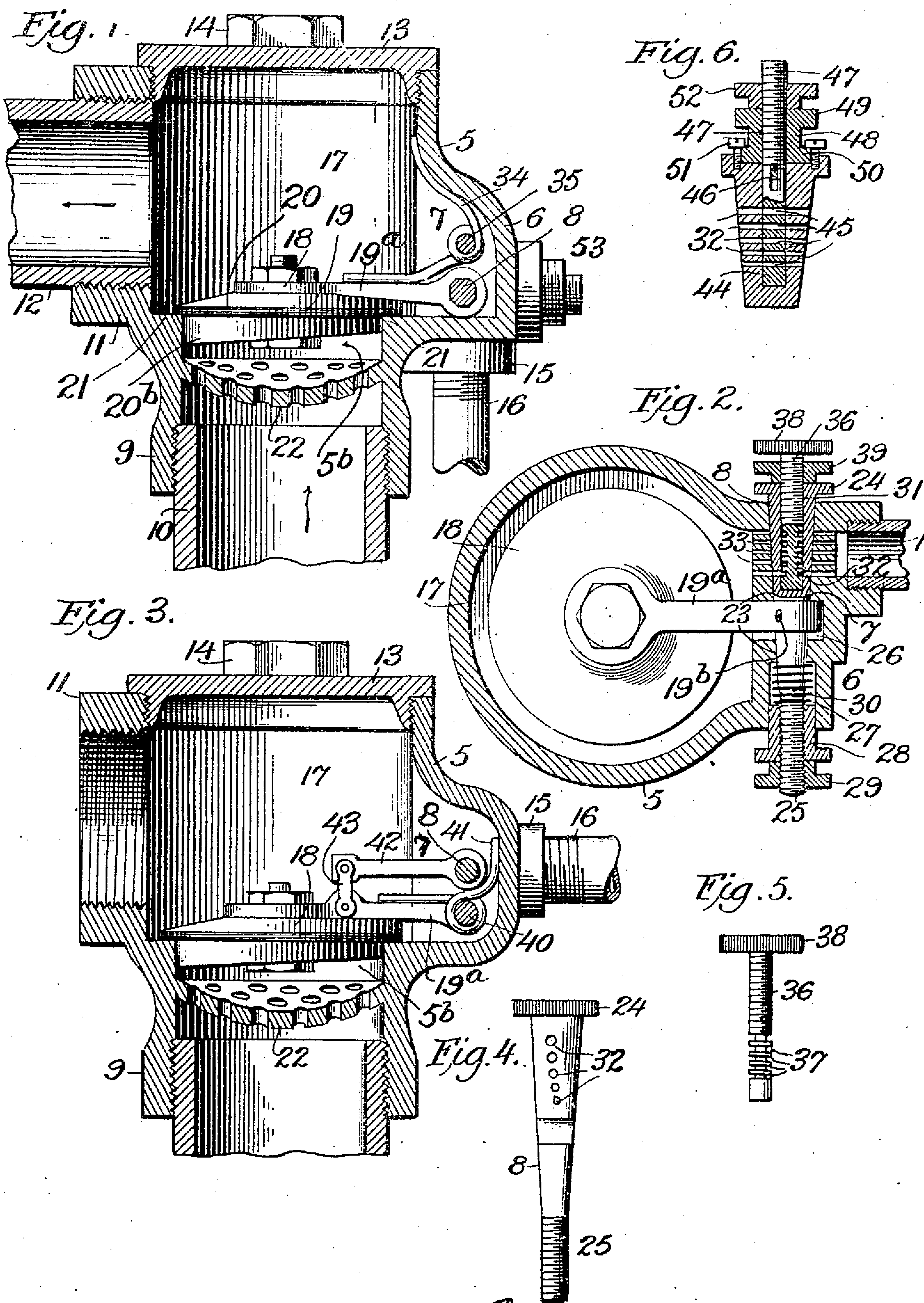
No. 895,709. PATENTED AUG. 11, 1908.

E. F. & G. H. ABERNETHY.

CARBURETER FOR HYDROCARBON ENGINES.

APPLICATION FILED JAN. 19, 1904.

2 SHEETS—SHEET 1.



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By their Attorneys
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2 SHEETS—SHEET 2.

Fig. 7.

