F. W. HAGAR.

CARBURETER.

APPLICATION FILED NOV. 12, 1914.

1,155,232.

Patented Sept. 28, 1915.

3 SHEETS—SHEET 1.

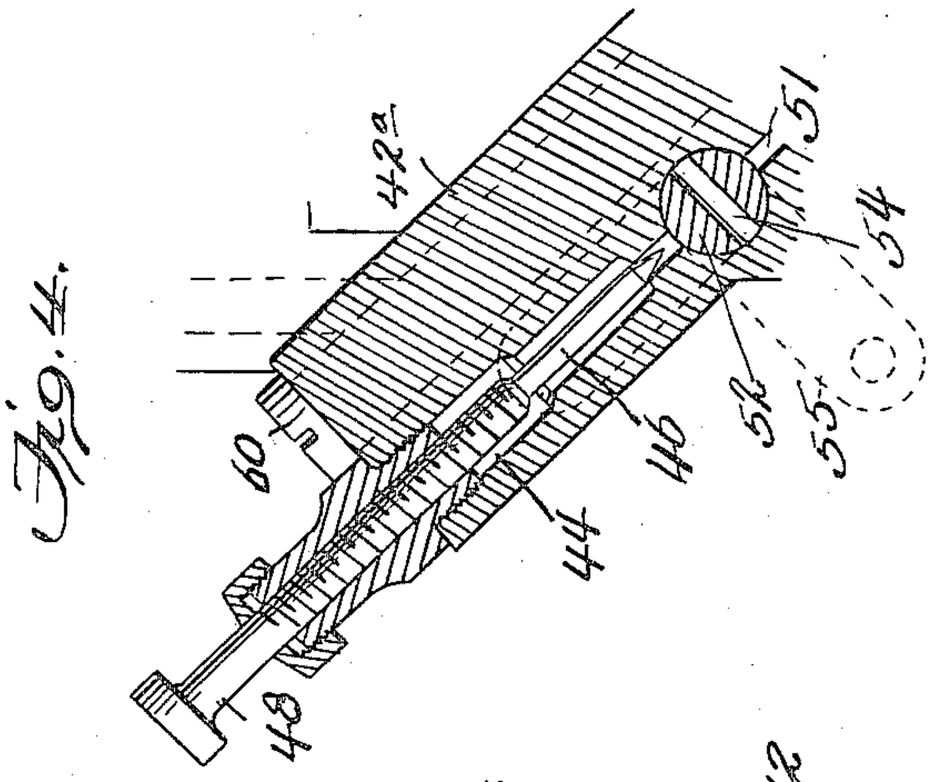

Fig. 4.

