(No Model.) 3 Sheets—Sheet 1.

J. B. BARNES.

LOCOMOTIVE FEED WATER HEATER.

No. 588,377. Patented Aug. 17, 1897.

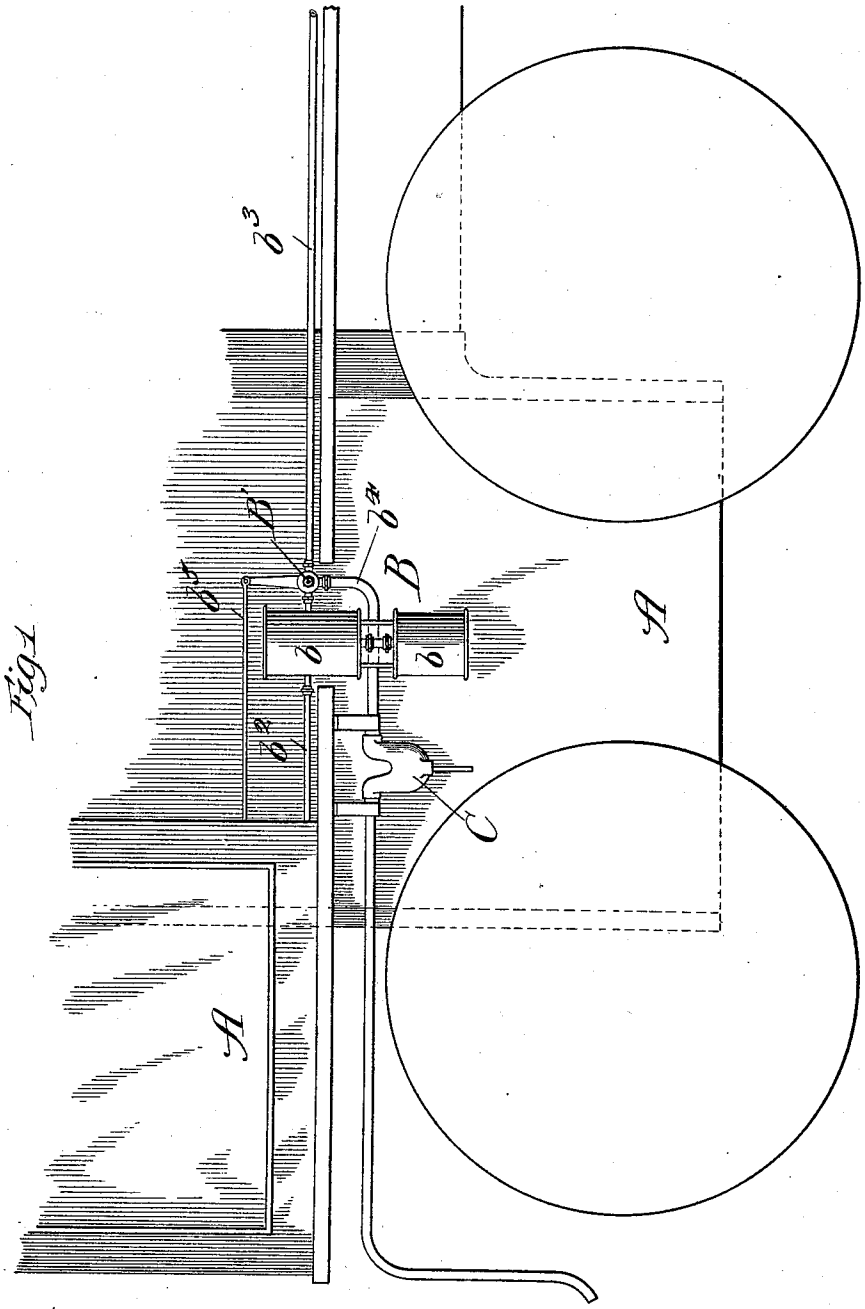


Fig. 1.

Witnesses:
Chas. E. Gaylord.
Lute S. Miller

Inventor.
Joshua B. Barnes,
By Banning & Banning & Sheridan
Attys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 3 Sheets—Sheet 2.

J. B. BARNES.

LOCOMOTIVE FEED WATER HEATER.

