Dec. 7, 1948. W. C. GLOVER, JR 2,455,754

DEVICE FOR TEMPERING STEAM

Filed March 10, 1945

Fig. 1.

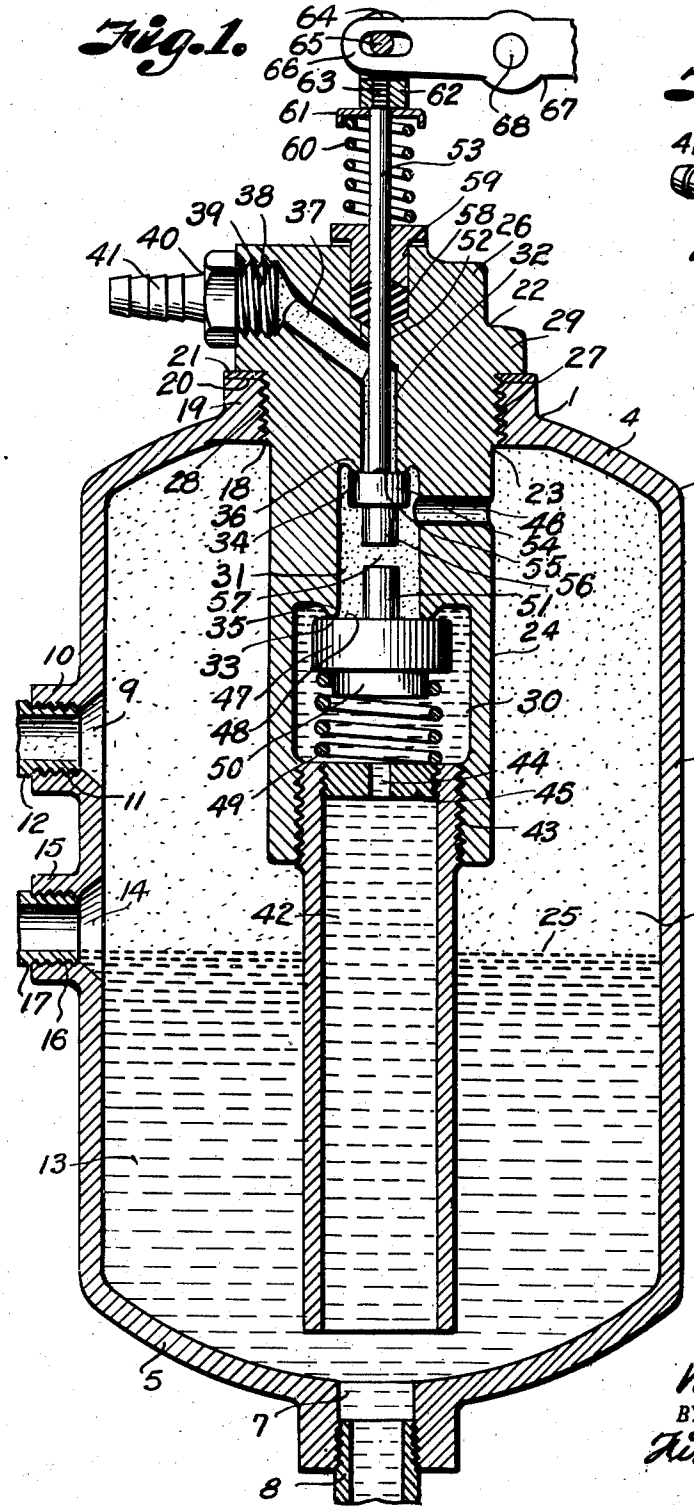
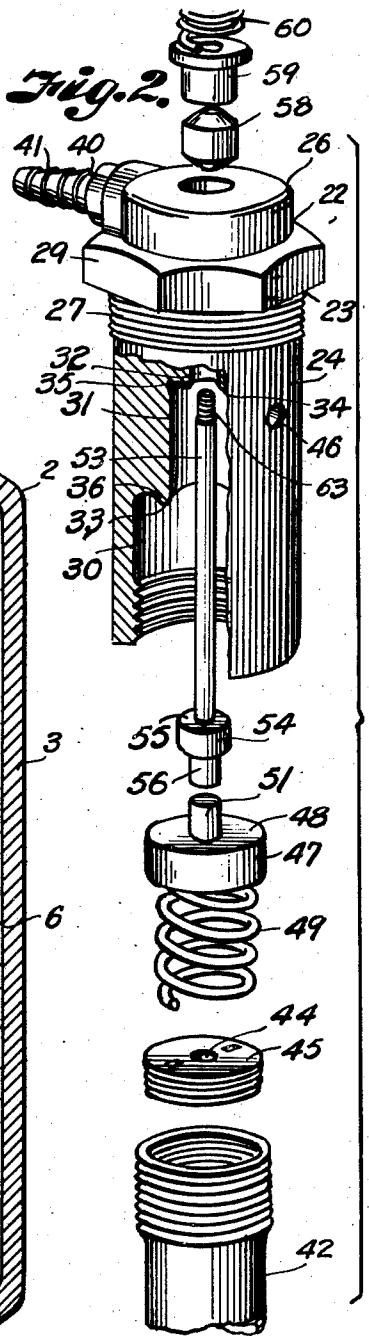


