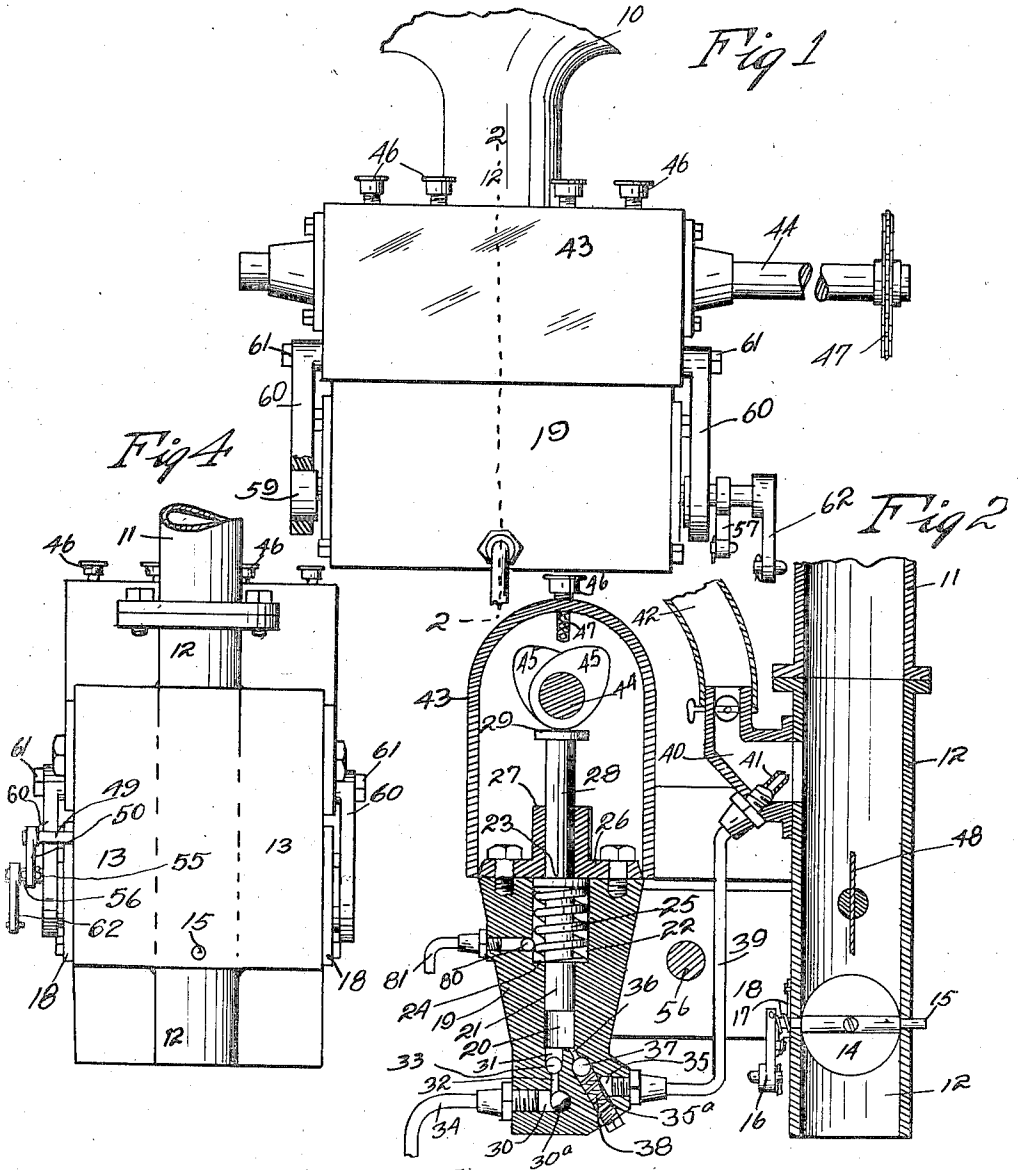
Feb. 13, 1923. 1,445,100

A. R. NELSON

CARBURETOR FOR INTERNAL COMBUSTION ENGINES

Filed July 6, 1920 2 sheets-sheet 1



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Fig 6