No. 588,377. Patented Aug. 17, 1897.

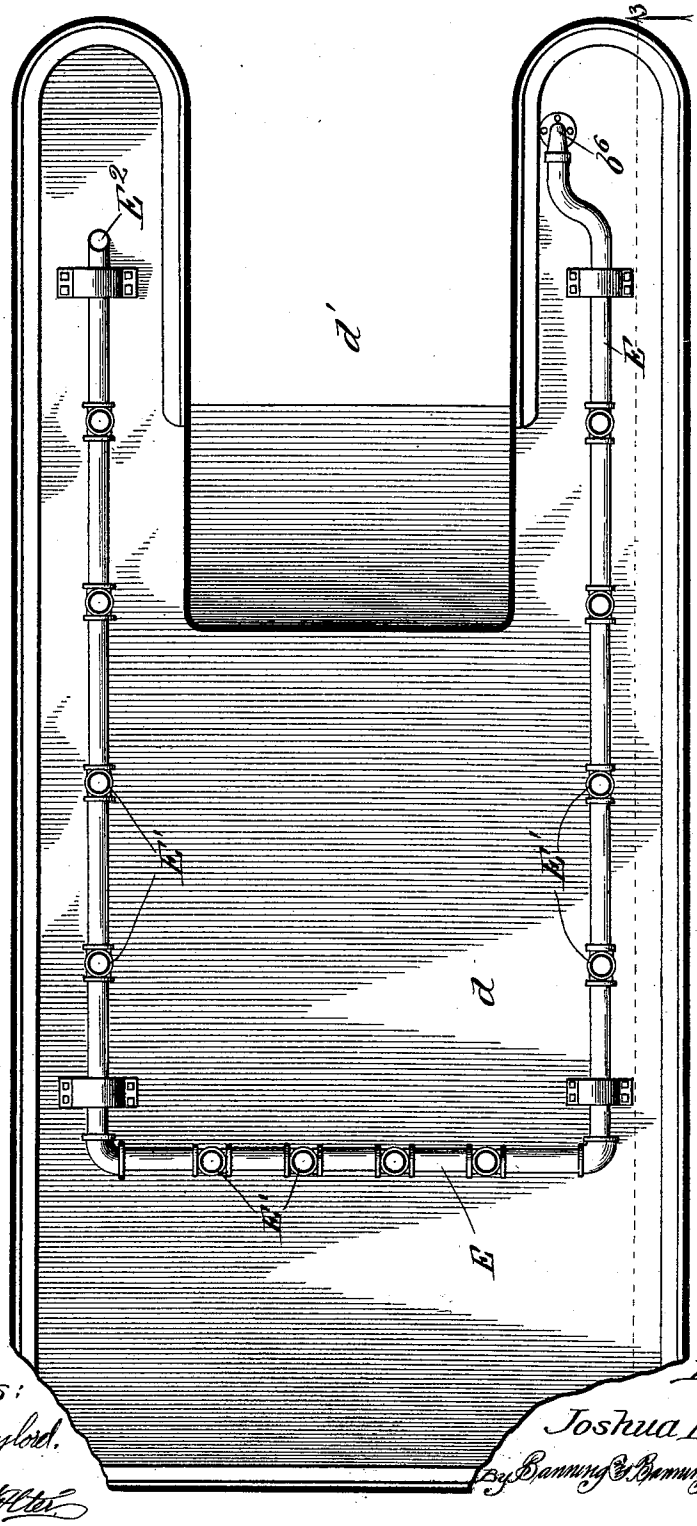


Fig. 2.

Witnesses:
Chas. E. Gaylord.
Lucie J. Potter

Inventor:
Joshua B. Barnes,
By Banning & Banning & Sheridan
Att'ys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 3 Sheets—Sheet 3.

J. B. BARNES.

LOCOMOTIVE FEED WATER HEATER.

No. 588,377. Patented Aug. 17, 1897.

