

April 13, 1943.

B. A. PYATT

2,316,618

INTERNAL COMBUSTION ENGINE

Filed July 28, 1942

2 Sheets-Sheet 1

Fig. 2.

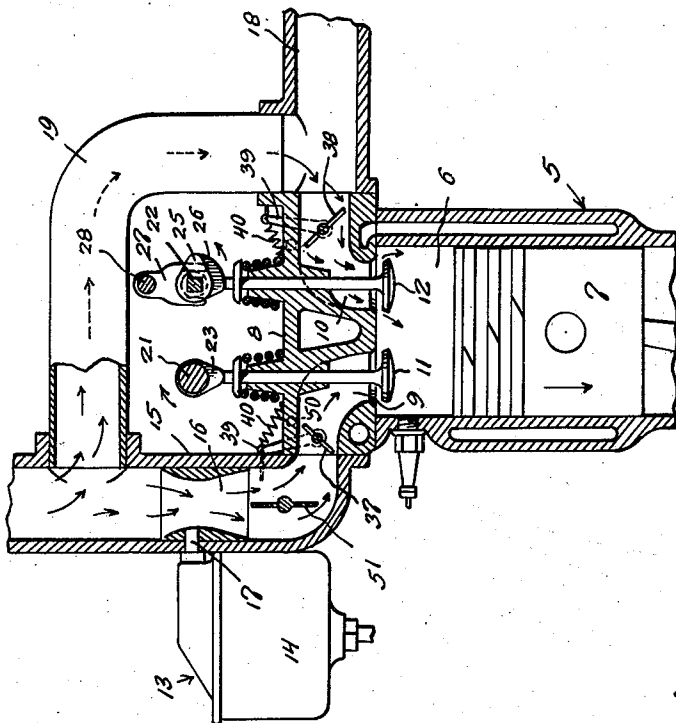
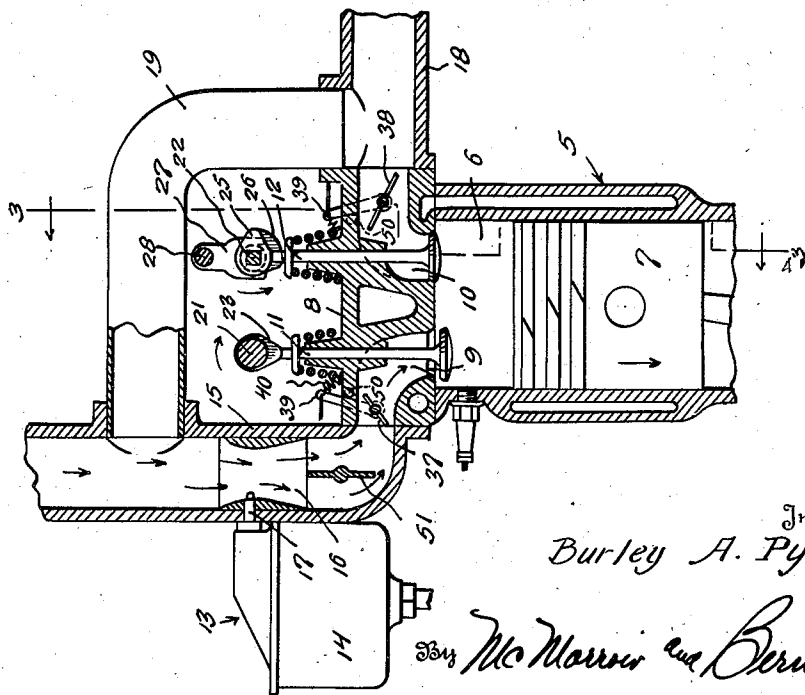


Fig. 1.