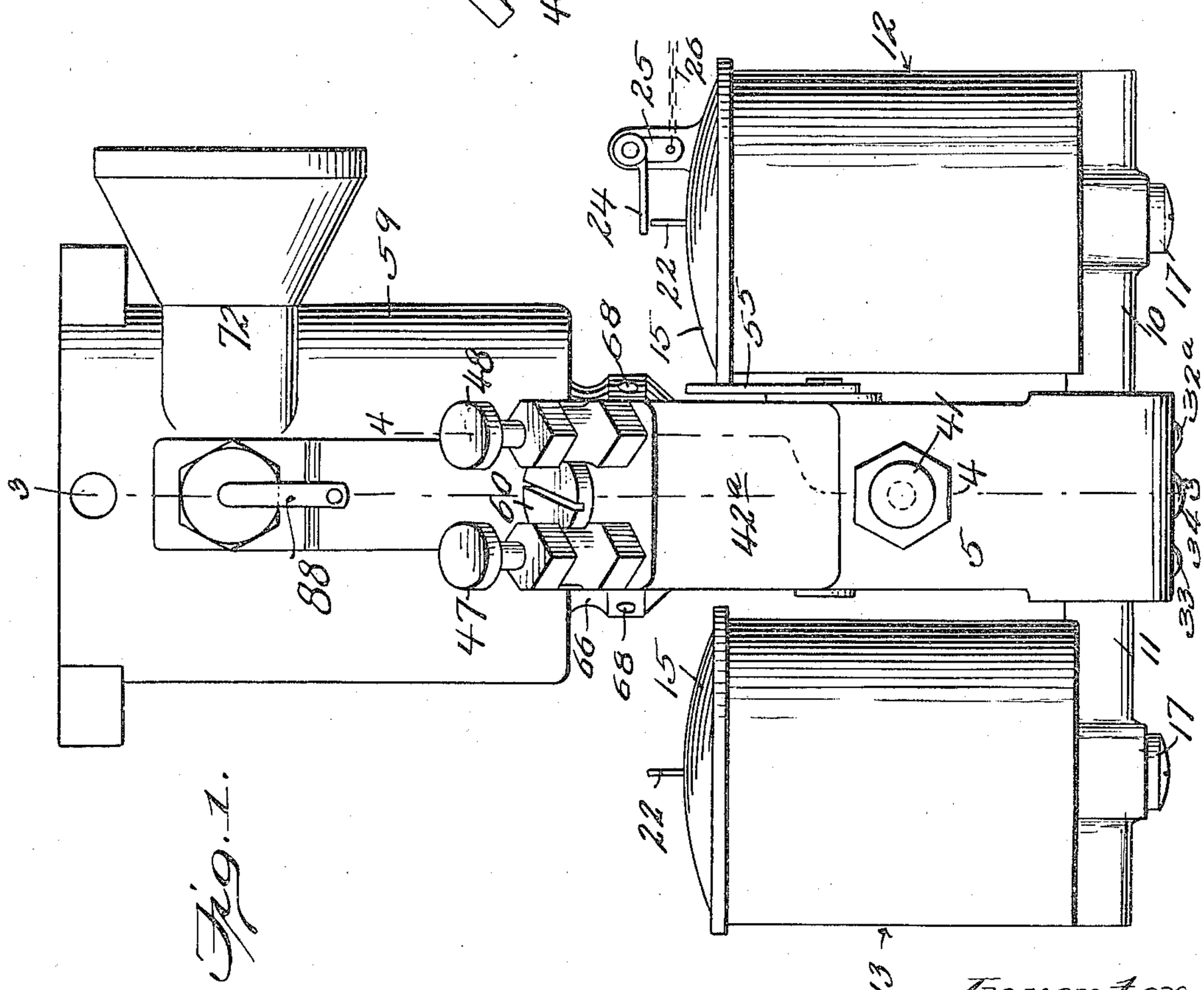

Fig. 1.

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3 SHEETS—SHEET 2.

