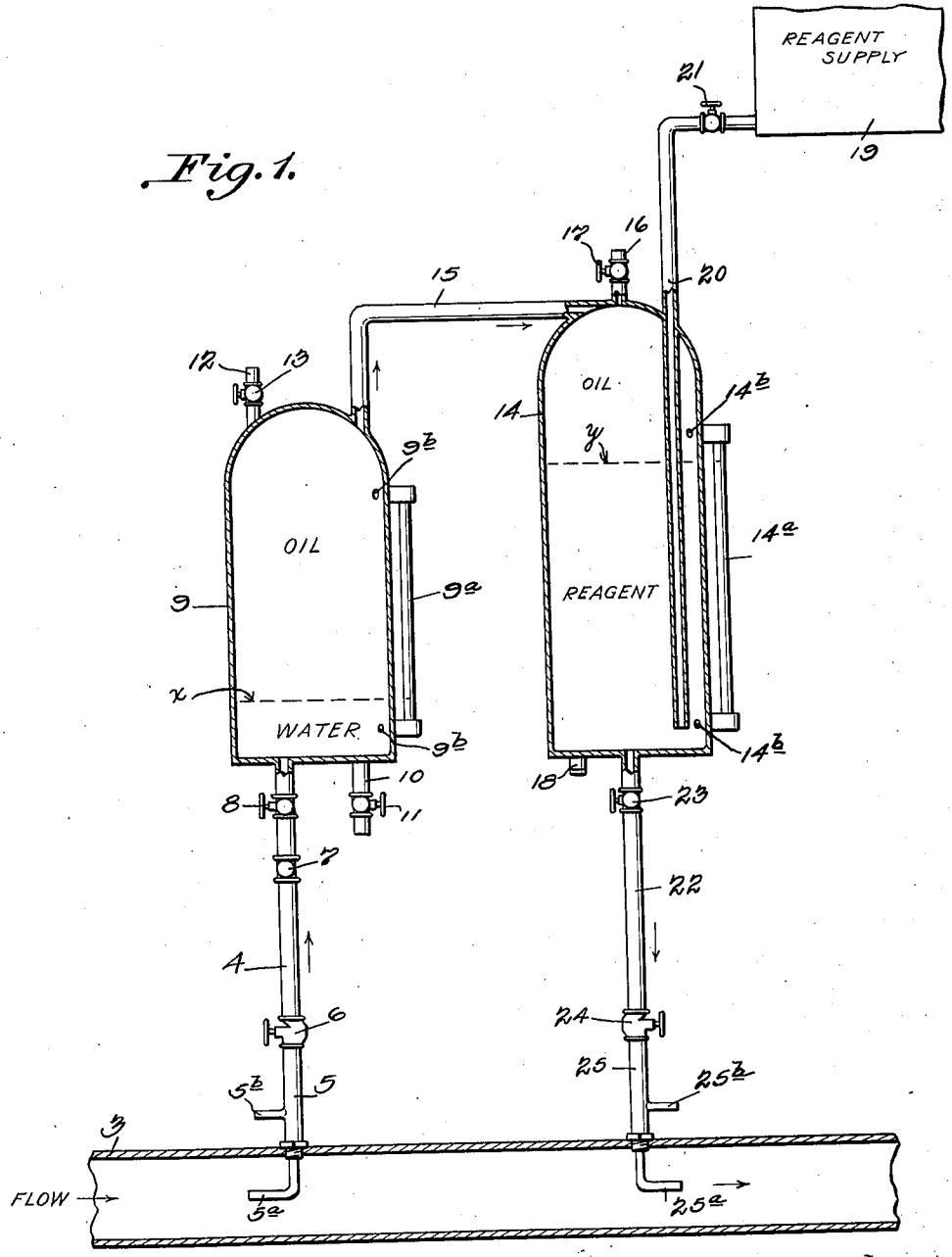
Oct. 20, 1936. D. W. HAERING 2,058,309

FLUID FLOW CONTROLLING APPARATUS

Filed April 30, 1934

Fig. 1.