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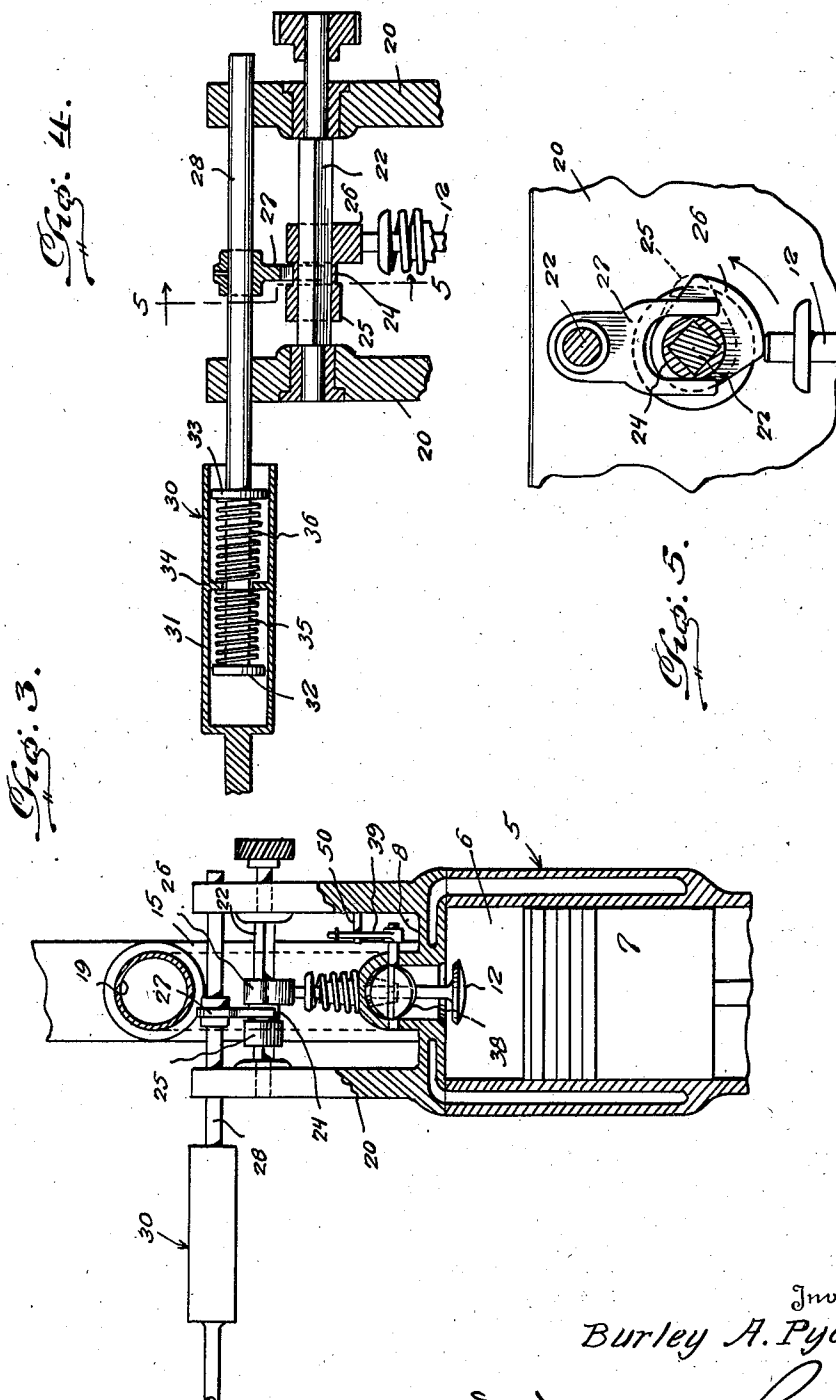
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UNITED STATES PATENT OFFICE

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INTERNAL COMBUSTION ENGINE

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5 Claims. (Cl. 123—75)

This invention relates to an internal combustion engine, and more particularly to the supplying of fuel and air to the engine to prevent the latter from failing to develop a maximum amount of horse power when operating at high speed for the lack of fuel and air reaching the cylinder of the engine for ignition.

The primary object of this invention is the provision of means for permitting the exhaust valve of the engine to be employed for admitting air to the cylinder of said engine in addition to the fuel admitted by the intake valve, when said engine is operating faster than a normal or predetermined speed to assure maximum horse power development by the engine, the additional amount of air as well as the amount of fuel being controllable by a means so that the speed of the engine may be varied when operating above normal or the predetermined speed, both of said means being manually controllable.

With these and other objects in view as will become more apparent as the description proceeds, the invention consists in certain novel features of construction, combination and arrangement of parts as will be hereinafter more fully described and claimed.

For a complete understanding of my invention, reference is to be had to the following description and accompanying drawings, in which

Figure 1 is a fragmentary vertical sectional view illustrating a portion of an internal combustion engine equipped with the present invention and showing the valve operation and flow of fuel to the cylinder under normal speed or a speed below a predetermined speed.

Figure 2 is a view similar to Figure 1 showing the flow of fuel to the cylinder of the engine when the latter is operating at a high speed or a speed above a predetermined speed.

Figure 3 is a sectional view taken on the line 3—3 of Figure 1.

Figure 4 is a fragmentary sectional view illustrating a means of shifting the position of the cams that operate the exhaust valve.

Figure 5 is a detail sectional view taken on the line 5—5 of Figure 4.

Referring in detail to the drawings, the numeral 5 indicates generally a fragmentary portion of an internal combustion engine consisting of a cylinder 6, piston 7, cylinder head 8 provided with intake and exhaust passages 9 and 10 controlled by intake and exhaust valves 11 and 12.