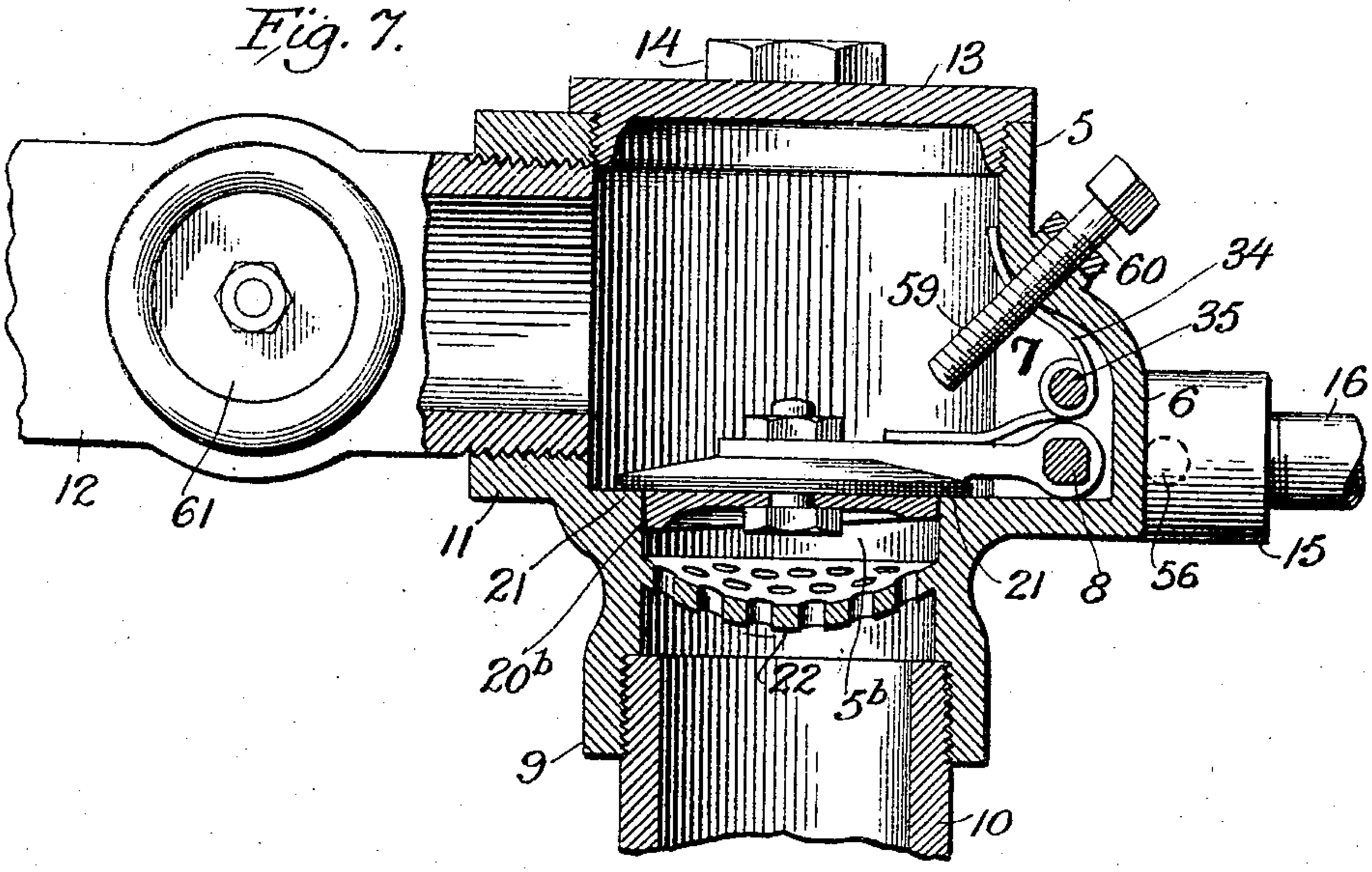