Fig. 2.



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Patented Dec. 7, 1948

2,455,754

UNITED STATES PATENT OFFICE

2,455,754

DEVICE FOR TEMPERING STEAM

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Application March 10, 1945, Serial No. 582,111

11 Claims. (Cl. 261—51)

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This invention relates to an apparatus for supplying steam needed in various processing steps; for example, in spotting or shaping garments and the like in dry cleaning establishments. In this type of work, steam is required having different degrees of moisture content varying from a very dry steam to one containing a considerable amount of entrained moisture. Heretofore it has been the practice to provide a dry steam and to temper the dry steam as required with condensate from some part of the steam system. This has necessitated a complicated piping system and separate control valves for regulating flow of dry steam and condensate. Thus, separate controls were required for actuating the valves or the valves were interconnected by a complicated operating system in which lost motion connections were required to time the valves.

It is, therefore, a principal object of the present invention to provide a steam supply apparatus involving a simple, self-contained, unitary structure devoid of complicated piping and which is adapted to be actuated by a single operating mechanism.

Other objects of the invention are to provide an apparatus which effectively and positively supplies steam having the desired characteristic at the time such steam is required; to provide an operating mechanism which has positive connection with the steam control mechanism; and to assure supply of tempered steam intermediate the flow of dry steam so as to avoid water streaking of a garment and extensive "feathering" operations necessary to prevent streaking and staining of the garments.

Further objects of the invention are to provide a structure requiring comparatively few machining operations and which may be assembled with a minimum of connections.

In accomplishing these and other objects of the invention I have provided improved structure, the preferred form of which is illustrated in the accompanying drawing wherein:

Fig. 1 is a vertical section through a steam supply unit embodying the features of the present invention.

Fig. 2 is a perspective view of the parts of the control and tempering mechanisms in spaced relation to better illustrate construction thereof.

Referring more in detail to the drawing:

1 designates a steam supply apparatus constructed in accordance with the present invention and which includes a vessel 2 that may be of any suitable shape depending upon the space and convenience of mounting thereof. In the illustrated

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instance, the vessel 2 has a vertical cylindrical wall 3 closed at the ends by outwardly dished heads 4 and 5 to form a pressure-tight chamber 6. The bottom head 5 has an outlet 7 to connect a drain pipe 8 through which sediment may be withdrawn from the bottom of the chamber 6 upon removal of a plug or opening a valve (not shown) that is connected therewith. Steam is supplied to the chamber 6 near the upper portion thereof through a lateral port 9 in a boss 10, the boss 10 being internally threaded as at 11 to connect the steam supply pipe 12 through which dry steam is supplied to the chamber 6. Part of the steam condenses and collects in the bottom of the chamber as indicated by the body of liquid 13. A predetermined level of liquid is maintained in the chamber 6 by providing the side wall at a point below the port 9 with an overflow port 14 formed in an outwardly extending boss 15 which is internally threaded as at 16 to connect a pipe 17 through which the excess condensate is conducted to the source of steam supply or otherwise disposed. The upper head 4 has a relatively large axial opening 18 encircled by a flange 19 having a gasket seat 20 thereon for seating a gasket ring 21 in encircling relation with the opening 18. The opening is internally threaded to mount a steam tempering unit 22 now to be described.