Connected to the intake passage 9 is a carburetor construction 13 consisting of a fuel chamber 14, an air passage 15 in the form of a

manifold connected with the head 8 and including a Venturi element 16 through which air passes to the cylinder of the engine from the atmosphere, as indicated by the arrows in Figure 1. The fuel from the chamber 14 enters the Venturi element 16 by a nozzle 17.

An exhaust manifold 18 including an exhaust pipe opening to the atmosphere is connected to the exhaust passage 10 of the head. Also connected to the exhaust manifold 18 is an air pipe 19 connected to the air passage 15 between its air intake and the Venturi element so that air may flow into the exhaust manifold, as shown by the arrows in Figure 2. This air may enter the cylinder by way of the exhaust valve 12 during certain operations of the engine.

The head 8 is provided with supports 20 for rotatably supporting cam shafts 21 and 22. The cam of the cam shaft 21 is indicated by the character 23 for operating the intake valve 11 in a normal four cycle manner. The cam shaft 21 is provided with a square portion on which is slidably mounted a sleeve 24 provided with cams 25 and 26. The cams 25 and 26 move with the sleeve and either may be brought into operative relation with the exhaust valve 12 for the operation thereof on a four cycle principle.

It is to be noted that the cam 26 has a longer high face than the cam 25 so that the cam 26 will hold the exhaust valve 12 open longer than the cam 25.

The sleeve 24 is engaged by a fork 27 secured to an operating shaft 28 slidable in the supports 20. The operating shaft 28 is adapted to slide in opposite directions for engaging and disengaging either the cam 25 or the cam 26 with the exhaust valve.

Connected to the operating shaft 22 is a manually controlled operating means 30 whereby the operator may cause a force to be applied to the operating shaft 22 in either direction for the purpose of shifting the position of the cams 25 and 26 with respect to the exhaust valve when the low faces of the cams are opposite the exhaust valve. The operating means 30 may be varied as to construction and in the present showing consists of a sleeve 31 slidably receiving one end of the operating shaft 22 which is provided with a head 32 forming a spring seat. The sleeve 31 is slidably secured to the operating shaft by a head 32 having slidable engagement with the operating shaft and fixed to the sleeve 31.

A spring seat 34 is formed on the sleeve and apertured to freely receive the operating shaft and has bearing thereagainst coil springs 35 and

36. One end of the spring 36 bears against the head 33, while one end of the spring 35 bears against the head 32.

Thus it will be seen that when the sleeve is slid in either direction, one or the other of the springs will be placed under tension so that an endwise force will be exerted on the operating shaft 22 sufficient to move the operating shaft to bring about shifting of the positions of the cams 25 and 26 when the low faces are opposite the exhaust valve.

Control valves 37 and 38 are mounted in the intake and exhaust passages 9 and 10 and include an operating arm 39 to which are connected springs 40 acting to normally position the valves 37 and 38 in open position. Any suitable manually operated control means is connected to the arm 39 for moving the valves 37 and 38 simultaneously toward and into closed position.

The cam shafts 21 and 22 are operatively connected with the crank shaft of the engine (not shown) in any well known manner so that the engine will operate on a four cycle principle.

Stops 50 are arranged on the head 8 of the engine to be engaged by the arm 39 to limit the movement of the control valves 37 and 38 into closed position.

The carbureter construction 13 will include a main control valve 51 operated in any suitable manner for the control of air and fuel to the intake passage 9.

In operation, it is to be understood that the engine operates on the four cycle principle either when the engine is operating above or below normal speed or a predetermined speed. When the engine is operating at normal or below a predetermined speed, the cam 25 operates the exhaust valve so that said exhaust valve merely acts in its original capacity of scavenging the cylinder of spent gases on the exhaust stroke of the piston. At this operation the control valves 37 and 38 are in open position. The fuel from the carbureter enters the cylinder on the suction or intake stroke of the piston, as shown in Figure 1.

In order that the engine may develop maximum power at speeds above normal or a predetermined speed, the cam 26 operates the exhaust valve 12 so that during the intake stroke of the piston the exhaust valve is opened along with the intake valve 11. The fuel flows into the cylinder from the carbureter as indicated by arrows in Figure 2 and also air flows into the cylinder by way of the exhaust valve, as shown by arrows in said Figure 2. This additional supply of air to the cylinder will assure the engine of operating at its maximum capacity of horse power development at a speed above normal or a predetermined speed. The carbureter may be provided with means (not shown) for supplying an additional amount of fuel into the air stream passing through the Venturi element 16 when the engine is operating faster than normal or a predetermined speed.

