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AUTOMATIC BOILER FEED

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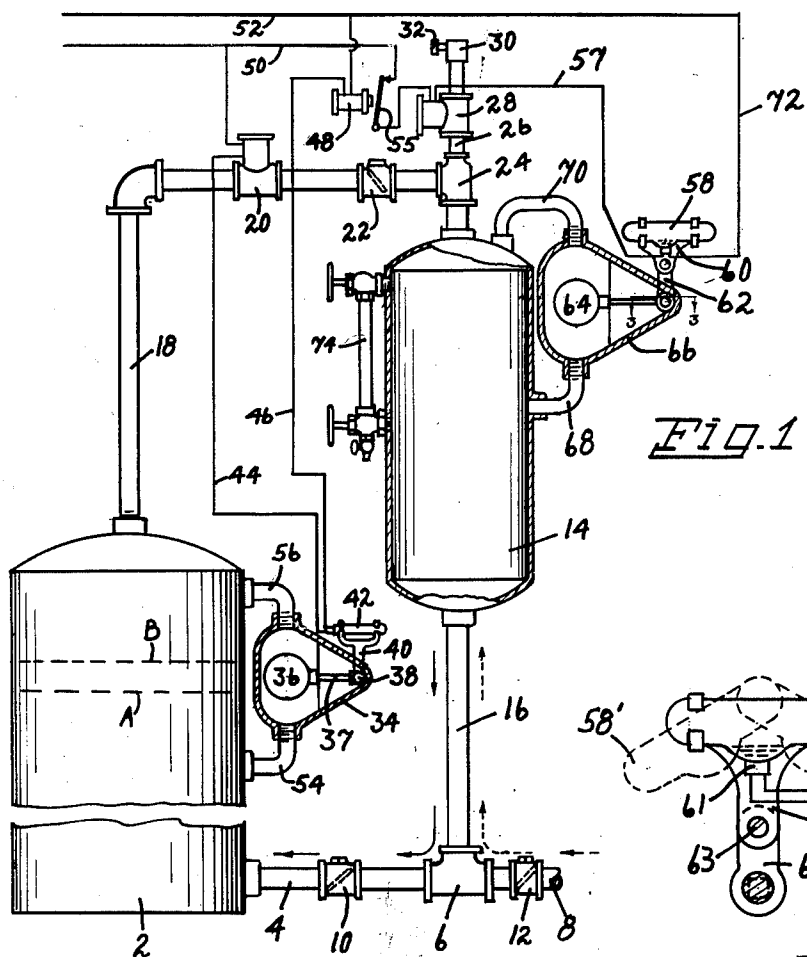


Fig. 1

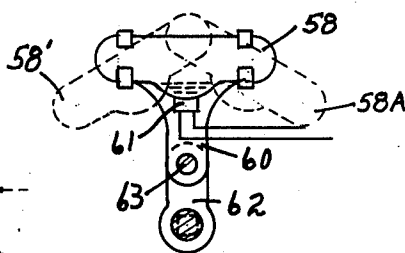


Fig. 2

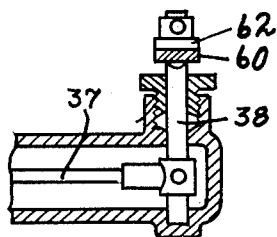


Fig. 3

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AUTOMATIC BOILER FEED

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1 Claim. (Cl. 103—253)

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My present invention relates to an improved automatic boiler feed and more particularly to a feed for boilers of small size as used to provide steam for clothes pressing machines.

Usually in pressing establishments it has been found that the best work requires steam pressure at or above 60 lbs. and as few water systems provide pressure high enough to feed such boilers directly from the mains some sort of automatic boiler feeding equipment is essential. Many if not most of such plants are so small as to make the cost of present types of boiler feeding equipment prohibitive or disproportionate to the costs of boiler and fittings.

The principal object of this invention is to provide a system of boiler feeding that will be fully automatic and dependable but within the cost range of such small plants eliminating the need for a pump and motor.

The invention includes means whereby a vacuum produced by condensing steam may be made to serve as a means of boiler feeding when combined with a gravity head between vacuum chamber and boiler water level.

In the accompanying drawings I have illustrated one complete example of the physical embodiment of my invention according to the best mode I have thus far devised, but it will be understood that various changes and alterations may be made in the exemplified structure within the scope of the appended claim.