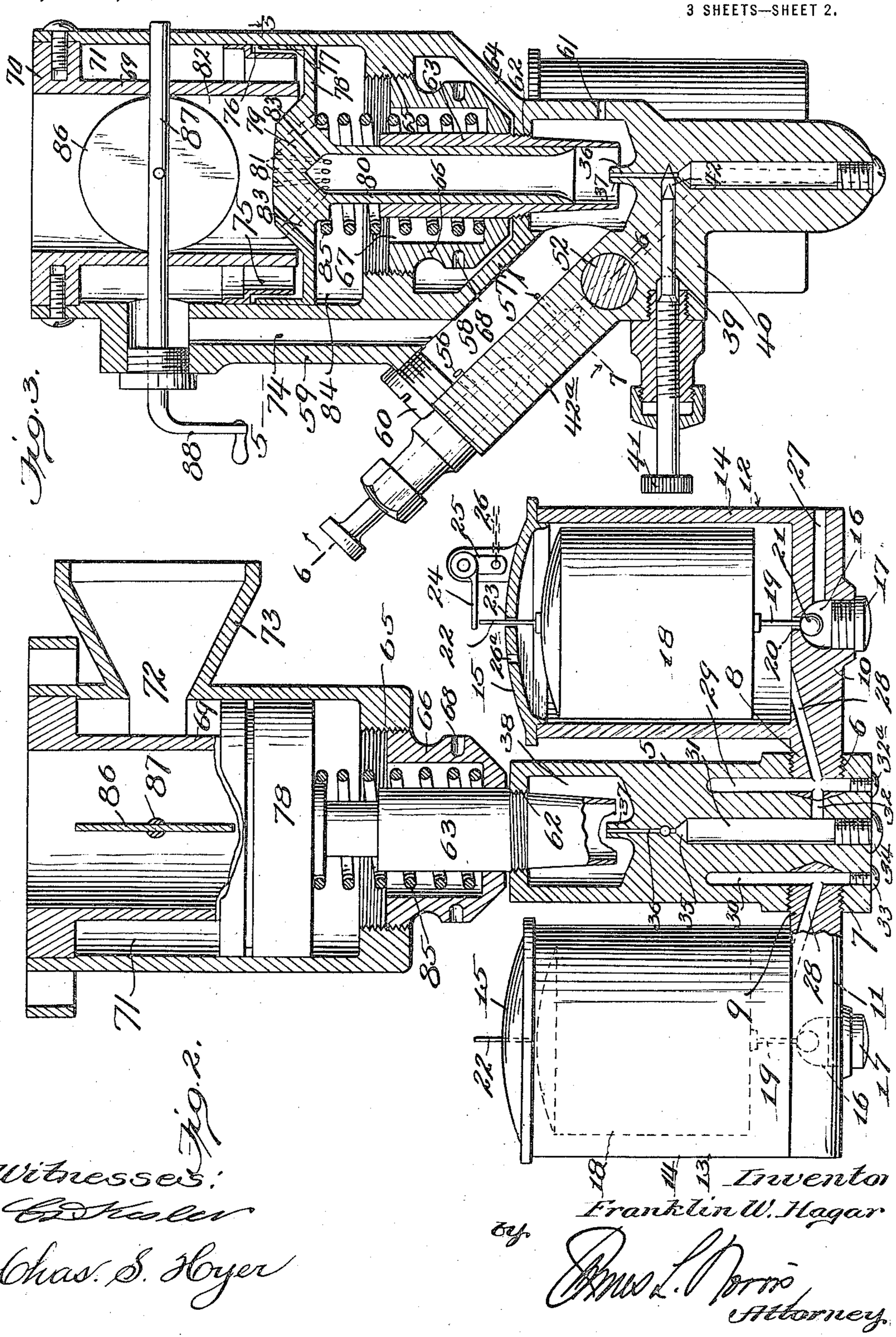

Fig. 3.



Fig. 2.

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3 SHEETS—SHEET 3.

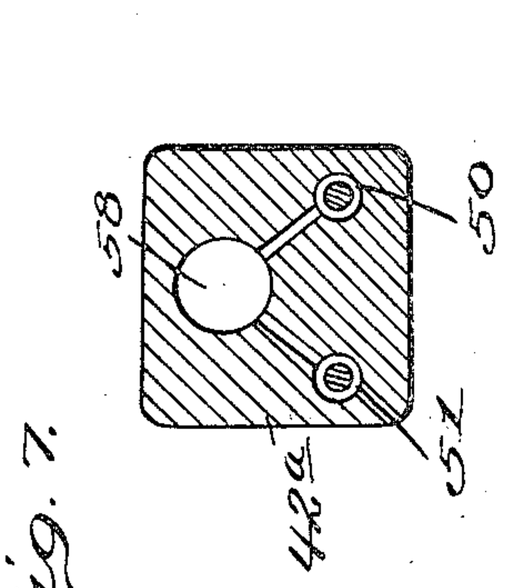


Fig. 7.

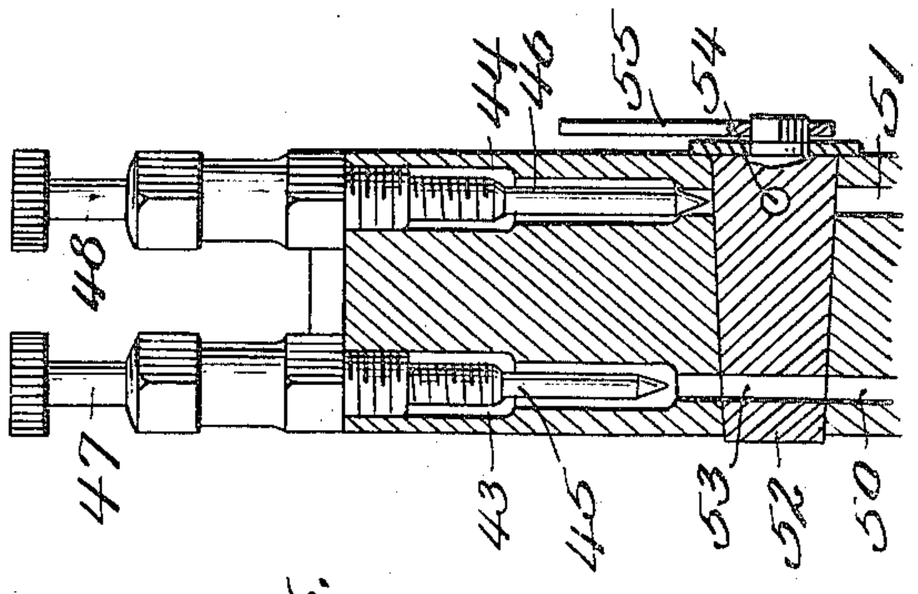


Fig. 6.

