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PROPORTIONAL LIQUID REAGENT FEEDING DEVICE
ACTUATED BY FLUID IN A CONDUIT
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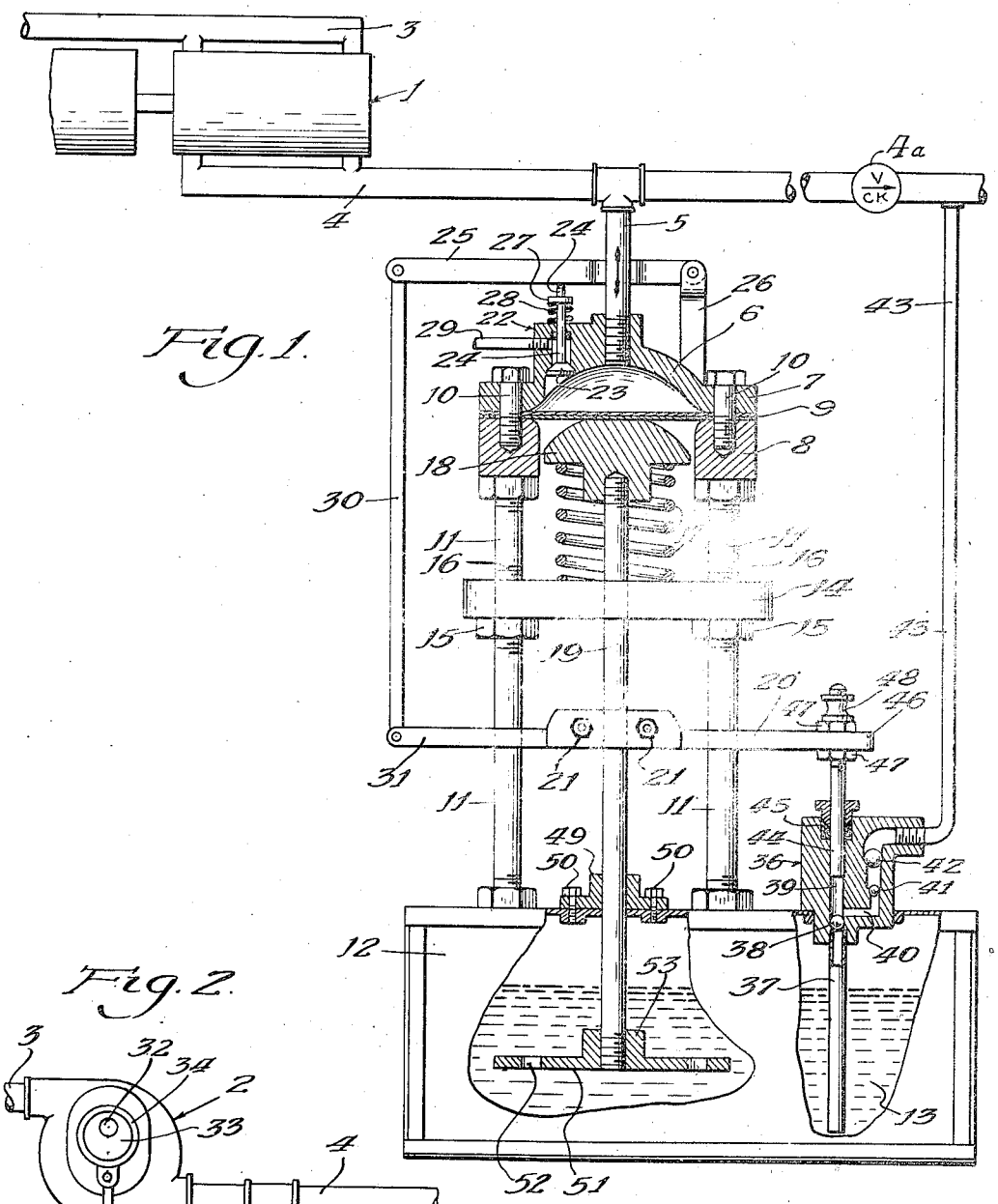
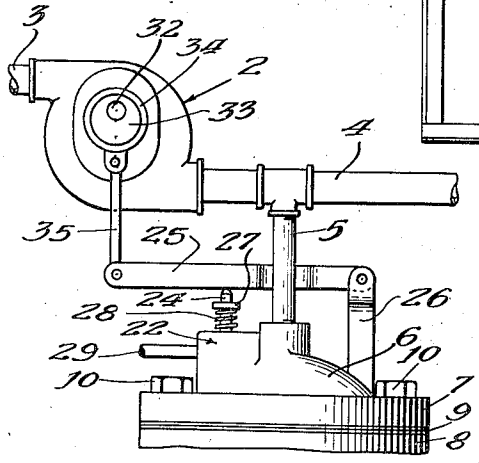



