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WATER SEPARATOR FOR FLUID LINES

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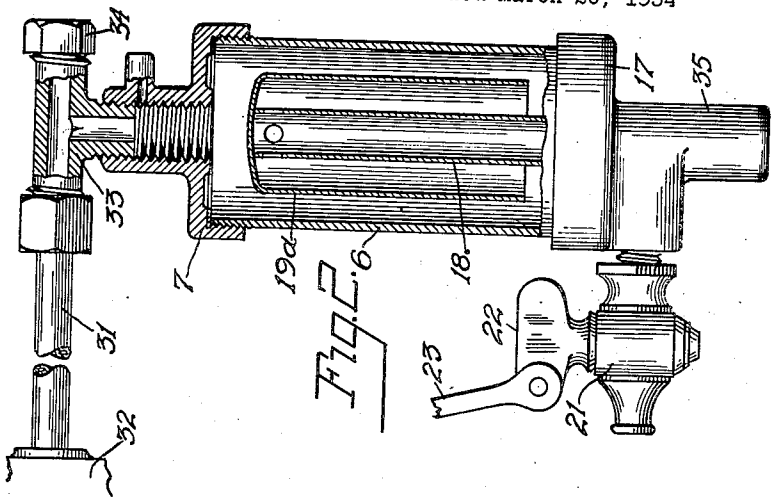

Fig. 2.

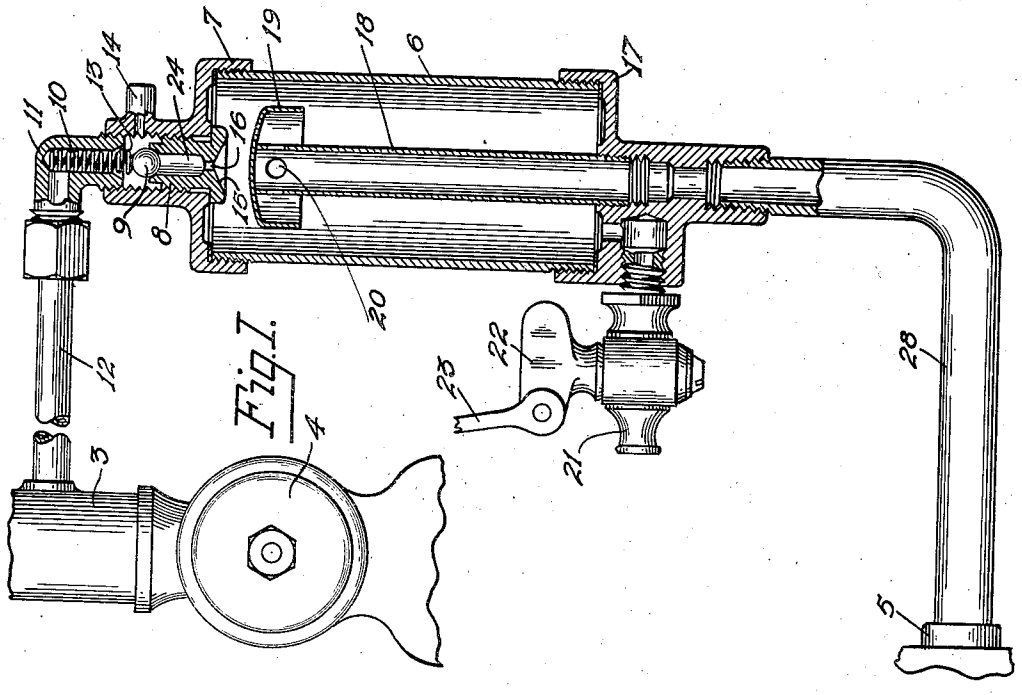

Fig. 1.

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WATER SEPARATOR FOR FLUID LINES

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6 Claims. (Cl. 183—75)

My invention relates to water separator systems for fluid lines and has to do more particularly with systems of this character for internal combustion engines. To this end the apparatus is adapted for separating water vapors from the fumes extracted from the crank case passing the remainder on into the intake manifold, and also adapted for use in the oil feed line so as to remove water from the oil as it is being circulated in the engine.

In carrying out my invention I have provided a device adapted for use in different fluid lines for separating water or water vapor from the fluid flowing therein. For example, the device may be interposed between the intake manifold and the crank case of the engine and so arranged that the vapor from the crank case is drawn through the apparatus where the water in the vapor is condensed and retained in the device while the oil and gas saturated air passes on into the manifold and working parts of the engine. The condensate may then be drawn off so that it will not be returned to the oil in the crank case.

Systems along the above line have been in use heretofore but there have been several defects in such systems, one of the principal ones being that the water in the vapor drawn from the crank case was sucked up into the intake manifold and without any means for controlling the amount of water, it was objectionable. Other devices of the above character have been provided wherein the oil is separated from the vapor so that only the gasified vapor passes into the manifold.