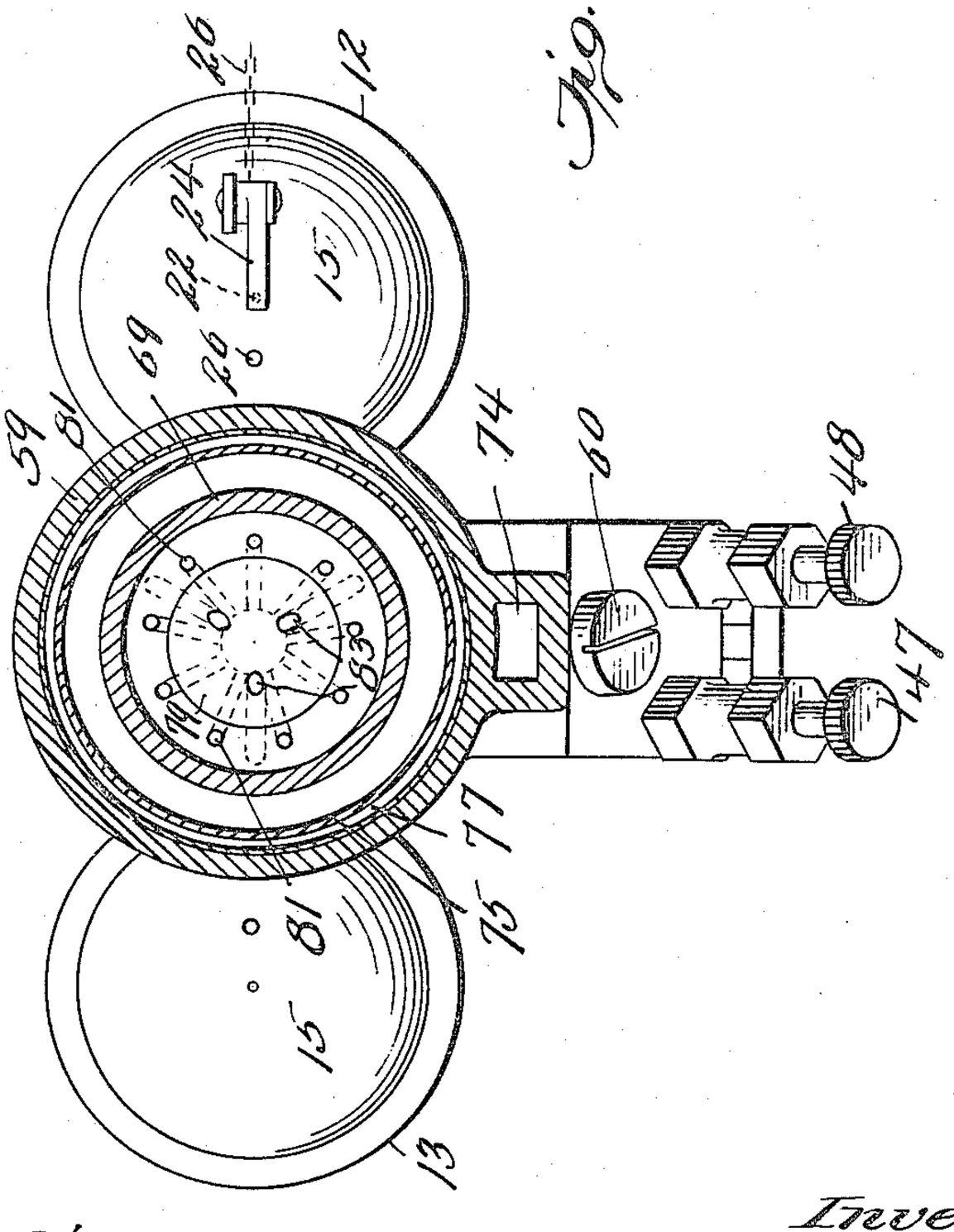


Fig. 5.

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# UNITED STATES PATENT OFFICE.

FRANKLIN W. HAGAR, OF NASHVILLE, TENNESSEE.

## CARBURETER.

1,155,232. Specification of Letters Patent. Patented Sept. 28, 1915.

Application filed November 12, 1914. Serial No. 871,774.

*To all whom it may concern:*

Be it known that I, FRANKLIN W. HAGAR, a citizen of the United States, residing at Nashville, in the county of Davidson and State of Tennessee, have invented new and useful Improvements in Carbureters, of which the following is a specification.

This invention relates to carbureters of that type having two float feed chambers, the one for gasolene and the other for coal-oil, alcohol, light petroleum and other volatile hydrocarbons; and the primary object of the invention is to provide an automatically operating carbureter which gives an absolute mixture by disintegrating and breaking up all the solid liquids into a perfectly sprayed or comminuted condition before being brought into contact with the main volume of air and thereby thoroughly and practically mixing the sprayed or comminuted gasolene, coaloil or other suitable fuel liquid and as a consequence materially increasing the efficiency of operation of the motor with which the carbureter is used. The improved carbureter is so constructed and arranged that gasolene and coaloil, for instance, may be individually sprayed, comminuted or vaporized and mixed with a suitable proportion of air, or there may be an admixture of the sprays or vapors of the said two fuel mediums in regulated quantities relatively to each other as may be desired and with economy in the use of a fuel medium for a motor.

The invention consists in the construction and arrangement of the several parts which will be more fully hereinafter described and claimed in preferred form.

