(No Model.) 2 Sheets—Sheet 1.

J. F. BRADFORD.

STEAM LIQUID HEATER.

No. 418,939. Patented Jan. 7, 1890.

Fig. 1.

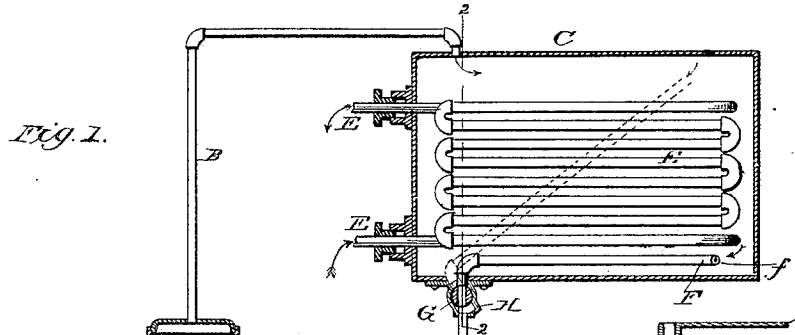
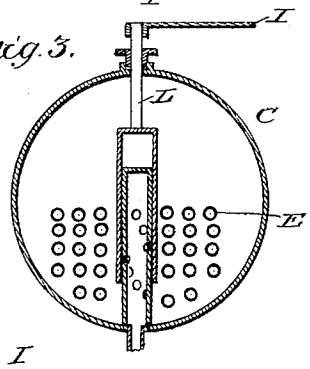


Fig. 3.



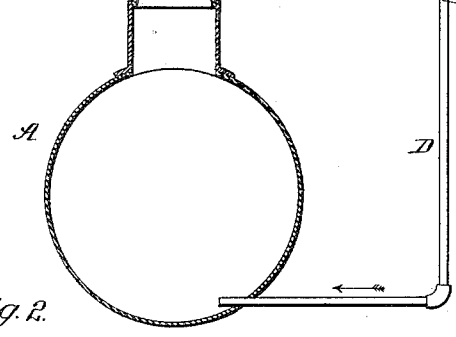


Fig. 2.

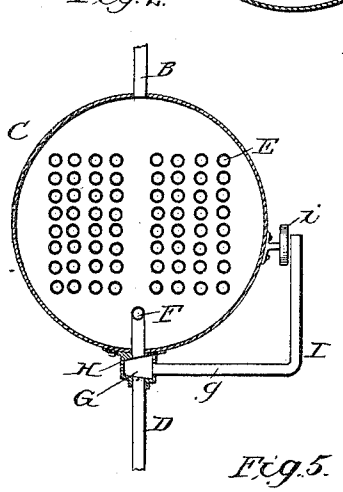


Fig. 4.

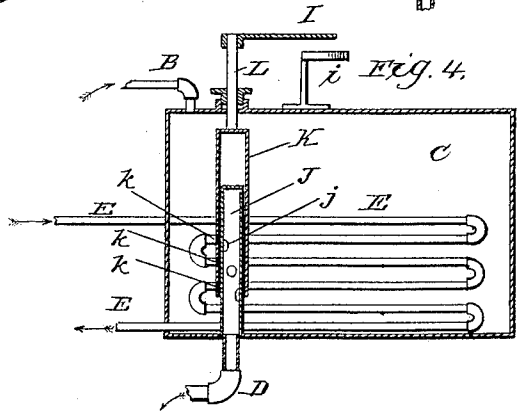


Fig. 5.

