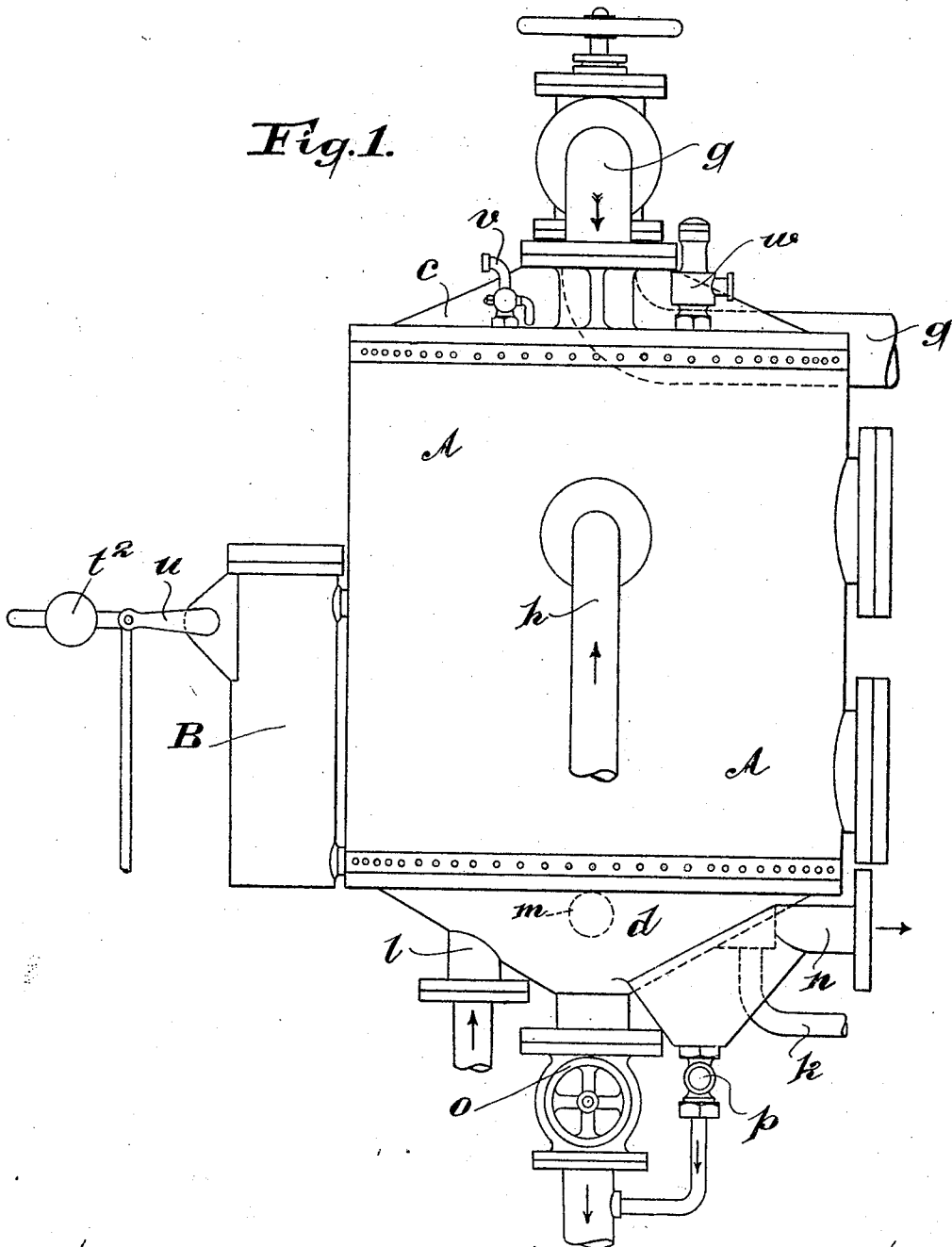


J. POLLOCK.
 FEED WATER HEATER.
 APPLICATION FILED APR. 6, 1909.

932,810.

