J. A. WATSON.

OIL PURIFYING APPARATUS FOR HYDROCARBON ENGINES.

APPLICATION FILED MAY 17, 1920.

1,359,453. **Patented Nov. 16, 1920.**

2 SHEETS—SHEET 1.

FIG. 2.

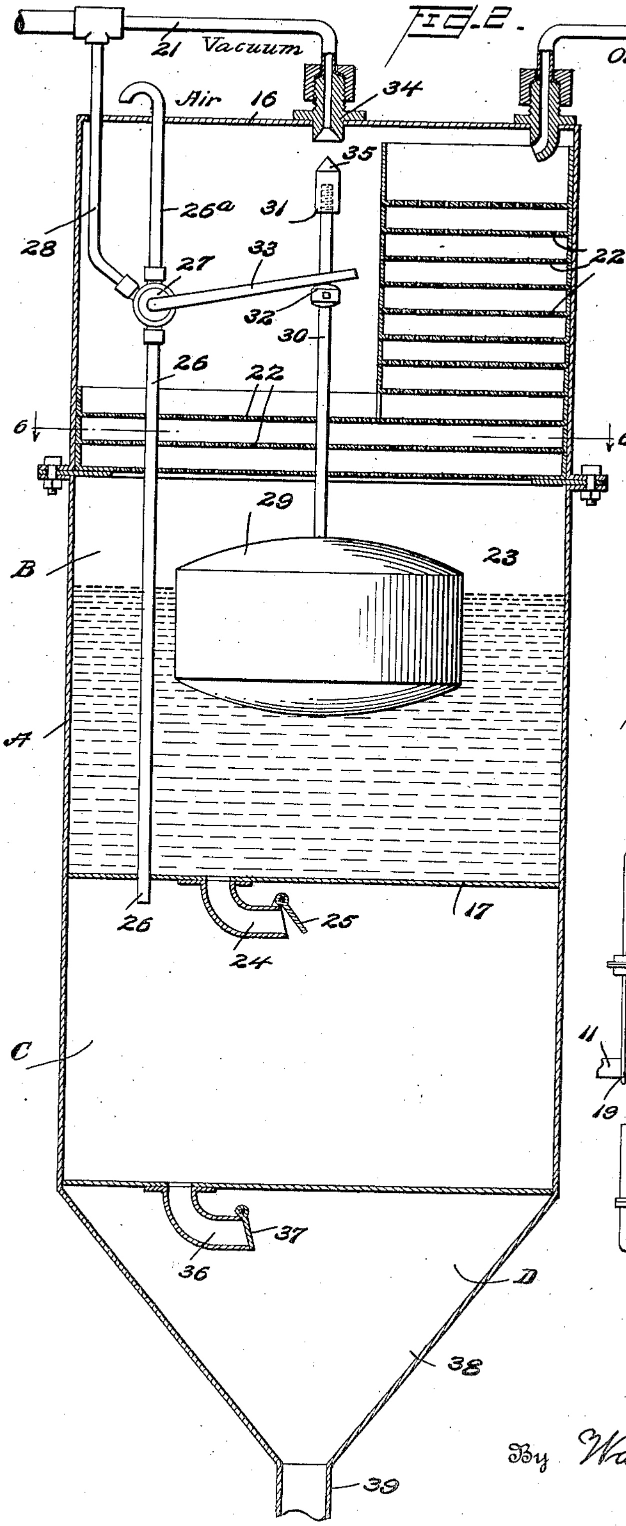


FIG. 3.

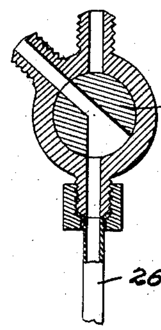
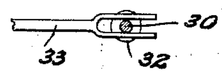


FIG. 4.



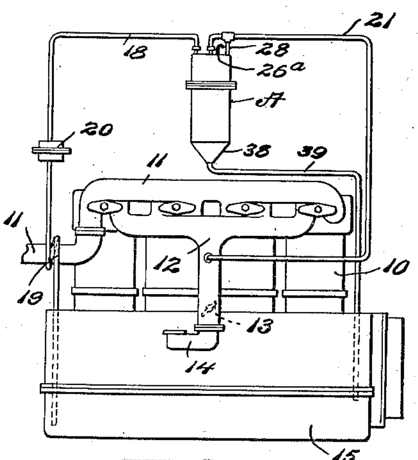


FIG. 1.