The assembly 22 includes a valve body 23 having a cylindrical portion 24 depending within the steam space of the chamber 6 but preferably terminating above the condensate level indicated at 25. At the opposite end of the body is a head 26 having a threaded portion 27 engaged in the threads 28 of the opening 18. Formed on the head above the gasket is a nut-shaped flange 29, the sides of which are adapted to be engaged by a suitable wrench to thread the assembly within the opening 18 and to effect sealing contact with the gasket ring 21. The valve body has an axial bore of varying diameter to provide a condensate compartment 30 of relatively large diameter in the lower end thereof, a steam compartment 31 of smaller diameter, and a flow passageway 32 of still smaller diameter to provide stepped valve seats 33 and 34 between the compartments 30 and 31 and the compartment 31 and passageway 32 respectively. The seats are preferably formed by providing depending circumferential ribs 35 and 36 encircling the lower end or inlet of the steam chamber and the inlet of the passageway 32.

The passageway 32 continues through the head of the valve body by connection with an upwardly and outwardly inclined bore 37 which connects with an internally threaded socket 38 to mount

the threaded neck 39 of a steam outlet connection 40. In the illustrated instance the connection 40 includes a nipple 41 for attaching a hose (not shown) of a steam nozzle (also not shown) but which is used in connection with the spotting of garments on a spotting board in accordance with established practice in the cleaning industry. When the steam is to be used for other purposes, the connection 40 may be suitably shaped to connect the desired flow duct.

Condensate is delivered to the chamber 30 by the steam pressure on the body of condensate 13 through a tubular duct 42 having its upper end threadingly connected as at 43 with the valve body and having its lower end terminating short of the lower head 5. Flow of condensate through the tubular duct is maintained at a fixed constant by an orifice 44 in a plate 45 that is threaded into the upper end of the tubular duct and which forms the bottom of the chamber 30. Steam is admitted to the chamber 31 through a lateral port 46 opening through the side of the valve body at a point within the upper portion of the steam chamber, the flow capacity of the lateral port being less than the effective flow capacity through the passageway 32 so as to assure flow of condensate through the orifice 44 by the aspirating effect of steam flow later described.

Contained within the condensate chamber and adapted to close the lower end of the steam chamber is a valving member 47 having a seating face 48 normally retained in contact with the seat 33 by action of a coil spring 49 that has one end seated on the bottom of the chamber 30 and its opposite end encircling a boss 50 on the valving member as shown in Fig. 1. The valving member 47 has an axial stem 51 projecting upwardly into the steam chamber 31 but which terminates short of the steam inlet port 46. The bore of the valve body continues therethrough to provide a valve stem guide 52 for a stem 53 of a valve 54 contained within the steam chamber 31, the valve having a seating face 55 adapted to engage the seat 34 to normally prevent flow of steam from the steam chamber. The valve member 54 has a depending stem 56 that is coaxial with the stem 51 but spaced therefrom as indicated at 57 (Fig. 1) whereby the valve 54 may be actuated independently of the valve 47. The stem 53 is extended through a packing 58 that is retained in sealing contact by a gland 59. The gland 59 is retained in pressing relation with the packing and the valving member 54 against its seat by a coil spring 60 having one end seated against the gland and its other end against a cup-like washer 61 supported on the projecting end of the valve stem and abutting against a yoke-shaped head 62 that is attached to a reduced terminal 63 of the valve stem as shown. The yoke 62 has spaced ears 64 carrying a cross pin 65 for connecting the slotted end 66 of operating lever 67, the lever being suitably pivoted as at 68 so that oscillation of the outer end thereof effects opening movement of the valving member 54. Further movement of the lever effects opening of the valving member 47 as hereinafter described.

In assembling the parts composing the apparatus just described, the stem 53 of the valve 54 is projected through the bore of the valve member from the lower end so that the seating face 55 thereof engages the seat 34. The packing 58 and packing gland 59 are then sleeved over the projecting end of the valve stem, after which the spring 60 is applied followed by the washer 61 which is retained by threading the yoke 62 upon the terminal of the valve stem. The valving member 47 is then passed through the lower end of the valve body together with the coil spring 49 so that they are positioned within the condensate chamber 30. An orifice plate 45 having a desired sized orifice 44 is screwed into the upper end of the tubular duct 42 and the tubular duct is threaded into the open lower end of the valve body to seat the coil spring 49 so that it yieldingly retains the valving member 47 in contact with its seat 33. The entire unit is then applied to the vessel 2 by passing the tubular duct 42 and the lower portion 24 of the valve body 23 through the threaded opening 18 in the head 4 and turning the assembly within the opening to cause the threads to draw the flange 29 into sealing contact with the gasket ring 21 completing assembly of the steam supply unit.