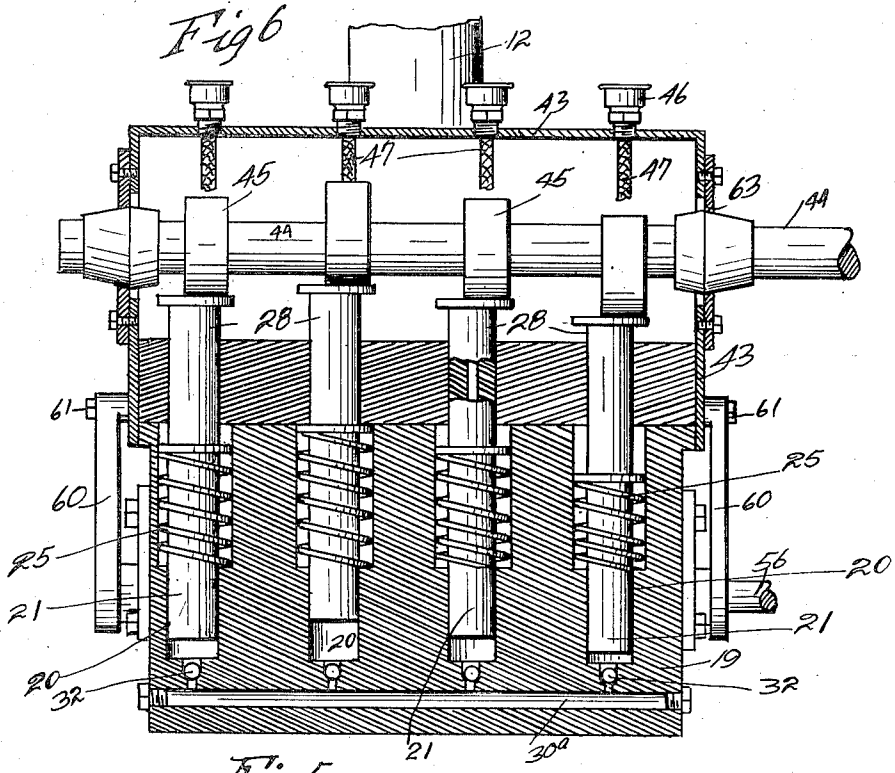
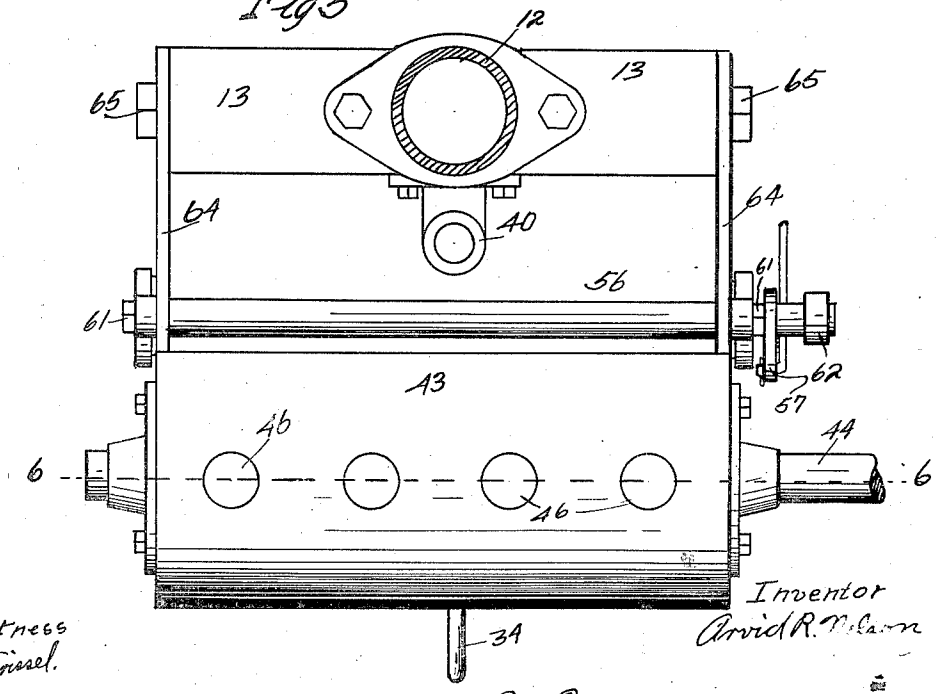


Fig 5



Witness
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UNITED STATES PATENT OFFICE.

