

Feb. 2, 1937.

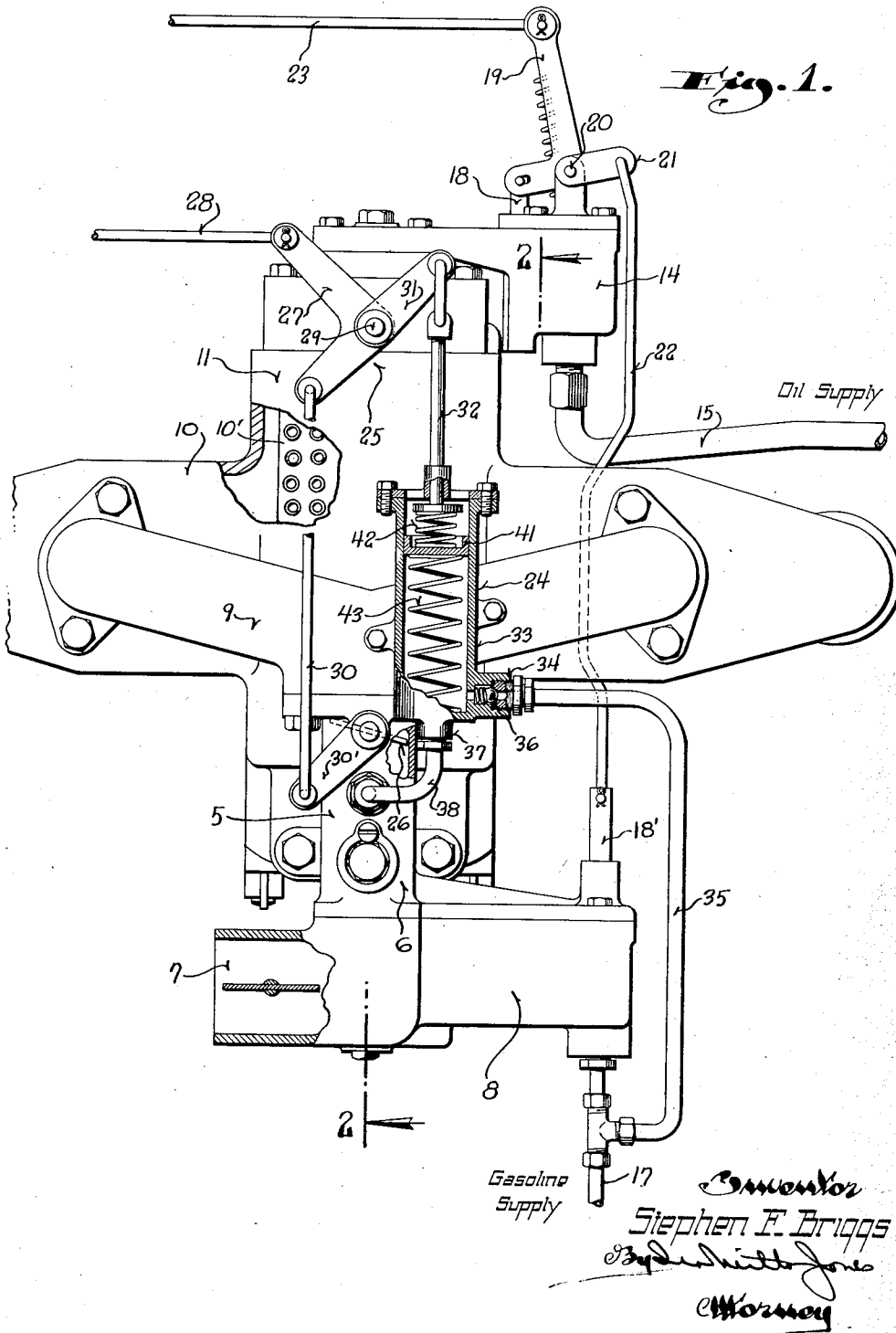
S. F. BRIGGS

2,069,642

CARBURETOR

Filed Aug. 13, 1934

2 Sheets-Sheet 1



Feb. 2, 1937.

S. F. BRIGGS

2,069,642

CARBURETOR

Filed Aug. 13, 1934

2 Sheets-Sheet 2

Fig. 2.