In connecting the steam supply unit, the yoke-shaped head 62 is connected with the lever 67. The pipe 12 is connected with a source of dry steam, and the pipe 17 with the source of disposal for excess condensate. The drain pipe 8 is connected to a source of disposal and a suitable fitting 40 is applied in the threaded socket 38; for example, the hose connection illustrated. When the steam is turned into the pipe 12 the vessel fills with steam and the relatively cold walls thereof cause condensation of the steam so that condensate collects in the vessel as shown in Fig. 1. With the valves 47 and 54 closed, steam from the chamber 6 will flow through the port 46 into the steam chamber 30 and condensate will rise within the tubular duct 42 and pass through the orifice 44 to fill the condensate chamber 30.

Assuming that a nozzle such as used in spotting garments is connected with the hose connection 40, dry steam is delivered to the nozzle upon movement of the operating lever 67 to effect unseating of the valving member 54 against action of the spring 60 whereupon dry steam from the steam chamber 31 flows through the passages 32, 37, and fitting 40 to the steam nozzle.

Should wet steam be required, then the operating lever is moved a greater extent to cause the depending stem 56 on the valving member 54 to engage the stem 51 on the valving member 47 whereupon further movement of the operating lever unseats the valving member 47 and the aspirating effect of the flowing steam through the passageway 32 draws condensate from the condensate chamber 30 into the steam being delivered to the steam nozzle so as to increase the moisture content thereof. When the operating lever 67 is shifted in the opposite direction, the depending stem 56 moves away from the stem 51 so that the spring 49 returns the valve member 47 to its seat 33. Flow is then closed from the condensate chamber to the steam chamber and only dry steam is being delivered to the steam nozzle. Further movement of the operating lever 67 seats the valving member 54 to shut off flow of steam from the nozzle.

It is thus obvious that with an apparatus constructed as described, dry steam is delivered upon opening of the valve member 54 and the moisture is added to the dry steam when desired by effecting further opening movement of the valving member 54 to cause engagement of the stem thereon with the stem 51 of the valving member 47.

As the operating lever is shifted to close the valve, flow of condensate is suspended into the steam chamber and dry steam is delivered to the nozzle for finishing the spotting operation.

While I have particularly described the invention as being used in connection with the spotting of garments, it is obvious that it may be used for any purpose wherever dry and moist steams are required.

From the foregoing it is obvious that I have provided a steam supply apparatus for the purposes described that is of simple and inexpensive construction and which may be installed without requiring a complicated system of piping.

What I claim and desire to secure by Letters Patent is:

1. An apparatus of the character described including a vessel for containing a body of liquid and having means for limiting the maximum level that the liquid can attain in the vessel to provide a steam space above said liquid, a steam inlet connection for the vessel, a steam tempering unit including a valve body having a steam chamber and an interconnected tempering liquid chamber, a duct having an inlet located within the body of liquid contained in the vessel and connected with the tempering liquid chamber for flow of liquid from the vessel into the tempering chamber under pressure of the steam acting on the body of liquid in said vessel, a valve controlling flow of tempering liquid from the tempering liquid chamber into the steam chamber, said steam chamber having a steam inlet connected with the steam space in the vessel and an outlet, the last mentioned inlet being restricted in size as compared with said outlet, a valve controlling said outlet and having lost motion connection with the first-named valve, and means for actuating the last-named valve for discharging steam from the steam space in said vessel through said outlet and for opening the first-named valve for admitting liquid from the tempering liquid chamber into the steam chamber for tempering said steam when the last-named valve is moved a sufficient distance to actuate the first-named valve.

2. An apparatus of the character described including a vessel for containing a body of liquid and having means for limiting the maximum level that the liquid can attain in the vessel to provide a steam space above said liquid, a steam inlet connection for the vessel, a steam tempering unit including a valve body having a steam chamber and an interconnected tempering liquid chamber, a duct having an inlet located within the body of liquid within the vessel and connected with the tempering liquid chamber, an orifice member in said duct for restricting flow of liquid from the vessel into the tempering chamber under pressure of the steam acting on the body of liquid in said vessel, a valve controlling flow of tempering liquid from the orifice member into the steam chamber, said steam chamber having a steam inlet connected with the steam space in the vessel and having an outlet, said outlet being larger in size than the last-named inlet, a valve controlling flow through said outlet and having lost motion connection with the first-named valve, and means for actuating the last-named valve for discharging steam from the steam space in said vessel through said outlet and for opening the first-named valve for admitting liquid from the tempering liquid chamber into the steam chamber for tempering said steam when the last-named valve is moved a sufficient distance to actuate the first-named valve.