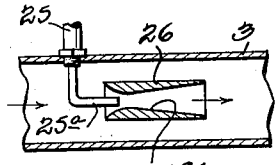


Fig. 2. 26a

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FLUID FLOW CONTROLLING APPARATUS

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2 Claims. (Cl. 210—31)

My invention relates to improvements in flow controllers or apparatus for proportioning liquids such as is used, for instance, for introducing a chemical-containing fluid into a water conduit at a rate that will be proportional to the rate of flow of the water in the conduit.

The invention has among its objects to provide, (1) a simple, inexpensive, durable and highly efficient device for the purpose specified; (2) a device of this kind, which, while eliminating diaphragms etc., (which tend to rot or wear out),—provides nevertheless a highly efficient means for preventing dilution of the reagent, or chemical, by the water; (3) a flow controller embodying novel means for readily and at all times indicating the amount of chemical carrying liquid that is on hand so that the amount used may be checked; and (4) a device for the purpose indicated wherein the pressure of the water taken in from the "upstream" end of the water conduit is transmitted to the reagent, or chemical-containing fluid, by means of a third fluid body interposed therebetween, the said third fluid being lighter than the other two, immiscible with same, and incapable of reacting chemically with either of the said other fluids,—to wit, the water and reagent.

The foregoing and other objects are attained by means of a novel combination and arrangement of parts to be hereinafter described and claimed, reference being had to the accompanying drawing forming a part of this specification, and which illustrates what now appears to be a preferred form of apparatus.

In the drawing, wherein the same parts are designated by the same reference characters throughout the several views,—

Figure 1 is a side elevational view, largely diagrammatic, of an apparatus embodying my improvements,—certain of the parts being broken away and others being shown in section; and

Figure 2 is a detail view of a modification showing the conduit in longitudinal section to disclose a Venturi tube which may be used.

It is to be understood that the invention is susceptible of many other mechanical expressions within the spirit and scope of the subject matter claimed hereinafter; and that I do not limit myself to the precise details illustrated.

Referring to the drawing in detail, numeral 3 denotes a water main, or other flow conduit, into which it is desired to introduce a reagent in proportion to the rate of flow of the water. In referring to main 3 and the contents thereof the term "water" will be used. But it is understood that this is merely for convenience in handling the description, and that the apparatus is applicable to other mains and conduits.

Rising from the conduit 3 is a pipe 4 having the Pitot tube lower end portion 5 sealingly secured to and extending into the conduit, as shown. The Pitot tube 5 has a laterally turned lower end portion 5^a pointed "upstream" in conduit 3, and is also provided above the conduit with a handle or flag portion 5^b which serves as an indicator to denote the position of the inlet end 5^a,—the portions 5^a, 5^b being superposed and parallel as shown.

The inflow pipe 4 is shown as provided with a needle valve 6 for regulating the flow through pipe 4 from conduit 3, while above needle valve 6 is a check valve 7; and above that a gate, or cutoff valve 8.

Pipe 4 communicates, at its upper end with the bottom of a tank 9 which has the drain pipe 10 and the control valve 11 therefor. The upper end of the tank 9 provides the combined filler and vent pipe 12 having the cutoff valve 13, while the side of the tank 9 has the gage glass attachment 9^a whose top and bottom end branches communicate with the interior of the tank 9 through the holes 9^b adjacent the top and bottom of the tank, as shown.

Tank 9 is designed to be filled with oil preparatory to opening the cutoff valve 8 of inflow pipe 4, and as indicated at 15 there is a pipe leading from the top of tank 9 to the larger tank 14. This latter tank 14 is initially filled with a reagent or liquid solution of chemical and has the outflow pipe 22 whose lower end has the Pitot tube 25 entering the conduit 3. It is to be noted that the laterally turned lower end of Pitot tube 25 (see 25^a is directed "down stream", the position of Pitot tube end 25^a being indicated by the handle or flag 25^b the same as flag 5^b of tube 5.

The upper end of the reagent tank 14 has the vent pipe 16, controlled by valve 17,—there being also provided the reagent supply pipe 20 leading from the reagent supply tank 19 and terminating adjacent the bottom of the reagent tank 14. A cut-off valve 21 controls the reagent supply pipe.