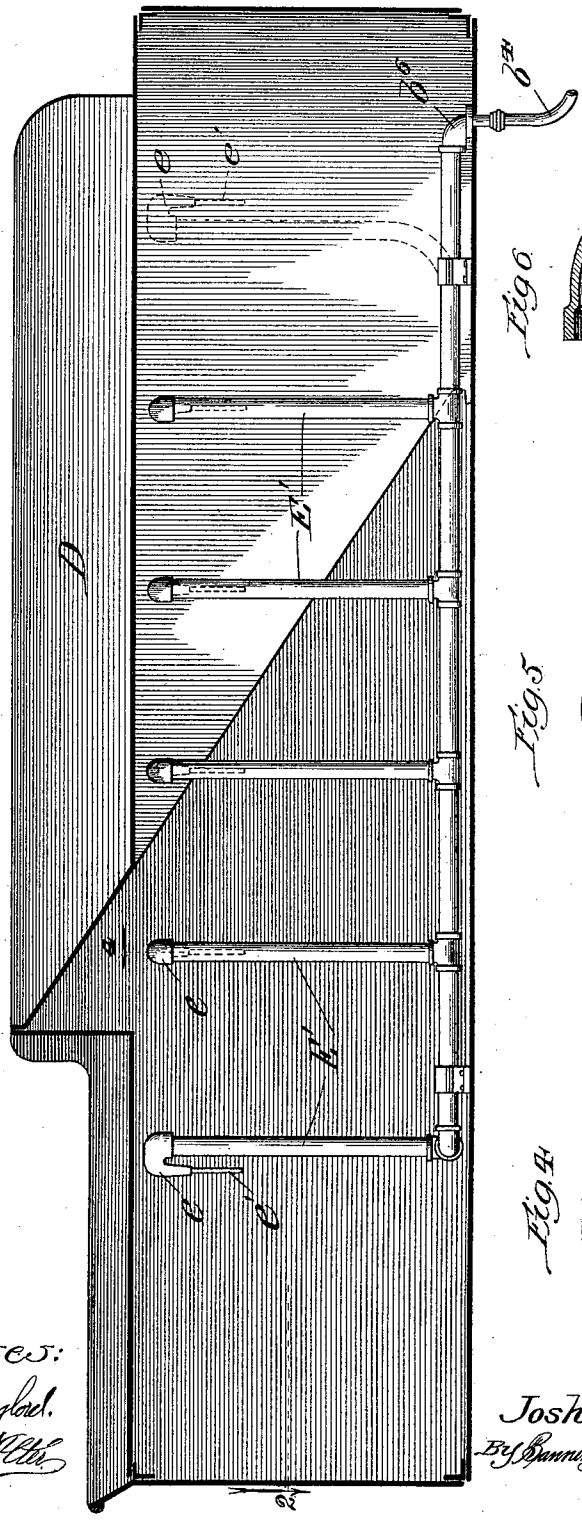


Fig. 3.

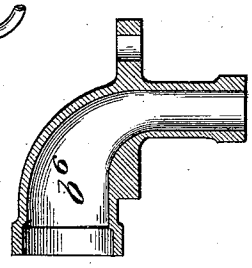


Fig. 6.

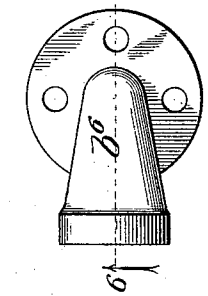


Fig. 5.

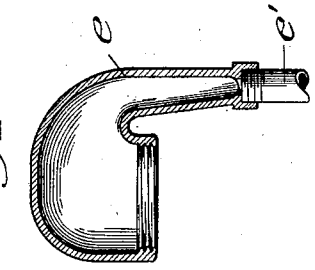


Fig. 4.

Witnesses:
Chas. E. Gaylord.
Luke V. Sullivan.

Inventor:
Joshua B. Barnes.
By Banning & Banning & Sheridan.
Attys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JOSHUA BARTLETT BARNES, OF SPRINGFIELD, ILLINOIS.

LOCOMOTIVE FEED-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 588,377, dated August 17, 1897.

Application filed February 11, 1897. Serial No. 622,930. (No model.)

To all whom it may concern:

Be it known that I, JOSHUA BARTLETT BARNES, a citizen of the United States, residing at Springfield, in the county of Sangamon and State of Illinois, have invented certain new and useful Improvements in Locomotive Feed-Water Heaters, of which the following is a specification.