3. An apparatus of the character described including a vessel for containing a body of liquid and having means for limiting the maximum level that the liquid can attain in the vessel to provide a steam space above said liquid, a steam inlet connection for the vessel, a steam tempering unit including a valve body having a steam chamber and an interconnected tempering liquid chamber, a duct having an inlet located within the body of liquid within the vessel and connected with the tempering liquid chamber, an orifice member in said duct for restricting flow of liquid from the vessel into the tempering chamber under pressure of the steam acting on the body of liquid in said vessel, a spring-pressed valve controlling flow of tempering liquid from the orifice member into the steam chamber, said steam chamber having a steam inlet connected with the steam space in the vessel and having an outlet, said outlet being larger in size than the last-named inlet, a spring-pressed valve controlling flow through said outlet and having lost motion connection with the first-named valve, and means for actuating the last-named valve for discharging steam from the steam space in said vessel through said outlet and for opening the first-named valve for admitting liquid from the tempering liquid chamber into the steam chamber for tempering said steam when the last-named valve is moved a sufficient distance to actuate the first-named valve.

4. An apparatus of the character described including a vessel for containing a body of liquid and having means for limiting the maximum level that the liquid can attain in the vessel to provide a steam space above the liquid, a steam inlet connection for the vessel, a steam tempering unit within said vessel including a valve body having a steam chamber and an interconnected tempering liquid chamber, a duct depending into the body of liquid within the vessel and connected with the tempering liquid chamber for flow of liquid from the vessel into the tempering chamber under pressure of steam in said steam space, a valve controlling flow of tempering liquid from the tempering liquid chamber into the steam chamber, said steam chamber having a steam inlet directly connected with the steam space in the vessel and having an outlet from the vessel, the last mentioned inlet being restricted in size as compared with said outlet, a valve controlling said outlet and having lost motion connection with the first-named valve, and means for actuating the last-named valve for discharging steam from the steam space in said vessel through said outlet and for opening the first-named valve for admitting liquid from the tempering liquid chamber into the steam chamber for tempering said steam when the last-named valve is moved a sufficient distance to actuate the first-named valve.

5. An apparatus of the character described including a vessel for containing a body of liquid and having means for limiting the maximum level that the liquid can attain in the vessel to provide a steam space above the liquid, a steam inlet connection for the vessel, a steam tempering unit within said vessel including a valve body having a steam chamber and an inter-connected tempering liquid chamber, a duct depending into the body of liquid within the vessel and connected with the tempering liquid chamber, an

orifice member in said duct for restricting flow of liquid from the vessel into the tempering chamber, a valve controlling flow of tempering liquid from the orifice member into the steam chamber through the connection between said chambers, said steam chamber having a steam inlet directly connected with the steam space in the vessel and having an outlet from the vessel, said outlet being larger in size than the last-named inlet, a valve controlling said outlet and having lost motion connection with the first-named valve, and means for actuating the last-named valve for discharging steam from the steam space in said vessel through said outlet and for opening the first-named valve for admitting liquid from the tempering liquid chamber into the steam chamber for tempering said steam when the last-named valve is moved a sufficient distance to actuate the first-named valve.

6. An apparatus of the character described including a vessel for containing a body of liquid and having an opening in the top of the vessel, a liquid overflow connection for maintaining a predetermined maximum level of the liquid in the vessel, a steam inlet connection connected with the space in said vessel above the surface of the liquid, a steam tempering unit mounted within the opening in the top of said vessel including a valve body having an upper steam chamber and a lower liquid chamber connected with the steam chamber, a duct depending from the valve body into the liquid contained within the vessel, an orifice member in said duct for restricting flow of liquid from the vessel into the tempering chamber under pressure of the steam in said steam space, a spring-pressed valve controlling flow of tempering liquid from the orifice into the steam chamber, said steam chamber having a steam inlet directly connected with the steam space in the vessel and having an outlet from the vessel through the valve body, a stem movable through said outlet the last-named inlet being restricted in size as compared with the cross-sectional area of the annular space between the stem and said outlet, a valve on the stem for controlling discharge of steam from the steam space through said outlet and adapted to engage and open the first-named valve for admitting liquid from the tempering liquid chamber into the steam chamber for tempering said steam, a packing carried by the valve body for effecting a seal about the stem, and an actuator for the stem.

