P. DANIEL.

CARBURETER.

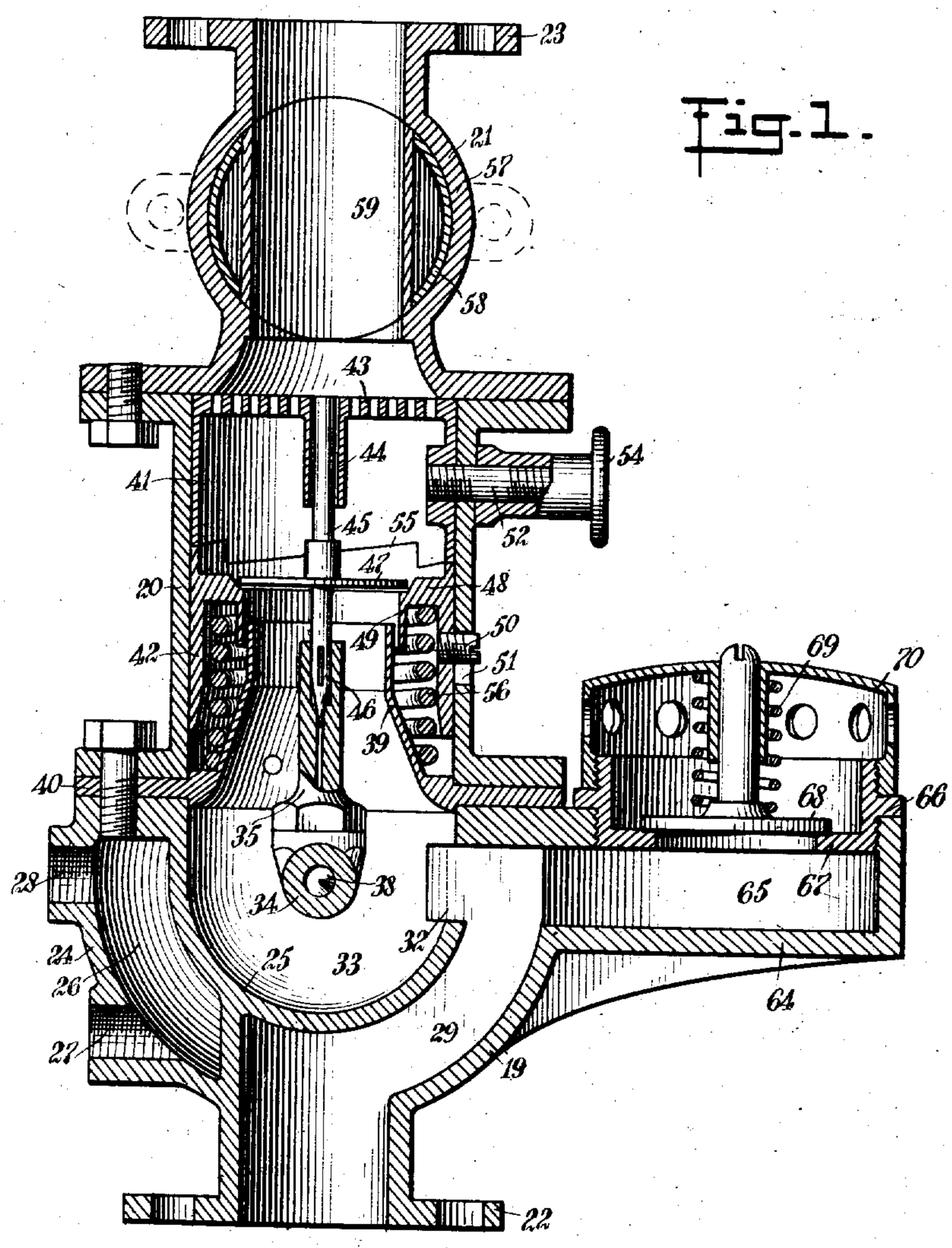
APPLICATION FILED APR. 12, 1910.

974,033.

Patented Oct. 25, 1910.