Fig. 1.

Fig. 2.




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## PROPORTIONAL LIQUID REAGENT FEEDING DEVICE ACTUATED BY FLUID IN A CONDUIT

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11 Claims. (Cl. 210—40)

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The present invention relates to means for feeding a compound, such as a boiler compound, proportionately to the rate of feeding of a fluid, such as feed water, to a point of use, such as a boiler.

When supplying compound or similar material or substances to a fluid, such as boiler feed water to prevent the formation of scale in the boiler, it has been the custom to feed the compound to the boiler, or to the feed pump, by means, such as a pump, controlled manually by the boiler attendant, and in accordance with the rate of feed of the feed water, thus heretofore depending on the human element with his shortcomings.

Among the objects of the invention is to provide a novel device for feeding the compound in accordance with the rate of feed of the feed water to the boiler, and comprises means connected to the feed water line to be operated by the force of the feed water, and which operates a means for forcing the compound to the water in the feed water line on its way to the boiler or to the water in the boiler, as desired, the action of the means being automatically commensurate with or proportionate to the rate of feed of the feed water, so that the ratio of the compound to the feed water will be maintained constant regardless of the rate of flow of the feed water to the boiler.

In the case of using a feed water pump of the reciprocating type the pulsations in the delivered feed water will effect a commensurate or coordinate pulsation of the means connected to the feed water line; or in the case of using a feed water pump of the rotary type means is connected to such pump to interrupt the force of the feed water on the means connected to the feed water line coordinately with the rate of operation of such pump and, hence, with the rate of feed of the feed water in the feed line; or in the case of the feed water being fed at a smooth rate, oscillating means, similar to a water wheel, may be used, so as to produce an interruption of the force of the feed water on the means connected to the feed water line coordinately with the rate of oscillation of the oscillating means and, hence, the rate of feed of the feed water in the feed water line.

Other objects, capabilities, advantages, features and the like are comprehended by the invention as will later appear and as are inherently possessed by the invention.

Referring to the drawings:

Fig. 1 is a part elevational view, a part sectional view and a part diagrammatic view of a device following the invention; and,

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Fig. 2 is a fragmentary elevational view of an alternative structure.

Referring more in detail to the drawings an embodiment selected to illustrate the invention is shown in connection with any suitable feed water pump, such as a reciprocating pump 1 shown in Fig. 1, or a rotary pump 2 shown in Fig. 2, such pump having an intake 3 and a delivery line 4 leading to the boiler (not shown). Connected to the line 4 is a pipe or duct 5 leading to a means to be operated by the force of the feed water in the feed line 4 having a usual check valve 4a.