In the drawings: Figure 1 is an elevation of a carbureter embodying the features of the invention. Fig. 2 is a transverse vertical section through one of the float feed chambers and the remaining intermediate portion of the carbureter. Fig. 3 is a transverse vertical section taken in the plane of the line 3—3, Fig. 1. Fig. 4 is a detail section taken in the plane of the line 4—4, Fig. 1. Fig. 5 is a horizontal section taken in the plane of the line 5—5, Fig. 3. Fig. 6 is a transverse vertical section of the adjacent pair of needle valves and feed ducts and taken in the plane of the line 6—6, Fig. 3. Fig. 7 is a transverse vertical section taken in the plane of the line 7—7, Fig. 3.

The numeral 5 designates a central upright forming the lower portion of the casing or frame of the carbureter, the said upright at its lower extremity and at diametrically opposite points being formed with screw sockets 6 and 7 to removably receive screw-threaded extensions 8 and 9 respectively of the bottoms 10 and 11 of independent tanks 12 and 13, each provided with a surrounding side wall 14 and a top or closure 15. The tanks or reservoirs 12 and 13 are of similar structure and preferably of equal capacity, and in the bottoms 10 and 11 thereof valve chambers 16 are formed and extend entirely through the lower portions of the bottoms and are closed by screw plugs 17 which render said chambers 16 accessible for cleaning or other purposes. In each chamber 12 and 13 a float 18 is mounted and provided with a depending stem 19 freely movable through an opening 20 in the center of the bottom of each chamber, and on the lower end of the stem is a ball valve 21 adapted to close against the lower portion of the opening 20. Extending upwardly from the center of the top of each float 18 is a stem 22 freely movable through an opening 23 in the top or cover 15 and positioned under a pressure arm 24 which is preferably in the form of a bell-crank lever 25 to which a pull chain or other analogous device 26 is attached, as clearly shown by Fig. 2. Each cover 15 also has a vent opening $26^a$ to permit the escape of gas or any pressure medium that may be present in each tank above its float so that the operation of the two floats may not in the least be retarded when the tanks 12 and 13 are supplied with a fuel medium or liquid. A supply duct 27 extends into each base 10 and opens into the valve chamber 16 thereof, said duct 27 of each base being adapted to be connected to a suitable source of supply, such as a tank or reservoir that may be located at a distance from the carbureter and by means of which the tanks are provided with the necessary quantities of fuel medium from time to time as the said tanks become exhausted and require replenishment. Each base 10 and 11 of the tanks has a downwardly inclined outlet duct 28 formed therein and continued through the screw extensions 8 and 9, and in the upright 5 two vertical ducts 29 and 30 are constructed, the duct 29 being intersected by the duct 28. The upright 5 also has a central larger duct

31 and in line with the duct 28 and in continual communication therewith is a short cross duct 32 which opens into the lower portion of the duct 31.

The ducts 28 and 29 are in continual communication and the duct 28 is likewise at all times open to the duct 31. The downwardly inclined duct 28 in the extension 9 of the base 11 intersects and terminates at the duct 30 and does not have communication with the central larger duct 31 of the upright 5. The ducts 29, 30 and 31 extend through the bottom of the upright 5 and are normally closed by screw plugs 32ª, 33 and 34 for obvious purposes. The duct 31 extends upwardly through only a portion of the upright 5 in its enlarged construction and is contracted, as at 35, and continued in the form of a restricted outlet 36 which continues into and through a nozzle 37 rising from the center of the lower wall of a chamber 38 formed in the upper portion of the upright 5, the restricted outlet 36 being controlled as to its open and closed condition preferably by a needle valve 39 extending laterally into the upright and mounted in an extension 40 at the upper part of the upright, the said needle valve being exteriorly operative through the medium of a stem and head 41 and applied in operative position in the usual manner or similar to the mounting of needle valves, as clearly shown by Fig. 3. A valve bore 42 intersects the restricted outlet opening or duct 36 and the inner pointed extremity of the needle valve 39 may be readily adjusted to close the said outlet. In some instances it may be found unnecessary to use the needle valve 39, and it is proposed to dispense with the same if the service thereof is not required. The extension 40 at the upper portion of the upright 5 is continuous with an upwardly and outwardly inclined valve seat extension 42ª formed with a pair of elongated valve chambers 43 and 44 in which two needle valves 45 and 46 are respectively mounted and have their stems 47 and 48 projecting upwardly through the upper end of the said extension 42ª and equipped with the usual accessories of this type of valve. The chambers 43 and 44 continue at their lower terminals into upwardly inclined ducts 50 and 51 which in turn open into the upper portions of the ducts 30 and 29, the ducts 30 and 29 and 50 and 51 being practically continuous means of communication between the outlet ducts 28 and the tanks 12 and 13. The pointed ends of the needle valves 45 and 46 may be readily adjusted to open or close the upper terminals of the ducts 50 and 51, the points of intersection of the latter ducts and the terminals of the lower chambers 43 and 44 forming seats for the ends of the said needle valves 45 and 46. Communication between the ducts 50 and 51 and their respective chambers 43 and 44 with relation to the feed of the contents of the tanks 12 and 13 to the said chambers is controlled by a transversely disposed plug valve 52 having two transverse ports 53 and 54 in planes at right angles to each other so that when the said plug valve is turned in one position the port 53 will be in line with the duct 50 and when turned in another position the port 53 will be closed relatively to the duct 50 and the port 54 opened to the duct 51, the plug valve being controlled as to its operation through the medium of a lever 55 secured to one end thereof and readily operable exteriorly of the one side of the valve seat extension 42ª. Each chamber 43 and 44 has upper and lower outlet ports 56 and 57 extending therefrom and into a receiving chamber 58 provided at the inner portion of the valve seat extension 42ª at the point where the said extension intersects and becomes a part of the upper casing 59, the receiving chamber 58 serving as a mixing chamber and normally closed at its upper end by a screw plug 60. The chamber 58 is downwardly inclined and opens at its lower extremity into the chamber 38 at the upper portion of the upright 5. Each chamber 43 and 44 is varied as to its dimensions throughout its length, the upper part of each chamber being larger than the lower part. By this means a greater quantity of the liquid fuel passes out through the ports 56 than through the ports 57, these ports serving as spray nozzles. The ports, nozzles or orifices 57 are very small and feed by gravity as the liquid fuel gradually moves up to the ports, nozzles or orifices 56 as will be more fully hereinafter explained.