2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:

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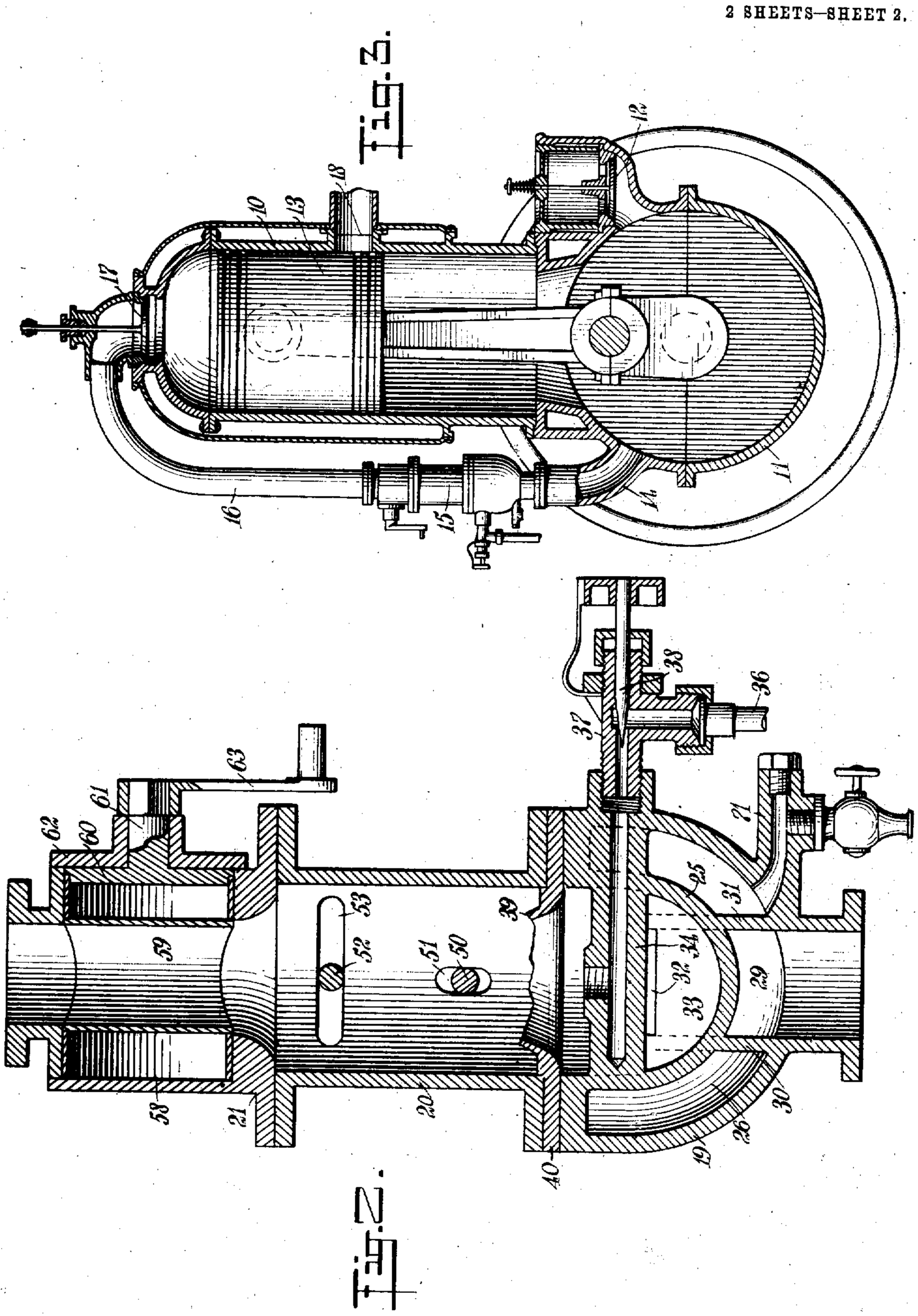
2 SHEETS—SHEET 2.

Fig. 2.



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CARBURETER.

974,033. Specification of Letters Patent. Patented Oct. 25, 1910.

Application filed April 12, 1910. Serial No. 554,968.

To all whom it may concern:

Be it known that I, PAUL DANIEL, a citizen of the Republic of France, and a resident of Perth Amboy, in the county of Middlesex and State of New Jersey, have invented a new and Improved Carbureter, of which the following is a full, clear, and exact description.

This invention relates to certain improvements in carbureters and more particularly to a type of carbureter designed for use in connection with two-cycle internal combustion engines for charging the air with the liquid fuel after the air has been compressed and while being delivered from the compression chamber to the explosion chamber. By charging the air after the latter has left the compression chamber, I avoid any possible explosion within said compression chamber, due to "back fire" or to any other cause.

One object of my invention is to provide for the escape of gas from the carbureter in case of back fire, so that the pressure of the exploded charge will not be communicated to the compression chamber.

A further object of my invention is to provide an improved means for controlling the size of the air passage through the carbureter, and thus to control the explosion charge.

A still further object of my invention is to provide for the heating of the air before its delivery to the spray nozzle, so as to facilitate the vaporization of the fuel and the forming of the mixture.

