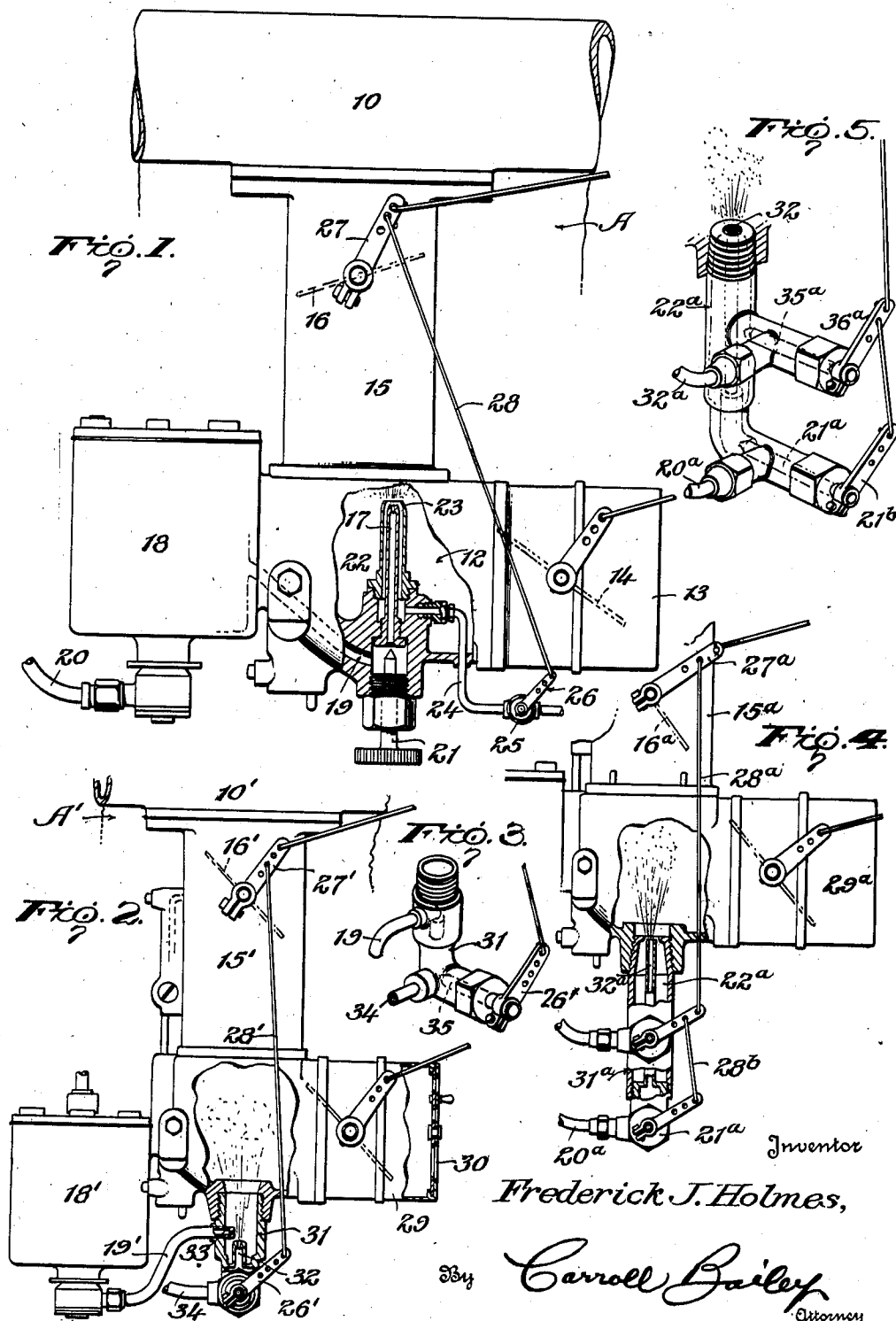


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CARBURETOR

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This invention relates to fuel supply means for internal combustion engines, and has generally in view to provide a simple, inexpensive, practical means to adapt internal combustion engines for economical and efficient operation using as fuel relatively heavy oil such, for example, as commercial fuel oil.

More particularly, the invention has in view to provide a fuel atomizing device of exceptionally simple, inexpensive construction, and to provide for control of said device in a novel manner, whereby a proper amount of atomized fuel is fed to an engine for all speeds thereof.