This means comprises a diaphragm chamber 6 having a flange 7, a clamping ring 8 and a diaphragm 9 clamped between said flange 7 and the ring 8, the clamping being effected by any suitable clamping elements, such as screws 10. To the ring 8 is suitably secured posts 11 which, in turn, are secured at their lower ends to a receptacle 12, the latter being for holding the compound 13. On the posts 11 is adjustably supported a plate 14 by way of nuts 15 adjustably connected to threaded portions 16 of the posts 11, for vertically adjusting the position of the plate 14. On the plate 14 is a spring 17 for resiliently pressing a head 18 upwardly against the diaphragm 9. Suitably secured to the head 18 is a connecting rod 19 which extends down through the plate 14 and has fastened to an intermediate portion of it a cross-head 20, as by way of clamp screws 21. The diaphragm 9 may consist of a single sheet or stratum of diaphragmatic material, or of a plurality of sheets or strata, as desired or found advantageous for efficient operation of the device.

The diaphragm chamber 6 may have a relief valve means 22, of any suitable type, and which comprises an inlet controlled by a valve element 23 having a stem 24 extending exteriorly to be engaged by a lever 25 pivoted to a post 26 fixed to the top of chamber 6, as shown. The stem 24 carries a collar 27 between which and the top of the valve means 22 is interposed a spring 28 for normally maintaining the valve 23 in closed position. To the valve means 22 is connected an outlet pipe 29. To the arm or lever 25 may be pivotally connected a link 30 in turn pivotally connected to an arm 31 of the cross-head 20.

Referring to Fig. 2 the device 2 may be a rotary pump in the feed line 3—4, for forcing water through 1, or may be a rotor device operated by the flow of water through the line 3—4. In either event it has a shaft 32 on which is fixed a cam or eccentric 33 operative in a strap 34 piv-

otally connected to a link 35 in turn pivotally connected to the lever 25.

The compound 13 is pumped up by way of a pump 36 attached to the top of the receptacle or tank 12, as shown, and having an intake 37 leading by way of a check valve 38 to a pump chamber 39. From this chamber 39 leads a discharge passage 40 by way of check valves 41 and 42 and thence to a pipe 43 leading to and connected with the feed water line 4, as shown in Fig. 1. In the pump chamber 39 reciprocates a plunger or piston 44 which extends upwardly by way of suitable packing means 45 to and adjustably connected with an arm 46 of the cross-head 20. The upper end portion of the plunger 44 is threaded for receiving adjusting nuts 47 and a manual set-nut 48.

The rod 19 preferably extends down into the receptacle 12 and through a suitable guide 49 secured to the top of the receptacle, as by bolts 50. In this way the rod 19 is laterally braced against deflection by the cross-arm 20 when operating to work the pump 36. To the lower end of the rod 19 is secured an agitator which may be in the form of a plate 51 having holes 52 and suitable means, as a hub 53, suitably secured to the rod 19. As the rod 19 is reciprocated the agitator 51 maintains the compound 13 stirred and evenly mixed, the holes 52 permitting surging of the compound therethrough as the agitator is moved up and down.

In operation the pump 1 will set up intermittent pulsations in the line 4 with the frequency of the reciprocations of the pump, and each impulse will be impressed or imposed, by way of the water, on the diaphragm 9 so as to force it down, as also the head 18, rod 19 and cross-head 20, and hence the plunger 44, to force the compound from the cylinder 39 by way of the pipe 43 to the feed water line 4. These impulses will occur at greater or less frequencies in accordance with the greater or lesser rate of reciprocation of the pump 1 and, hence, with the greater or lesser rate of feed of the feed water.

If the feed of the water into the line 4 is regular or nearly so so that the pressure differentials are not sufficient to operate the diaphragm means as desired the plate 14 may be so adjusted as to obtain the particular stressing of the spring 17 desired, and also the cross-head 20 may be so adjusted on the rod 19 that with the normal or given pressure of the water in the line 4 the water will so lower the diaphragm 9, the cross-head 20, and the plunger 44, as to feed a charge of the compound to the pipe 43 and the line 4, to a point when the lever 25 will open the relief valve 22, and the water will vent out by way of the outlet pipe 29. This drops the pressure in the chamber 6, and the spring 17 will return the head 18, the diaphragm 9, the cross-head 20, and plunger 44, whence the relief valve will close. The building up of the pressure again in the diaphragm chamber 6 for repeated operation will depend upon the rate of the supply of the water in the line 4. Hence, is obtained a pulsation commensurate with the feed of the water in the line 4.

