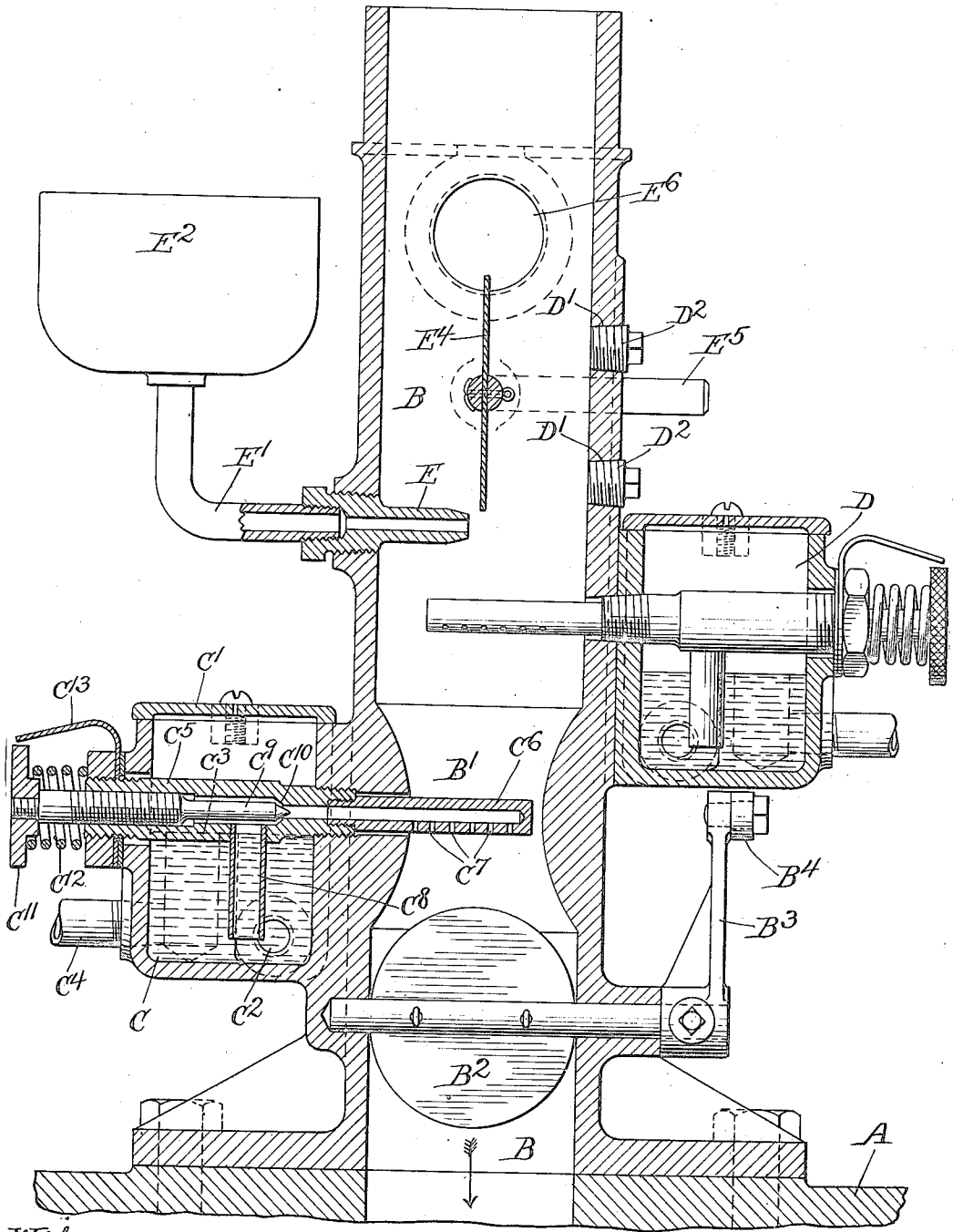
W. H. C. HIGGINS, JR.

PROCESS OF SUPPLYING A COMBUSTIBLE MIXTURE TO INTERNAL COMBUSTION ENGINES.

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1,423,482. Patented July 18, 1922.



Witnesses.
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UNITED STATES PATENT OFFICE.

WILLIAM H. C. HIGGINS, JR., OF LAPORTE, INDIANA.

PROCESS OF SUPPLYING A COMBUSTIBLE MIXTURE TO INTERNAL-COMBUSTION ENGINES.

1,423,482. Specification of Letters Patent. Patented July 18, 1922.