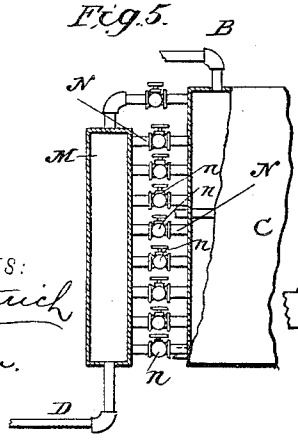
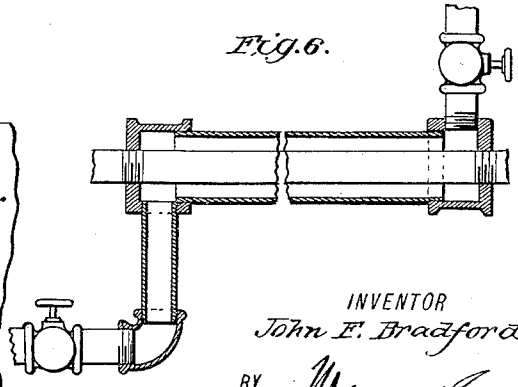


Fig. 6.



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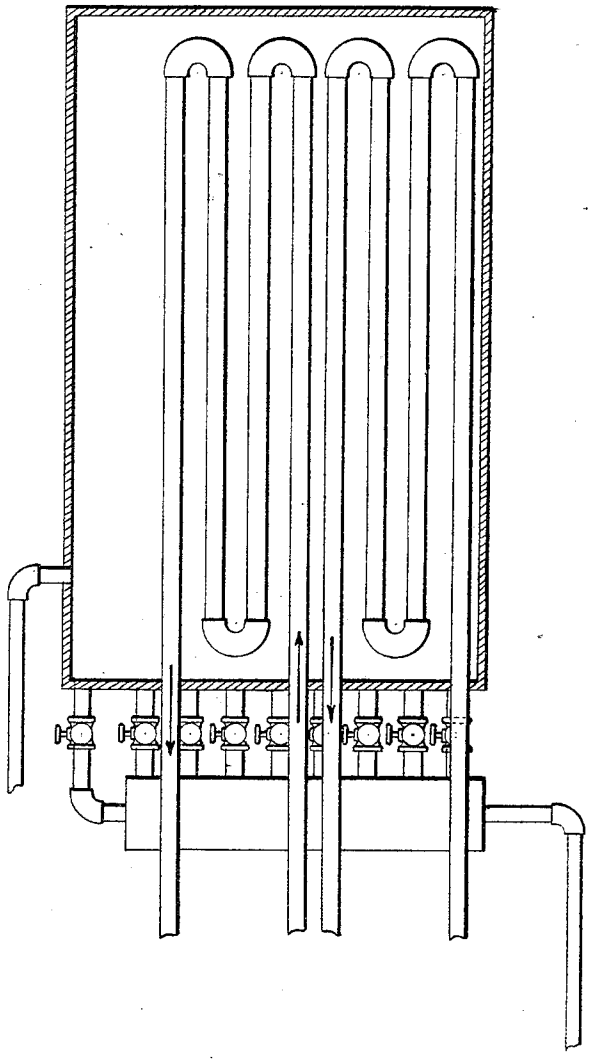
(No Model.) 2 Sheets—Sheet 2.

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Fig. 1.



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UNITED STATES PATENT OFFICE.

JOHN F. BRADFORD, OF LEETONIA, PENNSYLVANIA.

STEAM LIQUID-HEATER.

SPECIFICATION forming part of Letters Patent No. 418,939, dated January 7, 1890.

Application filed June 3, 1889. Serial No. 313,023. (No model.)

To all whom it may concern:

Be it known that I, JOHN F. BRADFORD, of Leetonia, in the county of Tioga and State of Pennsylvania, have invented a new and useful Improvement in Steam Liquid-Heaters, of which the following is a specification.

My invention is an improvement in steam liquid-heaters intended especially for use in heating tanning-liquor; and the invention has for an object, among others, to provide means whereby the degree to which the liquor is heated may be automatically regulated.

The invention consists in certain novel constructions and combinations of parts, as will be described and claimed.

In the drawings, Figure 1 is a sectional view of my preferred construction. Fig. 2 is a cross-sectional view on about line 2 2 of Fig. 1. Figs. 3 and 4 represent a somewhat different construction within some of the principles of the invention. Fig. 5 represents a still different construction within some of the broad principles of the invention. Fig. 6 shows a somewhat different construction within the broad principles of my invention, and Fig. 7 shows a double arrangement of the pipes for the liquor to be heated.

