

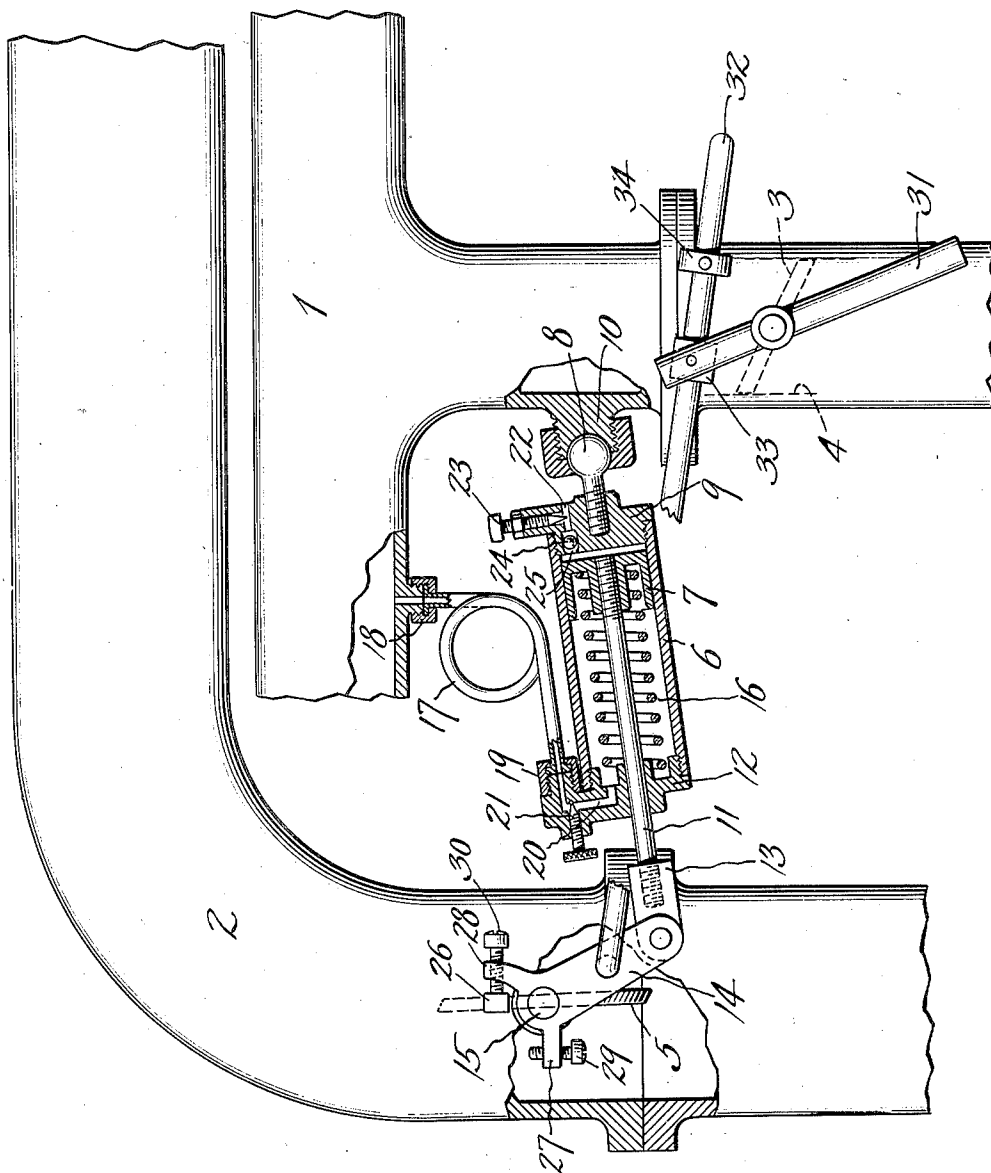
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INTERNAL COMBUSTION ENGINE

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INTERNAL-COMBUSTION ENGINE.

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This invention relates to internal combustion engines and my improvements are directed to means for avoiding the suction inflow of lubricating oil into the cylinders while permitting the piston and cylinder surfaces to be sufficiently lubricated through the splash system.

Much of the carbonizing troubles in engine cylinders and upon the valves, their stems, guides and seats occurs through incomplete combustion of lubricant which is drawn into the cylinders, past the piston rings, as a high vacuum is created, this condition existing particularly when the engine is running under a partly open throttle, because when the throttle is more widely open the more free filling of the cylinders with gaseous mixture prevents the creation of so high a vacuum.

But with the establishment of a high vacuum in the intake manifold under a strangled intake I have found it desirable to set up a proportionate degree of back pressure in the exhaust manifold to thereby neutralize the otherwise existant tendency to induce an indraught of lubricant under reduced cylinder pressures.

