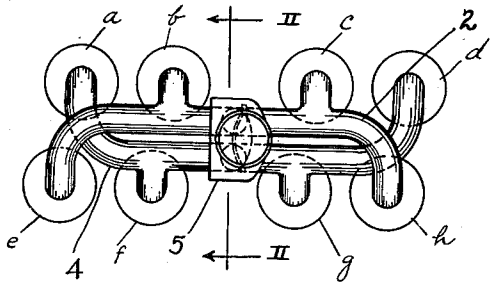
April 16, 1940. J. R. MOORE 2,197,529

INTERNAL COMBUSTION ENGINE

Filed June 17, 1938

Fig. I.



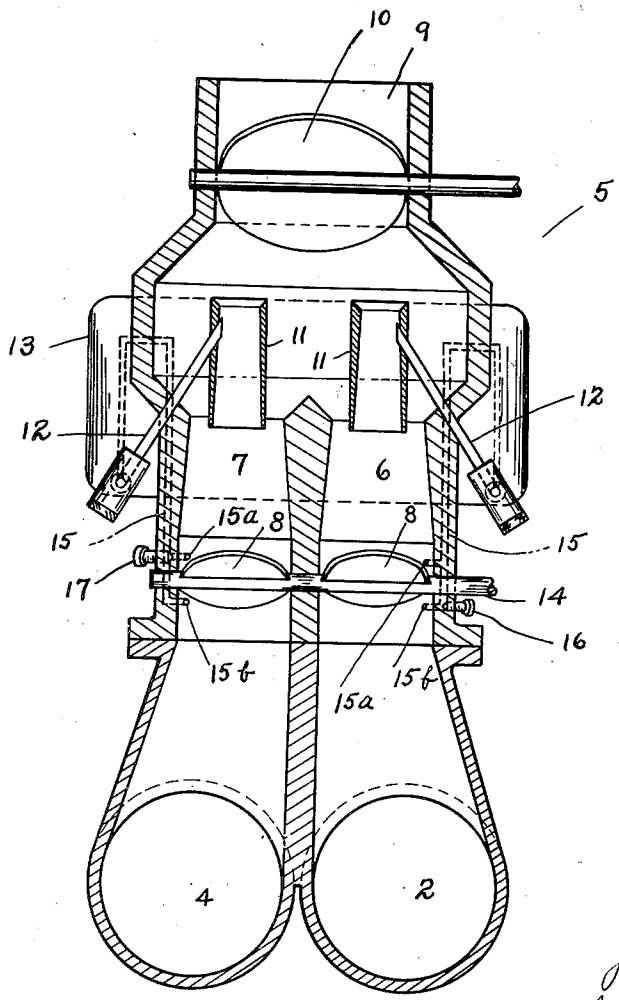


Fig. II.

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INTERNAL COMBUSTION ENGINE

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Application June 17, 1938, Serial No. 214,225

3 Claims. (Cl. 123—119)

The invention relates to internal combustion engines, and consists in refinements in the fuel-delivery system of such an engine, to the end that the fuel consumption in certain of the power cylinders may be automatically arrested when the engine is throttled to idling speed.

The invention finds particular utility in the operation of what is called a "service" truck. Such an automobile stops at frequent intervals, and the engine is permitted to run idly while the driver attends to some errand. There is a consumption of gasoline that becomes a serious factor, and yet it is a great convenience, and a saving too in wear and tear on the starter mechanism, that the engine be kept constantly running. In such a situation the advantage is manifest of withdrawing from service one or more cylinders of the idly running engine.

The invention is practiced in an engine whose power cylinders receive fuel in two separate lines of delivery; that is, an engine provided with two inlet manifolds. Certain of the cylinders are connected to one manifold, and the others to the other manifold, and each manifold is provided with a carbureter for admitting air and fuel in regulated quantities. And, with engine performance in mind, it will be understood that the grouping of the cylinders with the two manifolds is dynamically balanced.

I have discovered that in an engine of such organization (with the firing order of the cylinders properly established) one group of cylinders may be withdrawn and held withdrawn from service when the engine is running idly. The removal of a particular group of cylinders from service is effected by arresting the flow of fuel into one inlet manifold, while delivery to the other manifold is maintained. Advantageously the means to this end consist in a carbureter embodying a simple and economical refinement in construction.

In order that the invention may be readily understood, I shall first describe the operation of an automobile engine of well-known construction, and then I shall describe the structural modification or refinement, in which my invention is found.