Referring to Fig. 2, in which the element 2 represents a rotary pump for feeding the water in the line 4 at a regular or smooth rate, or represents a rotor in the line 3—4 which rotates by the force of the water moving through the line 3—4, the eccentric 33 will give the lever 25 an oscillation commensurate with the rate of operation of the pump or rotor 2 and, hence, of the flow of feed water through the line 3—4, to accordingly open the relief valve 22 with the effect above described.



In all cases the rate of feed of the compound is coordinate with the rate of feed of the feed water in the line 4.

While I have disclosed the invention with particular reference to feed water feeding, it is to be understood that it is applicable to supply proportionately other kinds of materials or substances to other kinds of fluids, whether liquids, gases, vapors or the like, and for other purposes.

While I have herein described and on the drawing shown illustrative embodiments of the invention it is to be understood that the invention is not limited thereto but comprehends other constructions, details, arrangements of parts, features, and the like without departing from the spirit of the invention.

Having thus disclosed the invention, I claim:

1. In a device of the character disclosed having a feed line and means for feeding a fluid under pressure therethrough; the combination therewith of means for supplying a fluidal substance to said feed line proportionate to the rate of feed of said fluid in said line, comprising a receptacle for containing said substance, a pump having an intake extending into said receptacle and said substance, and having a discharge means connected to said feed line, and actuating means having a duct connected to said feed line for operation of said actuating means by the force of the fluid in said feed line and having means connected to said pump for operating said pump proportionately to the rate of feed of said fluid in said feed line, said actuating means comprising a chamber communicating with said duct, a movable member connected to said chamber and being subjected to the force of the fluid from said feed line and in said chamber, said chamber having a spring support, and a spring between said member and said support, said connecting means to said pump being operatively associated with said member for actuation by said member.

2. In a device of the character disclosed having a feed line and means for feeding a fluid under pressure therethrough; the combination therewith of means for supplying a fluidal substance to said feed line proportionate to the rate of feed of said fluid in said line, comprising a receptacle for containing said substance, a pump having an intake extending into said receptacle and said substance, and having a discharge means connected to said feed line, and actuating means having a duct connected to said feed line for operation of said actuating means by the force of the fluid in said feed line and having means connected to said pump for operating said pump proportionately to the rate of feed of said fluid in said feed line, said actuating means comprising a diaphragm chamber communicating with said duct, a diaphragm connected to said chamber and being subjected to the force of the fluid from said feed line and in said chamber, a head engaging said diaphragm, a spring support connected to said chamber, a spring between said support and said head, said connecting means to said pump being connected to said head for actuation by said head.

3. In a device of the character disclosed having a feed line and means for feeding a fluid under pressure therethrough; the combination therewith of means for supplying a fluidal substance to said feed line proportionate to the rate of feed of said fluid in said line, comprising a receptacle for containing said substance, a pump having an intake extending into said receptacle and said

substance, and having a discharge means connected to said feed line, and actuating means having a duct connected to said feed line for operation of said actuating means by the force of the fluid in said feed line and having means connected to said pump for operating said pump proportionately to the rate of feed of said fluid in said feed line, said actuating means comprising a diaphragm chamber communicating with said duct, a diaphragm connected to said chamber and being subjected to the force of the fluid from said feed line and in said chamber, a head engaging said diaphragm, a spring support connected to said chamber, a spring between said support and said head, said connecting means to said pump being connected to said head for actuation by said head, and means for adjustably connecting said spring support to said chamber.