A greater amount of lubricating oil is drawn past the rings at light load and idling than at heavier load or when the motor is put under a strain. This is due to the high vacuum in the inlet manifold and insufficient heat and back pressure in the exhaust manifold. The oil gradually accumulates in the cylinder and then is thrown against the spark plugs and works down the exhaust valve stems and guides. Then when the motor is put under load the oil only partly burns and forms carbon on the plugs and the upper part of the valve stems, while the lower part gradually gums up. The oil when heated becomes gummy because its lighter part burns and the thicker part remains forming a gum that prevents the valve from closing properly, also spoiling the valve seat, by allowing the hot gases to escape before the proper time. By means of my invention all the oil is burnt from the plugs and valve stems at each power stroke by creating back pressure in the exhaust manifold at light load and idling so as to retain some of the burnt gases to partially fill the cylinder and supply heat for vaporizing a succeeding charge.

Another object sought and achieved by me through the creation of back pressure in the

exhaust manifold when the engine is idling or under light load, is that of thereby insuring an even temperature as well as an even pressure throughout the cylinders so that the distribution of gaseous mixture, to the different cylinders may be uniform and the engine in consequence is enabled to function with regular pulsations.

Also, by the same back pressure means, functioning when the engine is operating at idling speed and under light loads, the back pressure increasing with the speeding up of the R. P. M. thereby the strength of the vacuum is kept down and prevented from drawing from the nozzle an excess of fuel which otherwise would result in the creation of too rich a mixture.

Still further the back pressure provision under idling and light load conditions prevents the escape of unexploded gaseous charges and causes them to be burnt in the exhaust muffler by succeeding explosions.

With the foregoing objects and advantages in view my invention consists in the provision of a valve mounted in the exhaust manifold and of operation means for said valve, controlled by the vacuum in the intake manifold, to regulate the exhaust passage and thereby set up a degree of back pressure proportionate to the height of the vacuum, to thus under all conditions of engine operation prevent the induction of lubricating oil into the cylinders.

The controlling means devised by me comprises a passage connecting the intake manifold with a small cylinder in which is placed a spring held plunger carrying a rod which is linked to the valve in the exhaust manifold, in order that as the plunger responds to the suction pull exerted by the vacuum in the intake manifold the exhaust passage may be correspondingly restricted.

Also my invention comprehends the employment of means connecting the movements of the plunger and the throttle, so that each may be influenced by the other.

Other features and advantages of my invention will hereinafter appear.

In the drawing there appear in side elevation, partly broken away, portions of the intake and exhaust manifolds of an internal combustion engine, thus being representative of such engine, the view including the showing of the back pressure valve in the exhaust manifold, the controlling device (in

side section) and its connection with the intake manifold.

As representing an internal combustion engine equipped with my improvement I have shown at 1 a portion of an intake manifold and at 2 a portion of an exhaust manifold. Also at 3, I have shown the intake throttle in the passageway 4 leading to the intake manifold, and in the exhaust manifold I have indicated at 5 the exhaust throttle.

A cylinder 6 containing a spring held plunger head 7, is here shown for example as connected by means of a ball and socket joint 8 extended between the cylinder head 9 and a boss 10 projected from the intake manifold. Obviously other means of connection can be employed, but the ball and socket joint is desirable because the plunger rod 11, which works through a stuffing box in an end closure device 12 for the cylinder 6, pivotally engages, as by an extension 13, with a link 14 that is fast upon the exhaust-valve spindle 15. A spring 16 within the cylinder 6 normally presses the plunger toward the head 9, and in that spring pressed position of the plunger the exhaust throttle is in its wide open position.

As means for moving the plunger 7 outwardly, against the tension of spring 16, to thereby, through rod 11 and link 14 turn the exhaust valve 5 toward its closed position, I connect the cylinder 6 with the intake manifold by a pipe 17, this pipe preferably being of flexible character so that it may yield in the swaying motion accorded cylinder 6 in the swing of link 14. Pipe 17 is shown as communicating with the intake manifold by connecting means 18, and with the cylinder 6 by connecting means 19 attached to head 12. A passageway 20 in head 12 leads from the cylinder interior to the connecting means 19, this passageway being controlled by a needle valve 21 to regulate its operative area.

Also the cylinder head 9 is provided with a relief passageway 22, controlled by a needle valve 23, for regulation thereof, and a ball valve 24 is disposed in a recess 25 provided therefor in head 9 between passageway 22 and the cylinder interior.

This relief passageway is provided to permit return of plunger 7, under the tension of spring 16, as the vacuum pull diminishes, and also, as is obvious, the opening to atmosphere presented by the relief passageway enables the plunger to respond to the vacuum pull for its operation.

