

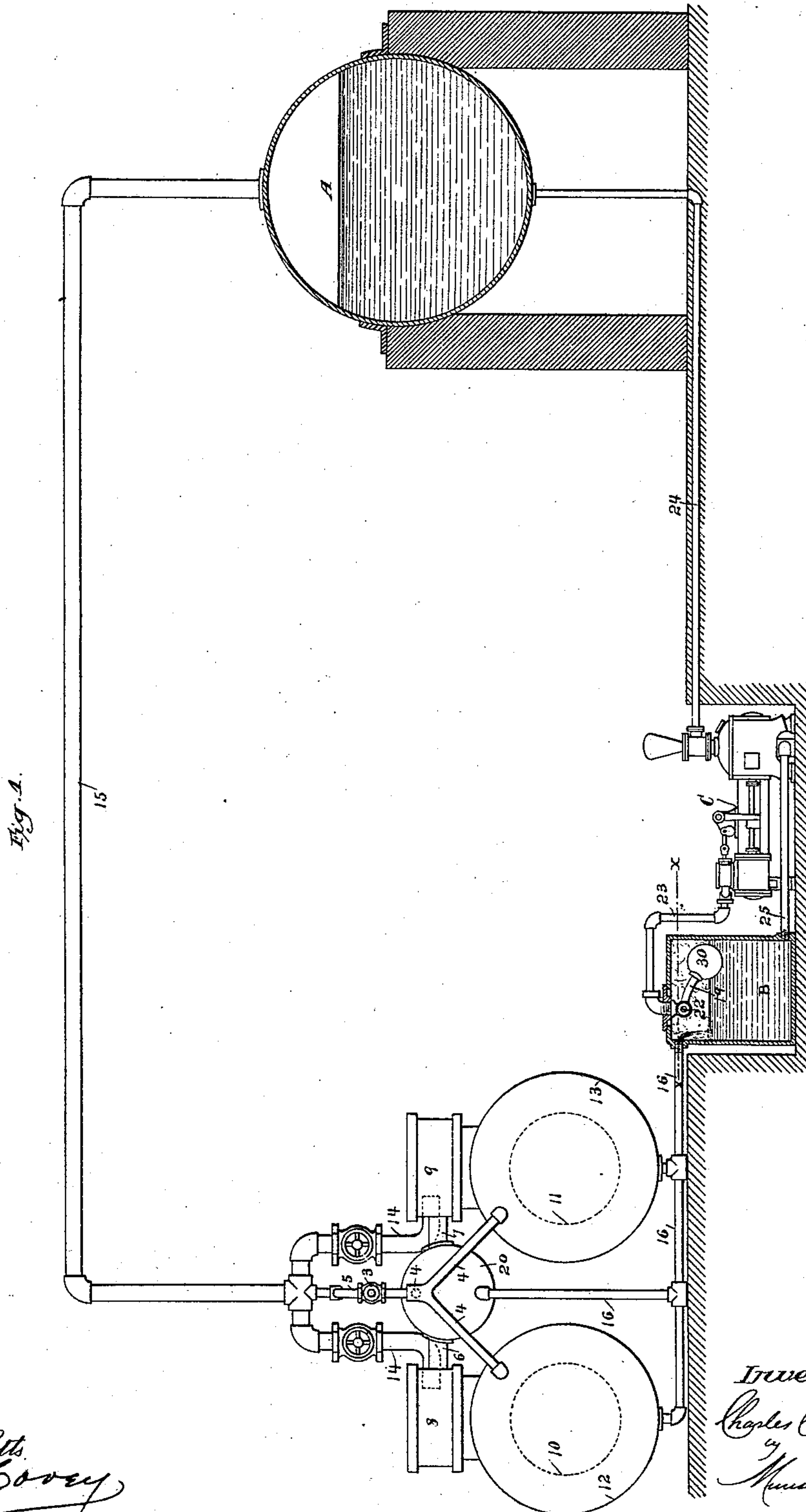
(No Model.)

2 Sheets—Sheet 1.

C. C. WORTHINGTON.  
DRAINING STEAM JACKETS.

No. 345,469.

Patented July 13, 1886.



Attest:  
Geo. H. Bells  
J. A. Hoovey

Inventor:  
Charles C. Worthington  
by  
Munroe & Chaffin

Atty's

(No Model.)

