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CRANKCASE VENTILATION

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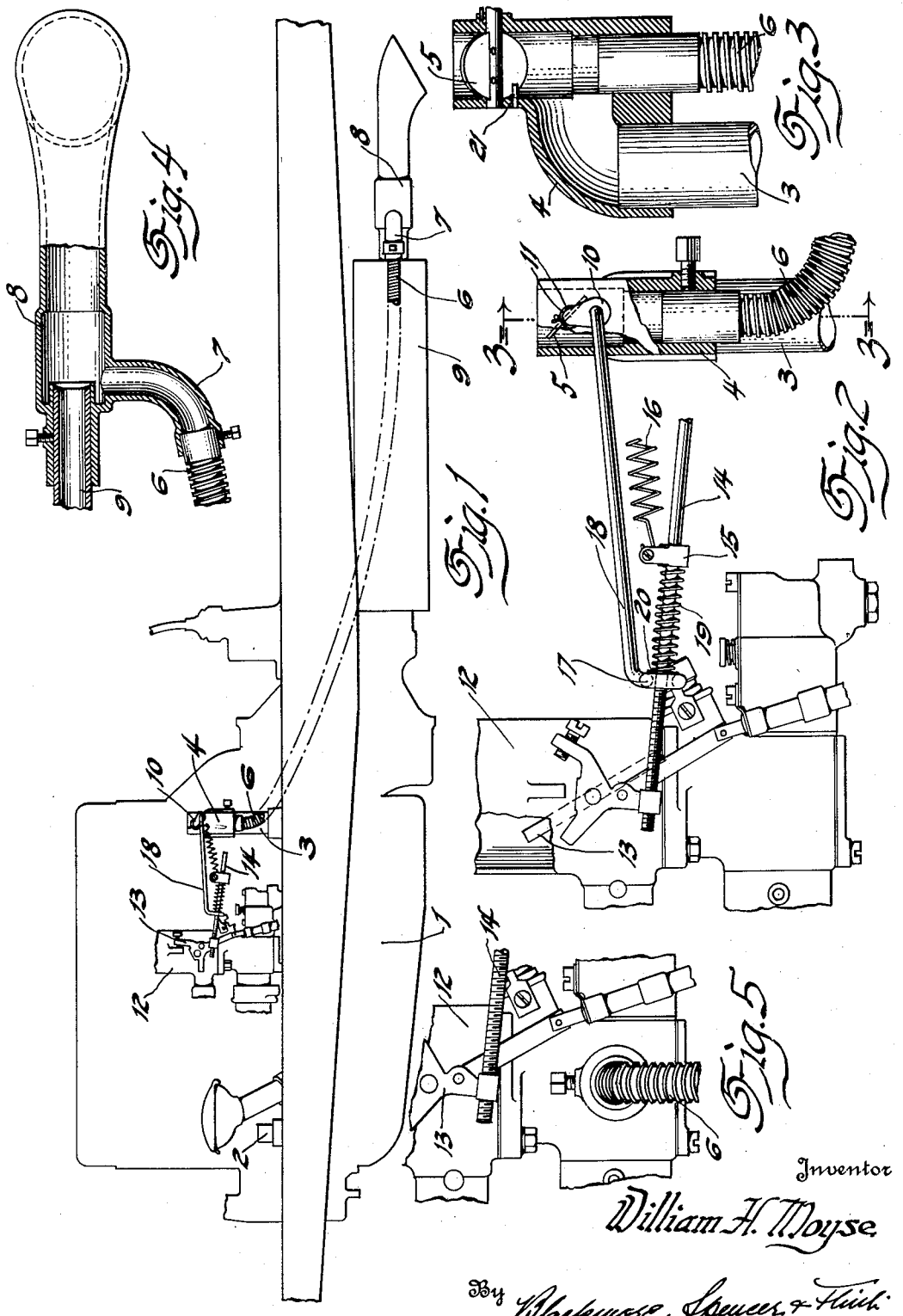


Fig. 4

Fig. 3

Fig. 2

Fig. 1

Fig. 5

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CRANKCASE VENTILATION

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20 Claims. (Cl. 123—119)

This invention relates to oil purification, and more particularly to crankcase circulation and has for one of its primary objects the elimination of condensation of gases in the crankcase of an explosive engine and the consequent dilution of the lubricant. Dilution not only destroys the lubricating characteristics of the oil, but under cold weather conditions, diluted oil has a tendency to congeal and freeze, causing injury and preventing the operation of the engine. It is, therefore, desirable to withdraw adulterants, such as vapors that seep past the pistons and any steam that may be developed within the crankcase, from the engine, before they condense on the walls or mix with and dilute the lubricating oils.

