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SAMPLING DEVICE FOR PIPE LINES

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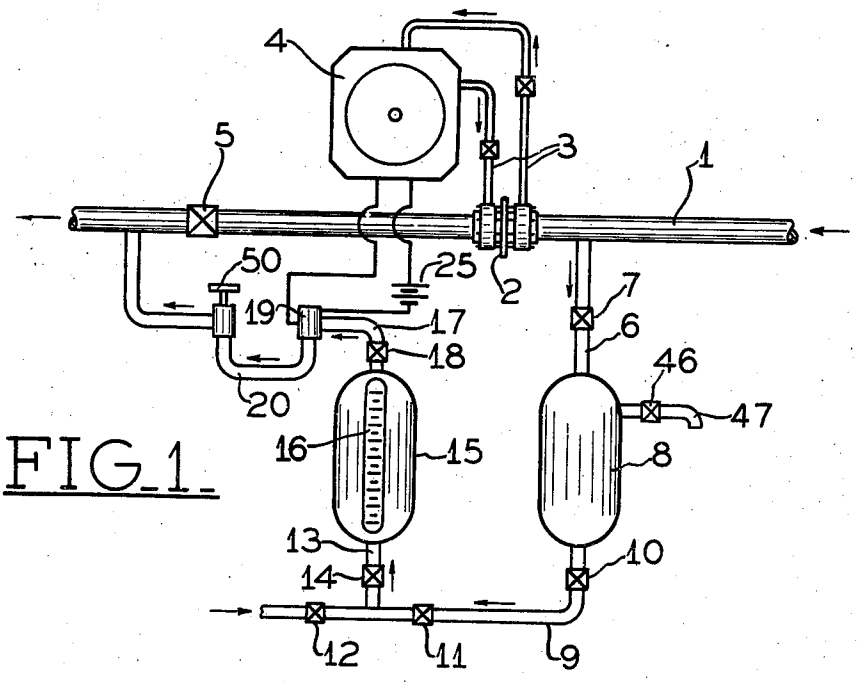

FIG. 1.

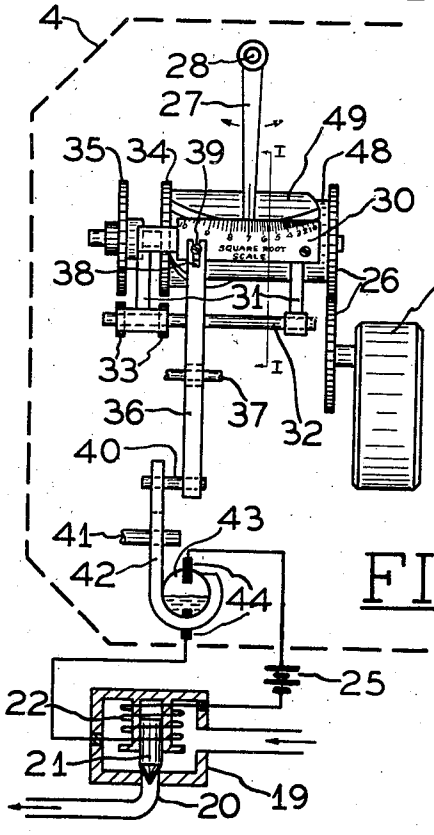

FIG. 2.

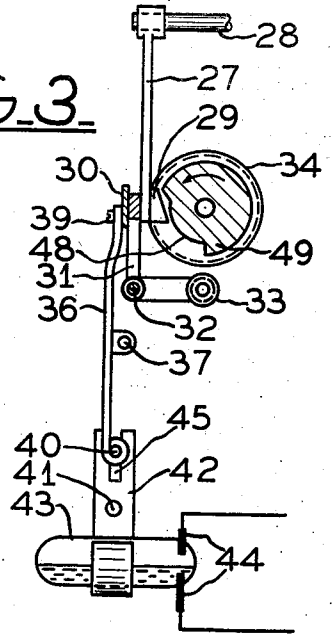

FIG. 3.

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SAMPLING DEVICE FOR PIPE LINES

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4 Claims. (Cl. 23—257)

The present invention is directed to a device for sampling fluids from flowing lines.

An object of the present invention is the provision of a device of the character described which will collect a representative sample of fluid flowing through a closed line, particularly a fluid which is gaseous or readily vaporizable.

A further object of the present invention is the provision of a device of the character described which is capable of collecting a sample representative of the fluid which has passed through the line over a period of time, particularly where the rate of flow has not been constant; that is to say, in the device according to the present invention, the sample collects at a rate which varies with the rate of flow of the fluid in the line.

An additional object of the present invention is the provision of a device of the character described which is capable of being actuated by a flow meter of conventional design.

Other objects and advantages of the present invention will appear from the following detailed description of the accompanying drawing in which—

Figure 1 is a front elevation of the collection device of the present invention;

Figure 2 is a detail view showing the manner in which the collection device is controlled by a flow meter; and

Figure 3 is a vertical section taken along the line I—I of Figure 2.

Referring to Figure 1, in detail, numeral 1 is a pipe line provided with the conventional orifice 2, on either side of which are branch lines 3 connected with a liquid level device such as a mercury U-tube which is used to actuate the recording device 4. Arranged in line 1 is a pressure reduction valve 5. On the high side of this valve is a branch line 6 controlled by a valve 7 connecting main line 1 to tank 8 from the bottom of which is a second line 9 carrying valves 10, 11 and 12. Between valves 11 and 12 a branch line 13 controlled by valve 14 connects line 9 with the bottom of a second tank 15 having a sight glass 16 and an outlet line 17 at its upper end controlled by a valve 18. Line 17 empties into the side of a small housing 19 which has an outlet pipe 20 at its lower end controlled by a needle valve 21 which is operated by a solenoid 22, the winding of which is connected to battery 25 through a mercoid switch operated by one of the elements of the meter 4. Outlet pipe 20 is connected back to main line 1 on the low side of valve 5 and carries a manually operated needle valve 50.

