W. T. HARRIS.

FEED WATER HEATER AND EXHAUST STEAM CONSERVER.

APPLICATION FILED AUG. 16, 1919.

1,337,556.

Patented Apr. 20, 1920.

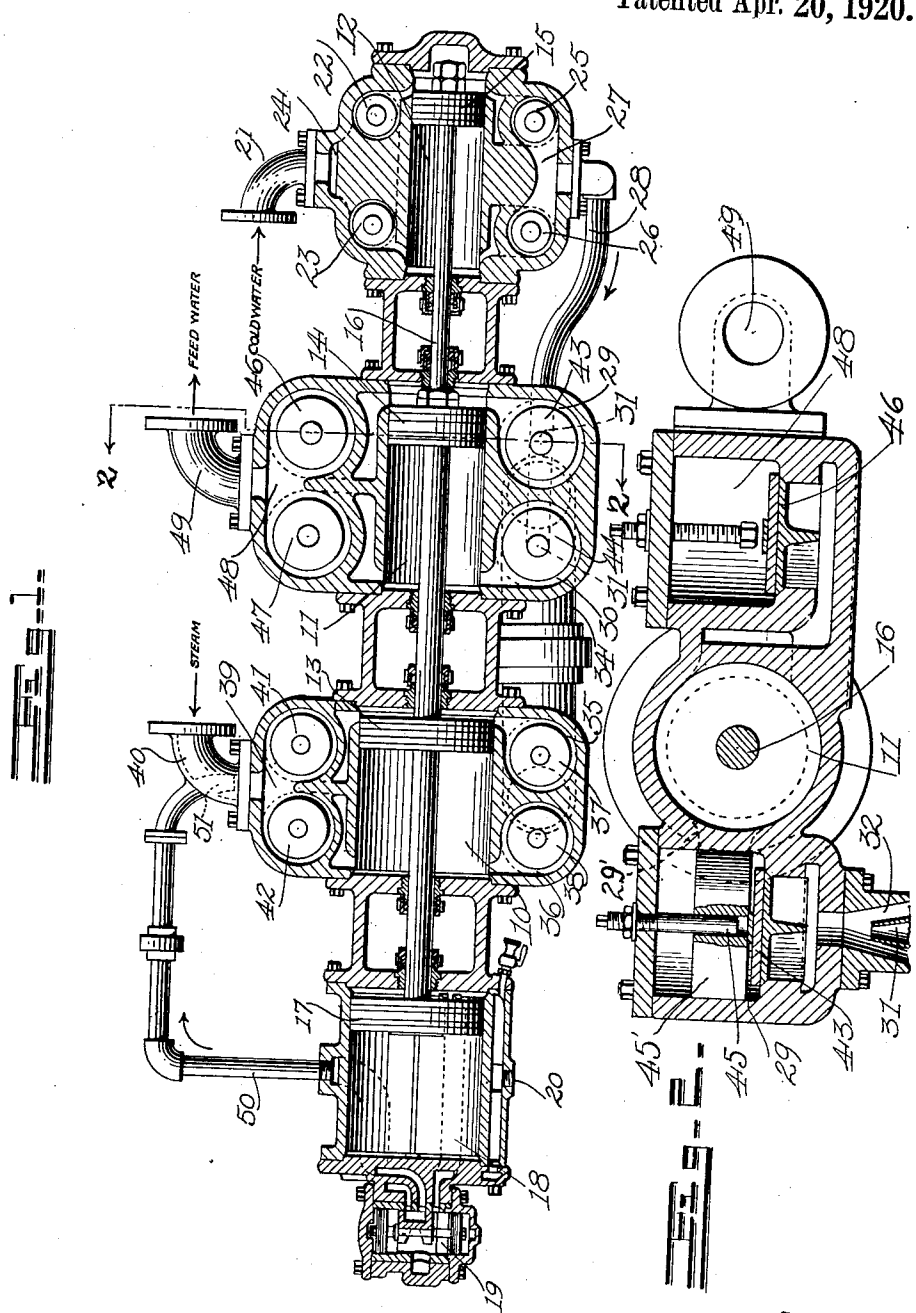


Fig. 1.