ARVID R. NELSON, OF MARATHON, IOWA.

CARBURETOR FOR INTERNAL-COMBUSTION ENGINES.

Application filed July 6, 1920. Serial No. 394,332.

To all whom it may concern:

Be it known that I, ARVID R. NELSON, a citizen of the United States, and a resident of Marathon, in the county of Buena Vista and State of Iowa, have invented a certain new and useful Carburetor for Internal-Combustion Engines, of which the following is a specification.

The object of my invention is to provide a force feed carburetor for internal combustion engines.

More particularly it is my object to provide such a device especially adapted for use with plurality cylinder engines of the type mentioned, said device including a pump structure or its equivalent adapted to be operated according to the speed of the engine and provided in connection therewith a regulating mechanism, whereby the stroke of the pumping devices may be regulated, preferably corresponding to the regulation of the throttle valve.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of the device, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims and illustrated in the accompanying drawings, in which:

Figure 1 shows a front elevation of my improved carburetor device, illustrated adjacent to the intake pipe of an intake manifold.

Figure 2 shows a vertical, central, sectional view taken on line 2—2 of Figure 1.

Figure 3 shows a detailed view of part of the operating mechanism.

Figure 4 shows a rear elevation of a portion of my device viewed from the opposite direction from that shown in Figure 1.

Figure 5 shows a top or plan view of my carburetor device; and

Figure 6 shows a detailed, sectional view taken on the line 6—6 of Figure 5.

In the accompanying drawings, I have used the reference numeral 10 to indicate the intake manifold of an internal combustion engine, having the intake pipe 11.

Connected with the intake pipe 11 is a fuel supply pipe 12 forming a mixing chamber. The pipe 12 is preferably arranged vertically, as shown, and has spaced from its upper end and formed preferably in an integral casting, the laterally extending frame members 13, which serve as supports for my force fuel feed mechanism.

In the lower part of the pipe 12 is an ordinary choker valve 14 of the butterfly type, having the stem 15, which is provided with an arm 16. The arm 16 may be operated in any suitable way from the dash of an automobile or the like.

A coil spring 17 normally holds the choker valve 14 in its open position.

Extending away from the members 13 are parallel plates or the like 18, which may be cast integral with the members 13. The outer ends of the plates 18 support a pump cylinder block 19, in which may be mounted one or more pump cylinders or fuel forcing devices.

In the present instance, I have illustrated four of these devices; one or more may be employed regardless of the number of engine cylinders.

I preferably use a plurality in order to secure a more even and accurate fuel supply.

In the pump cylinder block 19, there is a plurality of upwardly opening bores or the like 20 forming pump cylinders. Slidably mounted in each so-called cylinder 20 is a piston 21.

At the upper end of each cylinder 20 is an enlarged cylindrical recess 22. Each cylinder 20 has at its upper end, a head 23, which travels in the recess 22 and serves the purpose of a cross-head.

Mounted on the piston 21 between the head 23 and the shoulders 24 at the lower end of the recess 22 is a coil spring 25, which normally tends to hold the piston in its raised position.

Above each recess 22, there is bolted to the cylinder block 19, a cover plate 26, having a central, vertical opening, which registers with the cylinder 20. Extending upwardly from said last-named opening is a tubular or cylindrical extension 27, which forms a bearing and guide for the lower end of the tappet rod 28.

Each tappet rod 28 has at its upper end a head 29.

In the lower end of the block 19, an inlet opening 30 is provided preferably below each cylinder 20. The opening 30 is connected with a passage 30^a, which is in turn

connected with the lower end of each cylinder 20 by means of a passage 31, having a restricted portion 32, the upper part of which forms a seat for a ball valve 33.