According to one practical embodiment of the invention the present fuel atomizing means is combined with an ordinary carburetor such as is commonly employed on internal combustion engines designed primarily to use gasoline as fuel, and in this connection a special object of the invention is to provide means which may readily be combined with ordinary carburetors, substantially without modification or material change in such carburetors, to adapt the same for atomizing relatively heavy fuel substantially as efficiently as light fuel such as gasoline. Also, in this connection, another object of the invention is to provide for control of the fuel atomizing means in a novel manner in response to opening and closing movements of the usual throttle valve constituting part of an ordinary carburetor so that the amount of fuel supplied to the engine always is proportional to the speed of the engine as regulated by the throttle valve.

In the operation of an ordinary carburetor the suction or vacuum produced in the intake manifold of the engine is utilized to draw fuel through the fuel nozzle of the carburetor and to effect atomization of the fuel. This is effective for the atomization of light fuels such as gasoline, but is not suitable for the atomization of relatively heavy fuels such as commercial fuel oil. Accordingly, when combined with an ordinary carburetor the present atomizing means is designed to afford a controlled jet of air under pressure to assist engine suction in effecting atomization of the fuel, thus to adapt the carburetor for atomizing heavy fuel in a manner to permit the engine to operate efficiently using relatively heavy oil as fuel.

According to another practical embodiment of the invention dependence on engine suction to effect atomization of the fuel is entirely eliminated and atomization of the fuel is effected solely by means of an air jet. Thus, in accordance with the invention, more or less compli-

cated and expensive carburetors such as are commonly employed to atomize fuel may be eliminated in favor of a more simple and less expensive fuel atomizing means.

According to still another practical embodiment of the invention, dependence on engine suction to effect atomization of the fuel again is eliminated and atomization of the fuel is effected not only by means of an air jet, but by subjecting the fuel itself to pressure to effect a better intermixture of the same with the air.

In connection with each of the last two mentioned embodiments of the invention another special object of the invention is to provide a simple, compact, inexpensive fuel atomizing device and to provide for control of the device in a novel manner in response to opening and closing movements of a throttle valve as in the case of the embodiment of the invention first mentioned.

With the foregoing and other objects in view, which will become more fully apparent as the nature of the invention is better understood, the same consists in the novel features of construction, combination and arrangement of parts as will be hereinafter more fully described, illustrated in the accompanying drawing and defined in the appended claims.

In the drawing:

Figure 1 is an elevation, partly in section, illustrating the application of the present fuel atomizing means to an ordinary carburetor.

Figure 2 is a view similar to Figure 1 illustrating an alternative embodiment of the invention.

Figure 3 is a perspective view of the fuel and air valve shown in Figure 2.

Figure 4 is a view similar to Figure 1 illustrating another alternative embodiment of the invention; and

Figure 5 is a perspective view of the fuel and air valve shown in Figure 4.

Referring to the drawing in detail, first with particular reference to the embodiment of the invention illustrated in Figure 1, A designates, generally, a portion of an internal combustion engine of a known type such, for example, as is commonly employed to furnish power for automobiles, trucks, boats and the like, and which includes, as usual, an intake manifold 10 having connected thereto an ordinary carburetor 11.

The carburetor 11 illustrated in the present instance is of a known type and comprises a mixing chamber 12, an air supply conduit 13 communicating with said mixing chamber, a choke

valve 14 for controlling the flow of air through said conduit, a vertical tube 15 by means of which the carburetor body is connected to the intake manifold 10 and through which communication is established between said manifold and the mixing chamber 12, a throttle valve 16 in said tube 15 for controlling the flow of fuel to the engine, a fuel nozzle 17 extending from the bottom of the mixing chamber 12 upwardly into said mixing chamber, a float chamber 18 in fuel supply communication through a duct 19 with the lower end of the fuel nozzle 17 and having connected therewith a fuel supply pipe 20, and a needle valve 21 for regulating the flow of fuel through the nozzle 17.

In the ordinary operation of the carburetor 11 the suction produced in the intake manifold 10 of the engine draws fuel upwardly through the fuel nozzle 17 and at the same time draws air into the mixing chamber 12 through the conduit 13, the fuel becoming atomized or intermixed with the air in the mixing chamber and during flow of the fuel and air to the manifold 10 through the tube 15. As aforesaid, this is satisfactory for the atomization of light fuels such as gasoline, but is not suitable for the atomization of relatively heavy fuels such as commercial fuel oil. Therefore, in order to adapt the carburetor 11 for the efficient atomization of relatively heavy fuel oils, so that such oils may be employed as fuel for the engine A, the present invention includes means for the supply of a jet of air under pressure about the fuel nozzle 17 to assist engine suction in effecting delivery of fuel from said nozzle to the mixing chamber 12 and atomization of the fuel within said chamber and within the tube 15.