2 Sheets—Sheet 2.

C. C. WORTHINGTON.  
DRAINING STEAM JACKETS.

No. 345,469.

Patented July 13, 1886.

Fig. 2.

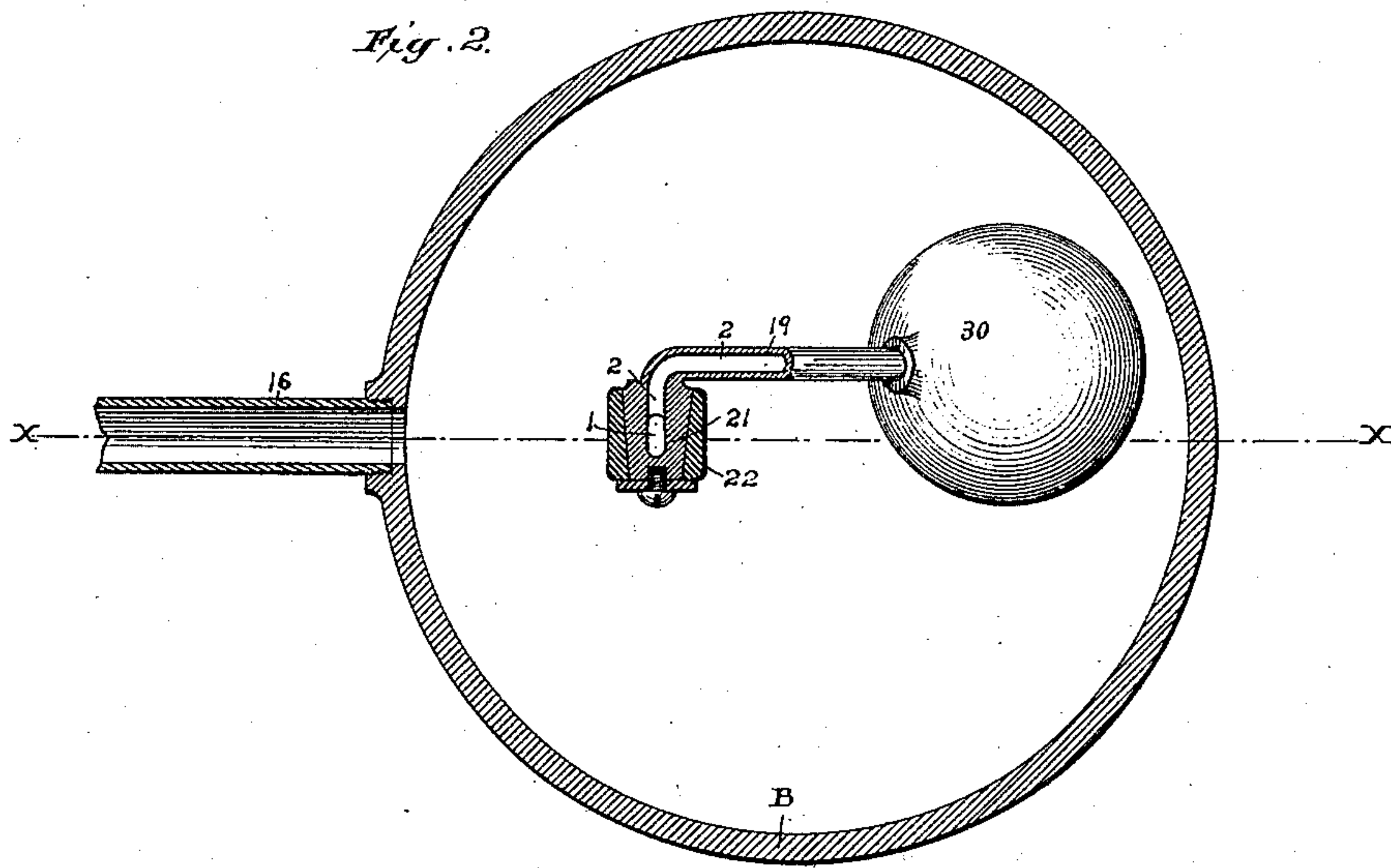


Fig. 3.