Reagent tank 14 also has a gage glass, designated as 14^a, and having its laterally directed upper and lower end portions communicating with the interior of the tank through holes 14^b.

It is to be noted that the gage glasses 9^a and 14^a are each disposed with their lower ends very

close to the plane of the bottom of the respective tanks 9, 14.

The reagent outflow pipe 22 from the reagent tank 14 has the cut off valve 23 adjacent tank 14, and below the same is provided the needle valve 24 for regulating the flow through such outflow pipe 22.

Reagent tank 14 also has the drain pipe 18 which will be controlled by a valve, not shown.

To prepare the apparatus for operation, the valves 8, 23 are closed. Tank 9 is filled with light mineral oil or other fluid which is (1), lighter than the reagent and water; (2) immiscible with either water or the reagent, and (3) which will not react chemically with either the water or reagent. Next valve 21 is opened to allow the reagent to flow from the supply tank into the reagent tank 14. When reagent flows out through the vent pipe 16 the operator knows that both tanks 9, 14 are filled with fluid and that there is no air in the same or connection 15.

Tanks 9, 14 having been filled as above described and air excluded therefrom, valves 8, 23 in the inflow and out flow pipes 4, 22, respectively, are opened to put the apparatus in operation.

The water flowing in the conduit 3 in the direction of the arrow (Figure 1) hitting the "upstream" directed Pitot tube end 5^a and passing the "down stream" directed end 25^a of the other Pitot tube 25 creates a pressure differential between these two points which is always proportionate to the velocity head, or rate of flow of the water in conduit 3. Thus water passes up the inflow pipe 4 into the oil tank 9. The oil being lighter than the water is displaced and forced out through pipe 15 into the reagent tank 14 causing reagent to be forced out through outflow pipe 22 and Pitot tube 25, 25^a into the water stream in the conduit 3.

Obviously the quantity of reagent passing out through Pitot tube 25 will always be proportionate to the rate of flow of the water in conduit 3. Needle valves 6, 24 in the inflow and outflow pipes 4, 22, respectively, enable the quantity of reagent supplied to conduit to be regulated according to varying requirements.

It may be desirable where large proportionate quantities of reagent to the water are required, to instal a Venturi tube in main 3 so as to relatively increase the pressure at Pitot tube 5 over the same factor at Pitot tube 25.

Figure 2 of the drawing illustrates a novel Venturi tube element 26, into the flared rear part of whose bore 26^a the end 25^a of Pitot tube 25 projects. As will be noted the major length of such bore 26^a flares outwardly in a gentle taper to the outlet end of the Venturi element 26. Water entering the rear part of bore 26^a about 25^a accelerates the flow of reagent out through 25^a and also such Venturi element increases the pressure in conduit 3 at the intake of Pitot tube 5. Other Venturi formations may of course be used, but the foregoing is of special advantage.

Gage glass 9^a indicates the water and oil level x in tank 9, while gage glass 14^a indicates the oil and reagent level y in tank 14. So that the demarcation lines x, y will stand out sharply the oil may be colored. The gage glasses enable the operator to readily keep check the amount of reagent on hand and the amount used.

A very important point to be noted is that the reagent tank 14 is larger than the oil tank 9. Thus, if all oil is allowed to pass into the reagent tank 14 due to carelessness of the attendant, there will still be quite a quantity of reagent in the lower part of tank 14 so that the flow of reagent to the water stream though Pitot tube 25 will continue for a substantial period after the oil has totally disappeared from gage glass 9^a of oil tank 9 and oil prevented from passing to conduit 3.

When the apparatus is to be recharged with reagent, it is only necessary to close valves 8, 23 and open vent 16 and drain 10 before opening valve 21 in reagent supply pipe 20. The oil being lighter than the reagent is caused to flow back through pipe 15 into oil tank 9 forcing the water out drain 10 as the reagent level y rises in tank 14. When the reagent runs out of vent 16 in reagent tank 14 the operator knows that the apparatus is reset and that all air is excluded therefrom. He then closes vent 16, drain 10 and valve 21, and opens the valves 8, 23 in the water inflow and reagent outflow pipes 4, 22, respectively. The operation of the device then continues. It is the work of but a few moments to reset the apparatus, as will be obvious.