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2 SHEETS—SHEET 2.

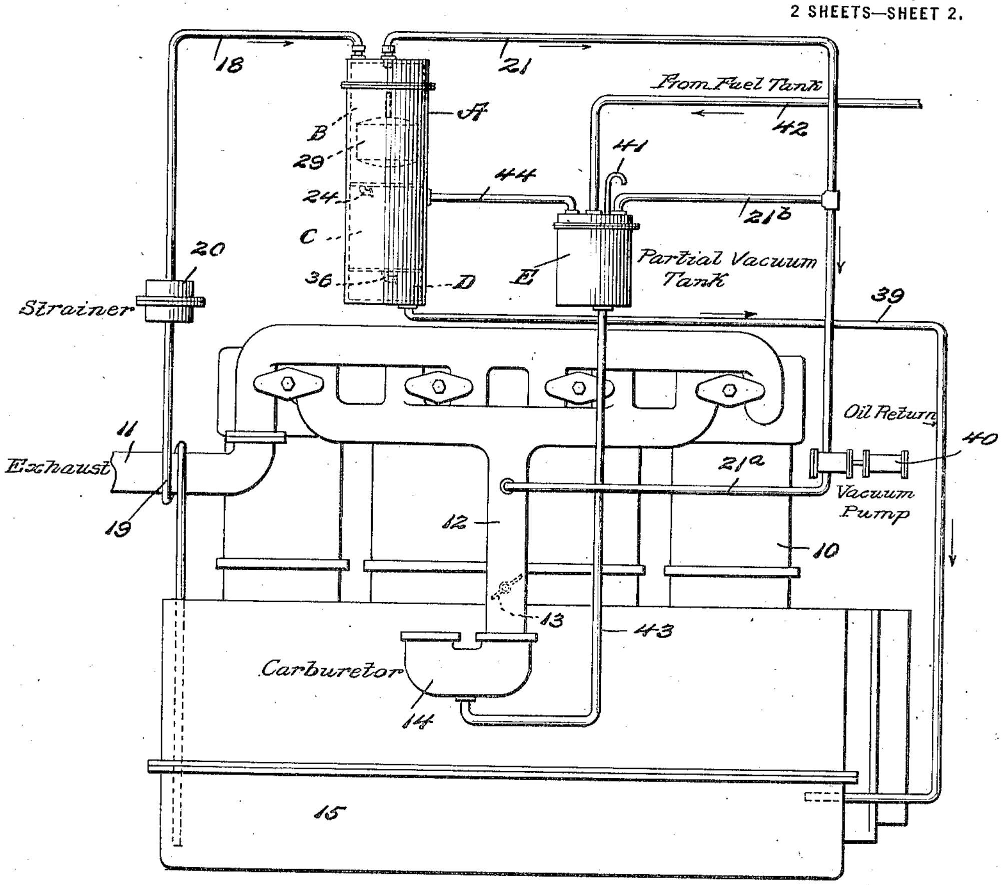
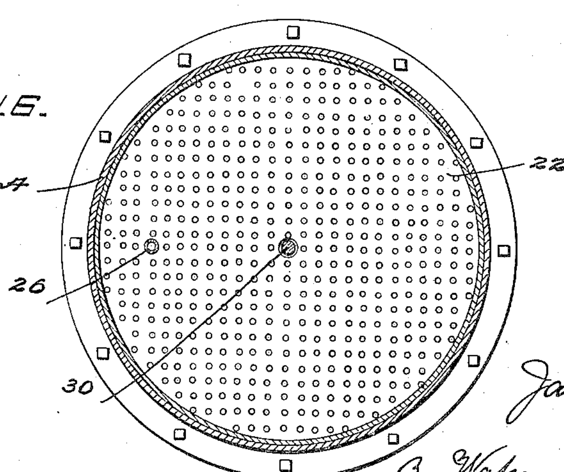


FIG. 5.

FIG. 6.



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UNITED STATES PATENT OFFICE.

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OIL-PURIFYING APPARATUS FOR HYDROCARBON-ENGINES.

1,359,453. Specification of Letters Patent. Patented Nov. 16, 1920.

