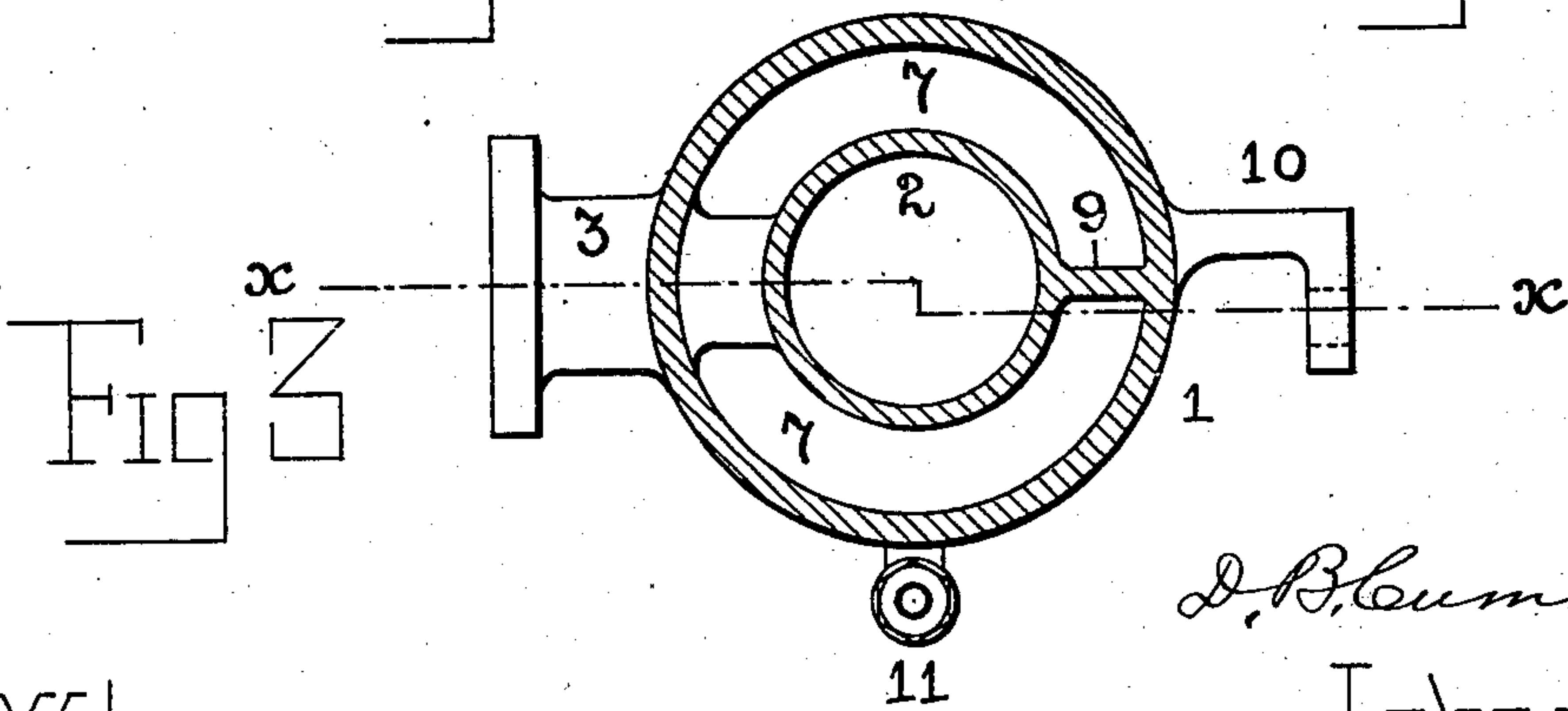


Fig 3

Witnesses
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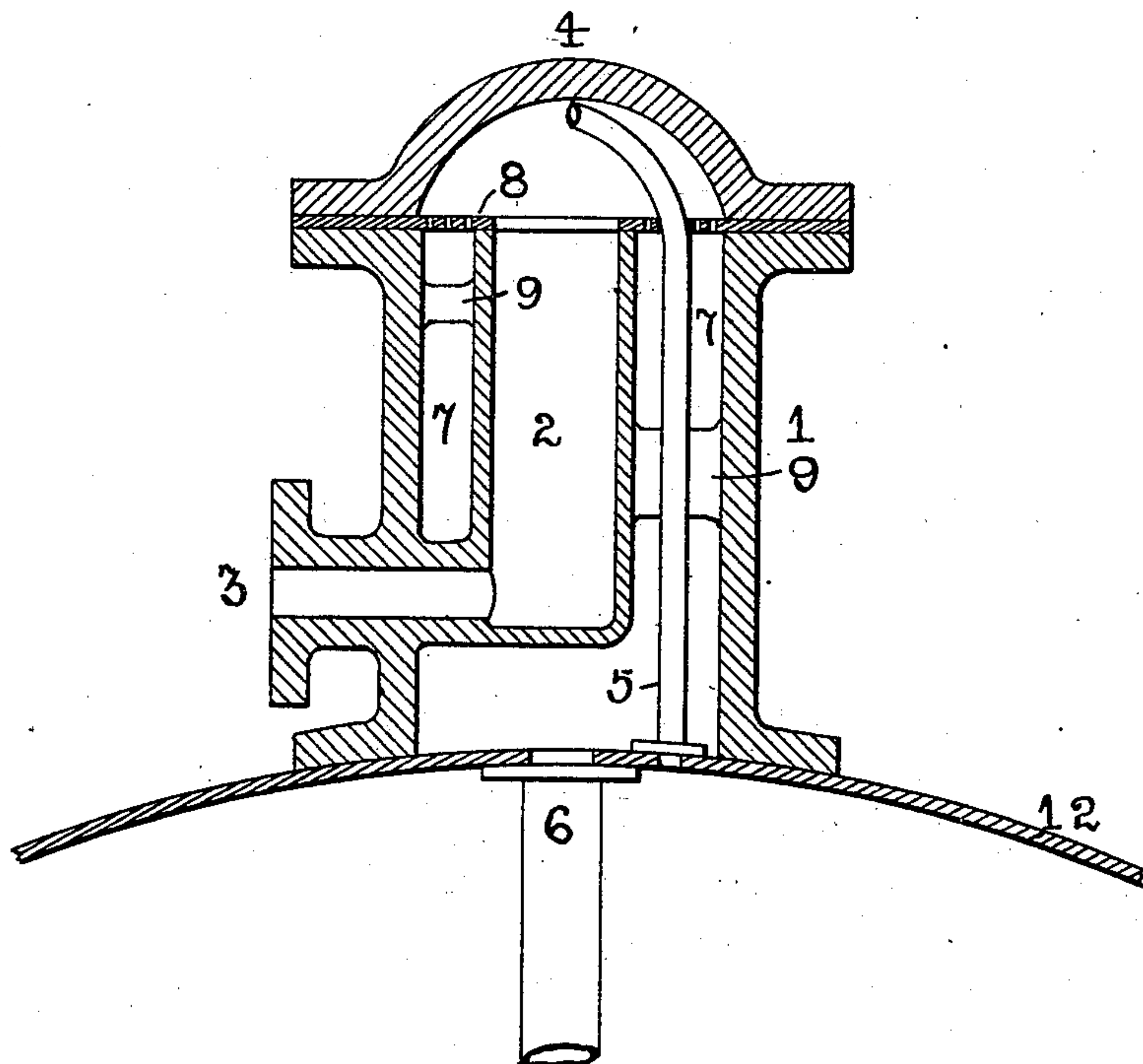


Fig 4.

Witnesses

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UNITED STATES PATENT OFFICE.

DAVID BRUCE CUMMING, OF LIVERPOOL, ENGLAND.

FEED-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 661,042, dated November 6, 1900.

Application filed April 16, 1900. Serial No. 13,209. (No model.)

To all whom it may concern:

Be it known that I, DAVID BRUCE CUMMING, consulting engineer, a subject of the Queen of Great Britain, residing at No. 16 Brunswick street, Liverpool, in the county of Lancaster, England, have invented a new and useful Improvement in Feed-Water Heaters, of which the following is a specification.

My invention has for its object a compact device for the heating of feed-water which while small in size shall be effective in action and cheap to make. It is especially applicable to steam-boilers.

My device is mainly composed of two castings which may be readily and cheaply made and of sufficient thickness to withstand the highest pressure of the steam in the boiler to which it is connected.

I am aware that attempts have been made to provide a feed-heater in which the feed-water and live steam from the boiler have been commingled; but as far as I am aware these have all failed. One cause of failure has been that the water and steam have been brought into contact while flowing in opposite directions. This interrupts the flow and causes a serious back pressure and in addition a violent commotion in the vessel. The commotion causes a deal of "hammer" and noise and the pressure and temperature within the vessel vary so much that there is danger of explosion, and in addition to this disadvantage an even temperature and flow of feed-water from the apparatus are impossible. According to my invention the steam enters at or near the top of the heater. One advantage of this lies in the fact that the water and steam after coming in contact travel together downward in the same direction, and another advantage is that there is no danger of the steam-inlet becoming choked with water in case an unusual quantity should be fed into the vessel. The heated feed-water leaves the vessel by gravity and flows into the water-space of the boiler, and the areas of the water-inlet and water-exit are so arranged that priming is impossible.

