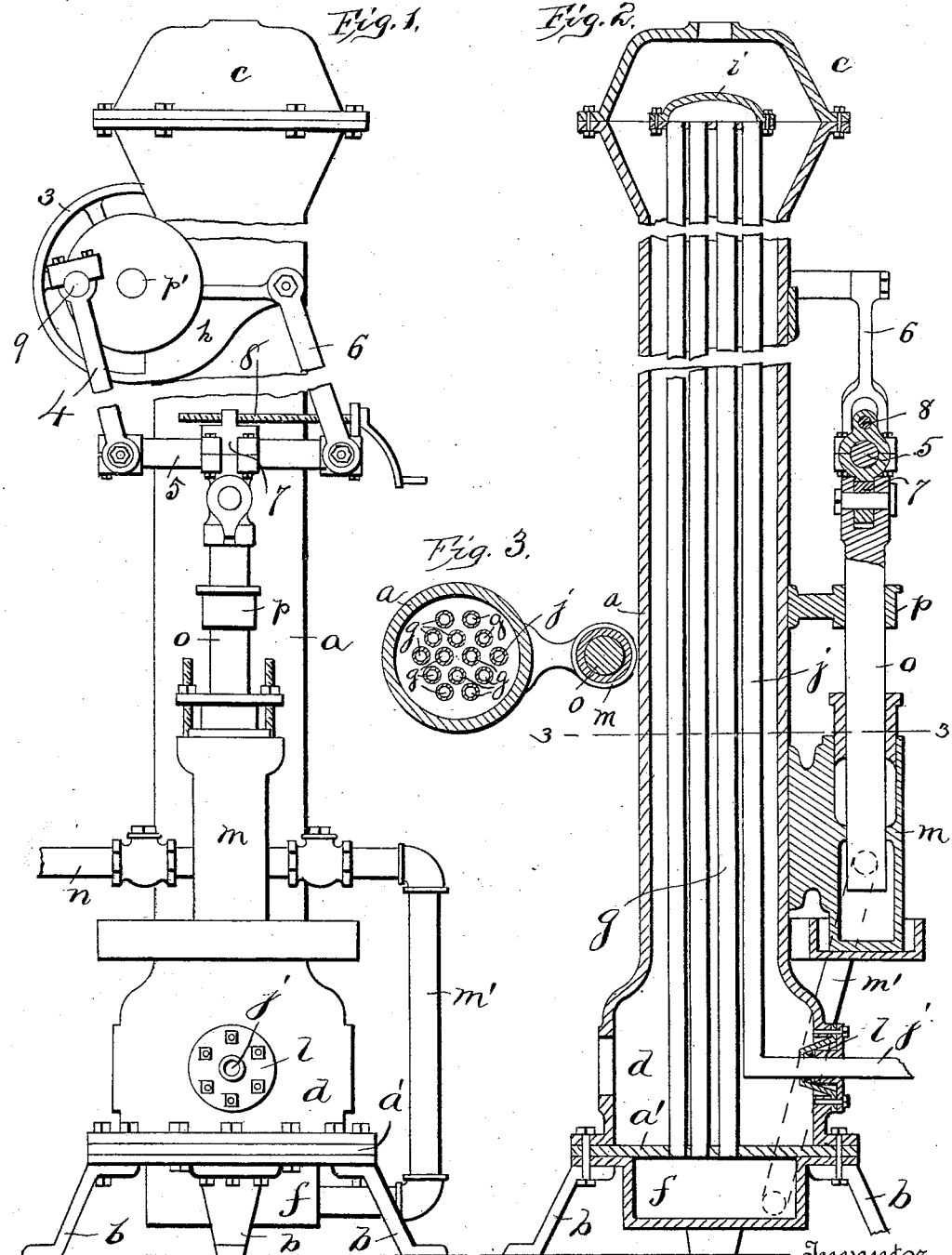


(No Model.)

W. E. MOFFATT.
FEED WATER HEATER.

No. 537,216.

Patented Apr. 9, 1895.



Witnesses
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UNITED STATES PATENT OFFICE.

WILLIAM ERSKINE MOFFATT, OF CHARLOTTE, NORTH CAROLINA.

FEED-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 537,216, dated April 9, 1895.

Application filed April 12, 1894. Serial No. 507,335. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM ERSKINE MOFFATT, of Charlotte, in the county of Mecklenburg and State of North Carolina, have invented certain new and useful Improvements in Feed-Water Heaters; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form part of this specification.

This invention relates to certain improvements in combined exhaust feed water heaters and supplying pumps for steam boilers.

The object of the invention is to provide an improved combined feed water heater and supply pump exceedingly simple and durable in construction and composed of a minimum number of parts and which will take up a small amount of space in the engine room or boiler room, being exceedingly compact in construction and effective in operation.

The invention consists in certain novel features of construction and in combinations of parts more fully and particularly pointed out hereinafter and described in the claims.

Referring to the accompanying drawings, Figure 1 is a side elevation of the improved feed water heater and supply pump. Fig. 2 is a longitudinal vertical section thereof. Fig. 3 is a cross section on the lines 3—3 Fig. 2.