The object of the invention is to provide a simple and inexpensive means of producing and controlling a suction for inducing ventilation and freeing the crankcase to such vapors, whereby, under normal conditions, there will be a tendency to substantial uniformity in the crankcase circulation.

The suction necessary to induce the flow of air through the crankcase may obviously be created in various ways. It is, of course, desirable that the power to create the suction be developed by the operation of the engine. This may be accomplished by the use of the vacuum pump driven off the crankshaft. However, it is important to obviate as far as possible moving or working parts, and to this end the suction produced in the engine cylinders on the intake stroke may be employed, when such vapors would be drawn with the combustible gases through the engine and discharged in the exhaust conduits. A more feasible method has been found to be the use of discharged spent gases as they leave the muffler to produce the suction. Thus it will be seen that the intensity of the suction developed, will vary with different engine speeds, and the great degree developed at high engine speed when the muffler discharge is heavy, would have a tendency to carry along the lubricant. To avoid this difficulty, the excessive suction must be by-passed before it reaches the crankcase, which will have the result of maintaining as nearly as possible a substantial uniform circulation within the crankcase. The present invention is particularly concerned with the by-passing and automatic control of the suction created.

In the drawing:

Figure 1 is a side elevation outlining an automobile frame with an engine mounted therein and the present invention applied thereto.

Figure 2 is a side elevation, partly in section, of the crankcase connection with the source of suction, showing the suction control mechanism.

Figure 3 is a transverse view of line 3—3 of Figure 2.

Figure 4 is a top plan view, partly in section, of the housing on the exhaust muffler and illustrates one form of creating the vacuum.

Figure 5 is a fragmentary side elevation of a carburetor with an air suction line connected thereon, and illustrating the employment of engine suction.

Referring to the drawing, wherein the invention is shown for illustrative purposes as applied to an explosive engine of an automobile, the reference character 1 indicates the crankcase, and 2 a breather pipe permitting the entrance of air into the crankcase. An exhaust conduit 3 on the top of the crankcase, extends into a chambered housing 4, which has therein two passageways. The conduit 3, communicates with one passageway, leading at a medial point into the second passageway, extending entirely through the housing. The upper end of the continuous passageway forms a by-pass conduit, having therein the butterfly control valve 5. From the lower end of the passageway, the flexible conduit 6 leads rearwardly, and is connected to a lateral arm 7 of the ejector housing 8, attached to the discharge outlet of the muffler 9. The shaft for the butterfly valve extends to one side of the housing 4 and has at its end the crank arm 10 with a small spring 11 exerting its force against the crank, tending to close the valve. The carburetor 12 is controlled by the throttle valve 13 connected by the rod 14, to a foot accelerator (not shown) in the driver's compartment. Clamped to the accelerator rod 14, is a collar 15 upon which the spring 16 exerts its tension to urge the throttle valve to closed position. The eye 17 of the rod 18, slides on the accelerator rod, and at the outer end is connected to the butterfly crank arm 10. The helical spring 19 surrounding the accelerator rod bears at one end against the clamped collar 15, and at the opposite end against the washer 20 resting on the eye 17.

When the foot accelerator is depressed, the rod 14 moves forwardly to open the throttle 13. If such movement is slight, the rod slides through the eye 17 and compresses the spring 19, without opening the butterfly valve 5. This is due to the fact that the spring 11 is exerting its tension in opposition to the spring 19, and is of sufficient strength to resist such slight throttle valve opening. In practice it has been found desirable to