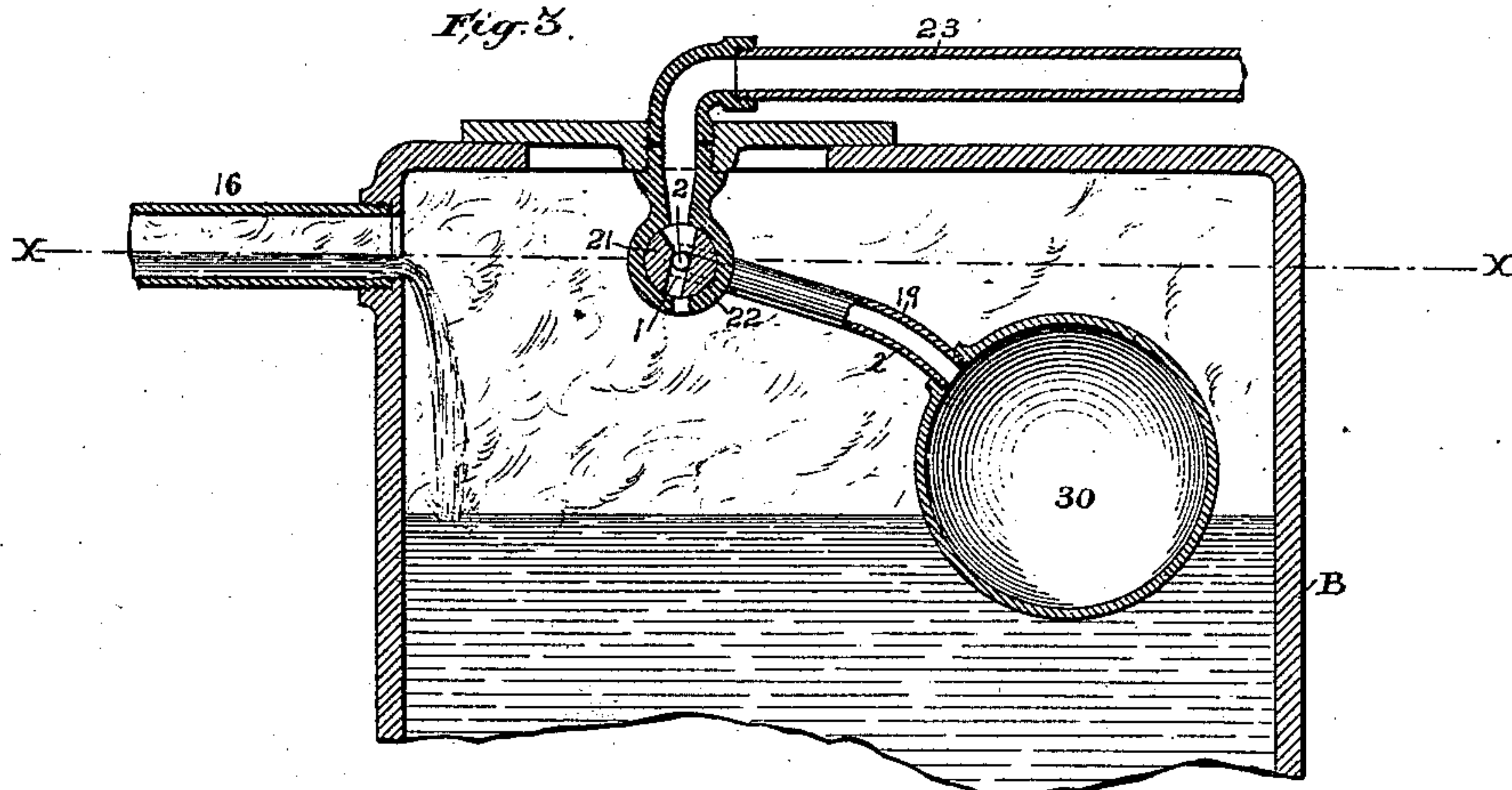
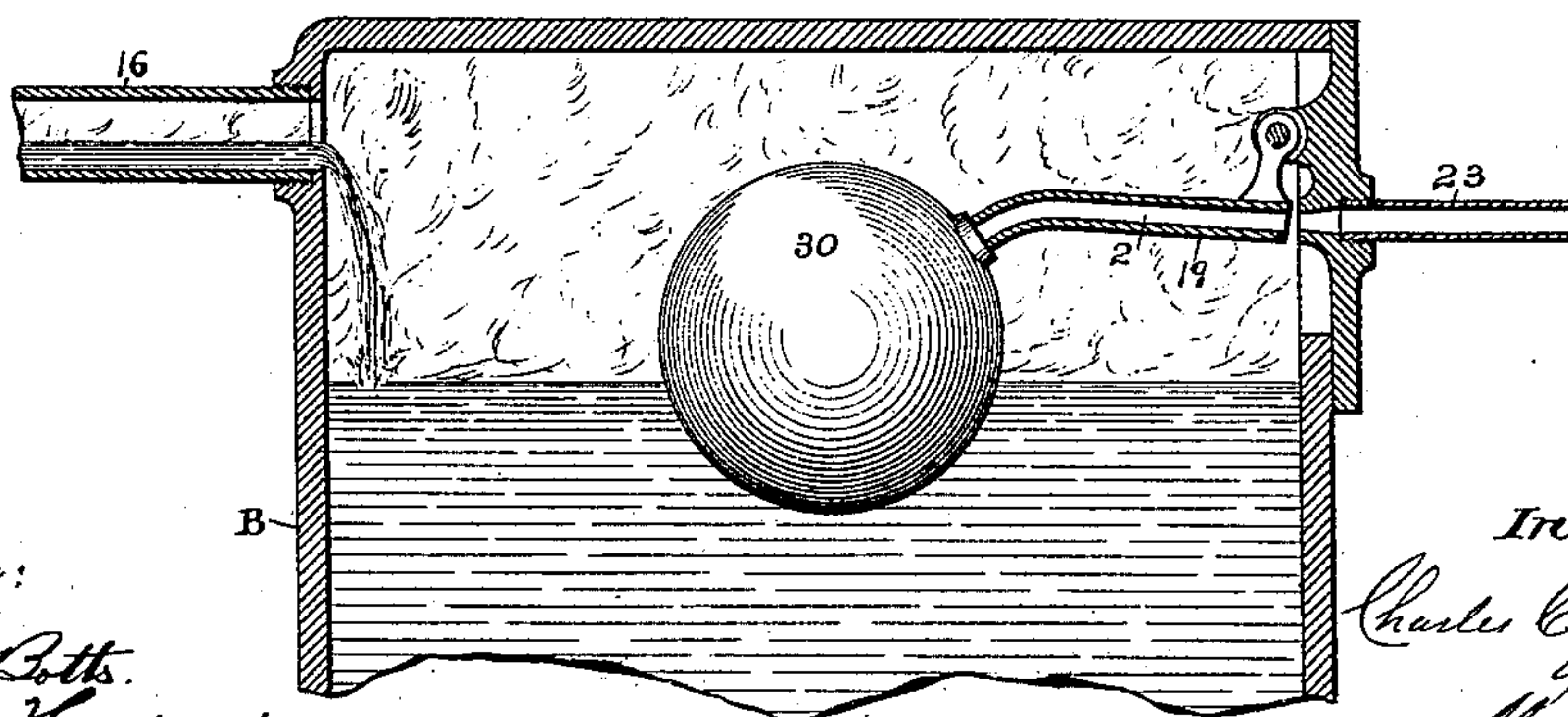