4. In a device of the character disclosed having a feed line and means for feeding a fluid under pressure therethrough; the combination therewith of means for supplying a fluidal substance to said feed lines proportionate to the rate of feed of said fluid in said line, comprising a receptacle for containing said substance, a pump having an intake extending into said receptacle and said substance, and having a discharge means connected to said feed line, and actuating means having a duct connected to said feed line for operation of said actuating means by the force of the fluid in said feed line and having means connected to said pump for operating said pump proportionately to the rate of feed of said fluid in said feed line, said actuating means comprising a chamber communicating with said duct, a movable member connected to said chamber and being subjected to the force of the fluid from said feed line and in said chamber, said chamber having a spring support, and a spring between said member and said support, said connecting means to said pump having a connecting rod operatively associated with said member for actuation by said member, and a cross head connected to said rod and to said pump.

5. In a device of the character disclosed having a feed line and means for feeding a fluid under pressure therethrough; the combination therewith of means for supplying a fluidal substance to said feed line proportionate to the rate of feed of said fluid in said line, comprising a receptacle for containing said substance, a pump having an intake extending into said receptacle and said substance, and having a discharge means connected to said feed line, and actuating means having a duct connected to said feed line for operation of said actuating means by the force of the fluid in said feed line and having means connected to said pump for operating said pump proportionately to the rate of feed of said fluid in said feed line, said actuating means comprising a chamber communicating with said duct, a movable member connected to said chamber and being subjected to the force of the fluid from said feed line and in said chamber, said chamber having a spring support, and a spring between said member and said support, said connecting means to said pump having a connecting rod operatively associated with said member for actuation by said member, and a cross head connected to said rod and to said pump, and means on said cross head for adjustably connecting said cross head to said pump.

6. In a device of the character disclosed having a feed line and means for feeding a fluid under pressure therethrough; the combination therewith of means for supplying a fluidal substance to said feed line proportionate to the rate of feed of said fluid in said line, comprising a receptacle for containing said substance, a pump having an intake extending into said receptacle and said substance, and having a discharge means connected to said feed line, and actuating means having a duct connected to said feed line for operation of said actuating means by the force of the fluid in said feed line and having means connected to said pump for operating said pump proportionately to the rate of feed of said fluid in said feed line, said actuating means comprising a chamber communicating with said duct, a movable member connected to said chamber and being subjected to the force of the fluid from said feed line and in said chamber, said connecting means to said pump being operatively associated with said member for actuation by said member, said chamber being provided with a relief valve having a stem extending exteriorly of said chamber, a lever arm fulcrumed to said chamber and extending opposite said stem to contact and operate it when the arm is moved, and means connected to said arm and movable by the force of the fluid in said feed line to move said arm.

7. In a device of the character disclosed having a feed line and means for feeding a fluid under pressure therethrough; the combination therewith of means for supplying a fluidal substance to said feed line proportionate to the rate of feed of said fluid in said line, comprising a receptacle for containing said substance, a pump having an intake extending into said receptacle and said substance, and having a discharge means connected to said feed line, and actuating means having a duct connected to said feed line for operation of said actuating means by the force of the fluid in said feed line and having means connected to said pump for operating said pump proportionately to the rate of feed of said fluid in said feed line, said actuating means comprising a chamber communicating with said duct, a movable member connected to said chamber and being subjected to the force of the fluid from said feed line and in said chamber, said connecting means to said pump being operatively associated with said member for actuation by said member, said chamber being provided with a relief valve having a stem extending exteriorly of said chamber, a lever arm fulcrumed to said chamber and extending opposite said stem to contact and operate it when the arm is moved and means connected to said arm and to said connecting means to said pump for moving said arm upon the movement of said latter connecting means.