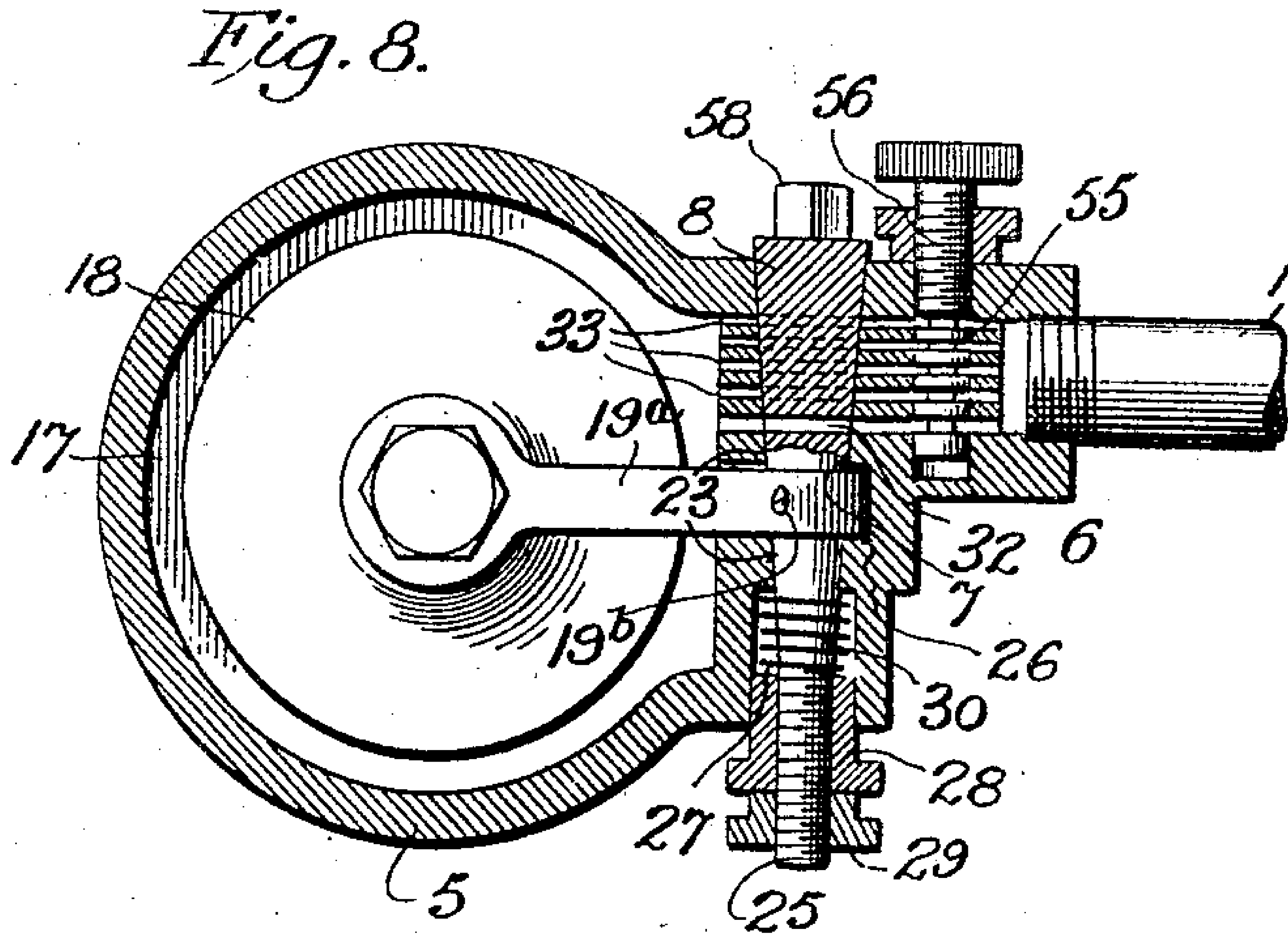