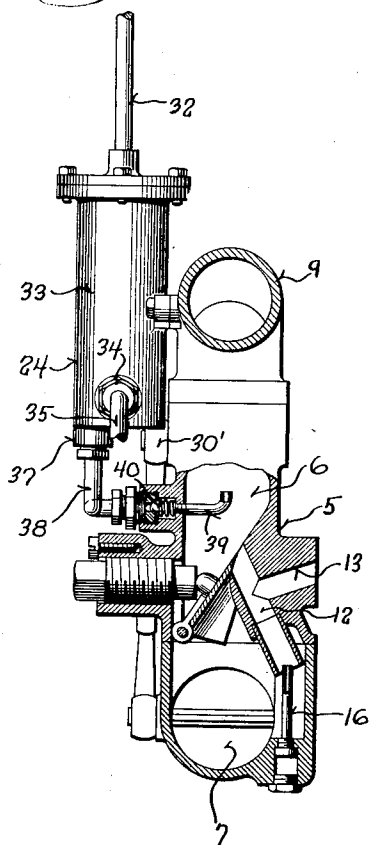
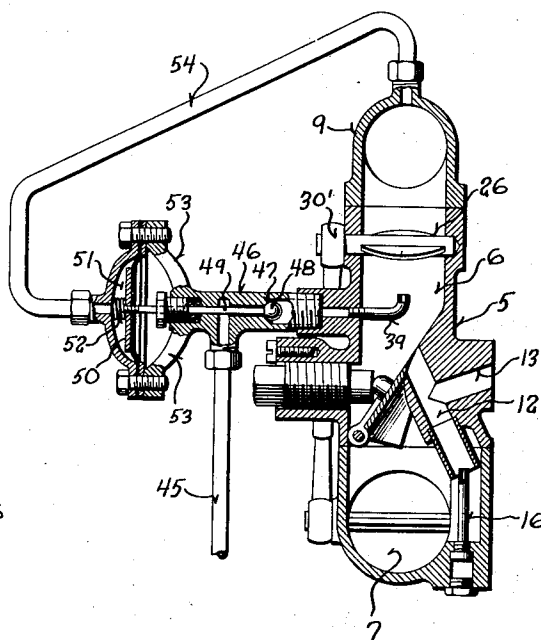


Fig. 3.



Inventor
Stephen F. Briggs
By *William Jones*
Attorney

UNITED STATES PATENT OFFICE

2,069,642

CARBURETOR

Stephen F. Briggs, Chenequa, Wis., assignor to
Briggs & Stratton Corporation, Milwaukee,
Wis., a corporation of Delaware

Application August 13, 1934, Serial No. 739,643

10 Claims. (Cl. 261—34)

This invention relates to carburetors and refers more particularly to oil carburetors in which the fuel generally used is a heavy oil which is vaporized and enters the carburetor proper as a fuel vapor.

These oil carburetors have been carried to a high state of development, but have one serious disadvantage, namely, sluggish response during acceleration. This invention therefore has as its object to provide means for overcoming this deficiency and to this end contemplates the provision of means for injecting a quantity of more volatile fuel into the carburetor mixing chamber during periods of acceleration.

For starting, oil carburetors are equipped for operation on a fuel more volatile than the oil which is used during the running conditions of the engine, and generally they have a dual fuel feed, one supplying the heavier oil for running conditions and the other supplying gasoline or some similar highly volatile fuel for use during starting.

Directed toward the general object of this invention, it is further contemplated to utilize this present gasoline supply for acceleration as well as starting, and to provide means for positively and automatically injecting gasoline directly from this source of supply into the carburetor mixing chamber whenever the throttle of the carburetor is quickly opened to effect acceleration.

It is also an object of this invention to provide means responsive to suction of the engine for controlling the admission of accelerating fuel into the carburetor.

With the above and other objects in view which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claims.

The accompanying drawings illustrate two complete examples of the physical embodiment of the invention constructed according to the best modes so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a side view of an oil carburetor of the type shown in the aforesaid co-pending application illustrating the application of this invention thereto;

Figure 2 is a detail section view through Fig-

ure 1, substantially on the plane of the line 2—2; and

Figure 3 is a view similar to Figure 2 illustrating a modified embodiment of this invention.