Should the needle valves 6, 24 be incapable of sufficiently reducing the flow of reagent through Pitot tube 25 for a given case, then the reagent can of course be diluted.

The specific example of the invention as disclosed herein deals with water as the fluid to be treated and oil as the medium interposed between the water and the reagent. Obviously, however, this is only an illustration of one of the many practical applications of the invention, which in its broadest aspect is the interposition between two fluids of a third fluid or semi-fluid which is immiscible with same. Of course, in most practical applications of the invention the third fluid should be chemically inert with respect to the other two; and in the example illustrated herein the third fluid must be lighter than the other two, but this may not always be necessary.

The use of fluid (the oil here, for instance) as a pressure transmitting medium is of great advantage over mechanical instrumentalities such as plungers, diaphragms, etc., heretofore used in the art as use of same involves moving parts that rot or wear out and also involves machining and other expensive work that greatly increases the cost over my device without approaching mine in efficiency, longevity or economy in operation. Plungers and diaphragms will sometimes stick, due to presence of foreign matter. There is no such difficulty in my device using the interposed oil or other fluid as the power transmitter from the one fluid to the other.

Attention is also invited to the use of tanks 9, 14 which are welded throughout, in the sense that they embody no removable closures. Not only does this construction lower manufacturing costs, but it also permits higher pressures to be carried than would otherwise be safe.

And furthermore, the user of one of my devices has an apparatus suitable for both low and high pressure lines at no extra cost.

The inclusion of the check valve 7 is simply a precautionary measure and is useful mainly in case foreign matter should get into tank 9. Valve 7 would then prevent such foreign matter from dropping back to water conduit 3. Such check valve would also be useful in case the operator forgot to close cut-off valve 8 in water inflow pipe 4 at a time when there was no flow in conduit 3.

It is of advantage to have the reagent filler pipe 20 terminate adjacent the bottom of the tank

14 so that the new supply of reagent will be introduced below the oil and thus effect ready return of the oil to tank 9 through pipe 15 without even temporary admixture with the oil.

It is further to be noted that the lower end of gage glass 14a terminates above the bottom of tank 14. Thus, reagent will still be supplied to conduit 3 not only while oil tank gage 9a shows all water, but also while reagent gage glass 14a shows all oil. Thus, the operator has a double signal or warning to reset the apparatus by refilling tank 14 with reagent from tank 19.

Having thus described my invention, what I claim is:

1. A proportioning apparatus comprising in combination with a fluid thruput conduit, a closed receptacle, an inlet pipe between the bottom of said receptacle and the conduit and communicating with said receptacle at its bottom, a second and larger receptacle having a capacity in excess of the capacity of said first receptacle, means for supplying a treating fluid to the lower part of said larger receptacle, a pipe between the upper ends of said receptacles and communicating with the top of each, a treating fluid outlet pipe between the bottom of said larger receptacle and the conduit and communicating with the bottom of said larger receptacle, and a body of liquid in the receptacles between the thruput fluid and the treating fluid, immiscible with both and chemically inert thereto, said body of liquid being disposed at all times above the thruput fluid and the treating fluid in the respective tanks.

2. In a proportioning apparatus in combination with a thruput fluid conduit, receptacle means comprising two separate chambers communicating one with the other at their upper ends only, means for supplying fluid under flow pressure from the upstream side of said conduit into communication with the bottom of one chamber, means for supplying a treating fluid to the bottom portion of other chamber at another portion thereof, means communicating with the bottom of said other chamber for discharging the treating fluid therefrom into said conduit on the downstream side, and a body of liquid filling said receptacle means at all times between the inlet fluid and the treating fluid and separating the same, said intermediate body of liquid comprising a piston operable by pressure of the inlet fluid and being immiscible with and chemically inert with respect both to the inlet fluid and the treating fluid.

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