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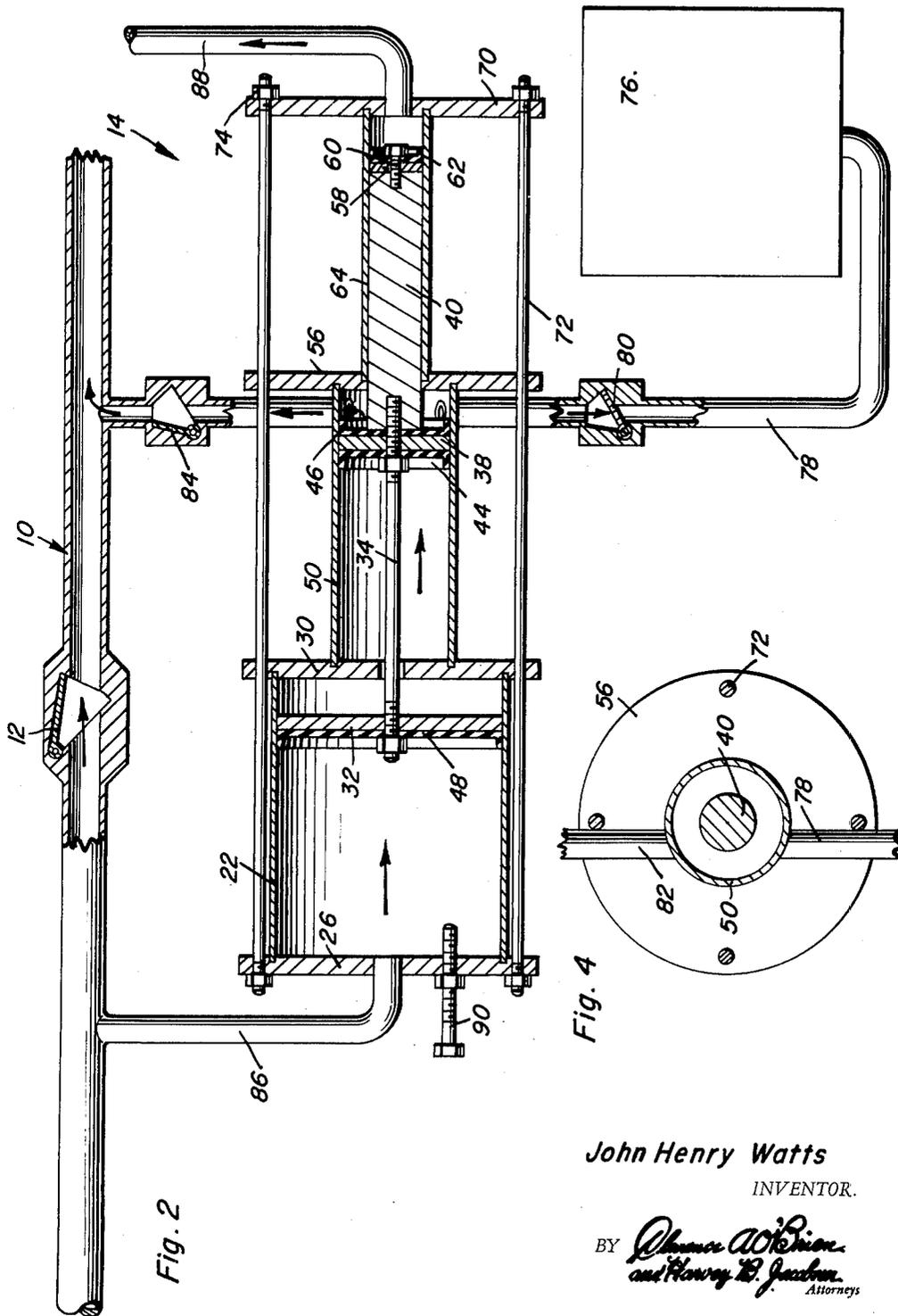
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PRESSURE OPERATED CHEMICAL INJECTOR

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2 Sheets-Sheet 2



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## PRESSURE OPERATED CHEMICAL INJECTOR

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4 Claims. (Cl. 137-564.5)

The present invention generally relates to chemical injectors, and more particularly to a pressure responsive injector easily incorporated into a conventional boiler system for operation in response to the pumped liquid being introduced into the boiler.

