March 7, 1933. W. A. McLEAN 1,900,514

AUTOMATIC VALVE

Filed March 25, 1932

Fig. 1

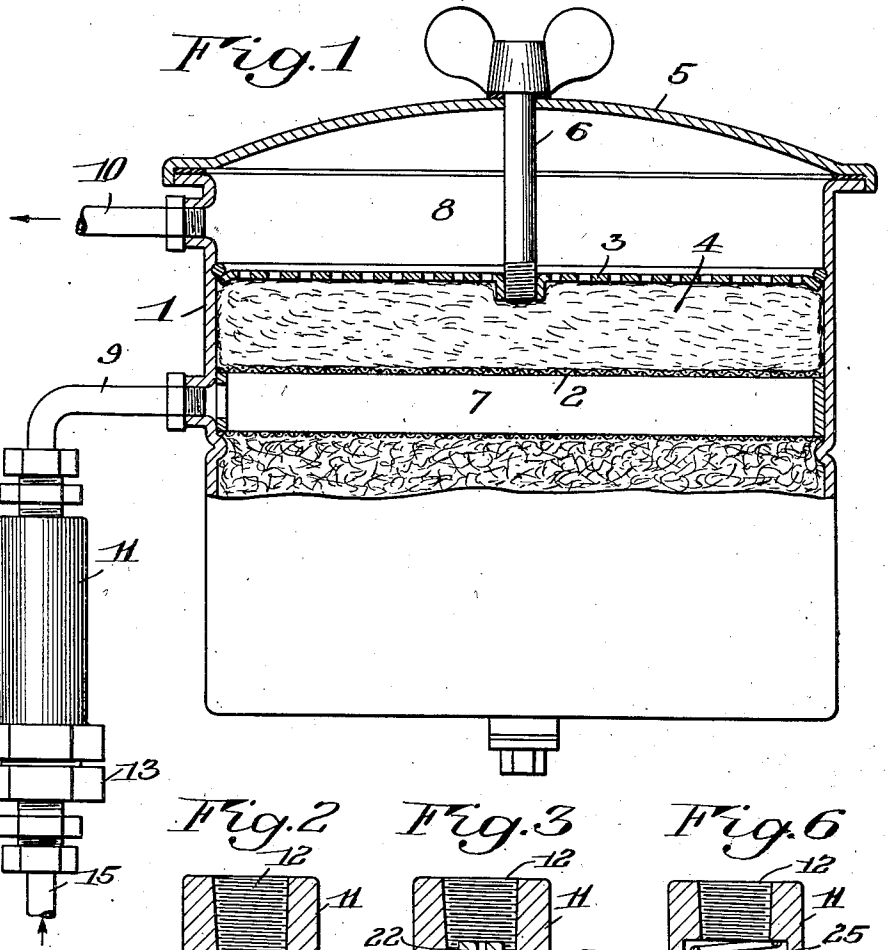


Fig. 2

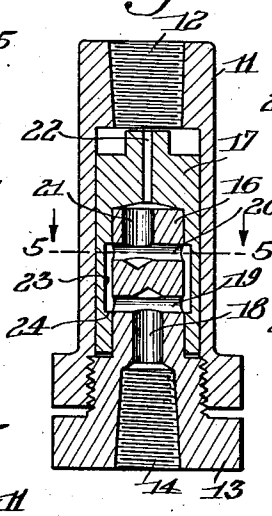


Fig. 3

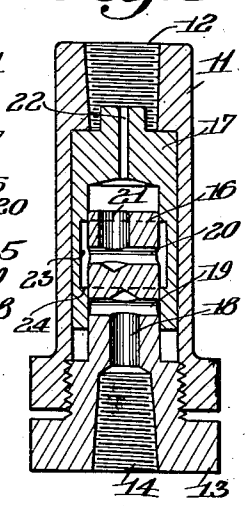


Fig. 6

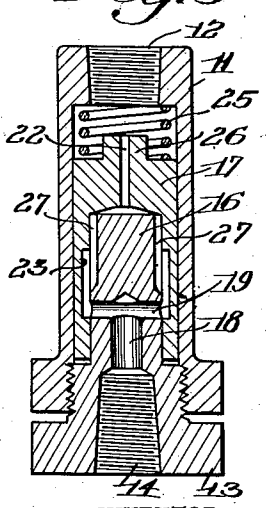


Fig. 4

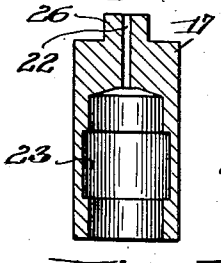
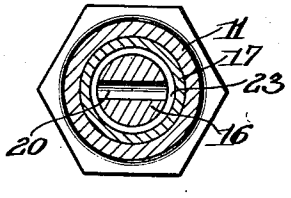


Fig. 5



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Patented Mar. 7, 1933 1,900,514

UNITED STATES PATENT OFFICE

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AUTOMATIC VALVE

Application filed March 25, 1932. Serial No. 601,196.

My present invention relates to liquid distribution, such as pipe lines in circulatory systems, and it has for its object to provide an improved automatically acting valve that will function to produce a substantially uniform predetermined flow under varying pressures. The improvements are directed in part toward providing a valve of this character of a very simple construction that may be produced at low cost and which will be substantially self-cleaning.

To these and other ends, the invention resides in certain improvements and combinations of parts, all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of this specification.

In the drawing:

Fig. 1 is an elevation of a valve constructed in accordance with and illustrating one embodiment of my invention, the same being shown attached to a lubricating system to control the feed through an oil filter and illustrative of one useful application thereof;

Fig. 2 is an enlarged central longitudinal section through the valve case and valve with the latter in one position;

Fig. 3 is a similar view with the valve in another position;

Fig. 4 is a longitudinal central section through the valve cylinder alone;