Referring now more particularly to the accompanying drawings in which like numerals indicate like parts throughout the several views, the numeral 5 designates the carburetor proper which comprises a mixing chamber 6, an air inlet duct 7 and a float chamber 8.

The mixing chamber 6 is attached to an intake manifold 9, the terminals of which pass through an exhaust chamber 10 connectible to the exhaust ports of the engine. The hot exhaust gases received in said chamber 10 are conducted into and around a vaporizer 10' disposed within a vaporizer chamber 11 forming part of the exhaust chamber casting 10.

The carburetor proper has an air passage 12 through which air is drawn from the air inlet 7 into the mixing chamber 6. Communicating with this passage 12 is a fuel inlet 13 to which the vaporized fuel from the vaporizing unit is conducted.

The liquid fuel supply for the vaporizing unit is controlled by a conventional float chamber 14 to which oil or any other similar liquid fuel having a high boiling point is supplied through a line 15.

During the running conditions of the engine with which the unit is used, when the vaporizer is sufficiently hot to vaporize the oil conducted thereto from the float chamber 14, the carburetor is supplied with the fuel vapor through the inlet 13 communicating with the air chamber 12.

To start the engine, however, it is necessary that a more volatile fuel than oil be used. For this purpose gasoline or a similar fuel is injected into the air chamber 12 by a jet 16 supplied from the float chamber 8 which in turn is connected with a suitable source of supply by a pipe line 17.

Obviously, both fuels are not ordinarily supplied to the carburetor simultaneously for after the engine has reached a normal operating temperature sufficient to enable the vaporizer to function properly, the gasoline supply is shut off and the oil supply is turned on.

The means for shifting from one fuel to another forms no part of this invention and is therefore, not illustrated in detail. In general, it comprises a valve in the communicating line between the oil float chamber 14 and the vaporizer unit, and a valve to shut off the supply of gasoline to the float chamber 8. These valves are actu-

ated respectively by rods or stems 18 and 18' respectively.

The valve stem 18 is connected to one arm of a bell crank lever 19 fixed to a shaft 20 which carries an arm 21. The outer end of the arm 21 is connected through a link 22 with the valve stem 18'. The valve-controlling stems 18 and 18' are thus interlinked so that they may be simultaneously and oppositely actuated to open one valve and close the other.

An operating rod 23 connected to the bell crank lever 19 affords means for so actuating the valves to selectively control the fuel supply.

As pointed out hereinbefore, quick acceleration cannot be obtained when oil is used as the fuel. To overcome this deficiency, the present invention contemplates the use of oil during the running conditions of the engine and the use of gasoline or whatever other fuel is used for starting, during acceleration. To this end a gasoline pump, indicated generally by the numeral 24, is conveniently mounted on any portion of the carburetor structure and is linked up with the throttle control 25 to be operated whenever the throttle 26 is adjusted.

The throttle control is of any conventional type and in the present instance embodies a bell crank lever 27 connected to the accelerator or other controlling device by a rod 28 and rotatable about a pivot 29. A rod 30 connects the bell crank lever 27 with a lever 30' fixed to the shaft of the throttle valve.

Movable with the bell crank 27 is a lever 31 the free end of which is linked to the piston rod 32 of the pump 24. The pump 24 comprises a cylinder 33 having a fuel inlet 34 connected through a pipe line 35 directly with the fuel supply line 17.

A ball check valve 36 of sufficient strength to remain closed against the pressure of the regular fuel supply pump (not shown) which, as is customary, is provided to force the gasoline from the tank into the float chamber 8 and also to the pump 24, normally closes the inlet 34.

The cylinder 33 also has a fuel outlet 37 connected by a line 38 with an auxiliary jet 39 discharging directly into the mixing chamber of the carburetor. A ball check valve 40 located at the connection of the line 38 with the jet 39 normally closes off communication therebetween and opens upon the expulsion stroke of the pump piston 41 operating in the cylinder 33.

The piston 41 is reciprocated by the rod 32 which, however, is not directly connected to the piston, but has a compression spring 42 interposed between it and the piston.