Fig. 4.



Attest:

Geo. H. Borth.  
J. A. Hoovey

Inventor:

Charles C. Worthington  
Munroe Phillips  
Atty's



# UNITED STATES PATENT OFFICE.

CHARLES C. WORTHINGTON, OF IRVINGTON, NEW YORK.

## DRAINING STEAM-JACKETS.

SPECIFICATION forming part of Letters Patent No. 345,469, dated July 13, 1886.

Application filed February 27, 1885. Serial No. 157,163. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES C. WORTHINGTON, a citizen of the United States, residing at Irvington, county of Westchester, and State of New York, have invented certain new and useful Improvements in Means for Draining Steam-Jackets and other Similar Apparatus, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to an apparatus for withdrawing the water resulting from condensation from steam jackets, heaters, and other similar apparatus, said apparatus being so constructed and organized that the water can be restored to the boiler without the necessity of forcing it against the pressure of the steam therein, and also that the starting and stopping of the pump by which the water is restored to the boiler is made automatic, thereby dispensing with the attendance of an engineer.

As a full understanding of the invention can be best imparted by a detailed description of the construction and organization of the complete apparatus, all further preliminary description will be omitted and a full description given, reference being had to the accompanying drawings, in which—

Figure 1 is a diagrammatic view illustrating the operation of the invention. Figs. 2 and 3 are enlarged sectional details of the valve or cock apparatus for controlling the operation of the steam-pump for restoring the water to the boiler, Fig. 2 being taken upon the line  $x$  of Figs. 1 and 3, and Fig. 3 upon the line  $x$  of Fig. 2. Fig. 4 is a view similar to Fig. 3, illustrating a modification, which will be hereinafter explained.