In the accompanying drawing, Fig. I is a diagrammatic view, illustrating the engine in plan from above, and Fig. II is a fragmentary view showing the intake manifolds and carbureters of the engine to a larger scale, and in vertical section on the plane II—II of Fig. I.

The engine under consideration is a V-8 type engine, including eight power cylinders arranged in two groups of four. The cylinders of each group are aligned in a plane, and the planes of the two groups are inclined to one another in the form of a V, with the vertex of the V coincident with the major axis of the crankshaft (not shown) of the engine. The engine includes two inlet manifolds, with a carbureter for each. Two cylinders of each group are connected to one manifold, and the remaining two cylinders of each group are connected to the other manifold. Each manifold, with its carbureter, feeds its own set of four cylinders. In each set of cylinders the suction periods succeed one another at 180° intervals of crankshaft rotation, in such manner that simultaneous suction of two cylinders on the same manifold is prevented, and uniform fuel distribution to all cylinders is assured.

Turning to the drawing, the two groups of aligned cylinders are indicated by the reference characters *a, b, c, d* and *e, f, g, h*. Cylinders *b, c, e* and *h* communicate with the inlet manifold 2, and cylinders *a, f, g,* and *d* communicate with the manifold 4. As already mentioned, the two manifolds provide separate lines of fuel-and-air delivery for the two sets of cylinders respectively connected thereto. In the engine chosen for illustration the carbureters for the two manifolds are included in a single structure 5. This twin carbureter structure includes two Venturi throats 6 and 7, severally communicating with the inlet manifolds 2 and 4. A single air inlet 9, subject to the control of a valve 10, admits air from the surrounding atmosphere to both of the throats.

A Venturi tube 11 is arranged at the upper end of each throat 6, 7, and fuel ducts 12, extending upward from the float-chamber 13, open severally through the walls of the Venturi tubes 11, as shown. The throats each include a butterfly valve 8, and such valves are arranged at the lower ends of the throats, that is, between the Venturi tubes 11, 11 and the manifolds 2, 4. More specifically, the two valves 8, 8 are mounted on a common axis 14, and such valves are (by means of the usual accelerator mechanism, not shown) movable in unison with the valve 10 for regulating the quantities of air and fuel admitted to the intake manifolds.

The air flows in divided stream into each throat. One component of the stream flows through the Venturi tube 11 and the other flows between the wall of such tube and the wall of the throat. The air streaming at high velocity through the Venturi tubes operates in known way to draw fuel from the ducts 12, 12 into the upper ends of the throats, and the fuel thus entering the carbureter struc-

ture is entrained and thoroughly mixed with the violently flowing air. The mixture, upon flowing into the manifolds 2, 4, is drawn into the cylinders of the engine.

When the valves 8, 8, 10 are swung into wide open positions, air in maximum quantity is by the suction of the engine drawn through inlet 9 and throats 6 and 7 into the intake manifolds; fuel in maximum quantity is drawn into and mixed with the air streaming through the throats; and the engine operates at maximum speed for given load. When the valves are swung into throttling positions, the velocity of the flowing air is reduced to such value that the air ceases to draw fuel from the ducts 12, 12, and (save as hereinafter described) air alone is delivered to the manifolds.

According as the valves are swung to greater or less degree from throttling positions, fuel in greater or less quantities is drawn into the carbureters, and the speed and power of the engine is correspondingly increased and decreased.

Each carbureter includes a supplemental fuel duct 15 whose delivery end communicates with a pair of orifices 15*a*, 15*b* in the lower end of the carbureter throat. One orifice opens through the wall of the throat above the valve 8, and the other below. When the valves are swung from throttling positions, and a combustible mixture is flowing into the manifolds 2, 4, the suction effective at the lower ends of the throats 6, 7 is insufficient to draw fuel from the passages 15, 15. When, however, the valves lie in throttling positions, the effect of engine suction is so far augmented at the orifices 15*a*, 15*b* that fuel is drawn from the passages 15, 15 and introduced with the flowing air to the manifolds. That is to say, when the valves are in positions to admit air alone, the supplemental ducts 15, 15 come into play and deliver fuel in sufficient quantities to keep the engine running idly.

The passages or ducts 15, 15 are known as the primary fuel-delivering passages, and the ducts 12, 12 are termed the secondary passages.

To the end that the fuel delivered by the passages 15, 15 shall not exceed requirements for idle operation of the engine, manually adjustable needle-valves are provided. Usually, a needle-valve is arranged in each passage, to control the delivery of fuel from the lower of the two outlets 15*a*, 15*b*. (Note the organization of the needle-valve 16 in Fig. II.) And in many cases inlets are provided in the needle-valves, to admit air from the outer atmosphere to the fine streams of fuel spurting into the carbureter structure.