7. Apparatus of the character described comprising an enclosed vessel, a source of steam connected to the vessel whereby condensate of the steam is adapted to collect in the vessel, a condensate overflow connection limiting the maximum level attained by the condensate in the vessel, an elongated body extending downwardly through the top of the vessel and having its lower end below the surface of the condensate, a passageway through the body with an inlet below the surface of the condensate and an outlet above the top of the vessel, said body having a lateral duct of restricted size connecting said passageway with the steam space above the surface of the condensate, a pair of aligned normally seated valves in said passageway one positioned above said lateral duct and the other below said duct, one of the valves carrying a member extending toward the other valve and the latter valve having aligned with said member an abutment surface normally spaced from the free end

of said member, mechanism for depressing the upper valve to unseat same thereby to permit steam entering said passageway through the lateral duct to escape to said outlet, said mechanism optionally operable to continue the downward movement of the upper valve thereby to close the gap between said member and said abutment surface and cause the member to depress the lower valve to unseat same, whereby condensate is permitted to pass through the lower valve and mix with the steam entering the passageway through the lateral duct.

8. Apparatus of the character described comprising an enclosed vessel, a source of steam connected to the vessel whereby condensate of the steam is adapted to collect in the vessel, a condensate overflow connection limiting the maximum level attained by the condensate in said vessel, a duct having its inlet end submerged in the condensate and its outlet end communicating with the space outside of the vessel, a pair of normally closed valves in said duct dividing the duct into three serially related sections, means for opening the valve nearest the outlet end of the duct, a lost-motion connection between the valves whereby the valve nearest the inlet end remains closed during the initial opening of the valve nearest the outlet end but upon further opening of the latter valve is also opened to permit condensate to pass through the two valves in series to the space outside of the vessel, and the section of the duct intermediate the two valves having in its wall a restricted orifice communicating with the steam space above the condensate in the vessel whereby opening of the valve nearest the outlet end of the duct permits steam entering the duct through said orifice to escape to the space outside of the vessel.

9. Apparatus of the character described comprising an enclosed vessel containing a liquid and, above the surface of the liquid, a fluid under pressure, an elongated body extending downwardly through the top of the vessel and having its lower end below the surface of the liquid, a passageway through said body with an inlet below the surface of the liquid and an outlet above the top of the vessel, said body having a lateral duct of restricted size connecting said passageway with the space above the surface of the liquid, a pair of aligned normally seated valves in said passageway one positioned above said lateral duct and the other below said duct, one of said valves carrying a member extending toward the other valve and the latter valve having aligned with said member an abutment surface normally spaced from the free end of said member, means for moving the upper valve downwardly thereby to unseat same and optionally continuing such movement thereby first to close the gap between said member and said abutment surface and then to advance said member to unseat the lower valve.

10. Apparatus of the character described comprising an enclosed vessel containing a liquid and, above the surface of the liquid, a fluid under pressure, a duct having its inlet end submerged in the liquid and its outlet end communicating with the space outside of the vessel, a pair of normally closed valves in said duct dividing the duct into three serially related sections, means for opening the valve nearest the outlet end of the duct, a lost-motion connection between the valves whereby the valve nearest the inlet end remains closed during the initial opening of the valve nearest the outlet end but upon further

opening of the latter valve is also opened to permit the liquid to pass through the two valves in series to the space outside of the vessel, and the section of the duct intermediate the two valves having in its wall a restricted orifice communicating with the space above the surface of the liquid in the vessel whereby opening of the valve nearest the outlet end of the duct permits the fluid entering the duct through said orifice to escape to the space outside of the vessel.

11. Apparatus for optionally mixing fluids, comprising a mixing chamber having aligned inlet and outlet ports on opposite sides thereof, coaxial normally seated inlet and outlet valves associated with the respective ports, one of said valves carrying a member in the mixing chamber which projects toward the other valve, said other valve having aligned with said member an abutment surface normally spaced from the free end of said member, means for moving the outlet valve toward the inlet valve thereby to unseat the outlet valve and optionally continuing such movement thereby to first close the gap between said member and said abutment surface and then cause said member to unseat said inlet valve, a source of fluid connected to said chamber independently of said ports whereby unseating of the outlet valve permits fluid from said source to enter said chamber and escape through the open outlet port, and a second source of fluid connected to said inlet port whereby opening of the inlet valve permits fluid from the latter source to enter the chamber and escape through the open outlet port along with said first fluid.

WILLIAM C. GLOVER, JR.

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