As illustrated, a tube 22 surrounds the fuel nozzle 17 in spaced relationship thereto and at its upper end is constricted, as at 23, in overlying relationship to the upper or discharge end of said nozzle 17, while communicating with said tube 22, at or near its lower end, is a pipe 24 for the supply of air under pressure to said tube.

In the pipe 24 is a valve 25 of any suitable type for controlling the supply of air to the tube 22, said valve being illustrated in the present instance as being of the type having a rotary valve element equipped with an operating handle in the form of a lever arm 26.

The throttle valve 16 is equipped with an operating lever arm 27 and, in accordance with the invention, this lever arm is connected to the lever arm 26 of the valve 25 by a rod or link 28 so that the valve 25 is opened and closed in response to opening and closing of the throttle valve. Consequently, air under pressure is admitted to the tube 22 and issues from the constricted end 23 thereof in the form of a fuel elevating and atomizing jet proportionately to opening and closing of the throttle valve so that a correct amount of fuel for each different engine speed as regulated by the throttle valve is assured, it being pointed out in this connection that the rod or link 28 is suitably connected with the lever arms 26, 27 for adjustment therealong to vary the effective lengths of said lever arms to obtain a desired amount of opening or closing movement of the valve 25 for a given amount of opening or closing movement of the throttle valve 16.

Air under pressure may be supplied to the pipe 24 from any desired source; for example, from the cylinder or cylinders of the engine or from

a pump or tank. Also, means may be provided if desired to heat the oil prior to and even after it is supplied to the carburetor, and to heat the air which is drawn into the carburetor through the air supply conduit 13 for admixture with the atomized oil to assist the atomization. Essentially, however, the improved atomizing means according to the embodiment of the invention illustrated in Figure 1 comprises the tube 22 or its equivalent, valve controlled means for regulating the supply of air under pressure through said tube and suitable means whereby the valve 25 is opened and closed in harmony with opening and closing of the engine throttle or variation in speed of the engine. By the provision of such means a carburetor 11 of ordinary construction is rendered effective for the atomization of relatively heavy fuel oil in a manner such that such oil may advantageously be used as fuel.

Referring now to the embodiment of the invention illustrated in Figures 2 and 3 of the drawing, it will be observed that the present fuel atomizing means is of exceptionally simple, inexpensive construction and is of such design that any necessity of a carburetor such as is shown in Figure 1 is entirely eliminated. In other words, in lieu of the carburetor 11 of Figure 1 there is connected with the exhaust manifold 10' of the engine A' the upper end of a vertical tube 15' which, at its lower end, is directed laterally as at 29, said lateral portion 29 being open to the atmosphere as shown.

In the vertical tube 15' is arranged a throttle valve 16' and, if desired, but not necessarily, suitable means as indicated at 30 may be provided to regulate the amount of air entering the lateral portion 29 of the tube 15'. In any event, in the bottom wall of the tube 15', 29 is threaded or otherwise suitably mounted a valve casing 31 having an air nozzle 32 which is vertically disposed and which opens upwardly into said tube 15', 29 preferably to one side of the pivotal axis of the throttle valve 16' so that when said throttle valve is open atomized fuel directed upwardly from the nozzle 32 does not impinge directly against the throttle valve but is permitted to flow substantially unobstructedly by the same.

Extending laterally into the valve casing 31 directly above the air nozzle 32 is a fuel nozzle 33 which is connected by a conduit 19' with a float chamber 18' which may conveniently comprise part of the tube structure 15', 29, or which may be mounted on said tube structure or in any other suitable manner at a desired or convenient location with respect thereto.