Inventor
William T. Harris

By Bradford, Morrell & Brinman
Attorneys

UNITED STATES PATENT OFFICE.

WILLIAM T. HARRIS, OF CHARLOTTESVILLE, VIRGINIA.

FEED-WATER HEATER AND EXHAUST-STEAM CONSERVER.

1,337,556. Specification of Letters Patent. Patented Apr. 20, 1920.

Application filed August 16, 1913. Serial No. 317,964.

To all whom it may concern:

Be it known that I, WILLIAM T. HARRIS, a citizen of the United States, residing at Charlottesville, in the county of Albemarle and State of Virginia, have invented certain new and useful Improvements in Feed-Water Heaters and Exhaust-Steam Conservers, of which the following is a specification.

This invention relates to feed water heaters and exhaust steam conservers and has for an object to provide an attachment to steam engines which shall employ the exhaust steam to heat the feed water and the feed water to condense the exhaust steam, whereby the aqueous content of the steam is conserved and at the same time introduced into the boiler with the feed water from a storage tank in a heated condition.

A further object of the invention is to provide a device adapted to be operated with a vapor engine wherein the exhaust steam presents no pressure, or less than atmospheric pressure, with means for employing such exhaust steam at low pressure for the same purpose of condensation and heating, as before stated.

With these and other objects in view, the invention comprises certain novel constructions, units, combinations of parts and arrangement of detail as will be hereinafter more fully described and claimed.

Referring to the accompanying drawings which form a part hereof and on which similar reference characters indicate similar parts,

Figure 1 is a sectional view taken substantially diametrically of the cylinders, and on substantially a horizontal plane, and Fig. 2 is a transverse sectional view taken on line 2—2 of Fig. 1 and on substantially a vertical plane.

The device comprises a series of cylinders 10, 11 and 12 with pistons 13, 14 and 15 mounted in said cylinders respectively, and actuated by a common piston rod 16. The piston rod with its connected pistons is driven from any approved source. As shown in the drawings, the piston rod is extended to operate in a fourth steam cylinder 18 having a slide valve in the steam-chest 19, the cylinder receiving live steam at 20 and being of conventional form. No further description of the cylinder 18 and its accompanying parts is believed to be necessary to the present explanation.

The cylinder 12 and piston 15 are adapted to take water from any convenient source, as the tank or tender of a locomotive, if the device is so employed, through the pipe 21. Valves 22 and 23 are employed for controlling the flow of water through the chamber 24 to the cylinder. Valves 25 and 26 are also employed for controlling the flow of the water from the cylinder 12 to the chamber 27 and pipe 28.

The pipe 28 discharges into chambers 29 and 30 by means of two nozzles 31 (see Fig. 2), which nozzles are conical, as indicated, and are located within conical passages 32, which passages form the termination of the pipe 34. The pipe 34 communicates with the chambers 35 and 36 controlled by valves 37 and 38 communicating with the cylinder 10. Upon the opposite side of the cylinder 10 a chamber 39 receives the exhaust steam through the pipe 40. The steam from pipe 40 is controlled in its passage to the cylinder 10 by the valves 41 and 42, so that the steam received through the pipe 40, valves 41 and 42, into the cylinder 10, irrespective of its pressure, when so received, is compressed by the piston 13, forced through the chambers 35 and 36, pipe 34, into the chambers 29 and 30, through the conical passages 32. In the conical passages 32 the steam is brought into engagement with the water from cylinder 12, forced through the nozzles 31 so that the steam is there condensed and the water heated. The chambers 29 and 30 are closed by valves 43 and 44. One of these valves 43 is shown in section at Fig. 2, and it is apparent that as the water is ejected through the nozzle 31 and combines with the steam through the nozzle 32, the combined steam and water will raise the valve. A screw adjusted guide 45 is positioned to limit the movement of the valve 43 which is similar in all respects to the valve 44 and the nozzle for introducing water and steam is also in all respects similar, both nozzles being branched from pipe 28. The guide 45 also properly positions slide valve 45′ which in its rise and fall with valve 45 opens and closes port 29′ to cylinder 11. The combined water and steam, now having been introduced into the piston 11, is forced through the valves 46 and 47, according to the direction of movement of the piston, into the chamber 48. From the chamber 48 the water passes through the pipe 49 and such further con-