The chamber 38 has an overflow outlet 61 and the top thereof is formed with a screw-threaded opening 62 to receive and support a guide sleeve 63 which depends into the chamber 38 over the nozzle 37, the said sleeve also rising a considerable distance above the top of the chamber 38. The casing 59 at its lower extremity is connected by arms or webs 64 with the top of the chamber 38, and above these webs the interior of the said casing is formed with an annular screw-threaded flange 65 and is engaged by an adjustable nut 66 which is formed with a cavity or chamber 67 opening out through the upper end thereof and also with sockets 68 in the side thereof which are exposed between the arms or webs 64 for the application of a spanner or other suitable tool to adjust the nut within the casing. In the upper part of the casing 59 an inner casing 69 is mounted and is open at both its upper and lower ends, the said inner casing having an upper outer flange 70 secured to the upper portion of the main or outer casing. The casing 69 is of materially less diameter than the portion of the main or outer cas-

ing in which it is fitted to provide a free air space or annular chamber 71 having a side inlet 72 with a flared or bell receiving flange 73 thereover, the said latter flange being adapted to receive the warm air taken off from the exhaust pipe of the motor. An air duct 74 extends through the main or outer casing and communicates at its upper end with the free air space or annular chamber 71 and at its lower terminal with the chamber 58 and through the medium of the latter indirectly with the chamber 38. By this means the heated air within the chamber 71 is fed downwardly into the chambers 58 and 38 and therewith is mingled the comminuted or sprayed liquid fuel medium. The lower end of the inner casing 69 forms a valve seat or an abutment within the outer or main casing, and secured to the latter casing is a shield 75 which is angularly bent to stand inwardly out of contact with relation to a portion of the inner surface of the said outer or main casing to provide an annular space 76 in which the outer flanged periphery 77 of a spray head 78 is movably mounted. This spray head 78 is movable toward and from the lower end of the inner casing 69 and is formed with a central enlargement 79 from which depends a hollow stem 80 movable within the guide sleeve 63 and tightly fitting the latter so as to avoid leakage between the said sleeve and stem. The enlargement 79 of the spray head 78 is formed with a plurality of ports 81 extending therethrough at outward angles of inclination in divergent planes and establishing communication between the interior of the stem 80 and the chamber 82 formed by the inner casing 69. The said enlargement 79 is also provided with ports 83 between the ports 81 and at angles reverse to the latter. It will be seen that an air tight chamber 84 is formed above the nut 66 or between the latter and the spray head 78, and the ports 83 open at their lower terminals into the said chamber 84 and at their upper terminals into the chamber 82. Surrounding the guide sleeve 63 and engaging the lower portion of the enlargement 79 of the spray head around the stem 80 and also extending into the cavity 67 of the nut 66 is a spring 85 whose tension is regulated by the adjustment of the said nut 66. This spring 85, through the adjustment thereof by the nut 66, holds the spray head normally raised and in contact with the lower end of the inner casing 69, and when the said spray head moves downwardly it will be seen that communication will be set up around the lower end of the casing 69 between the chambers 71 and 82. A throttle valve 86 is mounted in the chamber 82 on a shaft 87 which is horizontally disposed and extends diametrically through the inner and outer casing and at one end has a suitable crank handle or other analogous device 88 whereby it may be readily operated to open and close the same.