In the drawings:

Fig. 1 is a diagrammatic view of the invention as applied to a boiler of the type referred to.

Fig. 2 is a side elevation of the float control mechanism.

Fig. 3 is a sectional view showing the float arm attached to the shaft which controls the mercury switch, as at line 3—3 of Fig. 1.

Referring now to the drawings wherein I have illustrated the present preferred embodiment of my invention I provide a boiler 2 having a water inlet pipe 4 to coupling 6 to which supply pipe 8 is connected. One way check valves 10 and 12 control the movement of water to the boiler.

A vacuum and gravity feed tank 14 is positioned above the water level of the boiler 2 so that water will flow from tank 14 to tank 2 to maintain the supply of water in the latter tank, through pipe 16 to T 6.

A pipe 18 from the steam portion of boiler 2 has a normally closed magnetic valve 20 therein and a check valve 22 to T 24 in vent pipe 26 including a normally closed magnetic valve 28

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and a vent 30 having a screw 32 providing adjustment for the vent.

In a housing 34 I use a float 36 having a rod 37 actuating a trunnion 38 and arm 40 and carrying a mercury switch 42. Wires 44 and 46 provide a circuit including the switch 20 in wire 44 and an electro-magnet 48 in wire 46 to live wires 50 and 52. Pipes 54 and 56 provide access of water and steam in the boiler to the housing 34 to actuate the float 36.

An armature 55 is controlled by electro-magnet 48 to effect opening and closing of wire 57 to magnet valve 28 and thence to mercury tube 58 carried by switch 60 on trunnion 62 which is actuated by float 64 in housing 66 connected by pipes 68 and 70 to tank 14. Wire 72 completes the circuit to live wire 52.

To understand the working of the invention assume that the boiler 2 is in operation and that the water level has just fallen to A while chamber 14 is full of water. Magnetic valves 20 and 28 are in the closed position while water is held in 14 by the check valve 12 and the excess of boiler pressure over that in 14 or in the source of water supply, not shown. In this position float 36 will drop and complete its contact closing circuit 44—46—50—52, energizing magnetic valve 20 and lifting it from its seat, while at the same time opening relay 48 to break circuit 57. Circuit 57 being open magnetic valve 28 will remain in its normally closed position.

As magnetic valve 20 opens, steam will flow from 2 through 18 into 14 thus equalizing the pressure in 14 and 2 so that water from 14 will flow by gravity into 2 following the line of arrows and lifting check valve 10 by virtue of the gravity head in 14. As the water level in 14 falls float 64 will drop to its lowest position, and the mercury in tube 58 will flow to the 58' position passing over contacts 61 in circuit 57. But as relay 48 has broken circuit 57 valve 28 will remain closed.

As water rises in 2 to maximum working level B float 36 will rise and open its circuit 44—46, release valve 20 which will close and also release relay 48 which will close circuit 57—72.

Now when steam is shut off at 20 the steam in 14 will condense forming a partial vacuum in which case water will flow along 8 and 16 along the lines of the broken arrows, under the action of the vacuum in 14 and again fill 14. The momentum or surge of the inflowing water into chamber 14 will cause float 64 to rise to its middle position bringing the mercury tube to

approximately level when the mercury will flow from 58' position to make contact at 61. This will close circuit 57 and energize magnetic valve 28 in vent pipe 26, valve 28 will then open and permit any air in the upper portion of 14 to escape, which air would otherwise eventually destroy the vacuum created by condensing steam in 14. The adjustable vent 30 is opened, only, instantaneously to vent air from the tank as it fills with water under action of the condensing steam. The vent is initially adjusted so that when the tank is vented and water in the upper end of the tank reaches the lower end of pipe 26, the vent is closed, thus sealing the tank to insure a gravity feed of water from the tank to the boiler. As the water from the source forced in by the atmospheric pressure continues to rise in 14 carrying upward float 64 tube 53 will assume position 58a and the mercury will flow out of the contact chamber at 61 and open circuit 57—72 permitting magnetic valve 28 to close ready to repeat the cycle of steam admission when float 36 again makes contact. The volume of air or gas flowing from 26 while valve 28 is open may be regulated by the adjusting screw 32 in 30.

