May 5, 1931. H. D. LATHROP 1,803,628

LIQUID HEATER

Filed Aug. 5, 1927

Fig. 1.

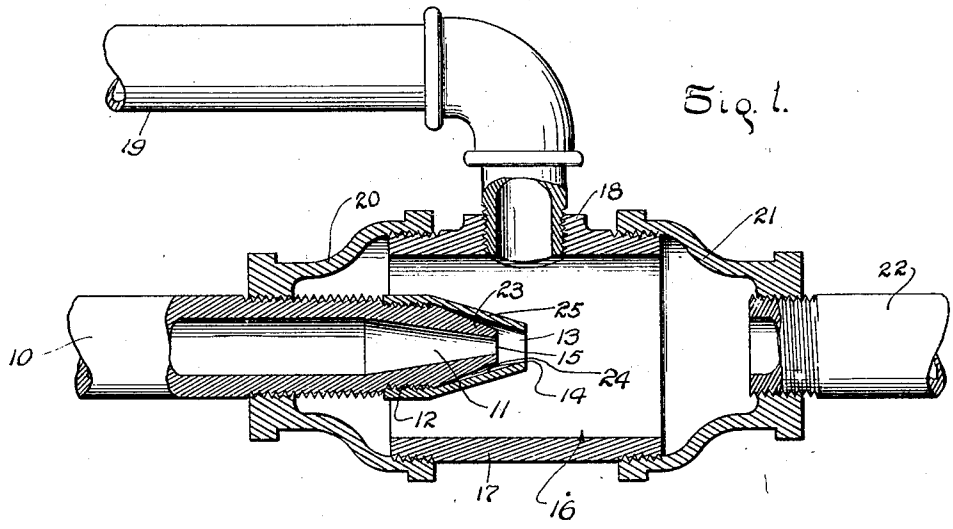
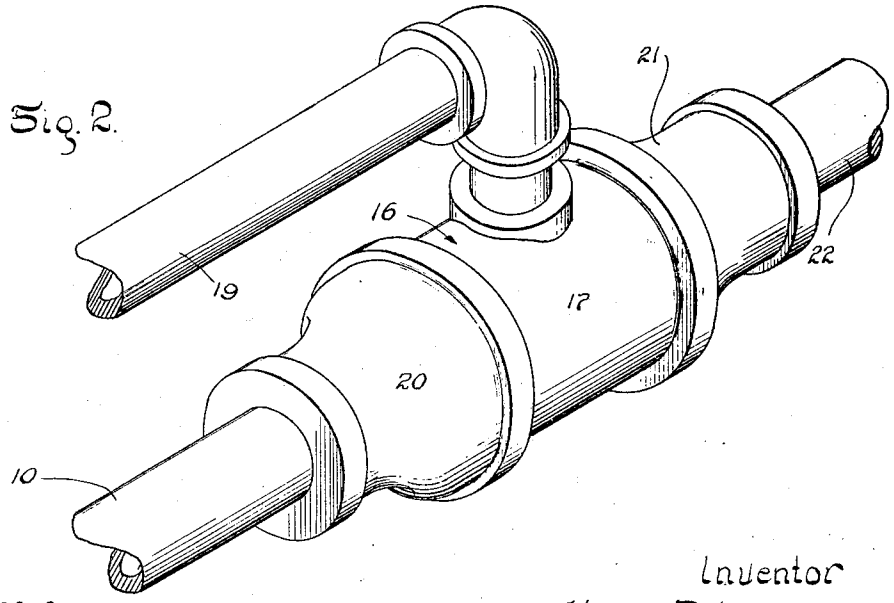


Fig. 2.



Witnesses

S. Wheeling

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UNITED STATES PATENT OFFICE

HARRY D. LATHROP, OF CHICAGO, ILLINOIS

LIQUID HEATER

Application filed August 5, 1927. Serial No. 210,772.

My invention relates to liquid heaters, and more particularly to a device for heating liquid by contact with steam.

The object of my invention is to provide such a device which is highly efficient in operation and economical in manufacture.

Another object of my invention is to provide a device of the above identified character, having means for graduating the initial condensation, and thereby avoiding the reactive resistance of the steam discharging into the liquid to be heated.

My invention will be best understood by reference to the accompanying drawing forming a part of this specification, and in which

Figure 1 is a longitudinal sectional view of a liquid heater incorporating my invention.

Figure 2 is a perspective view of that disclosed in Figure 1, with the inlet and outlet connections broken off.

In the drawing and for the purpose of illustration, I have shown the preferred embodiment of my invention in which 10 represents a steam inlet conduit having its end provided with a nozzle and disposed within a heating chamber 16, as best illustrated in Figure 1. Said nozzle comprises a reduced conical portion 11 which increases the steam velocity to a maximum as it passes the tip 15. The side walls 23 of the portion 11 are thinned toward the tip 15, thereby providing an annular space 24 of increasing thickness and of reducing diameter toward the tip 15, between the outer surface of the side walls 23 and the inner surface 14 of a nozzle hood 25, which surrounds said nozzle.

The hood 25 is provided with a screw thread engagement with the nozzle portion of the conduit 10, as at 12, and said hood projects inwardly of the chamber 16 beyond the tip 15, and terminates in a relatively small tip portion 13.