Connecting with the passage 31 is an intake tube 34.

In the lower part of the block 19, there is provided an outlet opening 35 connected with a passage 35ª, which passage 35ª is in turn connected with each cylinder 20 by a passage 36, at the outer end of which is a seat for a ball valve 37, which is normally held by the spring 38 in closed position.

The passage 35ª is connected by means of a pipe 39 with an intake passageway 40 communicating with the intake pipe 12 and adapted to serve as an auxiliary air intake passage.

At the discharge end of the pipe 39 is a spraying nozzle 41. A suitable tube 42 is connected with the passage 40 and is designed to extend to position, preferably adjacent to the exhaust manifold, so that the air supplied through the tube 42 and the passage 40 to the fuel mixture will be heated.

Seated on the upper part of the pump cylinder block 19 is a hollow, downwardly opening cover member 43, having the shaft 44 rotatably mounted in its end walls. On the shaft 44 is a series of cams 45, each of which stands above one of the tappet rods 28. Above each cam 45, there is mounted on the top of the cover member 43, an oil cup 46, below which is a wick 47, from which oil is supplied to the adjacent cam.

On the shaft 44 is a gearing device, such for instance, as the sprocket 47 adapted to be connected in any suitable way with the engine shaft.

Mounted in the intake pipe 12 below the spraying nozzle 41 is a throttle valve 48 of the butterfly type, having a stem 49 on which outside the pipe 12 is an arm 50, having a series of holes 51, anyone of which may be used to receive a pin 52 for connecting the arm 50 with a two-part link 53. The adjacent ends of the two parts of the link 53 are provided respectively with a right-hand and left-hand screw-threads to receive a turn buckle 54.

Mounted in the plates 18 is a shaft 56, on which is an arm 57 pivoted to the link 53, as shown for instance in Figure 3.

On the shaft 56 is mounted an eccentric collar or cam 59, which is rotatably received in an opening in the lower end of the arm 60. The arm 60 project upwardly from the shaft 56, as shown in Figures 1 and 6, and is pivoted at its upper end by means of the screw bolts or the like 61 to the ends of the cover 43.

On the shaft 56 is an arm 62, or other suitable means, whereby the shaft 56 may be given rocking movement for operating the throttle 48 and the cover 43. Two of the eccentric devices 59 received in the arms 60 are provided, one for operating each end of the cover 43.

Any suitable connecting means may be used for permitting the shaft 56 to be operated from the dash or other point convenient of access.

The shaft 44 is mounted in the ends of the cover 43 by means of suitable bearing plates 63 bolted or screwed to the end walls of the cover 43.

It will be seen that on account of the fact that the cam shaft 44 is mounted in the cover 43, when the cover 43 is raised or lowered, the action of the cams 45 on the tappet rods and consequently on the pump cylinders, will be regulated and varied.

The cover 43 is mounted to permit slight vertical reciprocation thereof for the purpose just mentioned in the following manner:

Extending from the cover 43 to position alongside of the ends of the members 13 are the arms 64, which are pivoted to the members 13 by screw bolts or the like 65 for thereby mounting the cover 43 on the intake pipe 13 with a sort of hinged or pivotal mounting.

In the practical use of my improved force feed fuel device, after the device has been installed on an engine, and the various parts are properly connected, it will be seen that when the engine is started and rotation is imparted to the shaft 44, the tappet rods 28 will be forced downwardly at each revolution of the shaft 44 by means of the cams 45 against the pressure of the springs 25. As the tappet rods move downwardly, they will force the respective pistons 21 downwardly. The downward movement of the piston when the pump cylinder is empty has no effect on the fuel. As the shaft 44 continues to rotate, the springs 25 will raise the pump cylinders 21, which causes fuel to be drawn in by suction through the pipe 34, the passage 30, the passage 30ª, and the small passage 31 for filling the cylinder 20. The next downward stroke of the piston forces fuel through the passage 36, the passage 35ª, the passage 35, the pipe 39 and the spray nozzle 41 into the passage 40 and intake pipe 12.