The operator may control the speed of the engine above normal or a predetermined speed through the movement of the control valves 37 and 38, the main control valve 51 at this time is left open and is only employed when the engine is operating at a speed below normal speed or the predetermined speed. It is also to be understood that when the exhaust valve is acting to admit air to the cylinder on the suction stroke of the piston, also acts in its normal manner of permitting the spent gases to escape from the cylinder on the exhaust stroke of the piston. The exhaust gases travel rapidly from the cylinder on

the exhaust stroke of the piston and pass to the exhaust pipe. The rapid movement of the exhaust gases as specified past the inlet of the pipe 10 to the exhaust manifold may draw air with the exhaust gases to the exhaust pipe so that when exhaust valve acts to admit air to the cylinder on the intake stroke of the piston, only air free of exhaust gases will enter the cylinder because the exhaust gases on the previous cycle has been cleared at the point of connection of the pipe 10 with the exhaust manifold.

While I have shown and described the preferred embodiment of my invention, it will be understood that minor changes in construction, combination and arrangement of parts may be made without departing from the spirit and scope of the invention as claimed.

Having thus described my invention, what I claim is:

1. In an internal combustion engine, a cylinder having intake and exhaust passages, a piston in said cylinder, intake and exhaust valves for said intake and exhaust passages, a carbureter construction connected to said intake passage for furnishing fuel and air to the cylinder under the control of the intake valve, means for operating said intake valve, and exhaust valve operating means for operating the exhaust valve for exhausting the cylinder of spent gases at a selected speed of the engine and under other selected speeds for operating the exhaust valve to admit air to the cylinder during the admittance of fuel and air to said cylinder by the intake valve and to exhaust spent gases from the cylinder.

2. In an internal combustion engine, a cylinder having intake and exhaust passages, a piston in said cylinder and operating on a four cycle principle, intake and exhaust valves for said intake and exhaust passages, a carbureter construction connected to said intake passage for furnishing fuel and air to the cylinder under the control of the intake valve, a cam mechanism for operating the intake valve, and a manually shiftable cam mechanism for operating the exhaust valve for exhausting the cylinder of spent gases under a selected speed of the engine and under other selected speeds for operating the exhaust valve to admit air to the cylinder during the admittance of fuel and air to said cylinder by the intake valve and to exhaust spent gases from the cylinder.

3. In an internal combustion engine, a cylinder including a head having intake and exhaust passages connecting with the cylinder, intake and exhaust valves for said intake and exhaust passages, a carbureter construction connected to the intake passage for furnishing air and fuel to the cylinder under the control of the intake valve, an exhaust manifold connected to the exhaust passage and including an exhaust pipe open to the atmosphere and a pipe connected to the carbureter construction for receiving air therefrom, a cam mechanism for operating the intake valve on the four cycle principle, and a cam mechanism for operating the exhaust valve on the four cycle principle to scavenge the cylinder of spent gases during the exhaust cycle and manually shiftable to open the exhaust valve during the admittance of fuel and air to the cylinder by the intake valve when said engine is operating at speeds faster than a predetermined speed and to open the exhaust valve for scavenging the cylinder during the scavenging cycle of operation.

4. In an internal combustion engine, a cylinder

der including a head having intake and exhaust passages connecting with the cylinder, intake and exhaust valves for said intake and exhaust passages, a carbureter construction connected to the intake passage for furnishing air and fuel to the cylinder under the control of the intake valve, an exhaust manifold connected to the exhaust passage and including an exhaust pipe open to the atmosphere and a pipe connected to the carbureter construction for receiving air therefrom, a cam mechanism for operating the intake valve on a four cycle principle, a cam mechanism for operating the exhaust valve on a four cycle principle to scavenge the cylinder of spent gases during the exhaust cycle and manually shiftable to open the exhaust valve during the admittance of fuel and air to the cylinder by the intake valve when said engine is operating at speeds faster than a predetermined speed and to open the exhaust valve for scavenging the cylinder during the scavenging cycle of operation, and simultaneously operated control valves located in the intake and exhaust passages and including spring means for normally urging said control valves into open position.

5 5. In an internal combustion engine, a cylinder having intake and exhaust passages, intake and exhaust valves for said intake and exhaust passages, a piston operating in the cylinder on a four cycle principle, a carbureter construction connected to the intake passage for furnishing the cylinder with air and fuel under the control of the intake valve, an exhaust manifold connected to the exhaust passage and including an exhaust pipe and an air pipe connected to the air intake of the carbureter construction, simultaneously operated control valves in the intake and exhaust passages, cam mechanism for operating the intake valve on a four cycle principle, and a manually shiftable cam mechanism including double cams for the operation of the exhaust valve on a four cycle principle to scavenge the cylinder of spent gases during the cycle of exhaust for the cylinder and to open the exhaust valve during the admittance of fuel and air to the cylinder by the intake valve during predetermined speeds of operation of the engine and to allow the exhaust valve to scavenge the cylinder on the scavenging stroke of the piston.

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