The heating chamber 16 is constructed of an intermediate cylindrical member 17 and reducer members 20 and 21 having screw thread engagement with said cylindrical member and with the inlet conduit 10, and an exhaust conduit 22 respectively. The inlet conduit and nozzle is in axial alignment with the outlet conduit for the purpose that will be hereinafter pointed out, and the tip 13 of the hood 25 is vertically beneath the end of a liquid inlet conduit 19, which has screw thread engagement in an embossed opening 18 in the cylindrical member 17.

In the operation of this liquid heating device, steam is admitted through the conduit 10 and through the nozzle portion 11, and into the space 24 before approaching the cold water or other liquid to be heated, which is admitted through the conduit 19 and fills the chamber 16. The hood 25 surrounding the nozzle is chilled by the cold liquid, and since the annular space 24 around the nozzle is relatively small, the steam becomes somewhat cooled and is more or less reduced to a vapor, while at the same time the water on the outside of the hood 25 becomes somewhat warmed by absorbing a certain degree of heat from the approaching steam before the actual mixture of the steam with the water, so that the reactive resistance of the steam discharging into water is avoided, and the required supply of steam is permitted to enter the chamber 16 sufficiently free and rapidly to raise the temperature of the water within said chamber 16, particularly near a discharge end thereof to the required degree of heat before discharge of the heated water through the outlet conduit 22, which leads from said chamber from the opposite end thereof, and in axial alignment with the nozzle. The heated water is urged outwardly through the exhaust conduit 22 and is provided with considerable pressure on account of the said axial alignment of the nozzle and the outlet conduit.

Having described my invention in its preferred form, it is capable of variation without departing from the spirit of the invention, and I do not wish to be limited to the precise details of construction herein illustrated and described, but desire to avail myself of such variations and modifications as come within the scope of the appended claims.

I claim as my invention:

1. A liquid heating devise comprising a heating chamber formed of an intermediate cylindrical member with a removable steam inlet reducer and a removable liquid outlet reducer; a steam inlet conduit having a nozzle thereon disposed within said chamber; an outlet in axial alignment with said steam inlet conduit; a liquid inlet at substantially right angles to said steam inlet conduit; a hood engaging and surrounding said nozzle and providing a relatively small annular cooling space between the nozzle and the hood for graduating the initial condensation, the tip of said hood extending beyond the tip of said nozzle, to a point in vertical alignment with the center of said liquid inlet, and means for varying the position of said nozzle relatively to said inlet.

2. A liquid heating device comprising a heating chamber; said chamber consisting of a relatively small cylindrical portion having reducing members secured to the ends thereof, and engaging inlet and outlet conduits; a liquid inlet conduit secured in an opening in the side of said cylindrical portion; the first said inlet conduit being provided with a nozzle and adapted to receive steam therethrough; said nozzle disposed within said cylindrical portion of said chamber; said outlet conduit being in axial alignment with said nozzle; said liquid inlet being positioned substantially vertically above the inner end of a hood secured to said nozzle; said liquid inlet being at right angles to said steam inlet conduit; said hood engaging and surrounding said nozzle and providing a small annular cooling space between said nozzle and said hood for graduating the intial condensation.

3. A liquid heating device, comprising a heating chamber having a restricted outlet, means for delivering liquid to be heated to said chamber, and a nozzle in said chamber for discharging steam directly into the contained body of liquid, said nozzle being arranged in opposed cooperative relation to and in axial alignment with said restricted outlet of the heating chamber and having annularly attached thereto the inner end of a restrictively spaced hood surrounding its discharge end portion for initially graduating condensation of the steam discharged therefrom said hood being closed annularly at its inner end and tapering to a restricted concentric outlet beyond the end of the nozzle member proper.

4. A liquid heating device, comprising a heating chamber having a restricted outlet and a transversely arranged inlet for the liquid to be heated, and a nozzle in said chamber for discharging steam directly into the contained body of liquid, said nozzle being arranged in axial alignment with said restricted outlet and its discharge end being located in proximity to said inlet of the heating chamber, said discharge nozzle having an annular hooded extension attached at its rear end portion thereto but being otherwise restrictively spaced therefrom.

5. A liquid heating device, comprising a heating chamber having a restricted outlet, means for delivering liquid to be heated to said chamber, and a nozzle in said chamber for discharging steam directly into the contained body of liquid, said nozzle having a tapered restricted discharge end portion, and a tapered hood element secured annularly at its rear end portion to the base of said nozzle, surrounding the discharge end portion thereof in restrictively spaced relation and projecting beyond the latter.

6. In a liquid heating device of the character described, a heating chamber having a restricted outlet, means for delivering liquid to be heated to said chamber transversely and a longitudinally adjustable nozzle in said chamber for discharging steam directly into the contained body of liquid, said nozzle being arranged in directly opposed cooperative axial alignment with said restricted outlet of the heating chamber and having an annularly spaced restricted hooded sleeve in proximity to the place of admission for the liquid to be heated, said sleeve being closed annularly at its inner end and projected at its forward end beyond the end of the nozzle member proper.

In testimony whereof I have signed my name to this specification.

HARRY D. LATHROP.