A second compression spring 43 engaging the opposite side of the piston and bearing on the bottom of the cylinder cooperates with the spring 42 to provide substantially a floating connection between the piston and its actuating shaft.

In operation the up stroke of the piston produced by the spring 43 causing the piston to follow the retraction of the rod 32, draws the ball check valve 36 open to admit fuel into the cylinder. The quantity of fuel contained within the cylinder is then discharged into the mixing chamber of the carburetor through the auxiliary jet 39 by the expulsion stroke of the piston.

By virtue of the yieldable connection between the piston rod and the piston afforded by the spring 42, the expulsion of fuel from the cylinder and to the carburetor continues in diminishing quantities after the initiation of the accelerating condition. After the contents of the pump

cylinder have been emptied sufficiently to allow the springs acting on the piston to balance each other, the ball check valves close and the supply of gasoline to the jet 39 ceases.

From the description thus far, it will be readily apparent that by the provision of means to inject gasoline or some similar highly volatile fuel into the carburetor mixing chamber during acceleration, the sluggishness of the oil carburetor is entirely overcome.

If desired the control of the admission of accelerating fuel to the carburetor during acceleration may be automatic and responsive to suction of the engine, and in Figure 3 one embodiment of this manner of controlling the supply of accelerating fuel is illustrated.

As here shown, the auxiliary jet 39 is supplied with fuel from a line 45 connected directly to the source of gasoline supply through a T-shaped fitting 46. The fitting 46 embodies a valve seat 47 adapted to receive a valve 48 to shut off the communication between the supply line 45 and the jet 39.

The position of the valve 48 is directly controlled by engine suction. To this end, the valve 48 has a stem 49 which extends to the exterior of the fitting 46 to be connected to a diaphragm 50 which closes a diaphragm chamber 51. The chamber 51 may be conveniently supported by arms 53 from the fitting 46. A compression spring 52 disposed within the chamber 51 yieldably urges the diaphragm outwardly to unseat the valve 48 and afford communication between the supply line 45 and the jet 39. This spring 52 is opposed by the effect of engine suction produced within the diaphragm chamber 51 through a communication 54 leading from the chamber 51 to the intake manifold 9.

Consequently, whenever the engine is suddenly accelerated and suction within the intake manifold drops as a result thereof, the valve 48 will be opened to allow the admission of accelerating fuel to the jet 39. The resumption of normal running conditions and normal suction within the intake manifold closes the valve 48 and shuts off the supply of accelerating fuel.

While the use of engine suction for controlling the injection of accelerating fuel to the jet 39 affords good results, the fact that the intake depression is not constant at any given angle of throttle setting but varies both with the speed of the engine and with the position of the throttle makes this modified embodiment of the invention less desirable than the preferred form wherein the actual mechanical motion of the throttle valve toward open position is utilized to inject the accelerating fuel.

It is to be observed, however, that in both embodiments of the invention the supply of normal running fuel is not lessened or in anywise interfered with during the injection of accelerating fuel, nor does the injection of the accelerating fuel cause precipitation or condensing of the mixture, as the point of injection of the accelerating fuel is not at the same point in the mixing chamber of the carburetor as the point of introduction of the running fuel but is located between the latter point and the engine intake manifold.

From the foregoing description taken in connection with the accompanying drawings, it will be readily apparent to those skilled in the art to which this invention appertains, that through the use of one type of fuel for running conditions and another type of fuel for starting and accelerating

periods, an exceptionally economical and in all respects, practical and efficient fuel supply for internal combustion engines is provided.

What I claim as my invention is:

1. In combination with a heavy oil carburetor for internal combustion engines having a throttle valve to control the supply of carbureted fuel mixture to the engine, means to supply vaporized oil and air mixture for normal steady running conditions of the engine, and means operable by the opening movement of the throttle valve to inject an auxiliary volatile liquid fuel into the engine during periods of acceleration to supplement the supply of heavy vaporized oil air mixture.