Patented Aug. 31, 1909.
 2 SHEETS—SHEET 1.

Fig. 1.



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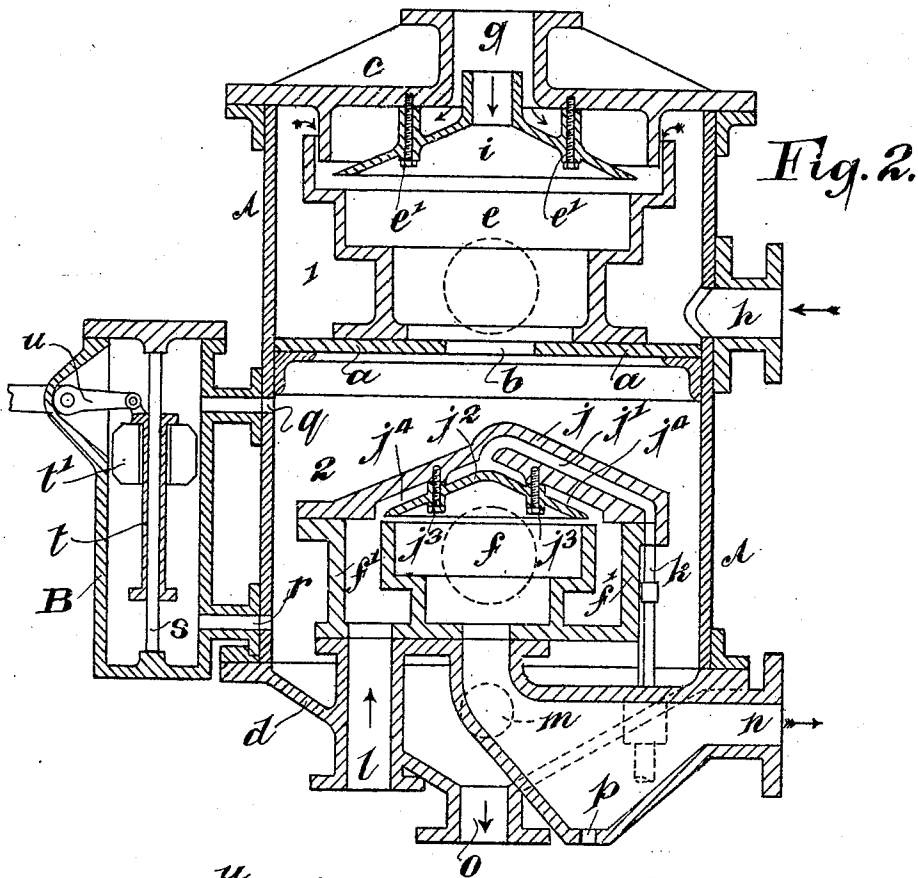
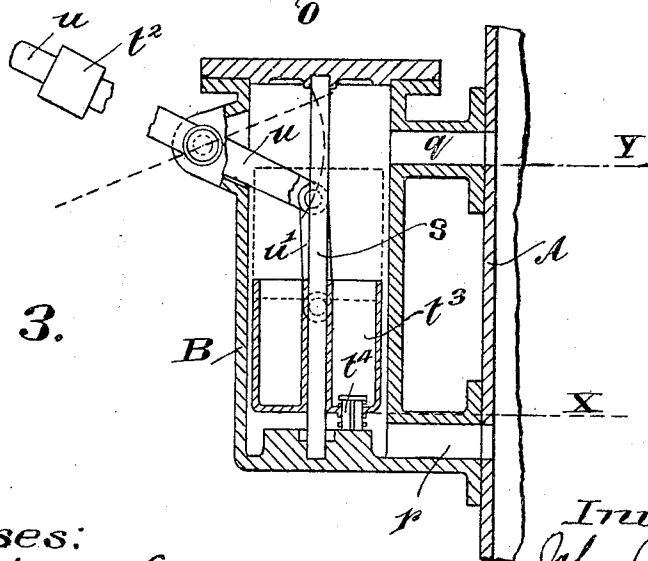


Fig. 3.



