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E. A. JOHNSTON

CARBURETOR.

Filed Nov. 6, 1916

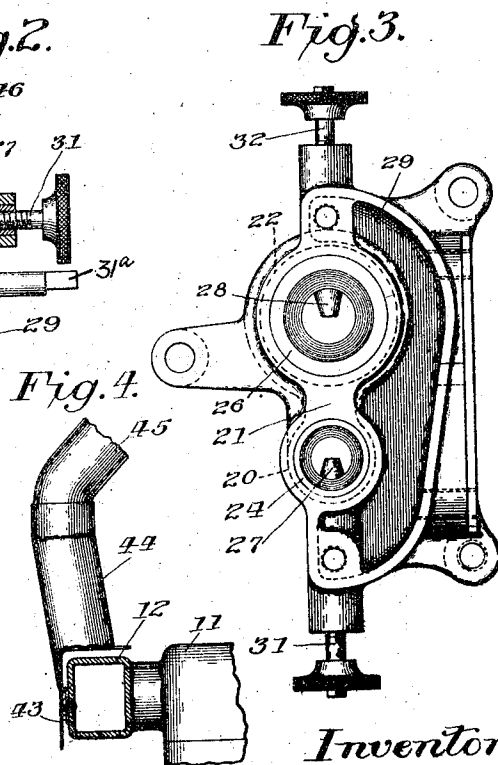
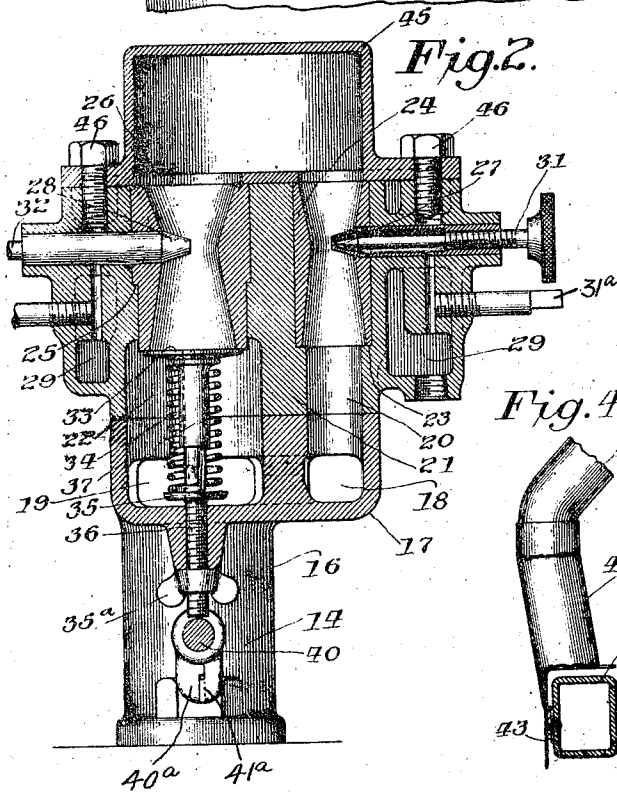
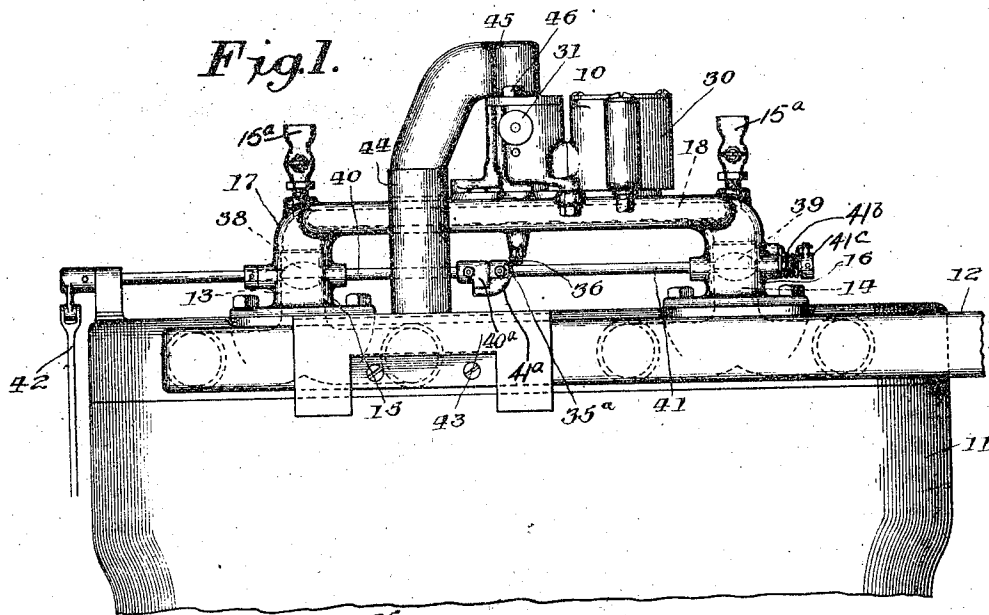
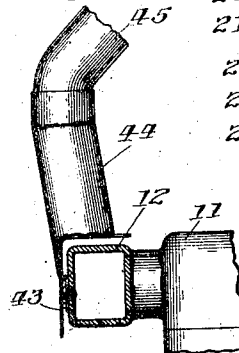