In Fig. 1, assuming the tank 14 is full of water with the switch 60 in open position 58A where the mercury is at its lowest point the valve 20 is open and steam is flowing from the boiler into the tank. Float 64 drops as water from the tank flows into the boiler, the switch 60 is rocked and for an instant the mercury rolls into the center-well of the switch. As the relay is holding open the control circuit, the vent is closed and steam and water are prevented from blowing out through the vent. When the boiler is thus supplied, float 36 acts to open the circuit of valve 28, and the relay closes the circuit to the vent-solenoid 28, but with the switch 60 open, at 61. After the vent opens instantaneously, the mercury of switch 60 rolls away from the center well to close the switch and activate the solenoid 43 and the vent-valve 28.

Whether working under vacuum or gravity head the accumulation of air in the tank 14 would eventually render the equipment inoperative unless venting means were provided.

Now as the water enters the tank 14 under partial vacuum the drop in pressure without a corresponding drop in temperature will release air. In this invention the water, at a temperature where air is being released, flows into the tank 14 into a partial vacuum or decreased pressure. Under this condition it releases much of its air which is all to the good if the air is eventually eliminated.

The air vent 30 being very sensitive and adjustable will be set so that the surge of the water entering the receiver tank 14 will carry the pressure in the tank 14 to a point slightly above atmosphere and momentarily open the vent 30 eliminating enough of the air that a following cycle will function.

With a volume of water under atmospheric pressure and a vacuum of say 15 inches, equivalent to approximately 15 foot head, the water will surge into the tank 14 at a velocity head that will be found to carry the pressure in the tank 14 to a point slightly above atmospheric pressure and sufficient to force out the trapped air when the vent valve 30 opens properly.

In other words the condensing of the steam in the tank 30 will set up a vacuum that would

lift water 15 feet provided no trapped air prevented formation of such vacuum.

Now this is equivalent to setting of an intake head of 15 feet, as the differential between the pressure in the tank 14 and the atmosphere is equivalent to a 15 foot head of water.

Now at 15 feet head the velocity of the entering water will be 30 feet per second. It will be found that this velocity head will require an appreciable time to dissipate after the vacuum is eliminated. In other words, the velocity head will surge up to an appreciable pressure instead of quietly dying out at exactly atmosphere equilibrium.

The kinetic energy of the water, suddenly released to enter tank 14 under a head of approximately 15 feet, will carry the water level in the receiver to such a height that the vent valve 30 may be set to work and insure the elimination of excess air or gas pressure in tank 14.

It will appear by this description that I have provided a vacuum forming chamber, positioned for gravity flow to the boiler, a means for equalizing the pressure in 14 with that in boiler 2, and a means for momentarily opening 14 to the atmosphere as the water nears the top of 14 in order to void any air or gases that may be liberated in 14 with the admission of steam or feed water and which would tend to render the mechanism inactive by preventing the entrance of water to 14 either under action of vacuum or pressure. If desirable to hasten condensing of cut off steam in 14 a water jacket may be placed around 14 and the water caused to flow through such jacket before entering 4.

It will be noted that this invention uses a mercury tube with side pocket and contact. The same effect may be secured by a series of mercury tubes placed in various positions or by non-mercury switch contacts variously arranged. The essential element however is the momentary energizing of circuit 57—72 while the float 64 is intermediate of its travel. The arrangement shown is illustrative of the working of the invention and not to be construed as limiting its scope.

It will appear that by altering the setting of the mercury tube 58 by means of the screw 63 and by varying the orifice opening in 30 with the adjusting screw 32 the volume and release point of the air or gases may be adjusted to meet the requirements of the case in hand. The gauge glass 74 serves as a means of determining the volume if any of trapped gases and the point of opening of the valve 28.

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

A boiler feed device for feeding water from a source having no head at atmospheric pressures, comprising a boiler having a steam pressure area, an elevated feed tank having an inlet pipe from said source and an outlet pipe to said boiler, valve means in said pipes to prevent reverse flow, a steam pressure pipe communicating the steam area of the boiler and the tank, a vent pipe for the tank, a normally closed electrically operated valve in said vent pipe, a normally closed electrically operated valve in said steam pressure pipe, control means actuated by the falling and rising water level in said boiler and including an electrically powered circuit and a switch operatively connected for actuating said second named valve, and control means actuated by the rising water level in said tank and including an electrically

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powered circuit and a switch operatively connected for momentarily opening said vent.

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