Fig. 5 is a transverse section taken substantially on the line 5—5 of Fig. 2, looking in the direction of the arrows, and

Fig. 6 is a longitudinal central section through a modified construction.

Similar reference numerals throughout the several views indicate the same parts.

In the accompany illustration, I have shown my invention applied to an oil filter in the line of the circulatory lubricating system of an internal combustion engine. The oil filter shown is of the nature disclosed in my copending application, Serial No. 549,963, filed July 10, 1931. The details of its structure and mode of operation are not important to this disclosure beyond the fact that it comprises a container 1 having screens 2 and 3 confining a filtering body 4. A cover 5 is clamped to the container by a bolt 6 threaded into the screen 3. This forms an inlet chamber 7 below the filtering medium and an outlet chamber 8 above it. An inlet pipe 9 takes into the chamber 7 and, being connected to the oil pump, forces the oil through the filter to chamber 8 and out through a pipe 10 leading therefrom to the bearings.

In the operation of such a system, the problem is to maintain a proper level and pressure of oil in chamber 8 and a feed therefrom through pipe 10 that will be adequate for the lubricating demand without straining the cover 5 and practically regardless of the size of pipe 10. The problem arises from the fact that pumps on different engines vary in capacity and produce different feed pressures and it is impracticable to use different sized pipes for the different systems. With my invention, in its present and other applications, the volume of the feed is rendered constant irrespective of the pumping pressure.