For regulating the amount of fuel supplied to the engine on each stroke of the pump, I have provided the means for raising and lowering the cover 43 hereinbefore described.

It will be seen that if the throttle is opened, when the engine is being started or run for the first few minutes, the parts are so arranged that the cover 43 is in its lowermost position, whereby the cams 45 operate to give to the tappet rods and the pump cylinders their maximum strokes. This results in supplying a maximum of necessary fuel to the engine.

If it is desired to reduce the amount of fuel supplied on each stroke of the pump, the throttle valve is moved from its open toward its closed position. Simultaneously with the movement of the throttle valve toward closed position, the arms 60 are raised for thereby raising the cover 43 on its pivots or hinges, whereby the shaft 44 is lifted away from the tappet rods, and the effect of the operation of the cams 45 on the tappet rods is to cause a shorter stroke of the tappet rods and the pump pistons.

It will be seen that at the same time, the amount of air which enters through the open end of the pipe 12 is reduced on account of the movement of the throttle valve 48 toward closed position, while more air will be supplied to the pipe 12 through the passage 40 and the tube 42 on account of the increased suction through the tube 42.

The raising and lowering of the cam shaft is done primarily for the purpose of varying the volume of fuel supplied for regulating my fuel supply according to the load on the engine.

It will be observed at the same time, that the fuel supply will be automatically regulated according to the speed of the engine on account of the fact that the number of operations of the pump in any given period of time is increased or diminished, corresponding to the diminution in the speed of the engine. Thus, if it is desirable to supply a greater amount of fuel for a heavy load, while the engine is running rather slowly, the device is manipulated for giving a longer stroke to the pump. On the other hand, if the engine is pulling a light load and running at high speed, the strokes of the pump may be shortened, but the number of operations of the pump will be increased.

Thus it will be seen that with my device, the volume of fuel and the speed of the supply of the fuel may be regulated or compensated according to the various conditions of load or speed, under which the engine is operated.

It will be noticed also that with my device, warm air may be supplied to the fuel mixture, if desired.

With my device, the engine cylinder can be filled practically with atmospheric pressure with the result that a fuller charge of fuel will be supplied.

On account of the arrangement of the throttle valve 48 below the spraying nozzle 41 and the auxiliary intake pipe 42, it will be seen that when my throttle is entirely closed, the air which passes into the fuel mixture will with sufficient velocity prevent the accumulation of fuel around the spraying nozzle or in the intake passages.

It will be noted that the cams on the cam shaft are staggered with relation to each other, so that the pumps work alternately for thereby supplying fuel, as nearly as possible, in a steady stream to the intake pipe.

It should be noted that lubricant from the wicks 47 will be supplied to the cams from the cam shaft and the oil will flow downwardly over the tappet rods to the pistons for properly lubricating my device.

I have provided a passage 80 along side and common to the recesses 22, which passage has an outlet 81 and is designed to take care of any overflow of fuel that might get up into the recesses 22.

It will be seen that this device does not pump the fuel directly into the engine cylinders but pumps the fuel into the mixing chamber 12, where it is mixed with air in the correct proportions, after which the fuel mixture is drawn into the engine through an ordinary intake manifold.

It will be seen that this device differs from all other carburetors in that with the present device, the liquid fuel is forced through the spray nozzle to the mixing chamber by means of a pump, and not by atmospheric pressure or suction, as in other carburetors. The spring tension of the discharge valves 37 is sufficient to prevent vacuum arising on account of suction from the engine cylinders from opening said valve.

In order to get the maximum power out of an engine, it is necessary under certain conditions of operation to allow the engine to take a maximum charge. The present device permits the taking of such maximum charge, since it has no air restriction as by means of spring tension, weights or choked passages. It follows therefore that the engine will receive a fuller mixture, than can be had with the suction feed type of carburetor where the liquid fuel must be drawn through the spray nozzle by partial vacuum by restricting the air currents.