One of the primary objects of the present invention is the provision of a means for effectively and automatically injecting a predetermined amount of material into a liquid flow.

Another object of the present invention resides in the provision of an easily installed means for injecting a chemical, such as for example various types of rust inhibitors, into the flow of water from the boiler pump to the boiler.

Another object of the present invention resides in the provision of a chemical injector responsive to the flow of water from the boiler pump.

Another object of the present invention resides in the provision of a chemical injector as in the above object wherein the injector is automatically filled upon a stopping of the boiler pump.

Another object of the present invention resides in the provision of a relatively simple pressure operated chemical injector which requires a minimum amount of parts and no complicated valve mechanisms thereby reducing the maintenance required to a basic minimum.

Another object of the present invention resides in the provision of a means for adjusting the amount of material injected by the device of the present invention.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 illustrates the injector of the present invention in its return or chemical receiving position, portions being broken away for purposes of clarification;

FIGURE 2 is a view similar to FIGURE 1 however illustrating the device in its forward or discharging position;

FIGURE 3 is a cross sectional view taken substantially upon a plane passing along line 3-3 in FIGURE 1; and

FIGURE 4 is a cross sectional view taken substantially upon a plane passing along line 4-4 in FIGURE 1.

Referring now more particularly to the drawings, reference numeral 10 designates a conventional water feed line extending from a boiler pump (not illustrated) and including a one-way check valve 12 for preventing backflow in an obvious manner.

The device 14 of the present invention is intended to be operatively interconnected with the feed line 10 and responsive to the water pressure therein induced by the periodic running of the boiler pump. This device 14 consists basically of three axially aligned and interconnected piston and cylinder assemblies 16, 18 and 20. The first piston and cylinder arrangement 16 consists of an enlarged hollow cylinder 22 having the rear end thereof peripherally received within an annular groove 24 in the inner face of the rear end plate 26. The front of the cylinder 22 is similarly received within the groove 28 of the intermediate plate 30 which is of the same size as plate 26.

The piston 32 in the first assembly 16 is threadedly received on the rod 34 and secured thereto by a suitable

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lock means 36. The front end of the rod 34 extends through the intermediate plate 30 and is fixedly secured both to the piston 38 and the rod 40, a suitable lock nut 42 being provided. The piston 38, as will be appreciated from the drawings, is smaller than the piston 32 and includes sealing means 44 and 46 on both sides thereof contrary to one sealing means 48 on the first piston 32. The cylinder 50 of the second assembly 18 is similarly smaller than the cylinder 22 and is engaged at the first end thereof within annular groove 52 in the plate 30, and at the other end thereof within an annular groove 54 in the plate 56.

The opposite end of the rod 40 is secured to a third piston 58 by a bolt 60 extending through both the piston 58 and a suitable seal 62. This piston 58 is of a reduced diameter as compared to the piston 38 and is received within a reduced diameter cylinder 64, the ends of which are suitably secured within annular grooves 66 in the plate 56 and 68 in the end plate 70. It will be appreciated that these plates are maintained in clamping relationships to the aligned cylinder assemblies 16, 18 and 20 by means of a plurality of peripherally spaced elongated tie rods 72, the ends of which are suitably threaded for the reception of nuts 74 thereon.

The chemical to be introduced into the liquid flowing through the feed line 10 is stored in a suitable reservoir 76 which is in communication with the intermediate cylinder 50 through a conduit 78 provided with a suitable check valve 80 for preventing any backflow. Upon being expelled from the cylinder 50, in a manner which shall be pointed out presently, the chemical flows through the conduit 82, provided with a check valve 84, into the feed line 10 at a point past the check valve 12 where it is mixed with the water flowing therethrough.

The movement of the pistons so as to effect an expelling of the selected chemicals from the cylinder 50 results from an introduction of the water, upon an activation of the boiler pump, through the intake line 86 affording a communication between the feed line 10 and the cylinder assembly 16 through the end plate 26, the pressure of the incoming fluid being sufficient so as to overcome the return pressure flowing through the conduit 88 into the piston and cylinder assembly 20.