Other objects of my invention and important features of construction will be set forth more fully hereinafter and particularly pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate correspondng parts in all the figures, and in which—

Figure 1 is a vertical section through a carbureter constructed in accordance with my invention; Fig. 2 is a longitudinal section taken in a plane at right angles to the plane of Fig. 1, a portion of the operating parts within the mixing chamber being removed; and Fig. 3 is a longitudinal section through an engine having my improved carbureter embodied therein.

My invention does not reside in any specific construction of engine, but in order to clearly disclose the function and construction of the parts, I have illustrated my carbureter in connection with an engine in Fig. 3. In this figure, I have shown an engine having a cylinder 10, adapted to serve as an explosion chamber and supported upon a crank case 11, adapted to serve as a compression chamber. Air is drawn into the crank case from the atmosphere, past a spring-pressed valve 12, by the action of a piston 13 during the up stroke of the latter. During the down stroke, the air which is free from any liquid fuel, is delivered through an outlet conduit 14 to my improved carbureter 15, and thence through a conduit 16 to the inlet valve 17 at the outer end of the engine cylinder. The exhaust port 18 of the engine is uncovered by the piston when the latter is adjacent the end of its down stroke, so that the exhaust gas may escape and the explosive mixture enter at the upper end of the cylinder and force the remainder of the exhaust gas downwardly and out at the exhaust port. It will be noted that there is no explosive mixture in the crank case at any time, and, therefore, there is no danger of an explosion in the crank case. Thus, the crank case may be formed of very light material and of only sufficient strength to stand the compression to which the air is normally subjected.

My improved carbureter illustrated in detail in Figs. 1 and 2, is formed of three main sections arranged in alinement with each other. In the specific form illustrated, these three sections are formed of three separate castings 19, 20 and 21. The lowermost section 19 is the air-heating and liquid fuel-delivering section, and also carries the emergency air outlet. The intermediate section contains the mixing chamber, and the regulating means, while the upper section carries the throttle valve. The sections are provided with suitable flanges, to facilitate the bolting together of the parts, and the sections when secured together provide a continuous passage from the lower end of the lower section to the upper end of the upper section 21. The lower section is provided with a base flange 22 adapted to be bolted to the corresponding flange on the conduit 14, and the upper section is provided with a terminal flange 23 adapted to be bolted to the delivery conduit 16. The

lower section 19 has two substantially hemispherical concentric walls 24 and 25, spaced apart to leave a chamber 26 therebetween, and this chamber has suitable inlet and exhaust ports 27 and 28, whereby the exhaust gas from the engine or warm water from the engine cooler may be circulated to heat the air, as the latter is delivered through the section 19. The chamber 26 does not extend entirely around the section, but instead a portion is partitioned off by walls 30 and 31, to form a passage 29, which communicates at its lower end with the inlet to the section 19, and at its upper end communicates through a port 32 with the center chamber 33, which is hemi-spherical in form and bounded by the wall 25. Extending diametrically across the chamber 33, is a conduit 34, one end of which extends to the exterior of the section. Axially of the carbureter, a nozzle 35 is screwed into the upper side of the conduit 34 and extends upwardly therefrom into the center section 20. The liquid fuel is delivered through the conduit 34 and up through the nozzle 35 from any suitable source. Preferably, the liquid fuel is under pressure and is delivered from the pressure tank through a conduit 36 to a valve casing 37, which is screwed into the outer end of the conduit 34. Within this valve casing, I provide a needle valve 38, and connected to the valve there is preferably means for retarding or preventing the free or accidental turning of the valve.

Disposed within the carbureter section 20, is an air nozzle 39, concentric with the fuel nozzle 35 and spaced therefrom to leave an annular passage for the air. The air nozzle 39 is preferably supported by an annular flange 40, which rests upon the upper end of the lower section 19 and is bolted in place between the sections 19 and 20. Closely fitting within the section 20, are two sleeves 41 and 42 in alinement with each other and spaced from the nozzle 39. The upper section has a perforated partition plate 43 at its upper end and adjacent the upper end of the section 20, and this perforated plate has a central tube or guide 44 for receiving and laterally supporting the valve stem 45 of a needle valve 46, which sets within the upper end of the fuel nozzle 45. The valve stem carries a disk or plate 47, of substantially the same size as the air nozzle 39, but normally spaced above the upper end of the latter. The sleeve 42 has an inwardly-directed annular flange 48, the inner edge portion of which is normally adjacent and below the periphery of the plate 47, so as to constitute a valve seat for the latter. The flange 48 has a depending flange 49 at its inner edge, which telescopes with the air nozzle 39. The sleeve 42 is held against rotation but is free to move longitudinally a limited distance. The controlling means illustrated is a stud or pin 50 carried by the sleeve 42 intermediate its ends and extending out through a longitudinally-disposed slot 51 in the wall of the section 20.