Application filed September 24, 1917. Serial No. 193,043.

To all whom it may concern:

Be it known that I, WILLIAM H. C. HIGGINS, Jr., a citizen of the United States, residing at Laporte, in the county of Laporte and State of Indiana, have invented a certain new and useful Improvement in Processes of Supplying a Combustible Mixture to Internal-Combustion Engines, of which the following is a specification.

My invention relates to improvements in processes of supplying a combustible mixture to internal combustion engines. It has for one object to provide a process wherein oil, air and water may be supplied to the engine in varying quantities to form a mixture of varying richness. Another object is to provide a process wherein the oil and air will be supplied at all times but wherein the water will be supplied only under certain predetermined conditions. Another object is to provide a process wherein air, oil and water will be fed to the internal combustion engine and wherein water will be automatically fed to the engine only as the load increases a predetermined amount above the minimum. Other objects of my invention will appear from time to time in the specification.

In the ordinary type of throttle control engine where the throttle is opened as the speed increases or as the load increases there is a varying air velocity and in my invention I propose to take advantage of this variation in air velocity to feed the oil at all times and to feed the water at certain times.

My invention is illustrated more or less diagrammatically in the accompanying drawing wherein is shown a section through a carburetor embodying my invention.

A is the engine cylinder and it may take the form of a manifold connecting one or more cylinders or merely part of a single cylinder as the case may be.

B is a cylindrical pipe communicating with the engine cylinder or manifold. It is open at its upper end and substantially unobstructed throughout its entire length. Intermediate its ends it is reduced as at B^1 in the form of the usual type of Venturi tube for the purpose of providing a zone of increased velocity and decreased pressure in the usual manner. Between this venturi and the engine is a simple butterfly throttle valve B^2 adapted to be operated by means of a lever B^3 and connection B^4. The connection B^4 may be controlled by an automatic governor or may be controlled by the hand of the operator.

C is a kerosene or fuel reservoir mounted on the pipe B. It is closed by a cover C^1 and is adapted to be supplied with oil from any suitable source through an opening C^2. C^3 is an overflow well having its wall well up in the chamber adapted to discharge through a passage C^4 so that any excess of oil pumped in will run out through the overflow and thus keep the oil level in the chamber constant. C^5 is a barrel extending across the chamber. It terminates in a supply nozzle pipe C^6 which extends into the neck of the Venturi tube B^1. This nozzle pipe is perforated as at C^7 C^7 for the purpose of discharging the fuel into the venturi. Communicating with the barrel C^5 is a sleeve C^8 extending down to the bottom of the reservoir the arrangement being such that the suction in the Venturi tube will draw the oil through the spray openings, the oil being fed by the suction from the reservoir through the sleeve C^8, barrel C^5, tube C^6 spray openings C^7 into the venturi. C^9 is a needle valve located within the barrel C^5 and adapted to be operated against the seat C^{10} by the operator. He may manipulate it by means of the hand wheel C^{11}. This hand wheel is yieldingly held against rotation by the spring C^{12} and rotates beneath the pointer C^{13}.

D is a water reservoir. So far as its mechanical structure is concerned it is exactly the same as the oil reservoir and so needs no further explanation. The operator sets the water valve in the same way as he sets the oil valve by either trying out the engine or by being instructed as to what position it is to assume.

If the size of the engine varied or the speed varied it might be desirable to change the position of the water supply. For that end I have shown the cylinder B provided with a series of perforations D^1 D^1 closed by plugs D^2 D^2. It will be understood that the nozzle is screwed in to any one of these screw-threaded holes and that the water reservoir may be fastened on to the cylinder either by the pull of this screw-threaded nozzle or by other means as may seem desirable.

E is a gasoline starting nozzle. It dis-

charges into the cylinder B above the venturi at any suitable point as indicated and is adapted to be fed with gasoline for starting through the pipe E^1 from any suitable reservoir E^2 controlled by any suitable means not here shown. E^4 is a choke valve controlled by the lever E^5 which may or may not be used in starting as the case may be. This choke valve has nothing to do with the running of the engine. Under some circumstances when starting up from cold it is desirable to close off the air so as to increase the suction on the gasoline line. It is never to be used for any other purpose. If desired, hot air may be introduced through the opening E^6.