Application filed May 17, 1920. Serial No. 381,936.

To all whom it may concern:

Be it known that I, James A. Watson, a citizen of the United States, and residing at Silver Spring, Montgomery county, State of Maryland, have invented certain new and useful Improvements in Oil-Purifying Apparatus for Hydrocarbon-Engines, of which the following is a specification.

It is commonly known that the lubricating oil of hydrocarbon engines rapidly deteriorates by reason of the admixture of gasolene and water which leaks by the pistons from the combustion chambers. The water is chiefly produced by condensation of the burned gases, especially when the engine is cold. The gasolene is sometimes entrained with the explosive mixture and carried in liquid condition into the cylinders and sometimes it condenses out of the mixture when the engine is cold in starting. When a cylinder is not firing a part of the gasolene passing through runs down its walls by the piston into the crank case. The result of the mixture of gasolene and water with lubricating oil is that the oil becomes too thin for lubricating purposes and if not frequently replaced with new oil injury to the bearings is likely to result.

The object of the present invention is to provide an apparatus which will continuously tend to remove water, gasolene, or other more or less volatile fluids from the oil, and preferably an apparatus which will operate automatically and continuously at all times when the engine is running. It is well known that water and gasolene will evaporate rapidly when exposed to a vacuum or to reduced atmospheric pressure, and in the apparatus embodying the present invention the oil, preferably in the form of spray, is subjected to a vacuum or to reduced pressure, which causes the more volatile portions to evaporate and pass to the pump or other means for creating the vacuum, the heavy oil being returned to the crank case or other reservoir or directly to the bearings of the engine, as may be desired. In the accompanying drawings I have illustrated two embodiments of the invention, but it will be understood that it may be embodied in a variety of apparatus.

Referring to the drawings,

Figure 1 is a diagram of an engine with the present apparatus applied thereto;

Fig. 2 is a sectional view of the tank in which the separation of the volatile impurities from the lubricating oil is effected, viewed from the rear of Fig. 1;

Fig. 3 is a sectional view of the two-way valve illustrated in Fig. 2;

Fig. 4 is a detail of the valve operating lever;

Fig. 5 is a diagram of an engine illustrating another embodiment of the invention; and

Fig. 6 is a section on the line 6—6 of Fig. 2.

Referring to Figs. 1 to 4 of the drawing, 10 indicates a hydrocarbon engine, 11 the exhaust pipe, 12 the intake pipe or manifold, 13 the throttle valve, 14 the carbureter and 15 the crank case.

A indicates a tank which should be constructed air tight and which may be of any desired shape and in any number of sections suitably connected together. The tank comprises a separating chamber B, an intermittent vacuum chamber C and preferably a discharge chamber D. The chamber B extends from the top 16 to the bottom 17. The oil enters chamber B through the pipe 18 leading from the bottom of the crank case or from some part of the oiling system from which the oil can be conveniently taken. The oil is preferably heated in its passage to the separating chamber and, as shown, this is accomplished by means of a coil 19 taking heat from the exhaust pipe 11. It is also desirable to strain the oil and this may be accomplished by introducing a strainer 20 in the pipe line 18.

The oil is drawn into the separating chamber B by creating a vacuum or partial vacuum therein and this is conveniently done by connecting the chamber with the intake manifold 12 of the engine. As shown the separating chamber is connected with the intake manifold above the throttle valve by the pipe 21. If a higher vacuum is desired than that existing in the intake manifold a vacuum pump or other device for creating a vacuum may be employed.

Within the upper part of the vacuum chamber B I arrange means for sub-dividing the oil so as to expose a large surface thereof to the influence of the vacuum. This is conveniently accomplished by the use of a series of perforated plates 22. The oil is discharged from the pipe 18 on to the upper plate and it drops from plate to plate through the series of plates and finally into a large compartment 23 in the bottom of the separating chamber B. From the bottom of the chamber B the oil is discharged intermittently through an outlet 24 having a valve 25 which is adapted to be held closed by air pressure in the chamber C and to open automatically when this pressure is sufficiently reduced. Atmospheric pressure is normally maintained in the chamber C by means of a conduit 26, 26[a] extending from the outside of the separating chamber into the chamber C. This pipe is provided with a two-way valve 27 which, as shown in Fig. 3, is adapted to alternately connect the chamber C with the external air through pipe 26, 26[a] and with the exhaust pipe 21 or other source of reduced pressure through the tube 28. The valve 27 is automatically operated by means of a float 29 having a vertical stem 30 on which are two shoulders 31, 32. Between these shoulders lies a lever 33 connected with the valve 27 and preferably forked, as shown in Fig. 4. The float stem 30 is preferably in line with the fitting 34 of the vacuum pipe 21 and this fitting is provided with a valve seat whereby the vacuum pipe 21 may be closed by a valve 35 on the end of the float stem 30 if the oil should rise abnormally in chamber B.