Such is the known construction and operation of the fuel-delivery system of an engine widely used in automobiles.

My invention embraces the discovery that the primary fuel-delivering passage of the carbureter for one of the manifolds 2, 4 may be blanked, and that the engine may be idly operated with the fuel delivered by the primary fuel passages of the other carbureter.

While it is contemplated that, within the scope of the invention, one of the primary passages 15, 15 may be eliminated or permanently sealed-off, I advantageously provide manually adjustable means for closing the passage. The passage may be closed for any desired interval of time, and the invention enjoyed at will. If in service it should develop that fuel economy is outweighed by other considerations of engine operation, the passage may be left open.

Referring again to Fig. II of the drawing, the means to this end consist in a needle-valve 17, adjustable in the carbureter between a position in which the primary fuel passage 15 of carbureter 7 is entirely closed at a point above both of its outlets 15*a*, 15*b*, and a position in which said passage is open to the flow of fuel.

When the needle-valve 17 is closed, and the valves 8, 8, 10 are in throttling positions, neither of the secondary fuel passages 12, 12 delivers fuel in any substantial quantity—fuel is supplied only by the primary fuel passage 15 of carbureter 6, and only those cylinders connected to manifold 2 operate. So long as the carbureter valves stand in throttling positions, fuel delivery to the manifold 4 is nil, and thus it is that the cylinders *a*, *f*, *g*, and *d* are withdrawn and held withdrawn from service. The engine runs idly on the four cylinders *e*, *b*, *c* and *h*. When the carbureter valves are swung from throttling positions, the increased rush of air through the Venturi tubes 11, 11 brings both fuel ducts 12, 12 into play, and, as already mentioned, all cylinders go into operation.

In the operation of an internal combustion engine, as above described, the method defined in one of the appended claims is practiced.

The invention is not limited to the number of cylinders in the engine, nor to the number withdrawn from service relatively to the number remaining in service when the engine runs idly.

I claim as my invention:

1. In an internal-combustion engine that includes a plurality of cylinders arranged in a plurality of groups severally with a plurality of intake manifolds, an intake passage leading to each manifold, a source of fuel supply, a mixing device for each manifold arranged in the intake passage and adapted to take air from the surrounding atmosphere and fuel from said supply, a plurality of throttle valves arranged one in each of said intake passages between the mixing device and the manifold and adapted to control selectively delivery to the manifold of air alone or air mingled with fuel, according to the position of the valve in the passage, and supplementary fuel-supply ducts leading from the said fuel supply and opening to the said passages, through which even when the throttle valves by their position permit the flow of air alone, the air stream may take up fuel before reaching the manifold, and a manually operable cut-off valve arranged in one of said supplementary fuel-supply ducts, by the closure of which when the throttle valves are in position for passing air alone one of the cylinders shall receive air alone while another receives a combustible mixture of air and fuel.

2. In an internal-combustion engine including in assembly a plurality of power cylinders, two inlet manifolds communicating each with a different group of cylinders of said assembly, and a carbureter for each manifold, said carbureters severally including valves movable in unison to and from throttling position, each carbureter including a fuel passage adapted to deliver fuel to its associate manifold when said valves are moved from throttling position, and an open auxiliary fuel passage for delivering fuel into one of said manifolds to the exclusion of the other manifold when said valves are moved into throttling position, whereby the group of cylinders communicating with the last-mentioned manifold is withdrawn from service.

3. In an internal-combustion engine including in assembly a plurality of power cylinders ar-

ranged in a plurality of groups severally with a plurality of intake manifolds, an intake passage leading to each manifold, a source of fuel supply, a carbureter for each manifold arranged in the intake passage and adapted to take air from the surrounding atmosphere, a plurality of throttle valves movable in unison to and from throttling position for severally controlling flow of air through said intake passages, fuel ducts leading from said supply and opening severally into said carbureters and adapted to deliver fuel to the air streaming to each of said manifolds when said valves are moved out of throttling position, auxiliary fuel ducts leading from said supply and severally communicating with said intake passages, and adapted even when said valves are in throttling position to admit fuel to each of said manifolds, and a manually operable valve arranged to blank the auxiliary fuel duct of one of said intake passages, whereby when said valves are in throttling position one of said manifolds shall receive air alone while another receives a combustible mixture of air and fuel.

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