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UNITED STATES PATENT OFFICE.

JOHN POLLOCK, OF BELFAST, IRELAND.

FEED-WATER HEATER.

932,810.

Specification of Letters Patent. Patented Aug. 31, 1909.

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To all whom it may concern:

Be it known that I, JOHN POLLOCK, a subject of the King of Great Britain, residing at Belfast, Ireland, have invented certain new and useful Improvements in Feed-Water Heaters, of which the following is a specification.

This invention relates to feed water heaters for use in connection with steam boilers in which steam is used for raising the feed water to the desired temperature before feeding same to the boiler.

It is well known in feed water heaters to use a supply of live steam, or exhaust steam for heating the feed water, but, as in some instances, sufficient live steam cannot be spared from the steam supply for feed water heating purposes, and as exhaust steam is not always available, the object of the present invention is to construct a simple and efficient feed water heater in which either live steam or exhaust steam or a combination of these can be used for raising the feed water to the desired temperature.

In order that my said invention may be properly understood I have hereunto appended two explanatory sheets of drawings, whereon:—

Figure 1 is an external view of a feed water heater as constructed under this invention. Fig. 2 is a vertical section of same. Fig. 3 is a detail view of a modification of the controlling device for controlling the steam admission valve of pump.

In carrying out my invention the heater preferably consists of a suitable cylinder or casing A which is divided into upper and lower compartments 1, 2, by means of a division plate *a* having a central opening *b*. The cylinder or casing A is closed at top and bottom by means of suitable end pieces *c*, *d*, while fitted in each compartment are inverted hollow stepped cones *e*, *f*.

The upper compartment 1 is provided with a connection *g* to the exhaust steam supply while an inlet *h* for the feed water is also provided. A dome-shaped or conical cover *i* is also provided, which fits inside the upper end of the inverted hollow stepped cone *e* being suitably secured at *e*¹ to the upper end piece *c*.

The inverted hollow stepped cone *f* fitted in the lower compartment 2 is made with an annular wall *f*¹ and is also provided with a dome-shaped or conical cover *j* having a passage way *j*² formed in it to which a sup-

ply of live steam from the boiler is conducted by means of a suitable pipe connection *k*. A second dome-shaped or conical cover *j*² is fitted to the interior of the dome-shaped or conical cover *j* and suitably secured thereto at *j*³ so as to leave an annular passage way *j*⁴ between the covers *j* and *j*². The cover *j* makes a steam-tight connection with the annular wall *f*¹ of the cone *f*.

An inlet opening *l*, communicating with the interior of the cone *f*, is made in the lower part *d* of the cylinder or casing A for a pipe connection to the discharge from feed pump while an opening *m* is made for the pipe connection to the suction to feed pump. A connection for discharge to the boiler is also made at *n* while a suitable blow off connection *o* is made at the bottom *d* of the cylinder or casing A and a sediment drain connection *p* is also provided. An air cock *v* and a safety valve *w* would also be fitted.

Fitted to the side of the cylinder or casing A and communicating with the interior thereof at *q* and *r*, is a controlling chest B provided with a central spindle *s* on which works a sleeve *t* to which is fitted one end of a lever *u* whose other end may be provided with a counterbalance weight *t*² and is suitably connected with the steam admission valve of feed pump for automatically stopping and starting same according to height of feed water in heater. A float *t*¹ is fitted in connection with the sleeve *t* so as to be capable of rising and falling thereon in accordance with the level of the feed water in the compartment 2, the arrangement being such that when the water level rises in the lower part of the cylinder or casing A it also rises in the controlling chest B, thereby raising the float *t*¹ until it contacts with the upper end of the sleeve *t* which is thereupon raised, and moving the lever *u* opens the steam valve of the feed pump so as to actuate same and cause the water to be drawn off by the opening *m* to the pump from which it is discharged by means of pipe connection and opening *l* to the interior of the stepped cone *f* from whence it passes to the boiler by means of the opening *n*. As long as there is a sufficiency of feed water in the lower part of the cylinder or casing A to keep the float *t*¹ in the position indicated in Fig. 2, the pump will remain in operation, but when the supply of feed water diminishes so that the float *t*¹ falls until it contacts with the lower end of the sleeve *t* then the weight of the