Fig. 4.



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UNITED STATES PATENT OFFICE.

EDWARD A. JOHNSTON, OF CHICAGO, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS,
TO INTERNATIONAL HARVESTER COMPANY, A CORPORATION OF NEW JERSEY.

CARBURETOR.

Application filed November 6, 1916. Serial No. 129,336.

To all whom it may concern:

Be it known that I, EDWARD A. JOHNSTON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Carburetors, of which the following is a full, clear, and exact specification.

This invention relates to carburetors.

One of the objects of the invention is to improve and simplify carburetors for use in connection with relatively heavy fuels, such, for example, as kerosene.

Another object is to render more efficient the burning of heavier hydrocarbons.

Another object is to provide a carburetor readily responsive to varying load conditions adapted to meet all of the requirements for successful commercial operation.

These and other objects are accomplished by providing a novel carburetor structure having, among other elements, primary and secondary supply passageways, means for supplying fuel through one of them continuously during the operation of the engine, and means whereby fuel is supplied through the other one in variable quantities in accordance with engine load conditions.

The invention is illustrated on the accompanying sheet of drawings, in which—

Figure 1 is a fragmentary side elevation of a four cylinder vertical engine equipped with my improved carburetor;

Figure 2 is a vertical sectional view taken through the carburetor, showing the primary and secondary fuel supply passageways, fuel supply means, and control means associated with one of the passageways;

Figure 3 is a fragmentary plan view of the carburetor showing the primary and secondary fuel passageways and the constant level fuel supply chamber associated therewith; and

Figure 4 is a fragmentary side elevation of the hot air connection from around the exhaust pipe to the carburetor.

The various novel features of my invention will be apparent from the following description and drawings and will be particularly pointed out in the appended claims.

The problem of efficiently utilizing or burning the relatively heavy hydrocarbons, such as kerosene, for power purposes, has, for a considerable length of time, confronted engineers and designers in a serious man-

ner. The problem is more serious where the engine, which is supplied with heavier grades of fuel, is subjected to rapidly varying load conditions, such, for example, as where the engine is installed in a tractor for drawing plows and the like. The same thing holds true where the engine is subjected to motor truck service, in which case variable speed conditions are also encountered to a considerable degree. In most carburetors there is but a single fuel supply passageway. One objection to such a carburetor is that the speed of the mixture is not sufficiently high on light loads to prevent an accumulation of the heavy fuel in the form of a deposit on the walls of all passageways leading from the carburetor to the cylinder. Under such conditions, when the throttle valve is opened and there is a heavy suction produced, this mass of accumulated fuel is drawn into the cylinder, having a fouling effect. The question of mixture or fuel speed, therefore, is a material one, especially where the heavy fuels are employed. To obtain and maintain the desired mixture speeds, I have chosen to employ a plurality of fuel passageways of proper dimensions, one of which passageways conducts the fuel supply for idling and light load conditions and another of which assists in accordance with other engine load conditions.