Referring to said figures, it is to be understood that 10 11 represent the high-pressure cylinders, and 12 13 the expanding cylinders, of an ordinary compound duplex engine, these cylinders being provided with ordinary steam-jackets. The cylinders 10 11 receive steam from the boiler A through the usual steam-connections, 14 15, and after the steam has acted in these cylinders it is exhausted in the usual manner into the reheater 20, from which it passes through the pipes 6 7 to the steam-chests 8 9 of the expanding-cylinders 12 13,

from which cylinders it is exhausted into the condenser, or into the open air. The pipe 15 is provided with a branch, 5, which is connected through branches, as 4, with the reheater 20, and with the steam-jackets upon the cylinders 10 11 and 12 13, so that this reheater and the jackets upon the cylinders are provided with live steam under the same pressure that exists in the boiler.

In order to withdraw the water resulting from condensation in the reheater 20 and the jackets of the cylinders 10 11 12 13, the reheater and the jackets are provided with connections (represented by the pipes 16) by which any water resulting from condensation is withdrawn from the reheater and jackets as fast as it accumulates therein.

The parts thus far described are simply illustrative of the constructions which are in common use.

The pipe 16, into which the water is drained from the reheater 20 and the jackets of the steam-cylinders, is connected to a closed tank, B, which is located in any convenient position, but upon a lower level than the steam-jackets, and in which the water accumulates under a pressure due to the steam in the boiler A. The tank B is provided at a point near its bottom with a pipe, 25, which leads to the suction-chamber of a pump, C, the force-chamber of which is connected by a pipe, 24, with the boiler A.

The pump C, as shown in the present case, is an ordinary direct-acting duplex steam-pump of the well-known construction manufactured by Henry R. Worthington, and therefore needs no specific description.

The operation of the apparatus thus far described is as follows: The throttle-valve 3 in the pipe 5 being opened, the steam from the boiler A will pass through the pipe 15 into the branch 5, and thence through the branches 4 into the reheater 20, and the jackets of the steam-cylinders 10, 11, &c., in which reheater and jackets it will circulate in the usual manner, after which any of the steam which remains uncondensed will be forced through the pipes 16 into the tank B, so that the water resulting from the condensation of the steam in the reheater and jackets, which flows through the pipe 16 into the chamber B, will accumu-



late therein under a pressure equal to, or substantially equal to, that of the boiler. The pump C being then set in motion, the water will be withdrawn from the tank B through the pipe 25 and forced through the pipe 24 into the boiler; but the water in the tank B, and consequently in the suction-chamber of the pump, being under a pressure equal, or substantially equal, to that existing in the boiler, the only labor which the pump will be called upon to perform will be that of raising the water from the level of the tank to the level of the boiler, thus effecting a saving of labor equal to that of forcing the water against a pressure equal to that of the steam in the boiler.

In an apparatus of this character it will of course not be necessary that the pump C should operate continuously, and it is therefore desirable that means should be provided by which the operation of the pump shall be controlled by the accumulation of water in the tank B, so that whenever sufficient water accumulates in the tank to make it desirable to have it withdrawn the pump will be set in operation, and that as soon as the water in the tank has been withdrawn the pump will be stopped. In the apparatus heretofore devised for accomplishing this result the steam for operating the pump has been supplied directly from the boiler, and the pipe through which the steam passed to the pump was provided with a cock, which was controlled by a float which rode upon the surface of the water in the tank. In the present organization, however, the pipe 23, through which the steam is supplied for operating the pump C, is connected to the upper side of the tank B, so that the steam for operating the pump is drawn from the tank instead of from the boiler or other source. The end of the pipe 23 which enters the tank B is provided with a cock, 22, the plug 21 of which is provided with an operating-lever, 19, to the end of which is attached a hollow sheet-metal float, 30, which rides upon the surface of the water in the tank. By thus taking the steam for operating the pump from the tank B the steam is caused to circulate more freely and rapidly through the reheater and the steam-jackets, and thus better results are attained. By this means also the cock or valve for controlling the supply of steam to the pump is located within the tank, so that no stuffing-boxes are required in the walls of the tank, and thus leakage is prevented.