Again referring in detail to the drawing, 11 indicates a valve shell or casing in the pumping line having an outlet 12 into which pipe 9 is threaded. The shell is preferably vertically arranged, as shown, for reasons that will hereinafter appear. At its lower end there is threaded therein a plug 13 provided with an inlet opening 14 into which is threaded in turn a pipe 15 connected to the oil pump or other source of pressure (not shown). A central reduced continuation of the plug 13 constitutes a fixed piston 16, over which fits a vibratory cylinder 17 slidable to reciprocate or float within the shell 11. A continuation 18 of the inlet 14 communicates with a laterally opening port 19 in the fixed piston 16, which port may be constituted by a bore drilled transversely therethrough. Another similar port 20, that may be formed in the same way, communicates with a discharge port 21 in the head of the fixed piston, which port opens into the interior of the sliding cylinder 17. This latter is provided with a restricted feed port 22 discharging into the shell 11 or, rather, to the outlet 12 thereof. A by-pass 23 normally

connects and holds in communication ports 19 and 20, as shown in Fig. 2. This by-pass may be formed, as shown in Fig. 4, by counterboring a circumferential cavity at a proper point in the interior wall of cylinder 17. The operation of the device is as follows:

As before stated, the feed port 22 in the cylinder is preferably smaller than all of its communicating passages and really determines the rate of feed up to a maximum. The pumped oil, in the normal or initial position of the valve shown in Fig. 2, travels through 14, 18, 19, 23, 20, 21, 22, 12, 9, 7, 8, 10, the by-pass 23 connecting ports 19 and 20 to capacity. As soon, however, as the rate of feed therethrough and through piston port 21 exceeds the desired feed capacity of port 22 in the cylinder, the pressure therein increases between it and the piston and the cylinder slides upwardly. When this happens, the shoulder 24 at the lower end of the by-pass cut-out 23 in the cylinder wall acts as a cut-off by raising the cylinder bodily and if the said pressure is sufficient, this will close port 19 entirely and hence inlet 18, as shown in Fig. 3, where the cylinder 17 has risen to the top of the shell. As soon thereafter as the normal feed through feed port 22 of the cylinder has reduced this pressure therein, the cylinder will drop back by gravity, which it is constantly tending to do, and reestablish the by-pass 23 with piston port 19 and hence with inlet 18.

A similarly acting construction is shown in Fig. 6, except that it is modified in two respects. A coil spring 25 centered on a boss 26 on the cylinder head 17 acts against the same and reacts against the end of the shell so that the cylinder will resume normal position independently of gravity and irrespective of the position that it occupies in the system or line. The port 19 is formed in the piston 16, as before, but the by-pass 23 connects it with longitudinal grooves 27 in the upper end of the piston that take the place of the ports 20 and 21.

My improved valve, besides being automatic in its action, is superior to set valves hitherto used to control the feed by permanently defining the size of an opening therethrough in that such valves clog with solid impurities present in the oil, whereas with the present construction the valve frees itself due to the frequent oscillations of the cylinder 17.

I claim as my invention:

1. In an automatic valve of the character described, the combination with a shell having inlet and outlet openings, of a fixed piston within the shell having a lateral port communicating with the inlet opening and a discharge port in its head, and a vibratory cylinder confined within the shell and fitted over the piston, said cylinder being provided with a feed port communicating with the outlet opening of the shell and with the piston head discharge; with a by-pass normally connecting the piston head discharge with the lateral port, and with a cut-off for such lateral port effective upon an outward stroke of the cylinder.

2. In an automatic valve of the character described, the combination set forth in claim 1 characterized further by the fact that the feed port in the cylinder is of less capacity than the other ports and passages.

3. In an automatic valve of the character described, the combination set forth in claim 1 characterized further by the fact that the cylinder has a running fit both in the shell and on the piston.

4. In an automatic valve of the character described, the combination set forth in claim 1 characterized further by the fact that the piston is carried integrally upon a plug fixed in the end of the shell and in which the inlet opening is formed.

5. In an automatic valve of the character described, the combination set forth in claim 1 characterized further by the fact that the piston is provided with two lateral ports, one of which, controlled by the cut-off, communicates with the by-pass and with the intake and the other of which communicates with the by-pass and with the head port.

6. In an automatic valve of the character described, the combination set forth in claim 1 characterized further by the fact that the by-pass is formed by an annular cavity in the wall of the cylinder and the cut-off by the shoulder formed thereby.

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