I have chosen to disclose my carburetor in connection with a four cylinder vertical engine 11 having the usual exhaust pipe 12 common to all cylinders. In so far as the supply of fuel to the cylinder is concerned, the cylinders are arranged in pairs so that the two left-hand cylinders, as shown in Figure 1, will receive their supply of fuel through a short passageway 13, and the two right-hand cylinders, as shown in Figure 1, will receive their supply of fuel through a short passageway 14. These passageways are formed in oppositely arranged, downwardly extending portions 15 and 16 of a main casting or manifold 17, said portions being suitably secured to the top of the cylinder structure in any suitable manner. The passageway 13 at the left-hand side and the passageway 14 at the right-hand side form terminations of longitudinally extending passageways 18 and 19, which are formed in the same casting 17. The passageway 18 is considerably smaller than the passageway 19, and communicates

with what I choose to call the primary supply passageway 20 of the carburetor. Adjacent the primary supply passageway 20, and properly separated therefrom by a suitable partition 21, is a secondary supply passageway 22 which communicates with the relatively large passageway 19. The wall of the primary passageway is provided with a shoulder 23 to properly locate a Venturi tube 24, and in a similar manner the wall of the secondary passageway is provided with a shoulder 25 to properly locate a Venturi tube 26 therein.

Liquid fuel is supplied to the primary fuel passageway 20 and secondary fuel passageway 22 through nozzles 27 and 28, respectively, projecting into the narrowest parts of the Venturi tubes, the fuel being supplied to said nozzles from a constant level fuel chamber 29, which is used in common by both of the passageways. This fuel supply chamber is formed on one side of the vertically arranged passageways 20 and 22 in a casting which is common to the body of the carburetor and which is suitably connected to the other casting 17. Fuel is supplied to this chamber 29 from a float chamber 30.

The supply of fuel through the primary fuel supply nozzle 27 may be regulated by a hand control needle valve 31 turning above the gauge 31^a, and likewise the supply of fuel through the secondary fuel supply nozzle 28 may be regulated by a needle valve 32. It will be noted that the vertically arranged primary supply passageway 20 is without a valve, so that when the engine is running this furnishes a free passage of air and liquid fuel; or, rather, a mixture of the two therethrough. On the other hand, the secondary passageway is provided with a poppet valve 33 which is pressed upwardly against or toward its seat by a spring 34, one end of which presses against the widened portion of the valve itself and the other end of which presses against a collar 35 secured to a threaded member 36 screwed into the lower part of the carburetor. This threaded member may be adjusted to vary the tension of the spring 34 and locked in adjusted position by a winged nut 35^a. The valve 33 is provided with a sleeve 37 which is slidable over a smooth portion of the threaded member 36, so that the valve may be freely reciprocated. Located in the passageways 13 and 14, respectively, are butterfly throttle valves 38 and 39, which are mounted upon suitably connected rocker shafts 40 and 41, which in turn are connected to the governor of the engine through a link 42. These rocker shafts are preferably connected by means of a coupling having two elements 40^a and 41^a securely fastened to adjoining ends of the shafts 40 and 41, respectively. The

coupling elements are held in yielding contact by means of the spring 41^b which acts through the collar 41^c and the shaft 41 on the coupling element 41^a.

The air which is supplied to the passageways 20 and 22 is heated in a hood 43 located around and secured to the exhaust pipe 12 and which is connected to said passageways through a vertically arranged conduit 44 of the hood and through a cap member 45 which fits over the top of the carburetor and is secured thereto by suitable bolts 46. Priming cups 15^a are placed on the vertical portions 15 and 16 of the intake manifold which provide an easy way of getting gasoline into the cylinders for starting.