The intermittent vacuum chamber C is provided with an outlet 36 having a valve 37 similar to the outlet 24 and valve 25 above described. The oil is intermittently discharged through the outlet 36 and conducted back to the crank case or other part of the oiling system and this may be conveniently accomplished by permitting the oil to discharge into the funnel 38 and to return through the pipe 39 connected to the funnel.

The operation of the apparatus illustrated in Figs. 1 to 4 inclusive is as follows: When the engine is running, and especially when idling or running under small throttle openings, a considerable vacuum is created in the intake manifold 12 and this reduced pressure or vacuum is communicated continuously by means of the pipe 21 to the separating chamber B. It may be assumed that on starting the float 29 is at the bottom of the chamber B. The suction in the chamber will cause oil to flow into the chamber through the pipe 18 the oil being preferably heated by means of the device 19 or other suitable heater. The oil percolates through the various screens whereby a large surface of oil is exposed to the vacuum, causing the gasolene or other volatile impurities in the oil to vaporize. The vapor thus produced is drawn off continuously through the vacuum pipe 21. Owing to the suction or vacuum in the chamber B and the fact that ordinary atmospheric pressure exists normally in the chamber C the valve 25 will be held closed by the atmospheric pressure and the oil will accumulate in B and raise the float 29. After a given quantity of oil has accumulated in chamber B the shoulder 32 on the float will engage the lever 33 and shift the valve 27 permitting the air in the chamber C to be exhausted through pipes 26, 28 and 21, thus removing the pressure from the valve 25 which will open and permit the oil in chamber B to run into chamber C. The suction at this time in the chamber C will hold the valve 37 closed. The chamber C should be large enough to hold a full charge from the chamber B without danger of the oil rising in chamber C to the inlet of pipe 26.

As the oil runs from the outlet 24 the float descends and eventually shifts the valve 27 so as to restore communication between the pipe sections 26, 26[a], communication with the pipe 28 being cut off. Air then rushes into the chamber C creating sufficient pressure to hold the valve 25 closed, and permitting the valve 37 to open and the oil in the chamber C to be returned to the engine lubricating system.

The cycle of operations above described is repeated indefinitely. It is to be understood that the flow of oil should be restricted so that it will be under the influence of the vacuum for a considerable period in passing through the separating chamber. It is to be also understood that the oil will be continuously circulating through the vacuum apparatus at all times when the engine is running and that the entire quantity of oil in the lubricating system of the engine will pass through the purifying apparatus many times during a day's run of the motor, thus maintaining the oil free from volatile impurities.

If for any abnormal reason oil should rise in the chamber B above the point at which the pipe 28 is placed in communication with the chamber C the valve 35 will seat and close the connection between the separating chamber and the vacuum producing apparatus, thus stopping the inflow of oil through pipe 18 and in any event preventing oil from being drawn into the intake of the engine.

In Fig. 5 there is illustrated a modified form of the apparatus embodying different means for creating alternately normal and reduced pressure in the chamber C, thus dispensing with the valve 27 and its operating means. Referring to this figure A indicates the tank having the vacuum chamber B, the intermittent vacuum chamber C and a discharge chamber D, substantially as shown in Fig. 2.

A reduced atmospheric pressure or partial vacuum is maintained in the chamber B by means of a vacuum pump 40, which should preferably exhaust into the intake 12 through pipe 21[a], or by directly connecting the chamber B with the intake 12 through pipes 21, 21[a].