The object of my invention is to provide a simple, economical, and efficient feed-water heater for locomotives, one that is adapted to take the exhaust-steam from a Westinghouse or other steam-pumps and convey it through the water-leg of the tender for the purpose of maintaining the steam therein at a uniform temperature and thus economize in the saving of fuel; and the invention consists in the features, combinations, and details of construction hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a side elevation, in diagram form, of a locomotive, showing a part of my improvement attached thereto; Fig. 2, a plan sectional view of the tender of a locomotive, taken on line 2 of Fig. 3, showing my improvements attached thereto; Fig. 3, a vertical sectional elevation taken on line 3 of Fig. 2, looking in the direction of the arrow; and Figs. 4, 5, and 6, details of construction hereinafter more fully described.

In the art to which this invention relates it is well known that the water in the tender of a locomotive is subject to the influence or temperature of the surrounding air and that the water enters the boiler at a very low temperature and prevents the economical production of steam. It is also well known that while feed-water heaters are applied to stationary boilers there has been no practical application of the same to locomotive-boilers, and no feed-water heater has been generally adopted owing to the fact that the level of the water is constantly changing in the tender, which is generally moving at a high rate of speed. My invention therefore is intended, primarily, to overcome these objections by providing mechanism that will simply, economically, and efficiently use the exhaust-steam of the usual Westinghouse or other pumps to raise the temperature of the water and maintain it at a substantially uniform point, and at such a temperature as will result in the economical production of steam and consequent saving of fuel.

In constructing a heater in accordance with my improvements and adapting it for use I use a locomotive A of any desired type, and which may be provided with an air-pump B of the Westinghouse or other type, in which b is the steam-cylinder and b' the air-compressing cylinder. I provide the steam-cylinder with an inlet-pipe b^2 and an exhaust-pipe on which is located a three-way valve B'. This three-way valve is provided with an exhaust-pipe b^3, that leads to the smoke-stack, and with a second exhaust-pipe b^4, that leads to the feed-water heater, as hereinafter described. The three-way valve has actuating rod and lever mechanism b^5, that leads into the cab of the locomotive, so that by moving the valve in the proper direction the exhaust-steam may be led to pass into the smoke-stack or back into the feed-water heater of the tender.

As the mechanisms of a three-way valve and Westinghouse or other steam-pumps are so well known, I do not think it either necessary or desirable to here describe the same, as such description would only tend to confusion and ambiguity.

The steam-exhaust pipe b^4, or, as I prefer to call it, the "exhaust-steam-supply pipe," is provided with a separator C, which extracts the oil from the steam and permits the steam or condensed vapor to pass back free from all impurities, so that when the condensed steam or vapor is forced into the water of the tender it will not tend to defile such water or render it unfit for steam-making purposes. This separator, however, is old and well known in the art of separation, and as I do not make any claim, broadly, for such device I do not deem it necessary to here illustrate or describe it in detail.

I next provide a tender D of any of the usual forms of construction, having a water-chamber d of the desired size and shape. This tender may be made in any desired way of metal and has the ordinary coal-bin d', arranged to suit different circumstances and conditions. Inside of the tender and ar-

ranged adjacent to the bottom portion of the water-chamber is a horizontal steam-pipe E of the desired size, and which is connected at one end with the exhaust-steam-supply pipe. In use I prefer to make the pipe for supplying steam-exhaust about one and a quarter inches in diameter and the horizontal heater-pipe in the tank about two and a half inches in diameter, thereby facilitating the passage of steam and giving a larger surface for the water to contact, and thus providing for rapid action of the heater. The horizontal heater-pipe in the water-leg is provided with an elbow b^6 to facilitate the connection between the exhaust-supply pipe and the heater.

The horizontal heater-pipe is provided with a series of vertical stand-pipes E', having what might be termed "goosenecks" or return-bends at their upper ends, to which are secured short sections of small pipes or nozzles e' of a diameter of from half to three-quarters of an inch to suit different circumstances and conditions. The last of the series, which also forms the end of the heater-pipe, should have a nozzle of slightly-larger diameter than the preceding stand-pipes, so that it will prevent back pressure and allow a free exhaust, while at the same time letting the hot water out of the pipe. The other stand-pipes are for the purpose of permitting the vaporized steam to condense and fall back into the main heater. At the same time their nozzles allow sufficient vent, as occasion may require, and materially relieve back pressure.