In operation, when the engine is idling or running on light loads, the supply of air is drawn through the hot air supply connection, through the primary Venturi tube 24 and past the primary fuel supply nozzle 27. In view of the fact that this primary passageway is small, and especially so at the small part of the Venturi tube, at which point the liquid fuel is drawn into the passageway, a relatively high speed of the heated air past the fuel nozzle is attained which atomizes liquid hydrocarbon, forming an explosive mixture which passes in opposite directions through the small passageway 18, then down through the passageways 13 and 14 into the four cylinders of the engine. It is to be noted that this primary fuel path is small throughout its length to maintain the high speed of the mixture. While the terminating passageways 13 and 14 are somewhat larger, it will be noted that the latter are arranged vertically, gravity thereby assisting in preventing deposits of liquid fuel at these sections. In passing through the passageways 13 and 14, the fuel supply is controlled by the throttle valves 38 and 39, which under no load and light load conditions are open a relatively small amount. As above indicated, under no load and light load conditions, all of the fuel which passes into the engine passes exclusively through the primary fuel supply passageway 20; that is to say, no fuel whatsoever passes through the secondary passageway 22. However, just as soon as the engine load increases, the poppet valve 33 is drawn downwardly due to the increased suction of the engine, whereupon a supply of air also passes through the passageway 22. When this increased load is slight, no liquid hydrocarbon is drawn into the secondary fuel supply passageway 22, but only the secondary supply of air which acts in a manner to increase the volume and slightly dilute the mixture passing through the primary passageway at this time, the fuel supply from the primary passageway and the air from the secondary passageway 22 meeting at the top of the terminating passage-

ways 13 and 14 which lead into the engine. As the load increases, the throttle valves 38 and 39 are opened more and more, through the action of the engine speed governor, and the effective vacuum increases in like proportion to increase the opening of the poppet valve 33, whereupon the supply of fuel is not only continued through the primary passageway 20, but fuel is also drawn into the secondary fuel passageway 22, this increased volume of fuel being supplied past the throttle valves 38 and 39 and into the engine to meet the increased demand. In this present carburetor, therefore, two relatively small passageways are provided to obtain and maintain high speed of the mixture and present it in thoroughly atomized and vaporized condition to the cylinders of the engine. As the load on the engine is increased the engine speed decreases slightly temporarily, the throttle valves 38 and 39 open a corresponding amount, and the poppet valve 33 is drawn further open to occasion an additional supply of fuel through the secondary passageway which is necessary over and above the supply which passes through the primary fuel supply passageway 20. When the engine is operating at full load the throttle valves 38 and 39 are substantially in wide open positions, the poppet valve 33 is maintained a considerable distance from its seat, and a large quantity of fuel is supplied at high mixture speed. If the load increases during any part of the range, the speed of the engine decreases temporarily and the openings of the valves are increased, an increased volume of fuel being thereby supplied to bring the engine up to normal speed and handle the load. The poppet valve 33 in opening and closing, or in varying the opening of the secondary passageway 22, takes care of the fuel supply for changes in load. All the fuel required for the engine during idling and light load conditions passes through the primary passageway. When a heavier load

is placed upon the engine, all additional fuel necessary is supplied through the secondary passageway.

By means of my carburetor, heavier hydrocarbons, such, for instance, as kerosene, may be utilized efficiently to a very high degree, meeting all the requirements under varying load and speed conditions which are encountered in commercial operation.

It is apparent that there may be various modifications of the invention other than that here particularly shown and described, and it is my intention to cover all such modifications which do not involve a departure from the spirit and scope of my invention as set forth in the following claims.

What I claim as new is:

1. In a charge forming device for internal combustion engines, the combination of an engine cylinder having an intake, a carburetor having a plurality of mixing chambers, a plurality of adjacent horizontal passageways connected therewith and terminating in a single downwardly extending passageway connected to the cylinder intake and a throttle valve in said downwardly extending passageway.

2. In a charge forming device for multi-cylinder engines, the combination of a plurality of cylinders, a carburetor having a plurality of vertically arranged mixing chambers, automatic means controlling one of said chambers dependent on the load on the engine, a horizontally extending manifold having a plurality of passageways communicating intermediate their ends with the respective mixing chambers, a downwardly discharging passageway at each end of the manifold communicating at its lower end with a cylinder and at its upper end with the parallel passageways, and a throttle valve in each of said downwardly discharging passageways.

In testimony whereof I affix my signature

EDWARD A. JOHNSTON.