The boiler A may be of any desired construction, and is provided with a steam-pipe B, which leads into the heating-tank C at or near the top of same. This tank C, it will be noticed, is arranged above the high-water mark of the boiler A, the purpose of which arrangement is to permit the water of condensation in the heating-tank to flow back into the boiler through the water-pipe D, which, as shown, may lead directly to the boiler or may lead into the water-supply pipe of the boiler, as may be desired. This arrangement permits all the water of condensation to flow back, so that when desired the tank may be kept free of such water. The liquor-pipes E lead into and out of the heating-tank and are suitably disposed or coiled therein, so that the temperature of the liquor circulated through the same will be raised by the heat within the tank.

I have discovered that by subjecting all the coils of the liquor-pipe to the action of the live steam entering the tank through the pipe B the liquor passed through the pipes E may be raised to the highest point, while by permitting the water of condensation to cover said coils to a greater or less extent the temperature may be regulated, the degree of heat lowering as the quantity of water is increased in the tank and rising as the quantity of water is decreased. Therefore by providing for the discharge of such water at different heights in the tank I am able to regulate its accumulation and so control the temperature of the liquor. In effecting this end I provide, together with the tank and the water-pipe, a connection or outlet pipe constructed as will be described, whereby the water of condensation may be taken from the heating-tank at different heights. In carrying out this feature of my invention I prefer the construction as shown in Figs. 1 and 2, and which I will now describe. In such construction the outlet-pipe F connects at one end with the water-pipe D and has its inlet end or opening at *f* adjustable vertically, so that it may be set to different heights in the tank to receive the water of condensation and conduct it out of such tank. The connection of pipe F is preferably effected by the construction shown, in which the said pipe is provided or connects at its lower end with a plug G, turning in a casing H, secured to the tank, such plug having openings or parts registering with the base of pipe F and with the pipe D, which connects with the plug-casing H, as shown in Fig. 1. I provide the plug G with a stem *g*, to which a handle or lever I may be applied to turn the plug, and so adjust the pipe F to set its inlet end up or down, as desired. It will be seen that the higher the said inlet end is placed the more water of condensation will accumulate in the tank and the lower will be the temperature to which the liquor in the liquor-pipes will be raised, and that as the pipe is lowered it will draw off the water of condensation and leave the pipes exposed down to the said inlet-opening. An index may be provided at *i* and suitably graduated to indicate the temperature to which the liquor will be raised, the handle I moving along such index and serving as a pointer to the graduations thereof.

By the described construction it will be seen that the outlet-pipe F forms or constitutes an

outlet device, which is constructed to enable the water of condensation to be drawn off at different heights. Now, so far as I know it is now in connection with tanks, liquor-pipes therein, and a steam-pipe leading into the tank to heat the liquor in the liquor-pipes, to provide means for discharging the accumulated water of condensation at different heights, so as to regulate the temperature to the desired degree. For such reason I do not desire to be limited in the broad principles of my invention to the particular construction shown in Figs. 1 and 2, although the said construction is preferred, but desire to be protected in the constructions shown in Figs. 3, 4, and 5, which to a certain extent are equivalents of that shown in Figs. 1 and 2 and before described.

In the construction shown in Figs. 3 and 4 the outlet device or connection consists of an inner cylinder J, having a series of spirally-arranged parts *j* formed through it and connected at its lower end with the water-pipe D, and the outer cylinder K, having a series of ports *k* formed parallel with its axis, the openings *j* and *k* being in the same diametrical or transverse planes, and the cylinder K being constructed to turn on cylinder J. Now it will be seen that as the cylinder K is properly turned its opening *k* will be brought successively into register with the different openings *j*, so that the lower or upper openings *j* or any intermediate one of such openings may be registered, so as to draw off the water of condensation at different heights in the tank. At its upper end the cylindrical section K has a stem L, to which the handle I is connected, and an index *i* may be provided, as described, in connection with the construction shown in Fig. 1.