It will also be noticed that this device differs from other carburetors in that the throttle valve is located farther from the discharge end of the mixing chamber, than is the spray nozzle for thereby creating a higher air velocity through the auxiliary air inlet and past the spray nozzle, as the throttle approaches its closed position. This is the reverse of the principle made use of in other carburetors.

To facilitate starting in cold weather, the choker valve may be closed and the throttle valve open, thus giving the pump a maximum stroke, and furnishing to the engine a very rich mixture in which the fuel has been atomized by the spray nozzle and the higher air velocity created in the auxiliary air inlet.

It may be mentioned that the valve is the auxiliary air inlet passage, shown in Figure

2, may be set for running the engine at the correct idling speed.

Some changes may be made in the construction and arrangement of my improved device without departing from the essential features and purposes of my invention, and it is my intention to cover by my claims, any modified forms of structure or use of mechanical equivalents, which may be included within their scope.

I claim as my invention:

1. In a device of the class described, the combination of an intake pipe, an auxiliary air passage connected therewith, a spray nozzle communicating with said intake pipe adjacent to said auxiliary air passage, a throttle valve in said intake pipe located farther from the discharge end thereof than is said spray nozzle, a force feed device for supplying fuel to said spray nozzle, comprising a pump cylinder communicating with a source of fuel supply and with said spray nozzle, a piston in said cylinder, a spring for normally holding said piston in one position of its movement, a cam shaft, a cam on said shaft, means whereby said cam actuates said piston against the tension of said spring, and means for supporting said cam shaft for movement, whereby the action of the cam is varied.

2. In a device of the class described, the combination of an intake pipe, an auxiliary air passage connected therewith, a spray nozzle communicating with said intake pipe adjacent to said auxiliary air passage, a throttle valve in said intake pipe located farther from the discharge end thereof than is said spray nozzle, a force feed device for supplying fuel to said spray nozzle, comprising a pump cylinder communicating with a source of fuel supply and with said spray nozzle, a piston in said cylinder, a spring for normally holding said piston in one position of its movement, a cam shaft, a cam on said shaft, means whereby said cam actuates said piston against the tension of said spring, and means for supporting said cam shaft for movement, whereby the action of the cam is varied, said last means being connected with means for operating said throttle.

3. In a device of the class described, a plurality of pumping devices, a common intake pipe connected with all of said pumping devices, means for alternately operating said pumping devices for supplying a steady stream of fuel to said intake pipe, said means including an adjustable member capable of movement to different positions, whereby each adjustment of said adjustable member varies the strokes of all the pumping devices, a throttle valve in said intake pipe operatively connected with said adjustable device, whereby the adjustment of the adjustable device corresponds to the adjustment of the throttle valve.

4. In a device of the class described, the combination of an intake pipe, a plurality of pumping devices for supplying fuel to said intake pipe, means for operating said pumping devices from an engine with which the device is used, for alternating the pumping devices, said means being adjustable for regulating the strokes of the pumping devices, a throttle valve operatively connected with said adjustable means, whereby the speed of the pumping devices is varied according to variations in the speed of the engine with which the device is used, and the strokes of the pumping devices may be regulated corresponding to the regulation of the throttle valve.

5. In a device of the class described, the combination of an intake pipe, an auxiliary air passage connected therewith, a plurality of pumping mechanisms, a common tube connected with said pump mechanisms and with said intake pipe adjacent with said auxiliary air passage, a throttle valve in said intake pipe farther from the discharge end thereof than the discharge end of said tube, means for operating said pumping mechanisms from the engine with which the device is used, said means including an adjustable member operatively connected with said throttle valve for regulating the strokes of said pumping mechanisms, whereby the speed of the pumping mechanisms will be varied according to variations in the speed of the engine and the strokes of the pumping mechanisms will be varied corresponding to the regulation of the throttle valve.

6. In a device of the class described, the combination of a plurality of pumping devices, a shaft, cams on said shaft for alternately working said pumping devices, and means for raising and lowering said shaft for varying the stroke of the pumping devices, a common intake pipe connected with said pumping devices, a throttle valve therein, and means for operatively connecting said throttle valve with said last-named means.

Des Moines, Iowa, June 9, 1920.

ARVID R. NELSON.