My invention comprises a vessel, preferably cylindrical, which in use is fixed at some point adjacent to the boiler and above the level of the water therein. There are three

openings into this vessel—one, a water-inlet leading from the feed-pump or other feeding device, such as an injector; the second, a water exit, which leads to the boiler, and the third a steam-inlet. The outer vessel contains an inner vessel or cylinder into which the water-inlet above mentioned opens. Surrounding the open top of the inner vessel is a perforated diaphragm which extends to the inner wall of the outer vessel. In action the water is fed into the inner vessel and rising therein overflows its edge and drops through the perforated diaphragm into the space around said inner vessel and thence by the water-exit to the boiler by gravity. The whole of the interior of the device is kept under steam-pressure by means of the steam-pipe hereinbefore referred to. Thus it will be seen that the water passing through my heater is subdivided and in contact with the steam from the boiler and is thereby heated.

In the drawings, Figure 1 is a front elevation of a feed-water heater constructed in accordance with my invention therefor. Fig. 2 is a vertical section thereof, as on line *xx* of Fig. 3. Fig. 3 is a cross-section taken as on line *yy* of Fig. 1. Fig. 4 is a similar view to Fig. 2, but showing a modification.

Like numerals refer to corresponding parts. 1 shows the main body of my heater. It is composed of a casting and has within it an inner vessel or cylinder 2, which is cast in one piece with it.

3 shows the water-inlet, which opens into said inner vessel and which is in use connected by a pipe with the feed-pump or injector.

4 is the cover of the apparatus, and 5 the steam-inlet, while 6 indicates the water-exit.

7 shows an annular space between the inner vessel 2 and outer wall 1. Space 7 is covered by an annular perforated diaphragm 8. In Fig. 2 this diaphragm is shown as an integral portion of cover 4, while in Fig. 4 it is shown as a separate plate, which is nipped between main body 1 and said cover 4.

It is to be understood that bolts or screws are used where necessary throughout the construction of my heater to couple up the various portions thereof. These are of well-known construction and for the sake of

clearness are omitted from the drawings. Strengthening-webs 9 may be located as desired.

In Figs. 1, 2, and 3 lugs 10 are shown, by means of which the heater may be bolted to a bulkhead or other support.

In Figs. 1 and 3, 11 shows a water-gage, which is used to indicate the amount of water at any time in the outer vessel.

In the modification shown in Fig. 4 the heater is attached direct to the boiler-shell 12, and in that case the steam-pipe 5 lies entirely within the outer casing 1. Check-valves are employed, as is usual with feed devices, to prevent back pressure and form no part of my invention.

It is obvious that my heater may be used to heat the feed-water for two or more boilers in well-known manner.

I have shown and described the pipe leading from the water-exit as passing vertically through the boiler-shell, and this is a convenient arrangement. It is, however, immaterial to the action of my apparatus at what point it enters the boiler, so long as it discharges below the level of the water therein. The heater itself must in all cases be located above the water-level of the boiler, as the feed passes from it by gravity.

The mode of action is as follows: The feed-water from the pump enters the inlet 3 and rising up the inner cylinder 2 flows over the surface of diaphragm 8 and drops through the holes therein. The live steam from the boiler having free access to the interior of the apparatus fills such portions of it as are not occupied by water, which latter is thus

brought in intimate contact therewith, so that a free interchange of heat is insured, some portions of the live steam being condensed and joining the feed.

It is obvious that if desired the whole of my device may be located within the boiler. It is essential that the apparatus be placed above the level of the water in the boiler, as the passage of the feed therefrom is due to gravity.

I have found in actual practice that the feed-water issuing from my heater may be heated to a temperature of about 2° below that of the live steam, and moreover the apparatus is automatic and practically silent in action.

What I claim as my invention, and desire to secure by Letters Patent, is--

A feed-water heater consisting of an outer cylindrical vessel, an inner cylindrical vessel formed in one therewith, a water-inlet leading into said inner vessel, a cover adapted to close them and having as an integral part thereof an annular perforated diaphragm whereby the water is subdivided in passing from one vessel to the other, and an inlet for steam so arranged that the direction of flow of the inflowing steam coincides with the direction of flow of the outgoing water, substantially as described.

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

DAVID BRUCE CUMMING.

Witnesses:

CHAS. COVENTRY,
HERBERT REEVES.