keep the butterfly valve closed until the automobile has attained a speed of approximately ten miles per hour. Up to this time the discharged spent gases from the muffler through the ejector housing 8, create a suction in the conduit 6 that is ideal for circulation purposes. With the butterfly valve closed, all of the suction is exerted on the crankcase, which withdraws the vapors and induces fresh clean air to enter the breather tube. However, as the engine speed increases a greater discharge of spent gases occurs, thereby creating a correspondingly increased suction. To relieve the crankcase of this increased suction, as the accelerator rod 14 continues its movement forward to open the throttle valve, the additional compression of the spring 19 causes its tension to equal that of the spring 11, and thereafter the eye 17, and with it the rod 18 will move forward with the accelerator rod 14, to open the butterfly valve. Thus, the operation of the butterfly valve depends upon the operation of the throttle valve, and the butterfly valve remains closed until the throttle has reached a predetermined point. Thereafter, the additional throttle valve opening, causing greater suction to be developed in the ejector housing, will correspondingly open the by-pass to relieve this increased suction, and the remaining portion, acting on the crankcase, will thus have a tendency to remain constant during all speeds, under normal operation of the engine. The connections are such that the butterfly valve is wide open in advance of the throttle valve, which will generally occur at an engine speed that will drive the automobile at approximately thirty-five miles per hour. During the further opening of the throttle valve, the stop pin holds the butterfly against further movement while the spring 19 is compressed to compensate for the difference in movement between the two valves.

As a modification of suction producing means, there is shown in Figure 5, the flexible conduit 6 leading to the carburetor. This may lead in at any place below the throttle valve, when the engine suction controlled by the throttle valve, acts on the crankcase vapors, the excess being bypassed in the manner described.

It is to be understood that the range of operation of the butterfly valve given in the above description as being from ten to thirty-five miles per hour is merely for illustrative purposes, as this range will vary according to different conditions and types of automobiles.

From the above description it will be apparent that there is thus provided a device which will have a tendency to maintain the suction on the crankcase at a fairly constant degree, automatically relieving the excess suction, whereby, undesirable vapors and steam are withdrawn from the crankcase before they become condensed and dilute the oil.

While the parts and arrangements have been described more or less specifically, it is to be understood that there is no intention to limit, but obvious modifications may be made without departing from the spirit or scope of the invention as set forth in the appended claims.

I claim:

1. Means to free an explosive engine crankcase of adulterants, including in combination a throttle valve governing engine operation, suction producing means controlled by the engine and communicating with the crankcase to induce circulation, a by-pass associated therewith, and means to control the by-pass in accordance with the actuation of the throttle valve to partially divert suction which is in excess of a predetermined valve for maintaining crankcase circulation substantially uniform.

2. Means to free an explosive engine crankcase of adulterants, including in combination a throttle valve governing engine operation, suction producing means controlled by the engine and communicating with the crankcase to induce circulation, a by-pass associated therewith to partially divert suction in excess of a predetermined value away from the crankcase for maintaining circulation substantially uniform thruout the range of engine operation, a control valve therefor, and means to operate the by-pass valve with the throttle valve after the throttle valve has been operated to a predetermined partial open position.

3. Means to free an explosive engine crankcase of adulterants, including in combination a throttle valve governing engine operation, suction producing means controlled by engine operation and communicating with the crankcase to induce circulation, a by-pass associated therewith to partially divert suction in excess of a predetermined value away from the crankcase for maintaining circulation substantially uniform thruout the range of engine operation, a control valve therefor, and means to operate the by-pass valve with the throttle valve until the by-pass valve is fully opened.

4. Means to free an explosive engine crankcase of adulterants, including in combination a throttle valve governing engine operation, suction producing means controlled by the engine operation and communicating with the crankcase to induce circulation, a by-pass associated therewith to partially divert suction in excess of a predetermined value away from the crankcase for maintaining circulation substantially uniform thruout the range of engine operation, a control valve therefor, and means to operate said valves in unison thruout an intermediate range of adjustment of the throttle valve, to permit an initial opening of the throttle in advance of the opening of the by-pass valve and a final opening of the throttle after the by-pass valve is fully opened.

5. Means to free an explosive engine crankcase of adulterants, including in combination, an exhaust conduit for spent engine gases, a muffler therefor, an ejector housing on the discharge outlet of the muffler communicating with the crankcase, whereby the flow of spent engine gases thru the ejector housing induces a suction to withdraw crankcase vapors.

6. Means to free an explosive engine crankcase of adulterants, including in combination, an exhaust conduit for spent gases, a muffler therefor, an ejector housing at the outlet of the muffler, a conduit connecting the crankcase with the ejector housing, in which a suction is created by the flow of spent engine gases thru the ejector housing, to draw off crankcase vapors, and means to control the action of suction on the crankcase vapors.

7. In an internal combustion engine, the combination of a carburetor throttle valve for governing engine operation, means to produce suction for withdrawing crankcase vapors from the engine, the value of suction produced being variable with engine operation, and means controlled by throttle valve adjustment to limit within a predetermined value the suction permitted to act on crankcase vapors, whereby the action is substantially constant at all times.