nection as may be attached thereto, in heated condition, to the boiler, or to such further heating appliances, as for instance, a heating coil in the front end of a locomotive, as shall be connected therewith. The cylinder 18 when employed as a motive power for operating the several pistons 13, 14 and 15, is provided with an exhaust pipe 50, which by means of its connection at 51 with the pipe 40, also exhausts its steam into the chamber 39, so that not only does the device receive and condense the steam of the larger engine to which it is applied, but also condenses its own steam in like manner. The valves 22, 23, 25, 26, 37, 38, 41, 42 and 47 are similar in all structural particulars to the valve 46 hereinbefore described.

In operation the device actuated by the motive power shown in the drawings, would receive live steam through the port 20 actuating the piston through the manipulation of the valve 19 in substantially the usual and ordinary manner. The actuation of the piston 17 would, of course, drive the piston rod 16 and its several connected pistons 13, 14 and 15. The driving of the piston 15 takes water from the storage, passing it through the pipe 28 to cylinder 11, while at the same time steam from the exhaust of the main engine is received through pipe 40 and cylinder 10, passing through the pipe 44, commingles at the nozzles 31 and 32 with the water from the pipe 28, and is condensed. Passing together in heated condition into the cylinder 11 such hot water is forced by the piston 13 through the chamber 48 and pipe 49 to return again to its work. In this manner practically the entire exhaust steam is conserved, thereby effecting a great saving in the consumption of water and at the same time the heat of the exhaust steam is also conserved by imparting its heat to the feed water, effecting a very great economy, both in water consumption and fuel consumption.

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

1. A feed water heater and exhaust steam conserver comprising a cylinder and piston adapted to move water, a cylinder and piston adapted to receive and compress the exhaust steam, means to commingle the exhaust steam and water, and a cylinder and piston adapted to force the resultant feed water to a point of further use.

2. A feed water heater and exhaust steam conserver comprising a cylinder and piston adapted to move water, a cylinder and piston adapted to receive and compress exhaust steam, a cylinder and piston adapted to receive commingled exhaust steam and water and to move it to a further point of use, nozzles positioned to commingle the water and exhaust steam, and valves positioned to control the flow of the condensed steam and water from such nozzles.

3. A feed water heater and exhaust steam conserver comprising means to move water, means to receive, compress and forward exhaust steam, means to commingle the exhaust steam and water, means to receive and forward the commingled water and steam, a steam cylinder and piston positioned to actuate the several parts, and an exhaust mechanism for the steam cylinder adapted to exhaust steam into the said exhaust steam line.

4. A feed water heater and exhaust steam conserver comprising a water cylinder, a steam compression cylinder, a cylinder for receiving a forwarding combined and condensed steam and water, all of said cylinders being in axial alinement, a common piston rod extending through the several cylinders, pistons mounted rigidly upon the piston rod, valves positioned to control the flow of water through the water valves positioned to control the flow of steam through the steam cylinder, valves positioned to control the flow of combined steam and water through the combined cylinder, and means to reciprocate the piston rod.

5. In a feed water heater and steam conserver a piston and cylinder, means to conduct water and steam commingled to the cylinder, a chamber introduced between the commingling conduit and the cylinder, a valve positioned to control the flow of commingled steam and water to the chamber and a slide valve positioned to control the flow of commingled water and steam from the chamber through a port to the cylinder.

6. In a feed water heater and exhaust steam conserver a chamber communicating with the cylinder through a port, a nozzle and passage positioned to discharge the commingled steam and water into the chamber, a valve positioned to prevent the return of steam and water from the chamber, and a slide valve operating in timed relation with the first mentioned valve adapted to close the port between the chamber and the cylinder.

In witness whereof I have hereunto set my hand and seal at Washington, D. C., this 14th day of August, A. D. nineteen hundred and nineteen.

WILLIAM T. HARRIS. [L. S.]