A pipe 34 is connected with the valve casing 31 for the supply of air under pressure from any desired source to the air nozzle 32, while suitably arranged in said valve casing 31 or, alternatively, in the pipe 34, is a valve 35 for regulating the flow of air to the nozzle 32. In the present instance the valve 35 is of the rotary type having an operating lever arm 26', and in accordance with the invention the operating lever arm 27' of the throttle valve 16' is connected to said lever arm 26' by a rod or link 28' so that the valve 35 is opened and closed in harmony with opening and closing of the throttle valve. Consequently, the amount of air under pressure which is admitted to the nozzle 32 is proportional to the speed of the engine as regulated by the throttle valve. The air in issuing from the nozzle 32 across the end of the fuel nozzle 33 acts to draw fuel from the latter nozzle and to atomize the fuel so drawn for admixture with atmospheric

air entering the tube 15' through the lateral portion 29 of said tube. Thus, a very simple yet efficient arrangement is provided for the use of relatively heavy fuel as the operating medium for the engine.

As in the case of the embodiment of the invention illustrated in Figure 1, the link or rod 28' of the embodiment of the invention illustrated in Figures 2 and 3 preferably is adjustably connected with the lever arms 27', 28' so that the effective lengths of said lever arms may be varied to obtain desired amounts of opening and closing movements of the air valve 35 for given amounts of opening and closing movements of the throttle valve 16'.

Referring now to the embodiment of the invention illustrated in Figures 4 and 5 of the drawing, it will be observed that the arrangement in general is similar to the arrangement illustrated in Figures 2 and 3 in that a valve casing 31a is mounted similarly to the valve casing 31 in the bottom wall of a tube structure 15a, 29a, but that the fuel nozzle 32a is disposed vertically and is surrounded by an air tube 22a as in the Figure 1 embodiment of the invention. The fuel, supplied under pressure from any desired source and in any desired manner through a pipe 28a to the fuel nozzle 32a, is controlled by a suitable rotary valve 21a, and air under pressure from any desired source is supplied to the tube 22a through a pipe 34a and is under the control of a suitable rotary valve 35a. The valves 21a and 35a are equipped with operating lever arms 21b and 36a, respectively, and the throttle valve 16a in the tube 15a is equipped with an operating lever arm 27a, which lever arm is connected with the lever arms 21b, 36a by rods or links 28a, 28b, respectively, or in any other suitable manner, so that for a given amount of opening or closing movement of the throttle valve the valves 21a, 35a are opened or closed desired amounts to admit proper amounts of fuel and air to the nozzle 32a and the tube 22a to assure a proper amount of properly atomized fuel being supplied to the engine for all speeds thereof as regulated by the throttle valve. Because of forcing the fuel under pressure through the nozzle 32a, in conjunction with atomizing air supplied under pressure through the tube 22a, a more positive atomizing effect is obtained than when dependence is placed on an air jet to draw the fuel through its nozzle. However, any one of the simple, inexpensive forms of

the invention illustrated provides for the use of heavy oil for the economical and efficient operation of an internal combustion engine of the type designed primarily for operation using gasoline or other relatively light fuel as fuel.

Without further description it is thought that the novel features and the advantages of the invention will be apparent. It is desired to point out, however, that while only certain specific embodiments of the invention have been illustrated and described, the invention is readily capable of embodiment in various other specifically different mechanical structures within its spirit and scope as defined in the appended claims.

I claim:

1. Fuel atomizing and supply means for internal combustion engines comprising a conduit for connection with the engine, a fuel nozzle arranged to discharge into said conduit, an air nozzle arranged to discharge into said conduit in such relationship to said fuel nozzle as to effect atomization of fuel flowing from said fuel nozzle, a rotatably adjustable valve controlling the fuel supply through said fuel nozzle, a rotatably adjustable valve controlling the air supply through said air nozzle and a connection between said valves whereby they are opened and closed in unison, said air and fuel nozzles and said valves and the connection therebetween being embodied in a single unitary structure connectible with and removable from the conduit as a single unit.

2. Fuel atomizing and supply means for internal combustion engines comprising an air supply tube to be screwed at its inner end into an engine fuel mixture supply conduit, a fuel nozzle within said tube, said fuel nozzle having an open inner end disposed adjacent to the open inner end of said tube whereby air flowing from the tube effects atomization of fuel flowing from the nozzle, a casing extending laterally from said tube to supply air thereto and having a rotatably adjustable valve therein to control the air supply, a casing extending laterally from said tube to supply fuel to said fuel nozzle and having a rotatably adjustable valve therein to control the fuel supply, and a link and lever connection between said valves whereby they are opened and closed in unison, said tube, nozzle, valves and the connection therebetween being embodied in a single unitary structure connectible with and removable from the conduit as a unit.

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