In operation the engineer or operative moves the three-way valve so that the steam passes from the exhaust of the Westinghouse or other pumps through the separator, extracting the oil, thence back into the main heater-pipe, and rises in the stand-pipes, where it is rapidly condensed, any and all vapor passing out into the water. The condensed water falls back into the main pipe, through which it is forced out through the end of the last stand-pipe in the shape of vapor or condensed water to mingle with the water of the tank. These actions raise the temperature of the water in the feed-tank, so that it may enter the boiler for the purpose of forming steam at a sufficiently high temperature to materially assist in steam formation, and consequently in the economy of fuel. As the water recedes in the water-leg of the tender the tops of the stand-pipes are exposed and the heating-surfaces in contact with the water correspondingly reduced, so that there is a tendency for the water to maintain a somewhat uniform temperature, according to the amount of water in the tank.

While I have described my invention with more or less minuteness as regards details and as being embodied in certain precise forms, I do not desire to be limited thereto unduly any more than is pointed out in the claims. On the contrary, I contemplate all proper changes in form, construction, and arrangement, the omission of immaterial elements, and the substitution of equivalents, as circumstances may suggest or necessity render expedient.

I claim—

1. In a feed-water heater for locomotives, the combination of a tender provided with a water-holding chamber, a horizontal pipe arranged therein adjacent to the bottom portion, a series of vertical stand-pipes having nozzles at or near their upper portion to assist in relieving back pressure, and a pipe connecting the horizontal pipe with a source of exhaust-steam, substantially as described.

2. In a feed-water heater for locomotives, the combination of a tender provided with a water-chamber, a horizontal pipe arranged in such chamber at or near the bottom portion of the same, a series of vertical stand-pipes arranged thereon having return-bends at their upper portions, nozzles on such return-bends, and a pipe connecting the horizontal pipe with a source of exhaust-steam supply, substantially as described.

3. In a feed-water heater for locomotives, the combination of a tender provided with a water-chamber, a horizontal heating-pipe arranged therein adjacent to the bottom portion, a series of vertical stand-pipes arranged on the horizontal pipe and provided with return-bend upper portions having reduced nozzles extending downwardly to permit the exhaust of vapor and relieve back pressure, and a pipe connecting the horizontal pipe with a source of exhaust-steam supply, substantially as described.

4. In a feed-water heater for locomotives, the combination of a tender provided with a water-chamber, a horizontal heating-pipe arranged on the chamber and adjacent to the bottom portion thereof, a series of vertical stand-pipes arranged thereon and provided with return-bend upper portions having nozzles of a reduced diameter—the last of the series being provided with a nozzle of a larger opening than the rest, and a pipe of smaller diameter than the horizontal pipe connecting it with a source of exhaust-steam supply, substantially as described.

5. In a feed-water heater for locomotives, the combination of a tender provided with a water-chamber, a horizontal heater-pipe arranged therein adjacent to the bottom portion, a series of vertical stand-pipes having return-bend upper portions and nozzles of a reduced diameter, a pipe connecting the horizontal pipe with the exhaust-opening of the steam-pump, a three-way valve interposed on such exhaust-steam-supply pipe, and a pipe connecting one of the exhaust-openings of the three-way valve with the stack of the locomotive, whereby steam may be shut off from the heater in the tender and forced out through the ordinary passage in the stack or vice versa, substantially as described.

6. In a feed-water heater for locomotives,

the combination of a tender provided with a water-chamber, a horizontal heater-pipe arranged therein and adjacent to the bottom portion thereof, a series of vertical standpipes on such horizontal pipe provided with return-bend upper portions having nozzles of reduced diameter, a pipe connecting the horizontal heater with a source of exhaust-steam supply, and an oil-separator on such exhaust-supply pipe, substantially as described.

JOSHUA BARTLETT BARNES.

Witnesses:
T. W. GENTRY,
A. B. MARS.