Assuming that the tanks 12 and 13 have been properly supplied, for instance, respectively with gasolene and coaloil, the operation in connection with gasolene will be as follows: The nut 66 is first adjusted until the light contact of the spray head 78 is established against the lower end of the inner casing 69. The needle valve 39 is then opened and the valve 46 is closed and the chamber 38 is then flushed with gasolene by pressing downwardly on the arm 24 of the valve crank lever 25 and forcing the float 18 downwardly in the chamber 12, this flushing operation of the chamber 38 continuing until the gasolene runs out of the overflow outlet or opening 61. Previous to this operation the throttle valve 86 has been closed, but immediately subsequent to the flushing operation relatively to the chamber 38 as just explained the said throttle valve is opened and the motor is then cranked to start the same. At the first impulse a heavy charge will be drawn into the cylinders of the motor and the latter will immediately operate. The motor is then throttled down to a medium speed for a few seconds until the parts become heated up to normal temperature, when the motor is then further throttled down slowly and the needle valve 39 is at the same time gradually closed until the slowest speed can be had. The needle valve 46, which controls medium and high speed, is then slowly and gradually opened to admit the gasolene into the chamber 58, the said valve 46 being adjusted in this manner until the correct mixture of comminuted or vaporized gasolene and heated air are thoroughly commingled and properly proportioned. During this latter adjustment of the needle valve the motor is gradually speeded up. The heated air enters the chamber 58 as hereinbefore explained through the duct 74 from the chamber 71 and the commingled vaporized gasolene and heated air pass down to the chamber 38 and then upwardly through the lower end of the guide sleeve 63 into the tubular stem 80 and then out through the ports 81 of the enlargement 79 of the spray head. Under the conditions just described the carbureter will be perfectly adjusted for the use of gasolene, the mixture passing through the ports 81 continuing through the chamber 86 to the motor cylinders. When the gasolene is used it will be understood that the plug valve 52 will be adjusted so as to bring the port 54 therethrough in alinement or communication with the duct 51 and thus close off the duct 50 from the chamber 43 containing the needle valve 45. When it is desired to use coaloil alone the plug valve 52 is turned until the port 53

thereof coincides with the duct 50 by opening up the chamber 43 to the tank 13 by way of the duct 30, which is continuous with the duct 50 as hereinbefore explained, and in the latter adjustment of the plug valve 52 the port 54 is turned so as to close the duct 51. When this adjustment of the plug valve 52 has been made, the motor is slowed down gradually and the coaloil from the tank 13 passes up through the ducts 30 and 50 to the chamber 43 and through the ports or nozzles 56 and 57 passes into the chamber 58 in the form of a spray or is thoroughly comminuted or broken up and is mixed with the heated air from the chamber 71 through the duct 74 and passes down to the chamber 38 and then upwardly through the spray head. The lower orifice 57, as hereinbefore indicated, is very small and only feeds by gravity.

The action of the valve or the spray head 78 is as follows: When a vacuum is formed in the chamber 82 air is drawn out of the chamber 84 through the plurality of ports 83, or in other words the same degree of vacuum is had in both chambers 82 and 84 in view of the fact that there is a greater area of the valve exposed to the vacuum in the chamber 84 than there is in the chamber 82. The unbalanced pressure forces the valve or spray head 78 downwardly from its seat and allows the free air to enter the chamber 82 from the chamber 71. The entire adjustment and arrangement of the carbureter is to give uniform mixture from the lowest to the greatest capacity of the carbureter when any kind of combustible adapted for the purpose is used.

When the carbureter is arranged to utilize coaloil and gasolene together, or either alone, the proportionate supply of each is fed respectively from the tank 13 through the ducts 30 and 50, chamber 43 and nozzles 56 and 57, and from the tank 12 through the duct 31, restricted duct 36 and nozzle 37, the mixture of the two hydrocarbons being effected in the chambers 38 and 58 where they are brought in contact with the heated air and the fuel prepared for discharge through the spray head 78 as hereinbefore explained. It will be seen that the coaloil connections or feed means are held separate from the gasolene feed means and either may operate to independently supply coal-oil or gasolene. When the motor is running on coaloil, about ten percent of gasolene is used or is automatically supplied in the carbureter. At extreme low speeds and when the motor falls to low temperature the fuel supply is all gasolene, and when running up to full capacity about ninety percent of coaloil is fed by the carbureter.