The operation of this cock apparatus in controlling the movements of the pump C is as follows: Whenever the water in the tank B has accumulated to such an extent as to make it desirable to withdraw it, the float 30, riding upward upon the surface of the water, will have turned the plug 21 to the position shown in Figs. 2 and 3, so as to open the cock 22 and allow the steam to pass from the tank B through the pipe 23 to the steam-cylinders of the pump and set the pump in motion. The pump being thus set in motion, the water will

be withdrawn from the tank B and forced into the boiler A until the level of the water in the tank is lowered to such an extent that the float 30, riding downward upon its surface, turns the plug 21, so as to close the cock and shut off the further passage of steam to the steam-cylinders of the pump, and thereby arrests the pump. The pump thus arrested will remain so until the water has again accumulated in the tank B, when the operation just described will be repeated.

In using hollow floats—such as the float 30—in those positions where they are subjected to pressure, as in the present case, great difficulty has heretofore been experienced, by reason of the fact that more or less water is forced through the pores of the metal composing the float, so as to accumulate upon the inside, and in time fill or nearly fill the float, so as to destroy its buoyancy. In order to overcome this defect, in the present case I provide the plug 21 and the lever 19 with a longitudinal duct, 2, which opens communication between the interior of the float 30 and the transverse port 1 of the plug. By this means, whenever the float is in the position shown in Figs. 2 and 3, so that the cock 22 is opened, the steam from the tank B passes through the duct 2 and fills the float, so that the same pressure exists upon the interior of the float as upon its exterior, thereby preventing any water from being forced through the pores of the metal by the pressure in the tank. The port 1 is made of such shape, as shown in Fig. 3, that when the water falls in the tank, so as to allow the float 30 to fall and close the cock 22, communication will still remain open between the interior of the float and the pipe 23; but the pressure in the pump being then less than that in the tank B, any water which may have accumulated in the float from condensation will be at once converted into steam and pass off through the duct 2 and pipe 23, thus keeping the interior of the float free from any accumulation of water.

It will readily be seen that many modifications may be made in the details of the cock apparatus just described without departing from the essential features of the invention or losing its advantages. For example, as shown in Fig. 4, the opening and closing of the pipe 23, so as to start and stop the pump C, may be effected by means of a valve instead of a cock. For this purpose the pipe 23 is caused to enter the side of the tank B instead of its top, and the edge of the opening upon the interior of the tank is arranged to form a seat, upon which the end of the tubular lever 19 rests, so as to surround and close the opening leading to the pipe 23 when the float 30 is lowered by the withdrawal of the water from the tank, and to be raised from said seat, so as to allow the steam to pass from the tank into the pipe 23, when the float is raised by the accumulation of the water, as shown in Fig. 4. The operation of the apparatus when thus constructed, as will readily



be seen, will be the same as that already described.

Many other modifications may be readily made in the construction of the cock or valve apparatus without departing from the invention; but the constructions shown are thought sufficient to impart a full knowledge of the principle of the invention.

In conclusion, it is to be remarked that although it is preferable that the pump C should be of the duplex form, as shown, yet the style of the pump may be varied or other forms of pump employed without departing wholly from the invention. It is also to be remarked that the invention is herein shown as applied to the steam-jackets and reheater of a compound engine simply for the purpose of illustrating its operation. Its application is not limited to this class of engines or to any class of engines, as it may be successfully employed in any case where it is desired to withdraw the water of condensation from the cylinders of an engine, or from a jacket, heater, or analogous apparatus.

What I claim is—

1. The combination, with the closed tank B, arranged to receive the water of condensa-

tion from a steam jacket, heater, or similar apparatus, of a pump arranged to withdraw the water from the tank, connections between the tank and pump by which the steam for operating the pump is taken from the tank, a cock or valve for controlling the supply of steam to the pump, and a float within the tank for controlling said cock or valve, substantially as described.

2. The combination, with the closed tank B, of the closed hollow float 30, provided with the duct 2, which is arranged to communicate with the exterior of the tank, whereby the water forced into the float will pass off in the form of steam, substantially as described.

3. The closed hollow float 30, provided with the duct 2, which is arranged to communicate with the interior of the tank, and with the pipe 23, according to the position of the float, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

CHARLES C. WORTHINGTON.

Witnesses:

W. A. P. BICKNELL,  
T. H. PALMER.