One of the features of my invention is a system wherein the vapor from the crank case is drawn through the device and impinges upon a condensing baffle where the water vapor is condensed and drops down into the bottom of a reservoir or tank permitting the oil and gas filled vapor to pass on into the manifold and the working parts of the engine. The water condensate remaining in the tank may then be drawn off from the reservoir so that it does not get back into the oil in the crank case.

Another feature of my invention is the provision of a device of the above character wherein the amount of vapor drawn from the crank case is controlled so that an objectionable amount of it is not passed into the intake manifold to mix with the gasoline vapor from the carburetor.

As previously mentioned, another use for my device is in the separation of water from the lubricating oil, the device being interposed in the oil feed line so that the circulating oil in passing therethrough has the water separated therefrom and stored in the device where it may be drawn off.

There are other features to my invention and these will be more particularly understood from the ensuing part of the specification and appended claims.

Referring now to the drawing;

Figure 1 shows the system applied to an internal combustion engine with the device interposed between the intake manifold and crank case for separating the water vapor out of the crank case vapor; and

Fig. 2 shows the device interposed in the oil feed line for separating water from the oil.

Considering first the system of Fig. 1, I provide a control apparatus interposed between an intake manifold 3 extending upwardly from a carburetor 4, and the crank case 5 of an internal combustion engine.

The control device itself is preferably made up of a reservoir or tank member comprising a cylinder 6 having an upper cap 7 with a check valve positioned therein in the form of a plug 8 which is screwed into the cap and has a seat upon which the ball 9 rests being held thereon by a suitable spring 10. An elbow 11 is shown for connecting to a pipe 12 extending to the manifold 3. The spring 10 is inserted in the element 11, the lower end of this part being slotted at 13 in several places so as to readily admit vapor around the ball and spring so that it will pass upwardly through the connection 11.

In the use of the device, sticky oil or other foreign matter may lodge around the spring 10 or adjacent surfaces and in order to clean this I provide a nipple 14 having the usual tire valve therein, but not shown, so as to clean the check valve, it is only necessary to place the usual air hose nipple against the end of the valve 14 whereupon the air pressure from the hose passes through the check valve and forces any oil or other foreign matter up into the intake manifold, where they pass into the engine and are consumed by the heat.

A feature of the valve plug 8 is a lower cap portion 15 against which the vapor impinges as it flows up through the opening 16 so that any remaining water vapor condenses upon the surface 15, runs to the peripheral edge of the plug and drops down onto the condensing baffle and into the bottom of the reservoir.

At the lower end of the cylinder 6 is a cap 17 connected by means of a suitable pipe 18 to some part of the crank case of the engine sufficiently above the oil level so as to prevent drawing oil

up into the apparatus. That is, merely the vapor above the oil is drawn out of the crank case. This lower cap 17 has an intake tube 18 threaded into the center thereof, said tube having the condensing cap 19 suitably fastened to the top of the tube by solder, brazing or otherwise. Inside this cap are a number of outlet openings 20 through which the vapor passes and impinges against the inner wall of the condensing baffle 19 where the water vapor condenses and drops down into the bottom of the reservoir or tank. This baffle 19 and the outlet openings 20 are positioned sufficiently above the tank bottom to provide a substantial condensate storage space in the bottom of the tank so that the vapor flows freely through the outlet openings 20 and against the baffle thereafter passing above the condensate and outwardly through the upper valve. In other words, the parts are so arranged as to permit a continued flow of vapor above the condensate from the inlet openings to the outlet of the tank so that the stored condensate will not saturate this vapor but to the contrary, the clear spaces and baffle will remove the objectionable water vapor and permit only the gas and oil saturated vapor to pass on into the engine.

In order to relieve the tank of the stored water and prevent its return to the crank case, I provide a valve 21 connected to the bottom of the tank and which may be controlled by the handle 22 or remotely by a knob 23 placed in a position convenient to the driver's seat.

In the use of the device it is desirable to regulate the amount of vapor drawn from the crank case and therefore the plug 15 is preferably interchangeable so that one with a suitable sized opening 16 may be inserted in the cap. I also preferably provide this opening 16 as a restricted one with a reservoir space 24 between the check valve and this opening so any oil or water running back from the connections 11 during the operation of the device will settle in the chamber 24 as it cannot pass the inlet 16 while air is passing through. But when the engine stops, although the check valve closes, the water or oil in 24 drops down into the tank. Without this chamber 24 such water or oil would accumulate above and around the valve, making it sticky. By the provision of the above arrangement, the valve is kept more clean.

From the foregoing, it will be seen that I have provided a system for drawing objectionable vapor from the crank case and condensing the water therefrom so as to pass the gas and oil vapors up into the working parts of the engine and permitting the objectionable water to be drawn off without returning it to the crank case.