The air duct 74 communicating with the air chamber 71 is practically a continuation of the chamber 58, or is a reduced upper portion of the latter chamber and operates to provide enough resistance to form sufficient vacuum around the spray nozzle 37 to draw up an ample charge for extreme low speed. The construction of the spray head 78 is such that its plurality of ports discharges a rich mixture at about right angles with relation to the incoming air, and as the inner casing 69 is warmed or heated by the entire charge of air coming in around it, immediate vaporization of all the liquid that is thrown out against the said inner casing by the plurality of ports in the spray head takes place. It will be understood that the spray head 78 is free to move under variation of pressure and that communication between the chambers 82 and 71 is automatically set up, and, moreover, all resistance to movement of the spray head 78 in a downward direction against the spring 85 by air that may be in the chamber 84 is avoided in view of the provision of the ports 83. The spray head 78 is also always forced back to its normal or adjusted position by the action of the spring 85 and the sensitiveness of operation of the spray head is readily controlled by the adjustment of the nut 66.

What is claimed is:

1. In a carbureter, the combination of a fuel supply source, a casing having a nozzle in communication with the said supply source and upper inner and outer chambers, a mixing chamber having a duct communicating therewith and with the said outer chamber and through which air moves downwardly to the said mixing chamber, and means for automatically setting up communication between the inner and outer chambers.

2. In a carbureter, the combination of a fuel supply source, a casing having a nozzle in communication with said supply source and upper inner and outer chambers, the inner chamber being provided with a throttle valve, a mixing chamber having a duct communicating therewith and with the said outer chamber and through which air moves downwardly to said mixing chamber, and an automatically movable spray head coöperating with the said inner and outer chambers and controlling the communication of the outer chamber with the inner chamber.

3. In a carbureter, the combination of a fuel supply source, a casing having a nozzle in communication with said supply source and upper air supply means, a mixing chamber having a duct communicating therewith and with the said upper air supply means and through which air moves downwardly to said mixing chamber, and an automatically movable spray head cooperating with said air supply means and

having a hollow stem depending therefrom and centrally disposed over the said nozzle.

4. In a carbureter, the combination of a fuel supply means, a casing having a nozzle in communication with said fuel supply means and also having an upper air supply, a duct setting up communication between said air supply means and the nozzle for feeding air to the latter, and an automatically operating spray head movable in relation to said air supply and disposed over the nozzle, the periphery of the spray head being flanged to form a piston which is movable close to the wall of the air supply means.

5. In a carbureter, the combination of a fuel supply source, a casing having a nozzle in communication with said fuel supply source and also provided with upper inner and outer chambers forming air and pressure controlling means, a mixing chamber to which the said nozzle is exposed, a duct leading downwardly from the air controlling chamber to the said mixing chamber, a spray head having a plurality of ports at the center thereof communicating with the inner chamber and also provided with a peripheral flanged construction to form a piston accessory which is movable in the outer chamber, the said spray head controlling communication between the inner and outer chambers and having a depending hollow stem over the said nozzle, and means for automatically moving the spray head and stem.

6. In a carbureter, a source of fuel supply consisting of two tanks each containing a different kind of fuel, a casing having a nozzle in the lower portion thereof and also provided with ducts communicating with said nozzle, a mixing chamber, ducts and valve chambers respectively communicating with the one duct of the nozzle and also with the remaining tank, the valve chambers having upper and lower ports or nozzles opening into the said mixing chamber, a valve extending through the ducts adjacent to the valve chambers and having ports therethrough at angles to each other to shut off one duct and open up the other, needle valves coöperating with the valve chambers and the adjacent ducts, upper inner and outer chambers, the inner chamber constituting the outlet to the motor and the outer chamber being provided to receive hot air, a downwardly extending duct between the outer chamber and the mixing chamber, and a spray head automatically movable in relation to the chambers and disposed over the said nozzle.

7. In a carbureter, a source of fuel supply, a casing having a nozzle in communication with said fuel supply and also provided with upper inner and outer chambers respectively communicating with the motor and a source of hot air, a mixing chamber to which the said nozzle is exposed, an automatically operating spray head movable in relation to said upper inner and outer chambers and disposed over the nozzle, an adjusting nut for the spray head, and a spring interposed between the said nut and head.

8. In a carbureter, independent tanks for supplying different kinds of liquid hydrocarbons, nozzles having communication with the said independent supply tanks and operable as outlet means both independentlv and conjointly, a mixing chamber with which said nozzles have communication, upper inner and outer chambers, the outer chamber being for the reception of heated air and having a downwardly extending duct opening into the mixing chamber and the inner chamber adapted to have communication with the motor and provided with a throttle valve, and an automatically operating spray head coöperating with said inner and outer chambers and disposed over and forming the outlet means for the mixing chamber and the nozzles, the spray head being movable to control communication between the inner and outer chambers.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

FRANKLIN W. HAGAR.

Witnesses:
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JNO. P. HOLT.