float t^1 depresses the sleeve t and reversing the movement of the lever u automatically stops the pump until the supply of water again increases sufficiently to restart it. With this arrangement the drawing off of steam and vapor is prevented.

Fig. 3 shows a slightly modified arrangement for actuating the feed pump. In this arrangement the float t^1 is dispensed with and a hollow vessel t^3 , open at its upper end substituted therefor. The vessel t^3 is connected with the lever u by means of links u^1 and when the pump is in operation the vessel t^3 rests at the bottom of the chest B the lift valve t^4 being thereby raised off its seat so that the interior of the vessel t^3 is in communication with the interior of the controlling chest B with the result that when the feed water in the cylinder or casing A falls to the level indicated by the dotted line X the vessel t^3 is empty, and under the action of the counter-balance weight t^2 it rises to the position indicated in dotted lines, while, at the same time, the downward movement of the outer end of the lever u stops the pump. When the feed water rises again in the interior of the cylinder or casing A to the level indicated by the dotted line Y the water then overflows into the hollow vessel t^3 which thereupon sinks downward and raising the outer end of the lever u starts the feed pump once more for the purpose of withdrawing the feed water in the manner already described.

With a feed water heater, such as described, in a marine installation, for example, when the main engines are working and there is a sufficient supply of exhaust steam, the feed water can be raised to the desired temperature by this agency alone, or if preferred, in addition, a small quantity of live steam may be used. The action of the apparatus is such that the feed water enters at the feed inlet h fills the interior of the upper compartment 1 passes over the lip of the hollow stepped cone e , as shown by the arrows, meets and mixes with the exhaust steam entering at g , is heated and falls to the bottom of the cylinder or casing A. It is drawn from thence by the opening m to the feed pump which again discharges it to the heater by the inlet l whence it passes upward and over the lip of the second cone f where it may meet and mix with live steam from the pipe k finally passing to the boiler by means of the discharge opening n . It enters the boiler at about the same temperature as the steam therein.

Should it be desired to use the feed water heater in port when the main engines are not working and there is no exhaust steam supply available the action of the apparatus is the same but a slightly larger supply of live steam will be required to raise the feed water to the required temperature. With

this arrangement only the lower inverted stepped cone f may be used if desired.

While, by way of example, the improved feed water heater has been described in connection with a marine installation it will be obvious that it can be used equally well in other installations and that with economical and successful results.

The improved apparatus can be easily taken to pieces for cleaning or repairing when required, and the scale or sediment collected can be readily blown off when necessary by means of the blow off connections o and p , while the feed water supply may be so arranged that, if desired, it can at any time be fed direct to the boiler independent of the feed water heater.

Having now fully described my invention what I claim and desire to secure by Letters Patent is:—

1. A feed water heater for steam boilers comprising in combination, a cylinder or casing divided into upper and lower compartments, an inverted hollow stepped cone fitted in each compartment, the upper stepped cone being in communication with the lower compartment and the lower stepped cone which is provided with a steam-tight cover being also in communication with the lower compartment and with the boiler.

2. A feed water heater for steam boilers comprising in combination, a casing divided into upper and lower compartments the lower compartment being provided with a blow off connection, an inverted hollow stepped cone fitted in each compartment, the upper stepped cone being in communication with the lower compartment, and the lower stepped cone which is provided with a steam tight cover being also in communication with the lower compartment and with the boiler.