8. In a device of the character disclosed having a feed line and means for feeding a fluid under pressure therethrough; the combination therewith of means for supplying a fluidal substance to said feed line proportionate to the rate of feed of said fluid in said line, comprising a receptacle for containing said substance, a pump having an intake extending into said receptacle and said substance, and having a discharge means connected to said feed line, and actuating means having a duct connected to said feed line for operation of said actuating means by the force of the fluid in said feed line and having means connected to said pump for operating said pump proportionately to the rate of feed of said fluid in said feed line, said actuating means comprising a chamber communicating with said duct, a movable member connected to said chamber and being subjected to the force of the fluid from

said feed line and in said chamber, said connecting means to said pump being operatively associated with said member for actuation by said member, said chamber being provided with a relief valve having a stem extending exteriorly of said chamber, a lever arm fulcrumed to said chamber and extending opposite said stem to contact and operate it when the arm is moved, means associated with said feed line and movable with the movement of the fluid in said feed line, and a connecting member between said latter means and said lever arm to move said lever arm according to the movement of said latter means.

9. In a device of the character disclosed having a feed line and means for feeding a fluid under pressure therethrough; the combination therewith of means for supplying a fluidal substance to said feed line proportionate to the rate of feed of said fluid in said line, comprising a receptacle for containing said substance, a pump having an intake extending into said receptacle and said substance, and having a discharge means connected to said feed line, and actuating means having a duct connected to said feed line for operation of said actuating means by the force of the fluid in said feed line and having means connected to said pump for operating said pump proportionately to the rate of feed of said fluid in said feed line, said actuating means comprising a chamber communicating with said duct, a movable member connected to said chamber and being subjected to the force of the fluid from said feed line and in said chamber, said chamber having a spring support, and a spring between said member and said support, said connecting means to said pump having a connecting rod operatively associated with said member for actuation by said member, and a cross head connected to said rod and to said pump, said chamber being provided with a relief valve having a stem extending exteriorly of said chamber, a lever arm fulcrumed to said chamber and extending opposite said stem to contact and operate it when the arm is moved, and a connecting member between said lever arm and said cross head to move said lever arm by said cross head.

10. In a device of the character disclosed having a feed line and means for feeding a fluid under pressure therethrough; the combination therewith of means for supplying a fluidal substance to said feed line proportionate to the rate of feed of said fluid in said line, comprising a receptacle for containing said substance, a pump having an intake extending into said receptacle and said substance, and having a discharge means connected to said feed line, and actuating means having a duct connected to said feed line for operation of said actuating means by the force of the fluid in said feed line and having means connected to said pump for operating said pump proportionately to the rate of feed of said fluid in said feed line, said actuating means comprising



a chamber communicating with said duct, a movable member connected to said chamber and being subjected to the force of the fluid from said feed line and in said chamber, said connecting means to said pump being operatively associated with said movable member for actuation by said member, said chamber being provided with a relief valve having a stem extending exteriorly of said chamber, a lever arm fulcrumed to said chamber and extending opposite said stem to contact and operate it when the arm is moved, a rotor in said feed line and having an eccentric means, and a connecting link from said latter means to said lever arm.

11. In a device of the character disclosed having a feed line and means for feeding a fluid under pressure therethrough; the combination therewith of means for supplying a fluidal substance to said feed line proportionate to the rate of feed of said fluid in said line, comprising a receptacle for containing said substance, a pump having an intake extending into said receptacle and said substance, and having a discharge means connected to said feed line, and actuating means having a duct connected to said feed line for operation of said actuating means by the force of the fluid in said feed line and having means connected to said pump for operating said pump proportionately to the rate of feed of said fluid in said feed line, said actuating means comprising a chamber communicating with said duct, a movable member therein being subjected to the force of the fluid from said feed line and in said chambers, said chamber having a spring support, and a spring between said member and said support, said connecting means to said pump having a connecting rod operatively associated with said member for actuation by said member, and a cross head connected to said rod and to said pump, said connecting rod having an extension extending into said receptacle, and an agitator connected to said extension for agitating the substance in said receptacle.

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