2. In combination with a heavy oil carburetor having a passage to conduct a carbureted fuel mixture to an internal combustion engine, means to supply a vaporized oil and air mixture to the carburetor for normal running conditions of the engine, and means automatically operable during periods of acceleration of the engine to inject an auxiliary charge of lighter more volatile fuel in addition to the unimpaired supply of the heavy vaporized oil and air mixture into the passage for the carbureted fuel mixture at a point between the engine and said first means to be conducted to the engine as a supplement to the heavy vaporized oil and air mixture to facilitate acceleration of the engine.

3. In combination with a carburetor having a mixing chamber arranged to discharge into the intake manifold of an internal combustion engine, means to supply a steady flow of heated heavy fuel vapor to the mixing chamber of the carburetor for normal running conditions of the engine, and means automatically operable during periods of acceleration of the engine to inject a highly volatile fuel directly into the stream of said heated heavy fuel vapor as it passes through the mixing chamber of the carburetor.

4. In an oil carburetor including a mixing chamber connectible with the intake manifold of an internal combustion engine, means to vaporize heavy fuel oil, means to conduct the vaporized fuel oil in a steady flow to the mixing chamber of the carburetor to supply the fuel for normal operating conditions of the engine, and means to inject a highly volatile fuel into the stream of vaporized fuel flowing to the mixing chamber of the carburetor, during periods of acceleration of the engine.

5. In an oil carburetor of the character described having a mixing chamber connectible with the intake manifold of an internal combustion engine, means to conduct vaporized oil to the mixing chamber of the carburetor to provide fuel for normal running conditions of the engine, means to supply light highly volatile fuel for starting purposes, interconnected valve means to control the flow of vaporized oil and starting fuel to the mixing chamber so that only one of said fuel supplies can function at a time, means to supply the same type of light highly volatile fuel to the mixing chamber of the carburetor for acceleration purposes, and means automatically operable during periods of acceleration for

controlling said last named means so that light fuel is supplied only for starting and accelerating.

6. In an oil carburetor having means to vaporize heavy fuel oil and to conduct such vaporized heavy oil to the mixing chamber of the carburetor in a steady stream to meet the normal running requirements of the engine with which the carburetor is used, a throttle valve to control the flow of carbureted fuel mixture from the mixing chamber, and means operable concomitantly with the opening of the throttle valve to effect the injection of an auxiliary charge of highly volatile fuel directly into the steady stream of vaporized running fuel flowing from the mixing chamber of the carburetor while maintaining the supply of running fuel undiminished to facilitate acceleration.

7. In a carburetor for internal combustion engines having a mixing chamber connectible with the intake manifold of the engine, a heavy fuel charge preparing means for supplying the normal steady running requirements of the engine, an auxiliary fuel jet to discharge a light highly volatile fuel into the heavy fuel stream beyond its point of preparation, means to supply fuel to said auxiliary jet, and means responsive to the running conditions of the engine to control the admission of fuel to said auxiliary fuel jet, said means allowing the passage of fuel to the auxiliary jet only during periods of acceleration of the engine and without interfering with the flow of the fuel from the charge preparing means.

8. In a heavy oil carburetor for internal combustion engines having a throttle valve for increasing the volume of carbureted fuel-air mixture passing from the carburetor to the intake manifold of the engine, means to supply a steady volume of gasified heavy oil vapor to the carburetor for running conditions of the engine, and means operable upon acceleration of the engine effected by opening of the throttle valve to supply an auxiliary charge of liquid highly volatile fuel into the stream of the gasified heavy oil vapor to facilitate acceleration of the engine.

9. In a carburetor for internal combustion engines having a throttle valve to control the supply of carbureted fuel air mixture to the engine, means for supplying a steady volume of carbureted fuel for normal steady running conditions of the engine, and means controlled by the opening of the throttle to inject an auxiliary charge of lighter more volatile fuel into the stream of the normal fuel supply while maintaining the steady volume of fuel for running conditions undiminished during accelerating periods of the engine.

10. In a carburetor for internal combustion engines, means to supply a heated vaporized heavy fuel for normal running conditions, and means automatically operable during periods of acceleration to feed a charge of light highly volatile fuel to the normal fuel supply stream while maintaining the supply of heavy running fuel undiminished to facilitate acceleration of the engine.

STEPHEN F. BRIGGS.