3. A feed water heater for steam boilers comprising, in combination, a casing divided into upper and lower compartments the lower compartment being provided with a blow-off connection, an inverted hollow stepped cone fitted in each compartment, the upper stepped cone being in communication with the lower compartment, a dome cover for the upper stepped cone and means for connecting the lower stepped cone, which is provided with a steam tight cover, with the lower compartment and with the boiler.

4. A feed water heater for steam boilers comprising in combination, a casing divided into upper and lower compartments, an inverted hollow stepped cone fitted in the upper compartment, an inverted hollow stepped steam tight cone having a scale or sediment collector and blow off connection fitted in the lower compartment, means for admitting feed water and exhaust steam to the upper compartment and the upper inverted

hollow stepped cone and discharging it to the lower compartment and the lower inverted hollow stepped cone, means for supplying live steam to the lower inverted hollow stepped cone and means for discharging the feed water therefrom to the boiler:

5. A feed water heater for steam boilers comprising, in combination, a casing divided into upper and lower compartments, an inverted hollow stepped cone fitted in the upper compartment, an inverted hollow stepped cone having an annular wall and a steam tight cover provided with a steam passage way fitted in the lower compartment, means for admitting feed water and exhaust steam to the upper compartment and the upper inverted hollow stepped cone, means for discharging the same to the lower compartment and the lower inverted hollow stepped cone, means for supplying live steam to the lower inverted hollow stepped cone and means for discharging the feed water therefrom to the boiler.

6. A feed water heater for steam boilers comprising, in combination, a casing divided into upper and lower compartments, an inverted hollow stepped cone fitted in the upper compartment, an inverted hollow stepped steam tight cone having a scale or sediment collector and blow off connection fitted in the lower compartment, means for admitting feed water and exhaust steam to the upper compartment and the upper inverted hollow stepped cone and for discharging it to the lower compartment and the lower inverted hollow stepped cone, means for supplying live steam to the lower inverted hollow stepped cone, automatic means for regulating the discharge of the feed water from the lower compartment to the lower inverted hollow stepped steam tight cone and means for discharging the feed water to the boiler.

7. A feed water heater for steam boilers comprising, in combination, a casing divided into upper and lower compartments, an inverted hollow stepped cone fitted in the upper compartment, an inverted hollow stepped steam tight cone having a scale or

sediment collector and blow off connection fitted in the lower compartment, means for admitting feed-water and exhaust steam to the upper compartment and the upper inverted hollow stepped cone, means for discharging the same to the lower compartment and the lower inverted hollow stepped cone, means for supplying live steam to the lower inverted hollow stepped cone, a controlling chest secured to the exterior of the casing and communicating with the interior thereof, a spindle fitted in the chest, a float working on the spindle, and a lever actuated by said float for controlling the discharge of feed water from the lower compartment to the interior of the lower inverted hollow stepped steam-tight cone.

8. A feed water heater for steam boilers comprising, in combination, a casing divided into upper and lower compartments, an inverted hollow stepped cone fitted in the upper compartment, an inverted hollow stepped steam tight cone having a scale or sediment collector and blow off connection fitted in the lower compartment, means for admitting feed water and exhaust steam to the upper compartment and the upper inverted hollow stepped cone, means for discharging it to the lower compartment and the lower inverted hollow stepped cone, means for supplying live steam to the lower inverted hollow stepped cone, a controlling chest secured to the exterior of the casing and communicating with the interior thereof, a spindle fitted in the chest, a hollow vessel open at its upper end working on the spindle, a lift valve fitted in the hollow vessel a lever for controlling the means for the discharge of feed water from the lower compartment to the lower inverted hollow stepped steam-tight cone and means for connecting the hollow vessel with said lever.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN POLLOCK.

Witnesses:

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THOMAS FREEBAIRN.