





# UNITED STATES PATENT OFFICE.

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## HEATING AND CONDENSING FEED-PUMP.

SPECIFICATION forming part of Letters Patent No. 754,826, dated March 15, 1904.

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*To all whom it may concern:*

Be it known that I, WILLIAM TATE, a citizen of the United States, residing at Greensboro, in the county of Guilford and State of North Carolina, have invented a new and Improved Heating and Condensing Feed-Pump, of which the following is a specification.

The invention resides in a peculiar attachment to pumps, providing improved steam-condensing and water-heating means, the pump being adapted for drawing the water from a supply thereof and forcing it, after passage through the heating means, into a steam-boiler or a storage-tank, from which it may be conveyed and used according to conditions and the purpose of its use.

The invention consists of an attachment of the character stated whereby induced or forced water is more effectively heated by the return water or steam in a heating system, exhaust or low-pressure steam, or the water of condensation from any steam-power plant.

More specifically stated, the invention consists of a peculiarly-constructed attachment of the character stated, specially adapted for use with double-acting pumps, though it may be modified, adapting it to be used with single-acting pumps, without departing from its broad conception or embodiment as invented by me.

In the accompanying drawing, forming a part of this specification, the view is in illustration of a vertical section taken through the whole apparatus, including the inlet connections, the outlet or discharge openings being also indicated.

In the preferred embodiment of my invention I employ a pump-cylinder A, having therein a suitable piston B. The pump-cylinder is suitably cut away, adapted for receiving a casing C, the casing being secured in place by bolts or other approved and well-known means.

In the casing C, I provide upper chambers D D', communicating, respectively, through passage-ways E E' with opposite ends of the pump-cylinder, as shown. A lower and elongated chamber F is also provided in the casing C, having therein a suitable discharge-opening G. In the chambers D D', I arrange suit-

able upwardly-seating and yielding valves D<sup>2</sup> D<sup>3</sup> and also in the chamber F similar yielding and upwardly-seating valves F' F<sup>2</sup>. All the valves above mentioned may be supported on depending pins H and yieldingly held by springs I, closing the respective openings J J' K K' in the upper sides of the chambers D D' F.

I would have it understood that I do not desire to be limited in the use of my invention to the relative location of the valves and chambers as shown, since they may be modified and adapted for downwardly-seating valves by those skilled in the art.

Upon the casing C, I arrange and secure by bolts or other means an extension L, having an inner chamber M, reduced at N and downwardly enlarging from N, as indicated at O.

In the chamber M the feed-water is heated, as will appear further on.

P denotes a water-chamber having screw-thread support on the upper end of the extension L, the said chamber being adapted for adjustment whereby the water-spraying passage Q is regulated, and it may be secured as adjusted by a locking-collar R.

S denotes the water-inlet, and T the steam and hot-water inlet. It will be noticed that the water-inlet S is extended down to near the bottom of the water-chamber P and that it may be adjusted for regulating the inflow. The water-chamber P and pump-cylinder A may be provided with washout-plugs U, as shown.

It will be understood that the space M in the extension L forms the main suction-chamber and that the water to be heated is sprayed therein with force, according to the more or less pressure on the water in the surrounding water-chamber and the degree of opening Q, which may be regulated by adjusting the water-chamber up or down on the screw-threaded portion of the extension L, thereby spacing its upper end more or less from the inner upper side of the water-chamber, as will be understood.

In the use of my invention upon reciprocation of the piston B suction is created down through the upper valves and the feed-water heated, as I will now describe. Upon move-



ment of the pump-piston, as indicated by the arrow, suction is created down through the valve  $D^2$  and passage E from the main inlet or suction chamber M, where steam or hot

5 water is entered through the inlet T. The feed-water may be forced into the chamber M in the form of spray or allowed to flow therein, as described, or according to pressure on the water-supply.

10 It is apparent that as the feed-water enters the chamber M suction produced therein and on the steam and hot-water inlet will effect improved heating of the feed-water and condensing of the steam. The enlarged upper

15 end of the chamber M provides expanding space for the entering steam, and its contracted portion serves to force the steam and water together before reaching the upper set of valves.

20 The operation of the pump and valves will be understood. I may say, however, that when the piston is moving as indicated by the arrow the water will be drawn into its cylinder through the valve  $D^2$  and passage-way E.

25 Upon reverse movement of the piston the valve  $D^2$  will be seated and the valve  $F'$  unseated. In this position of the valves mentioned water will flow into the chamber F and during the reverse movement of the piston

30 be forced therefrom through the discharge-opening G. Movement of the piston in direction indicated by the arrows will effect operation of the valves  $D^3$  and  $F^2$  the same as the operation of the valves  $D^2$  and  $F'$ , where-

35 by upon working of the piston back and forth a continuous flow of heated water is discharged through the opening G in the chamber F.

40 The main idea involved in my invention is the special means whereby the feed-water is heated. The water-conveying means to the chamber P may be connected to the lower side of said chamber, and any suitable form or type of pump and valves may be used. The

45 latter may be located on top of their chambers and seat downwardly simply by providing a suitable passage-way from the suction-

chamber down the side of the valve-chambers and leading to the lower set of valves. In the modified form just described obviously 50 the chamber F would be uppermost.

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

1. In a feed-water heater, and in combination, 55 a pump, a connected chamber, the chamber being divided into compartments, having communicating passage-ways with the pump, valves in the compartments, a heating and condensing chamber communicating with the 60 pump, through the said valves and compartments, a water-space surrounding the said heating and condensing chamber, in open communication therewith through a reduced passage-way, steam and hot-water conveying means, to 65 the said heating and condensing chamber, and water-conveying means leading into the said water-chamber, substantially as described.

2. In combination with a double-acting 70 pump, an extension having an inner heating and condensing chamber, a water-chamber on the said extension, communicating with the said heating and condensing chamber through a passage-way, one of whose walls is adjust- 75 able with respect to the other, steam and hot-water conveying means leading through the said heating and condensing chamber, and feed-water conveying means leading into the said water-chamber, substantially as described.

3. The combination with a double-acting 80 pump, of an extension, having an inner heating and condensing space, an adjustable water-chamber on the said extension, having water-conveying means leading thereto, and a spraying passage-way in open communication with 85 the said heating and condensing space, and steam and hot-water conveying means leading into the extensions heating and condensing space, substantially as described.

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Witnesses:

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