In the construction shown in Fig. 5 a drum or chamber M is provided alongside the tank and has pipes N connecting it at different heights with the tank, such pipes N being independently valved at *n*, and the pipe D being connected with such drum or chamber. By the said construction it will be seen that the water of condensation may be drawn from the tank at different heights. In this construction the drum or chamber M and the independently-valved pipes N constitute the outlet device.

It will be seen from the foregoing that the constructions shown in Figs. 3, 4, and 5 are to certain extents equivalents of that shown in Figs. 1 and 2, as before stated.

Obviously it would be within the broadest features of my invention to simply provide a tank or receiver, a pipe circulated through said tank for the liquor to be heated, a pipe for conveying the steam from the boiler to the tank or receiver, a pipe for conveying the water of condensation from the tank or receiver back to the boiler, such last-named pipe having a valve by which to control the return of water of condensation to the boiler, so that by constant watching the water may be kept at the desired height in the tank or receiver, as will be understood from Fig. 6 of the drawings; but the construction of water-outlet devices, as shown in Figs. 1 to 5, inclusive, and before described, may be preferred because it operates automatically to preserve the water at the proper or desired height in the tank or receiver.

While the single construction of liquor-pipes, as shown in Fig. 1, may give good results, it may be preferred to use the double construction of coils shown in Fig. 7. In this construction two coils are shown—a lower and an upper one—and liquor to be heated may be directed through the lower coil or through the upper coil, the lower coil being submerged and the upper coil being exposed to the direct action of the steam, as will be understood. By this construction it will be seen that two different degrees of heat may be secured from the same tank.

Having thus described my invention, what I claim as new is—

1. The herein-described improvement in liquid-heaters, consisting of the tank or receiver, the pipe for conveying steam to said tank or receiver, two independent liquor-pipes arranged one above the other within the tank or receiver, and means whereby the water may be discharged at a point between the upper and lower coils, substantially as set forth.

2. In an apparatus substantially as described, the boiler, the heating-tank, and the liquor-pipes therein, combined with the steam-pipe leading to such tank, and an outlet device, substantially as described, whereby the water of condensation may be taken from the heating-tank at different heights, substantially as set forth.

3. In an apparatus substantially as described, the combination, with the closed heating-tank having the liquor-pipes therein and the steam-pipe leading thereto, of the outlet-pipe having its inlet end or opening adjustable up and down within the heating-tank or the equivalent of such outlet-pipe, substantially as set forth, whereby the water of condensation may be taken from the heating-tank at different heights, substantially as and for the purposes specified.

4. In an apparatus substantially as described, the combination, with the tank having the steam-pipe leading therein and the liquor-pipes in said tank, of the outlet-pipe movably supported at one end at or near the bottom of the tank and movable at its other end up and down in the tank, substantially as and for the purposes set forth.

5. In a steam liquid-heater, the combination of the tank or receiver, a steam-pipe leading to such tank or receiver, an outlet device, substantially as described, whereby the height of the water of condensation within such tank or receiver may be regulated, and two independent liquor-pipes arranged one above the other, all substantially as described,

whereby liquor of two different degrees of heat may be obtained at the same time from the same heater, substantially as and for the purposes set forth.

6. In an apparatus substantially as described, the combination of the heating-tank provided with the plug-casing, the plug operating in said casing, and the outlet-pipe arranged to operate in the heating-tank and connected at one end with the said plug, whereby its opposite end may, by the turning of said plug, be moved up and down within the tank, substantially as set forth.

7. The improved apparatus, substantially as described, consisting of the boiler, the heating-tank arranged above the water-level of such boiler, the steam-pipe leading from the boiler into the tank, the liquor-pipes arranged in the tank, the plug-casing connected with the tank, the plug operating in said casing and having the shaft or stem and the handle or lever connected therewith, and the outlet-pipe connected at one end with the plug, substantially as set forth.

The above specification of my invention signed by me in the presence of two subscribing witnesses.

JOHN F. BRADFORD.

Witnesses:
P. B. TURPIN,
SOLON C. KEMON.