E indicates the well known partial vacuum tank or intermittent vacuum tank which is commonly used to draw fuel from the gasolene tank and deliver it to the carbureter. The internal devices of this partial vacuum tank are well known and need not be illustrated. The operation of these devices intermittently connects the interior of the tank E through pipe 21[b] with the intake of the engine or other source of reduced pressure, and with an air vent 41 whereby fuel is periodically drawn from the gasolene tank through pipe 42 and supplied to the carbureter through pipe 43. By connecting the interior of tank E with the interior of chamber C by means of conduit 44, the condition in tank E is duplicated in chamber C, that is, the pressure in the chamber C is intermittently normal and subnormal, whereby the oil which accumulates in chamber B is intermittently emptied into chamber C and from chamber C into receptacle D, and thence returned to the oiling system of the engine through pipe 39.

The devices substantially as shown in Figs. 1 to 4 are preferable to that shown in Fig. 5, for the reason that the operation of the former devices is practically continuous, that is, the oil will flow continuously into the chamber B while the engine is running, and will be emptied at regular intervals into the chamber C. On the other hand, the operation of the partial vacuum tank E is irregular, depending upon the rapidity with which the gasolene is consumed and hence the flow of oil in chamber B, Fig. 5, would be interrupted at times by reason of the irregular emptying of said chamber into chamber C. It will be understood that when the oil accumulates to a certain extent in chamber B, the valve carried by the float will shut off communication with the source of vacuum and thus interrupt the flow of oil into the chamber.

It will also be understood that the chamber B, Fig. 5, is to be provided with perforated disks, such as shown in Figs. 2 and 6, or with equivalent means for exposing a large surface of the lubricating oil to the action of the vacuum, and thus promote evaporation of the volatile impurities.

Having described the invention what is claimed is:

1. The combination with a hydrocarbon engine having a lubricating oiling system of means for withdrawing volatile ingredients from the oil comprising a separating chamber, means for delivering oil from the lubricating system to said chamber, means for creating a subatmospheric pressure in said chamber, a receiving chamber having a valved communication with the separating chamber and a valved outlet, and means for creating periodically a subatmospheric pressure in the receiving chamber.

2. The combination with a hydrocarbon engine having a lubricating oiling system of means for withdrawing volatile ingredients from the oil comprising a separating chamber, means for delivering oil from the lubricating system to said chamber, means for creating a subatmospheric pressure in said chamber, a receiving chamber having a valved communication with the separating chamber, means for creating alternately atmospheric and subatmospheric pressure in the receiving chamber, and means for returning the oil to the lubricating system.

3. The combination with a hydrocarbon engine having a lubricating oiling system of means for withdrawing volatile ingredients from the oil comprising a tank having a partition providing a separating chamber above the partition and an oil receiving chamber below the partition, a check valve controlling communication between said chambers, an outlet for the receiving chamber controlled by a check valve, means for creating subnormal pressure in the separating chamber, means for creating alternately normal and subnormal pressure in the receiving chamber, means for conducting oil from lubricating system to the separating chamber and means for conducting oil from the receiving chamber back to the lubricating system.

4. An apparatus for separating the volatile impurities from the lubricating oil in the oiling system of a hydrocarbon engine comprising a separating chamber, means for continuously creating subnormal pressure therein while the engine is running, means for conducting oil into said chamber, a valved outlet for said chamber, a float and means controlled by said float for effecting discharge of the oil through said outlet.

5. An apparatus for separating the volatile impurities from the lubricating oil in the oiling system of a hydrocarbon engine comprising a separating chamber, means for creating subnormal pressure therein, means for conducting oil into said chamber, a valved outlet for said chamber, a float within said chamber and means controlled by said float for effecting discharge of the oil through said outlet.

6. An apparatus for separating the volatile impurities from the oil in the oiling system of a hydrocarbon engine comprising a separating chamber, a receiving chamber, a valved communication between said chambers, a valved outlet for the receiving chamber, means for conducting oil to the separating chamber, means for creating subnormal pressure in the separating chamber, a float, and float controlled means for creating alternately normal and subnormal pressure in the receiving chamber.

7. An apparatus for separating the volatile impurities from the oil in the oiling system of a hydrocarbon engine comprising a separating chamber, a receiving chamber, a valved communication between said chambers, a valved outlet for the receiving chamber, means for conducting oil to the separating chamber, means for creating subnormal pressure in the separating chamber, a float within the separating chamber, and means controlled by said float for creating alternately normal and subnormal pressure in the receiving chamber.

In testimony whereof I affix my signature.

JAMES A. WATSON.