The sleeve 41 is free to rotate a limited distance but is held against longitudinal movement. The means for controlling the movements of this sleeve is illustrated as a pin 52 rigid with the sleeve 41 and extending outward radially therefrom through a slot 53, which is disposed circumferentially of the section 20. The pin or stud 52 may readily be grasped to rotate the sleeve 41, or it may be provided with a threaded knob 54, which serves as a handle and which when tightened against the wall of the section 20, prevents accidental rotation of the sleeve. The abutting ends of the sleeves 41 and 42 are provided with a series of cams 55, so that when the parts are in the position indicated in Fig. 1, the sleeve 42 is in its upper limiting position and is held in such position by a coil spring 56, disposed beneath the flange 48 and between the sleeve 42 and the air nozzle 39. At this time the seat on the flange 48 is spaced a short distance from the plate 47, so that there will be a limited annular passage between the periphery of the plate 47 and the seat. By rotating the sleeve 41, the sleeve 42 may be forced downwardly against the action of the spring 56 and the seat may be carried to a greater distance away from the disk 47, so as to increase the cross sectional area of the passage.

The upper section 21 serves merely to carry a throttle valve for manually controlling the flow of fluid to the engine cylinder. In the specific form illustrated, the section is provided with a substantially cylindrical valve casing 57, and within this casing is a cylindrical valve plug 58, preferably formed of sheet metal and rotatable about a horizontal axis. Through the sheet metal valve plug, there extends a tube or passage 59, which may be brought into or out of alinement with the vertical passage through the section. Any suitable means may be provided for rotating this valve, but, as shown, the valve is provided with an end plate 60, having a stem 61 extending out through a plate 62 constituting the end of the valve casing, and to the end of the stem a suitable crank 63 is connected.

In the normal operation of the engine, air is taken into the crank case past the valve 12 and is compressed therein and delivered through the conduit 14 and through the carbureter. Within the carbureter the air travels through the passage 29 and port 32, and thence upwardly through the air nozzle 29 and lifts the valve plate 47, so as to permit the fuel nozzle to spray the fuel upwardly. The greater the speed of the engine, the greater will be the speed at which the air is caused to travel through the air nozzle

39, and the higher will be lifted the valve plate 47, so that the supply of fuel may be increased with an increase in the speed of the engine. If the engine be run at a very low speed, the valve plate 47 will only open the spray nozzle to the limited extent. The extent to which the plate 47 is lifted and the valve 46 opened, will depend upon the extent of the annular air passage around the periphery of the plate. This distance may readily be controlled by rotating the upper sleeve 41, and thus raising or lowering the lower sleeve 42. This regulation may take place entirely independently of the throttle valve, and the latter will serve merely its usual function of controlling the supply of the charge to the engine.

In my improved construction I not only avoid the introduction of any fuel charge in the crank case of the engine, but I also provide a safety outlet, whereby gas may escape in case of a back fire, or in case of an ignition of the charge within the conduit 16. This safety outlet I preferably provide on the lower section 19, as shown in Fig. 1. The section 19 has cast integral therewith an outwardly-extending hollow branch 64, and the chamber 65 within this branch communicates with the passage 29 opposite the port 32. Screwed into an opening in the top wall of this chamber 65, is a collar 66 having a valve seat 67. A valve plate 68 rests upon this seat and is pressed into engagement therewith by a suitable coil spring 69. A perforated cap 70 is also secured to the collar 66, so as to protect the valve and to constitute a guide for the valve stem. The spring 69 is sufficiently strong to prevent the valve from lifting under the pressure of the compressed air delivered from the crank case, but in case of a back fire, the valve 68 may rise and the gas will escape through the ports in the cage or cap 70. It will be noted that the downward pressure of the gas within the conduit 16 will force the plate 47 downwardly, so as to effectively close the fuel nozzle. The pressure exerted upon the shoulder or flange 48 will force the sleeve 42 downwardly against the action of the spring 56, so as to give a free passage around the valve plate or disk 47. The valve plate 47 is free to move upwardly to open the passage in the normal operation of the engine, and the sleeve 42 is free to move downwardly and open the passage in case of back fire. It will thus be seen that the passage is automatically controlled and injury to the carbureter or to the engine in case of back fire is safeguarded against.