In the drawings the reference letter *a*, indicates a vertical, usually, cylindrical exhaust steam cylinder or chamber having suitable supporting legs or other means, such as *b*, and provided with the enlarged removable top cap *c*, having a small opening for the escape of exhaust steam. The lower end of this chamber is enlarged and provided with suitable openings, such as *d*, to receive the exhaust steam connections from the engine. The lower end of the chamber has an outside projecting flange to which the flue sheet *a'*, and chamber *f*, is bolted; chamber *f*, being preferably cast iron and dish shaped. This flue sheet forms the top of the water inlet chamber and bottom of exhaust chamber.

g, indicates a series of vertical water tubes which are secured or expanded into the flue sheet *a'*, and pass longitudinally up through

the steam chamber into the enlarged cap *c*. At their upper ends these tubes are secured or expanded in a plate or tube sheet which forms the bottom of a water return chamber *i*, arranged in the upper end of the steam chamber.

j, indicates the water discharge pipe opening at its end into said upper return chamber and extending down throughout the length of the steam chamber and at its lower end provided with an elbow and a lateral extending pipe passing out through the enlarged part of exhaust chamber to the boiler. Any suitable means such as *l*, can be provided to tightly close this opening in the exhaust chamber around the discharge pipe of the boiler. It will thus be observed that the water is forced by the pump into the lower inlet chamber and from thence passes upwardly through the plurality of vertical tubes and being entirely surrounded by the hot exhaust steam the water is heated and is discharged through the single discharge pipe to the boiler.

By employing one small discharge pipe *j*, from the chamber *i*, into which all the pipes *g*, discharge, the water is kept traveling very slowly indeed through the plurality or nest of pipes *g*, whereby the water is kept for a considerable length of time in small columns fully exposed to the action of the steam in the chamber *a*; also as the pipes *g*, open separately into chambers *f* and *i*, if one tube is thinner than others and hence heats the water quicker, the water can freely flow through the same more rapidly than through the other tubes *g* of the nest.

It should be observed that the water pipes in the chamber are completely surrounded by hot steam so that the water is quickly heated and that the water return chamber at the upper end of the pipe is also surrounded by the hot steam so that the water is most thoroughly heated in an exceedingly economical manner; also that the construction is very simple and allows free expansion and contraction of both exhaust cylinder and water tubes without any strain on either because the chamber 2, and tubes *g*, are disconnected from the tank *a*, except at their lower ends. This vertical exhaust chamber is provided with a pump on its exterior, the pump cylinder *m*, being longitudinally arranged on the ex-

terior of the chamber and bolted directly thereto and in the present instance having the discharge pipe m' , therefrom to the inlet chamber at the bottom of the heater and also having the water supply pipe n , from the source of water supply. o , indicates the reciprocating piston of said pump and cylinder reciprocating in a vertical plane and provided with the guide p , bolted to the chamber and arranged above the cylinder. Any suitable means can be provided to reciprocate the pump plunger or piston. Referring to means here shown for this purpose the horizontal driving shaft p , is mounted in a suitable saddle h , bolted on the upper portion of the chamber. This shaft is connected suitably to the pump piston to reciprocate the same and has a suitable pulley such as 3, by which the driving power can be attached, or it may be provided with any driving means.

The driving means for the pump consists of the pitman 4, from crank 9, of shaft p' , to one end of fulcrum bar 5. This bar at its opposite end is supported by the link 6, and is adjustable longitudinally through a bearing in head 7, pivoted in the upper end of piston rod o . A screw 8, is provided to adjust the bar 5 through the head 7 to vary the stroke of the pump. The screw is journaled to the bar 5, and extends through a threaded opening in the head 7.

The inlet and outlet from the pump can be provided with suitable check valves.

It will be observed that the water tubes are straight throughout their length and hence can be easily cleaned whenever desired by removing cap from the top of the steam chamber and inserting a flue scraper or other means into the said water tubes to clean them. It is also evident that I do not wish to limit myself to any particular construction of pump as either double or single acting pumps can be employed without varying my invention.

Great advantages are attained by this combined apparatus in that the cost of manufacturing is greatly reduced, and the space required in boiler room to set up is much less than is usually required for a heater or a pump of any kind. By this arrangement the pump is arranged close to the heater where it is very

desirable that it should be thereby doing away with much of the pipe usually required when the heater and pump are two separate machines. The time and labor in setting up machines are greatly reduced as when the heater is perfectly set in position the pump is carried by the heater and thereby the necessity of adjusting the pump and setting up the same is avoided.

The peculiar pump operating mechanism is not claimed herein, but forms the subject matter of a pending application, Serial No. 500,464, filed February 17, 1894.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The herein described feed water heater composed of the vertical steam tank having steam inlets and outlets, a water receiving chamber on the under side of said chamber, the plurality of parallel water heating tubes longitudinally in said chamber opening through the bottom thereof, the hot water chamber on the upper ends of said tubes and out of contact with the walls of the tank, and the single hot water discharge pipe from said hot water chamber, as and for the purposes set forth.

2. The feed water heater composed of the vertical tank having a removable top, the cool water chamber secured to the under side of the tank, the plurality of water tubes longitudinally arranged in the tank and opening through the bottom thereof into said chamber, the separable hot water chamber on the upper ends of said tubes so that access can be had to the interiors of the tubes as described, and the single discharge pipe from the hot water chamber arranged longitudinally of the tank and extending laterally therefrom, whereby the water is kept moving very slowly through said tubes, as set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

WILLIAM ERSKINE MOFFATT.

Witnesses:

J. W. COBB,

B. P. BOYD.