I have shown means whereby the height of the water reservoir and the distance between its point of discharge and the point of discharge of the fuel can be varied by changing its position along the line of air travel. This of course, is not done except when the carbureter is first adjusted for the machine. Ordinarily the carbureter would be made with the water and priming and running fuel reservoirs all integral and all in position and in a certain sense at least the adjustable feature is in the nature of an experimental device because it might be possible that if the carbureter were to be adjusted to a different type of engine it would be necessary to experiment with it a little and change the relative positions of water and fuel discharges and my arrangement makes that possible.

The use and operation of my invention are as follows:—

By the expression "pressure" I refer to absolute or any pressure which may be utilized for the purpose of causing the oil or water to be fed. In point of fact I am of course, referring to sub-atmospheric pressures. Of course, the feed is in no case caused by the pressure itself although it is responsive to such pressure. It is caused by the difference between the pressure applied to the water and the oil and the pressure in the zones to which such fluids are fed. In practice, of course, the pressure of these reservoirs is atmospheric pressure. In speaking of the air, I mean, of course, air whether atmospheric or carbureted so that at some points of the travel the air which starts at atmospheric air finally becomes carbureted air or the mixture in question. I make this explanation because it is, of course, possible in working my invention to introduce the water to one current of air and the oil to another and then to mix the two together or it would be possible in either order to introduce oil and water to a moving current of air.

I wish to emphasize the nature of the sub-atmospherical pressure or vacuum necessary for my process. It is what I call a flowing vacuum wherein differences in pressure are caused by the rate of flow of different portions of air treated. I have shaped my suction tube to eliminate modification of the pressure in portions that are out of the rate of flow. I accomplish this by using a Venturi tube, which prevents such cross currents and eddies as modify the effect of the flowing vacuum. I contrast my flowing vacuum to a static vacuum or reduction of pressure, wherein the pressure within the whole chamber is at any one moment substantially the same.

By means of the particular mechanism shown the water is introduced at a zone of relative pressure which causes it to begin to feed later than the oil and since the oil begins to feed at minimum load the water will begin to feed at a point above the minimum load. Because of a difference between the effective areas of the oil or water inlets or the head against which such water or oil must be raised, the water after it starts feeding increases as to the amount fed more rapidly than the oil, so that although the water starts feeding at a higher load than the oil it thereafter is supplied in relatively increasing quantities so that at the maximum loads the quantity of water fed is also at its maximum. This is in part an object of the invention and the method of bringing about this result is the use of the zones of different pressures. These explanations are made to make clear the significance of the language employed in the claims as well as to explain the purpose and method of the invention and the mode of operation of the illustrative apparatus here set forth.

It will be understood that for ordinary conditions with the engine running at low loads and low speeds, that is with the throttle partially shut down, there will be a general flow of air in through the pipe to the neck of the venturi. The air velocity will be radically increased about the neck of the venturi and owing to the suction of the engine the pressure will, in the system, be below atmospheric.

For the purpose of sucking liquid out of a spray nozzle such as I propose to use and such as is ordinarily used in a carbureter, a high velocity accomplishes in general terms substantially the same result as a low pressure. In other words a current of air passing rapidly across a spray nozzle will suck liquid from the nozzle in much the same way as if that spray nozzle were in a vacuum chamber with the air at rest. In my process, therefore, I arrange my apparatus so that the fuel is fed in that zone where there is always a relatively strong suction on the spray nozzle. It might be at the neck of the venturi as shown in the drawings or it might be somewhere lower down where the suction is still great, the venturi itself chok-

ing off enough of the air so as to make the suction great below it.

The water, however, is fed in that zone where the pressure approaches atmospheric or where the velocity is low.

It is understood, of course, that as the throttle responds to an increasing load and the air rushes in at a relatively higher rate the velocity in the open part of the passage will reach a point where the suction will be sufficient to feed water. When this takes place water is fed along with the oil.

I claim:—

1. The process of supplying a combustible mixture to an internal combustion engine, which consists in moving a continuous column containing all the air used in the engine toward the engine and setting up in such continuous column varying zones of pressure and feeding water to one zone and fuel to another.

2. The process of supplying a combustible mixture to an internal combustion engine, which consists in moving a continuous column containing all the air used in the engine toward the engine and setting up in such continuous column varying zones of pressure and feeding water to one zone and fuel to another, and causing said zones of pressure to vary in relative degree during variation in the velocity of the air column.

In testimony whereof, I affix my signature in the presence of two witnesses this third day of September, 1917.

WILLIAM H. C. HIGGINS, JR.

Witnesses:

C. B. FREESE,

F. J. KIRSCH.