Various changes may be made in the details of construction and the arrangement of parts without departing from the spirit of my invention. Various attachments may be applied thereto and various features of minor importance may be added or removed. For instance, the heating chamber 26 may be provided with a valve-controlled outlet 71, for draining any water of condensation which may collect in the heating chamber. A similar valve-controlled draw-off may be provided for the inner chamber 33.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. A carbureter having a passage therethrough and a valve and valve seat within said passage, said valve being movable in one direction by the delivery of gas to the engine and said valve seat being movable away from said valve upon the passage of gas in case of back fire.

2. A carbureter having a gas nozzle, a spray nozzle extending longitudinally thereof, a needle valve controlling said spray nozzle, a valve stem for said needle valve and extending lengthwise of said passage, a valve plate carried by said valve stem and substantially closing said passage, and a valve seat adjacent said first-mentioned valve and movable in respect thereto upon the return flow of gas through the carbureter.

3. A carbureter having a gas nozzle, a spray nozzle extending longitudinally thereof, a needle valve controlling said spray nozzle, a valve stem for said needle valve and extending lengthwise of said passage, a valve plate carried by said valve stem adjacent said first-mentioned valve and movable in respect thereto upon the return flow of gas through the carbureter, and a valve-controlled emergency gas outlet from said carbureter.

4. A carbureter having a substantially cylindrical casing section, a spray nozzle extending longitudinally thereof, a sleeve within said section and having a valve seat, a needle valve controlling said spray nozzle and having a valve stem extending lengthwise of the passage, a disk carried by said valve stem and disposed adjacent said seat, a spring for moving said sleeve longitudinally to bring the valve seat toward the valve, and manually-controlled means for moving said sleeve against the action of the spring.

5. A carbureter having a cylindrical casing section, a sleeve longitudinally movable therein and having a valve seat, an air nozzle within the casing section and extending longitudinally thereof, a spring intermediate said nozzle and said sleeve and tending to move said sleeve in one direction, and a valve supported adjacent said seat but independent thereof.

6. A carbureter having a substantially cylindrical casing section, two sleeves mounted therein and in alinement with each other, one of said sleeves being rotatable and the other of said sleeves being longitudinally

movable, means for moving one of said sleeves longitudinally upon the rotation of the other, and a spring tending to prevent said longitudinal movement.

7. A carbureter having a substantially cylindrical casing section, two sleeves mounted therein and in alinement with each other, one of said sleeves being rotatable and the other of said sleeves being longitudinally movable, means for moving one of said sleeves longitudinally upon the rotation of the other, a spring tending to prevent said longitudinal movement, and a valve substantially closing the passage through said longitudinally movable sleeve.

8. A carbureter having a substantially cylindrical casing section, a member within said casing and presenting a valve seat, said member being free to move lengthwise of said casing, and a rotatable member carried by said casing and having cam engagement with said valve seat for moving the latter lengthwise of the casing.

9. A carbureter having a substantially cylindrical casing section, a member within said casing and presenting a valve seat, said member being free to move lengthwise of said casing, a rotatable member carried by said casing and having cam engagement with said valve seat for moving the latter lengthwise of the casing, and a valve for coöperating with said valve seat, said valve having limits of movement independent of the position of the valve seat.

10. A carbureter having a substantially cylindrical casing, two telescoping members within said casing, one of said members comprising a nozzle and delivering lengthwise of the casing and the other of said members presenting a valve seat, a valve movable toward and from the first-mentioned member, and means for adjusting the position of the second-mentioned member in respect to the first-mentioned member.

11. A carbureter having a casing, an air delivery nozzle delivering lengthwise thereof, a fuel delivery nozzle within said air nozzle, a valve stem having separate valves for controlling said nozzles, and means constituting a valve seat for the air valve and movable toward and from said air nozzle.

12. A carbureter having a casing, an air delivery nozzle delivering lengthwise thereof, a fuel delivery nozzle within said air nozzle, a valve stem having separate valves for controlling said nozzles, and means constituting a valve seat for the air valve and automatically movable away from said valve in case of back fire.

13. A carbureter having a passage therethrough, and a valve and a valve seat within said passage, said valve being movable in one direction by the delivery of gas to the engine and said valve seat being manually adjustable relatively to the valve and automatically movable away from the valve upon the passage of gas in case of back fire.

14. A carbureter having a passage therethrough, and two members coöperating to substantially close said passage, one of said members being automatically movable to open the passage by the inflowing gas, and the other of said members being manually adjustable relatively to the first-mentioned member and being automatically movable in the reverse direction to open the passage in case of back fire.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

PAUL DANIEL.

Witnesses:
C. W. FAIRBANK,
PHILIP D. ROLLHAUS.