This conduit 88 is intended to be in communication with the conventional home water supply which is under substantially less pressure than the water within the conduit 86 under the influence of the boiler pump, and as such, offers little or no resistance to the movement of the pistons while effecting the discharge of the chemicals. However, upon the boiler pump being deenergized, the pressure through the conduit 86 is removed and the pistons return to the opposite ends of the corresponding cylinders under the influence of the reduced pressure through the conduit 88, the return of the piston 38 causing an inward flowing of the chemicals from the reservoir 76 through the conduit 78 so as to automatically prepare for a subsequent discharge of the chemicals upon the boiler pump again being energized.

It will be noted that the movement of the pistons, and consequently, the amount of chemicals discharged, can be regulated by an adjusting bolt 90 extending through the end plate 26 and being releasably maintained in position by a nut 92 for forming a stationary stop or abutment limiting the return movement of the piston 32 as well as the pistons 38 and 58 interconnected for simultaneous movement therewith.

From the foregoing, it is considered to be readily apparent that a novel pressure operated chemical injector has been defined wherein the pressure of the fluid from the boiler pump is introduced into a piston assembly normally maintained in an open position by the pressure

produced in the water conventionally supplied which is less than the pressure produced by the boiler pump thereby allowing a closing or expelling movement of the pistons, with the pressure of the conventional water supply returning the pistons upon a deenergization of the boiler pump thus allowing for an automatic and periodic injection of a specified amount of chemicals into a flow of liquid.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. For use in combination with a boiler feed line having a periodic flow, a pressure operated chemical injector comprising three axially aligned piston and cylinder assemblies consisting of a first plate, an enlarged cylinder having one end secured thereto, the opposite end of the enlarged cylinder being secured to a second plate the opposite side of which has a first end of a second cylinder secured thereto, the opposite end of said second cylinder being secured to a third plate, a third cylinder having one end secured to the opposite side of the third plate and being secured at its opposite end to a fourth plate, a piston slidably received within said enlarged cylinder, a rod secured thereto and extending through said second plate and into engagement with a piston within said second cylinder and a second rod secured to a piston within the third cylinder, means introducing pressure from said feed line into said enlarged cylinder, said pistons movable simultaneously in response thereto, means communicating said third cylinder with a constant source of pressure less than the pressure in said feed line, and means in communication with said second cylinder for introducing and expelling a chemical in response to movement of the pistons.

2. The device of claim 1 including means for varying the amount of a chemical introduced into said second cylinder, this last mentioned means consisting of an elongated bolt adjustably mounted through said first plate with the inner end thereof constituting an abutment limiting the return movement of the piston within the enlarged cylinder.

3. The device of claim 1 wherein said means for introducing and expelling the chemical includes a chemical reservoir, conduit means communicating the reservoir with the second cylinder for the introduction of a chemical thereto, a check valve preventing back flow into the reservoir, conduit means communicating the second cylinder with the feed line for introducing the chemical thereto, and a check valve in said last-mentioned conduit means for preventing back flow from the feed line into the second cylinder.

4. For use in combination with a boiler feed line having a periodic flow, a pressure operated chemical injector comprising three axially aligned piston and cylinder assemblies consisting of a first plate, an enlarged cylinder having one end secured thereto, the opposite end of the enlarged cylinder being secured to a second plate the opposite side of which has a first end of a second cylinder secured thereto, the opposite end of said second cylinder being secured to a third plate, a third cylinder having one end secured to the opposite side of the third plate and being secured at its opposite end to a fourth plate, a piston slidably received within said enlarged cylinder, a rod secured thereto and extending through said second plate and into engagement with a piston within said second cylinder and a second rod secured to a piston within the third cylinder, means introducing pressure from said feed line into said enlarged cylinder, said pistons movable simultaneously in response thereto, means communicating one of the other two cylinders with a constant source of pressure less than the pressure in said feed line, and means in communication with another of the cylinders for introducing and expelling a chemical in response to movement of the pistons.

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