In Figure 2 are shown some of the parts of a conventional Taylor Integrating Flow Recorder the full details of which can be found on p. 17 of the 1937 edition of catalogue 70–J, Taylor Instrument Company of Rochester, New York. The particular parts shown in Figure 2 are a drum 48 having a cam surface 49, said cam surface having a small periphery at one end and a periphery corresponding nearly to that of drum 48 at the other end. Drum 48 is driven by motor 24 through gears 26 at the rate of one revolution per minute. An arm 27 is hung from shaft 28 which is operated by the float arrangement of the meter in such a way as to rotate with every change in rate of flow in main line 1. Arm 27, at its lower end, has a cam surface 29 adapted to work with cam surface 49. A square root scale 30 is mounted in front of drum 48 and in front of arm 27 which latter acts as a pointer for the scale. This scale is carried by arms 31 which are mounted on a rocking shaft 32 which carries laterally offset gears 33 adapted to mesh with gear 34 fixed to one end of drum 48 and with gear 35 which actuates a counter.

Briefly, the position of arm 27 depends upon the rate of flow of fluid in main line 1, being near the low end of the square root scale for a low rate of flow and near the high end of the scale for a high rate of flow. This means that when the rate of flow is low, the arm 27 is pushed outwardly by cam surface 49 for only a short period of each revolution of drum 48, this period increasing as the rate of flow increases. When arm 27 is pushed outwardly shaft 32 is caused to rock bringing gears 33 into mesh with gears 34 and 35 whereby the counting mechanism is driven directly by drum 48.

Since it is an object of the present invention to provide a sampling device which will collect a sample at a rate varying with the rate of flow in the main line, the counting device of the meter above described has been utilized as the control mechanism. For this purpose a rod 36, pivoted at 37, is provided with a forked end 38 capable of slidingly engaging a stud 39 carried by the square root scale. The other end of rod 36 is pivoted on a spindle 40. Pivoted on a stud 41 below spindle 40 is a bracket 42 having a curved lower end carrying a boat 43 partially filled with mercury and provided with electrical contacts 44 one of which is below the mercury level and the other slightly above the mercury level when the boat is in horizontal position. The

upper end of the bracket 42 is provided with a slot 45 in which the spindle 40 rides.

As can be seen, when the arm 27 is pushed outwardly, thereby pushing the square root scale outwardly, rod 36 is caused to rotate about its pivot point 37 and in turn bracket 42 is caused to rotate clockwise about its pivot point 41 causing the mercury to accumulate at the right end of the boat and immerse both contacts 44. This closes the solenoid circuit and opens valve 21.

In taking a sample with the above described device valves 7 and 14 are closed while valves 10, 11, 12, 18 and 46, in flow line of tank 8, are opened. Water is introduced into the open end of pipe 9 until tank 8 is filled. Valves 12 and 46 are then closed and valves 7, 10, 11, 14, 18 and 50 are opened. Valve 50 is set so as to permit the collection of any desired percentage of a given volume of liquid flowing per unit of time.

As soon as valve 21 is opened by the flowing of the fluid in the main line, fluid begins to flow through line 6 into vessel 8, forcing the water out of this chamber into chamber 15. The volume of fluid collected in chamber 8 can be measured by the level of the water in chamber 15 as indicated in the sight glass.

It is apparent that various changes may be made in the above described arrangement without departing from the operating principles upon which it is based. All changes in form, dimension, arrangement and in other respects which do not involve a change in principle are contemplated within the scope of the appended claims in which it is intended to claim the invention described herein as broadly as the prior art permits.

I claim:

1. A device for collecting a sample of fluid from a main line in which it is flowing comprising a branch line connected to said main line at two points, a receptacle in said branch line, a valve operable to one open position in said branch line and means actuated by the flow of fluid in said main line for opening said valve periodically for periods directly proportional to the rate of flow of fluid in said main line.

2. A device for collecting a sample of fluid from a main line in which it is flowing comprising a branch line connected to said main line at two points, a receptacle in said branch line, a valve for controlling the flow of fluid in said branch line, a solenoid for controlling said valve, a normally open switch in the solenoid circuit, and means operated by the flow of fluid in the main line for periodically closing said switch for periods proportional to the rate of flow of fluid in said main line.

3. A device for collecting a sample of fluid from a main line in which it is flowing comprising a pressure reduction valve in said line, a branch line connected to said main line on either side of said valve, a receptacle in said branch line, a valve for controlling the flow of fluid in said branch line, a solenoid for controlling said valve, a normally open mercoid switch connected in series with said solenoid, a rocker arm for tilting said switch into and out of closed position and means actuated by the flow of fluid in the main line for rocking said rocker arm whereby to close said switch for periods proportional to the rate of flow of fluid in said main line.

4. An arrangement, according to claim 3, in which the means for rocking the rocker arm includes a cylinder, means for rotating the cylinder at a constant rate of speed, a cam surface disposed on the periphery of said cylinder, said cam surface having a periphery of increasing length from one end of the cylinder to the other, a scale pivotally mounted parallel with said cylinder, a pointer for said scale adapted to fit between it and the cylinder and to be pressed outwardly by the cam surface on said cylinder in such a manner as to cause the scale to rock about its pivot point, means actuated by the rate of flow of the fluid in the main line for fixing the position of said pointer along the cylinder and means for transmitting the motion of said scale about its pivot point to the rocker arm.

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