Considering the system of Fig. 2, the separating device here shown is interposed in the oil line system of the automobile preferably connecting one end of the separator by means of a tube 31 with the oil pump 32, using a T connection 33 having a cap 34 at one end thereof. The other end 35 of the separator is connected in the oil line preferably at the inlet end of the oil filter unit so that water and other sediment is separated from the oil before it passes into the oil filter unit, thereby saving the oil filter unit and prolonging the life of the filter insert. The baffle structure inside of the separator may be the same as the one shown in Fig. 1, although in this case I preferably use a longer skirted baffle 19a extending down to the lower end of the reservoir but leaving sufficient storage space to provide a non-moving body of oil and water.

In the device as connected in Fig. 2, the oil preferably enters at the top and passes out of the bottom, although it may be connected in the opposite way, that is, so that the flow is upwardly from the bottom if desired.

In connecting the separator as shown in Fig. 2, it is unnecessary to use the check valve of Fig. 1 as the oil flows from the pump 32 downwardly through the opening in cap 7, downwardly around the outside of the cap 19a under the skirt and upwardly through the openings 20 in the central tube, then flowing downwardly through the outlet 35. When so used, the flow of oil is regulated or restricted at the oil filter unit or a plug 15 with proper opening 16 used in the cap 7.

When used in this manner, I find that the oil in flowing through the device has the water separated therefrom, the water and such other sediment as is intercepted settling to the bottom of the reservoir where the body of oil is not in motion, and from which the water and sediment may be drawn off by the valve 21. In case the water does not flow freely from the reservoir, the cap 34 may be removed from the T 33, thus allowing the air to enter at the top so that the reservoir may be drained as stated.

If desired, the separating apparatus including the central tube 18 and elongated cap 19a may be inserted directly into the center of the oil filter unit through the bottom cap of the oil filter unit so as to act directly on the oil therein instead of placing the separator in the outside oil line as mentioned above.

What I claim as new and desire to protect by Letters Patent of the United States is:

1. In a vapor removal and water separator device adapted to be interposed between the crank case and intake manifold of an internal combustion engine, a tubular body, a cap for the upper end of the tube having an outlet for connection with an intake manifold, a cap for the lower end of the tube having an inlet for connection with a crank case, an intake tube extending upwardly from the lower cap into the tubular body and having outlet openings at its upper end, said openings being sufficiently above the bottom cap to provide a substantial liquid storage space in the bottom of the tubular body; and a condensing baffle cap positioned over and secured to the upper end of the intake tube and having an annular skirt extending into the path of vapor drawn through the outlet openings, and a valve in the bottom cap for releasing stored liquid.

2. In a vapor removal and water separator device adapted to be interposed between the crank case and intake manifold of an internal combustion engine, a tubular body, a cap for the upper end of the tube having an outlet for connection with an intake manifold, a cap for the lower end of the tube having an inlet for connection with a crank case, an intake tube threaded into and extending upwardly from the lower cap into the tubular body and having outlet openings at its upper end, a condensing baffle cap positioned over and secured to the upper end of the intake tube and having an annular skirt extending into the path of vapor drawn through the outlet openings, and a changeable plug for insertion in the outlet in the upper cap for limiting the amount of vapor supplied to the outlet.

3. In a vapor removal and water separator device adapted to be interposed between the crank case and intake manifold of an internal combustion engine, a tubular body, a cap for the

upper end of the tube having an outlet for connection with an intake manifold, a cap for the lower end of the tube having an inlet for connection with a crank case, an intake tube extending upwardly from the lower cap into the tubular body and having outlet openings at its upper end, a condensing baffle cap positioned over the upper end of the intake tube and having an annular skirt extending into the path of vapor drawn through the outlet openings, and a plug for insertion in the outlet in the upper cap for limiting the amount of vapor supplied to the outlet, said plug being positioned centrally above the baffle cap and having a cupped bottom with annular rim to permit condensate gathering thereon to drop onto the baffle cap and then down into the bottom of the tubular body.

4. A device of the character described for interposition in a fluid line including a tubular body, a cap screwed on the upper end of the body having an opening for connection in the fluid line, a cap screwed on the lower end of the body having an opening for connection in the fluid line, a central tube threaded into and extending upwardly from the lower opening toward the top of the tubular body with openings at its upper end, and a cap secured to and extending over the top of the central tube and having an annular skirt extending downwardly beyond the central tube openings whereby fluid passing from one cap opening to the other in the line will pass under the skirt and also through the central tube openings.

5. The combination of a vapor condensing and water separator device including a tubular body, a cap for the upper end of the tube having an outlet for connection with a conduit, a cap for the lower end of the tube having an inlet for connection with a supply conduit, an intake tube extending upwardly from the lower cap into the tubular body and having outlet openings in the wall at its upper end through which the vapor must pass, and a condensing baffle extending outwardly from the upper end of the intake tube above said outlet openings and having an annular skirt extending into the path of vapor drawn through the outlet openings, and means for causing a mixture of gas and water vapor to circulate through said separator device in the direction indicated at a speed which permits the water and water vapor to be separated therefrom.

6. The combination of a device for separating liquids from gases, a check valve controlling the outlet of said device, a restricted orifice between said device and said check valve, and means for protecting said check valve comprising a reservoir between said orifice and said check valve.

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