Now it will be apparent that when the engine is idling or under light load with the throttle valve partly open, thereby providing a high vacuum condition in the intake manifold, the effect thereof is to reduce the pressure in cylinder 6 by way of pipe 17, under whose influence and the relief means 22, suction pull is exerted to draw the plunger 7 and its rod 11 outwardly, whereby the link 14

swings the exhaust valve 5 toward its closed position. Thus a degree of back pressure is established in the exhaust manifold which retains a part of the burnt gases in the cylinders and tends to diminish the vacuum in the intake manifold and cylinders.

Since the control of the exhaust valve is variable in accordance with the strength of the vacuum as communicated to cylinder 6 and is therefore an automatic function of the engine operation, it is evident that a balanced vacuum is maintained of insufficient strength to draw excess of lubricating oil into the cylinders. For, as the intake throttle is opened more widely, to permit the intake of fuel mixture in larger volume the consequent filling of the intake manifold and cylinders more nearly satisfies the vacuum therein, so that no tendency remains to draw in lubricating oil.

Located in fixed relation to the exhaust manifold is a stop 26 and extended from the link 14 are two lugs 27, 28, provided respectively with adjustment screws 29, 30, adapted respectively to engage said stop, at opposite sides thereof, to limit the movement of the exhaust throttle between its full open position and a position of partial closure, so that at no time can said exhaust throttle be completely closed.

Also my invention includes a connection between the link 14 and the throttle lever 31 to provide means whereby the exhaust throttle may be moved from its partially closed position to its wide open position in the act of opening the intake throttle. Thus a bar 32 has pivotal connection with link 5 and carries a slide 33 that is in pivotal engagement with the intake throttle lever 31. A stop 34 upon bar 32 limits the movement of slide 33 in one direction. The stop 34 is so spaced from slide 33 when the exhaust throttle is wide open and the intake throttle closed or nearly closed that the exhaust throttle must swing through the arc of its closing movement before the stop 34 comes into operative relation with the slide 33 on lever 31—the intake throttle then being closed. Thus, while the act of closing the intake throttle has no direct effect upon the exhaust throttle, yet the act of opening the intake throttle has the effect of also opening the exhaust throttle.

Preferably with both throttles closed a space representing three quarters of the intake throttle opening movement separates the slide 33 from stop 34, so that the intake throttle can be opened three quarters wide without communicating opening movement to the exhaust throttle, but during its last quarter opening to full open position, the slide and stop then contacting, the bar 32 pulls the exhaust throttle wide open. This positive or manual means of opening the exhaust throttle may be desirable in case it fails

to respond quickly enough under the influence of spring 16.

Variations within the spirit and scope of my invention are equally comprehended by the foregoing disclosure.

I claim:

1. The combination with an internal combustion engine having an intake manifold, an exhaust manifold provided with a single exit passage and exhaust control means located in said exit passage, of means influenced by the vacuum created in said intake manifold, when the engine is operating under idling or light load conditions, for actuating said exhaust control means, to establish a degree of back pressure in the engine and thereby regulate the strength of the vacuum.

2. The combination, with an internal combustion engine, having an intake manifold, an exhaust manifold provided with a single exit passage and exhaust control means located in said exit passage, and communicating means between said intake manifold and control means for the operation of the latter by the vacuum created in the intake manifold.

3. The combination, with an internal combustion engine, having an intake manifold, an exhaust manifold provided with a single exit passage and exhaust control means located in said exit passage, of a cylinder having relief means, a plunger in said cylinder, a spring to press said plunger in one direction, means connecting said plunger and throttle, and passage means connecting said cylinder with said intake manifold, whereby the vacuum created in said intake manifold will move said plunger against the tension of said spring, to thereby control said throttle.

4. The combination, with an internal com-

bustion engine, having an intake manifold, an exhaust manifold provided with a single exit passage and exhaust control means located in said exit passage, of a cylinder having relief means, a plunger in said cylinder, a spring to press said plunger in one direction, means connecting said plunger and throttle, and passage means connecting said cylinder with said intake manifold, whereby the vacuum created in said intake manifold will move said plunger against the tension of said spring, to thereby control said throttle, and regulating means for said passage means.

5. The combination, with an internal combustion engine, having an intake manifold, an exhaust manifold provided with a single exit passage and exhaust control means located in said exit passage, of a cylinder having regulable relief means, a plunger in said cylinder, a spring to press said plunger in one direction, means connecting said plunger and throttle, and passage means connecting said cylinder with said intake manifold, whereby the vacuum created in said intake manifold will move said plunger against the tension of said spring, to thereby control said throttle.

6. The combination, with an internal combustion engine, having an intake manifold, a throttle therefor, an exhaust manifold, a throttle therefor, and means influenced by the vacuum created in said intake manifold, when the engine is operating under idling or light load conditions, for actuating said exhaust throttle, of connecting means between said throttles operating to open the exhaust throttle during the last portion of the opening movement of the intake throttle.

Executed this 22nd day of March, 1926.

FRANK POKORNY.