8. In an internal combustion engine, the combi-

nation with a carburetor throttle valve governing the feeding of fuel to the engine, suction producing means variable in accordance with the amount of fuel fed to the engine, and an engine crankcase, of a conduit connecting the suction producing means with the crankcase to withdraw vapors therein, a by-pass in said conduit and a control valve for the by-pass having an operative connection with the throttle valve to divert suction produced in excess of a predetermined value thru the by-pass for maintaining circulation of crankcase vapors substantially uniform thruout the range of throttle valve manipulation.

9. Means to free an explosive engine crankcase of adulterants, including in combination, a throttle valve governing engine operation, suction producing means controlled by the engine, a conduit connecting the suction producing means with the crankcase to relieve crankcase vapors, a relief valve in the conduit and means to operate the relief valve with the throttle valve including a flexible connection permitting an initial throttle valve movement in advance of the relief valve.

10. Means to free an explosive engine crankcase of adulterants, including in combination, a throttle valve governing engine operation, suction producing means controlled by the engine, a conduit connecting the suction producing means with the crankcase to relieve crankcase vapors, a relief valve in the conduit and a flexible connection between the valves to operate said valves in unison thruout a portion of the range of movement of the throttle valve.

11. In combination with an internal combustion engine including a crankcase, inlet and outlet openings in said crankcase, means operated by said engine for passing a current of air through said openings to ventilate the crankcase, and means operable by increasing the speed of said engine for progressively obstructing said current.

12. The combination of an internal combustion engine having a crankcase provided with an inlet passage and an outlet passage, means for causing a stream of air to be drawn into said crankcase through the inlet passage and discharged through said outlet passage, and means for restricting flow of air through one of said passages, said means operating inversely as the engine speed.

13. In an engine of the class described comprising a crankcase chamber, means for circulating air through said crankcase, a throttle valve for regulating the speed of said engine, and means for restricting the circulation of air therethrough by the opening of said throttle.

14. The combination of an internal combustion engine having a crankcase, means for passing a stream of air through the crankcase, and engine speed controlled means for preventing increase in flow of air through the crankcase with increase in engine speed.

15. The combination with an internal combustion engine having a throttle valve and a crankcase, said crankcase being provided with an inlet passage and an outlet passage, means controlled by engine actuation for causing flow of air through said crankcase from said inlet to said outlet, and means positioned in accordance with adjustment of the throttle valve adapted to control such flow.

16. The combination of an internal combustion engine having a crankcase and the usual throttle valve, means for passing a stream of air through the crankcase, and means connected with the throttle valve for preventing increase in flow of air through the crankcase with increase in engine speed.

17. The combination of an internal combustion engine having a crankcase, means for passing a stream of air through the crankcase, a valve for controlling flow through the crankcase, and means operated by increase in engine speed or load for operating said valve to prevent increase in flow of air through the crankcase.

18. The combination with an internal combustion engine including a crankcase and an exhaust, of a conduit for introducing air into one side of said crankcase, a pipe communicating at one end with said crankcase, an ejector enclosing said exhaust and connected to the opposite end of said pipe for creating a partial vacuum therein, and means connected to said pipe intermediate its ends and adapted to deliver air thereto in insufficient quantities to satisfy the depression therein created by said vacuum.

19. The combination with an internal combustion engine including a crankcase and an exhaust, of a conduit for introducing air into one side of said crankcase, means associated with said exhaust for creating a partial vacuum and communicating with said crankcase, and means connected with said first named means to deliver air to said first named means in insufficient quantities to satisfy the depression created by said vacuum.

20. The combination with an internal combustion engine including a crankcase, of a conduit for introducing air into one side of said crankcase, means communicating with said crankcase for creating a partial vacuum therein, and means connected to said first named means to deliver air to said first named means in insufficient quantities to satisfy the depression created by said vacuum.

W. H. MOYSE.

CERTIFICATE OF CORRECTION.

Patent No. 1,937,031. November 28, 1933.

WILLIAM H. MOYSE.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, after line 132, insert the following as claim 21:

21. In combination with an internal combustion engine including a crankcase, inlet and outlet openings in said crankcase, means operated by said engine for passing a current of air through said openings to ventilate the crankcase, and means operable by increasing the speed of said engine for progressively lessening the normal increase in said current as the speed of the engine increases.

And that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 30th day of January, A. D. 1934.

F. M. Hopkins

(Seal) Acting Commissioner of Patents.