Fig. 8.



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UNITED STATES PATENT OFFICE.

EDWIN F. ABERNETHY AND GEORGE H. ABERNETHY, OF NEW YORK, N. Y.

CARBURETER FOR HYDROCARBON-ENGINES.

No. 895,709. Specification of Letters Patent. Patented Aug. 11, 1908.

Application filed January 19, 1904. Serial No. 189,671.

To all whom it may concern:

Be it known that we, EDWIN F. ABERNETHY and GEORGE H. ABERNETHY, citizens of the United States, and residents of the city of New York, borough of Brooklyn, in the county of Kings and State of New York, have invented a new and useful Improvement in Carbureters for Hydrocarbon-Engines, of which the following is a specification.

Our invention relates to improvements in carbureters of that class intended to be used in connection with explosive engines, wherein the suction from the engine-cylinder operates to draw in a charge of a combustible vapor or mixture, the latter being ignited at a proper period in the operation of the engine by a suitable "sparker" or igniter, in order to explode the combustible charge and produce a gas, the energy of which is utilized for driving the engine piston. In this class of devices difficulty is experienced in securing the admixture of a proper quantity of the fuel with the air, and of regulating the proportion of fuel to the air. We overcome these objections by an automatically operating contrivance which includes an air valve that is opened by the suction created by the engine, a fuel valve controllable by the movement of the air valve and adapted to be opened and closed in unison therewith, and means for regulating the volume or quantity of fuel admitted at each period in the opening movement of the fuel-valve, said regulating means being adjustable independently of the operation of the fuel valve and being accessible for adjustment while the carbureter is in service.

The invention contemplates the employment of a rocking fuel-valve constituting the axis of movement of a swinging air valve, the latter being mounted on the fuel-valve and serving as a means for positively operating the same. With the fuel-valve is associated an independently adjustable fuel regulating contrivance which, in one form of construction, is embodied as a stem adjustable endwise with respect to the fuel-valve; an end portion of said stem, or a device associated therewith, being accessible to the operator for conveniently adjusting the same. According to this part of the invention, the fuel-valve has a longitudinal bore or passage, and a plurality of graduated transverse ports. The stem is fitted snugly in the longitudinal bore so as to prevent leakage, and said stem is formed with grooves or passages adapted for registration with the transverse ports of the fuel-valve; said stem being adapted for endwise adjustment within said fuel-valve in order to regulate the quantity of fuel admitted by said valve to the path of air which traverses the carbureter.

The fuel regulating means of our improved carbureter may be adjusted to vary the supply of fuel with such nicety that any required amount of fuel may be combined with the air to produce a mixture or combustible vapor of any strength. The new device by reason of the nicety of fuel regulation may be used to good advantage in connection with a hydrocarbon, such as gasolene, naphtha, or the like, or in connection with a gas. We have found that the devices operate successfully on a low grade of hydrocarbon, and they also work well in cold weather when, as is well known, a hydrocarbon does not ordinarily vaporize freely and quickly, thereby adapting our device to fulfil all the conditions required for practical service.

Although we have described our invention as being especially adapted for use in connection with explosive engines, it will be understood that we do not intend to restrict our invention to this particular use, because we are aware that it may be employed in other arts and in other relations.

Further objects and advantages of the invention will appear in the course of the subjoined description, and the actual scope thereof will be defined by the annexed claims.

Reference is had to the accompanying drawings, forming a part of this specification, wherein corresponding characters are used to indicate like parts in the several figures. Figure 1 is a vertical sectional elevation through an automatic carbureter constructed in accordance with our present invention. Fig. 2 is a horizontal sectional plan view of the carbureter shown by Fig. 1, the section being taken through the casing and through the rocking fuel valve, together with means for regulating the effective area of the fuel port. Fig. 3 is a vertical sectional elevation of another form of construction embodying our invention. Fig. 4 is a detail view of one form of rocking-plug fuel-valve contemplated by the invention. Fig. 5 is a detail view of regulating spindle or stem adapted for use in connection with said valve, and shown removed therefrom. Fig. 6 is a detail sectional view through a fuel valve and the regulating stem, illustrating a modified form of construction for imparting endwise adjustment to the stem. Fig. 7 is a vertical section through another form of carbureter embodying our invention. Fig. 8 is a horizontal section of a carbureter of the general type shown by Figs. 1, 3, and 7, illustrating a fuel-regulating valve mounted independently of the fuel controlling valve.

In carrying our invention into practice, we employ a casing 5, which may be of any suitable form and dimensions, but as shown by the drawings, the casing is approximately circular in cross section, with a flattened rear side, 6, the latter being chambered, as at 7, and constructed for the accommodation of a tapering plug-valve, 8, the latter constituting the fuel-valve of our improved device, as will be hereinafter described. The casing, 5, is provided with a nipple, 9, adapted to serve as an air inlet, to which nipple a pipe, 10, may or may not be connected, as preferred; and said casing is furthermore provided with a nipple, 11, serving as a suction connection for an explosive engine. As shown, this suction nipple, 11, has a suction pipe, 12, screwed thereto, said pipe serving as the operative connection between the chamber of the carbureter and the engine cylinder; but such operative connection between the engine and the carbureter may be obtained by any way known to those skilled in the art.

The upper side of the casing, 5, may be closed by a removable head, 13, which is provided with a knob, 14, for the application of a wrench or other tool in removing the head, and said flattened and extended rear side of the casing is shown by Figs. 1 and 2 as being provided with a connection, 15, for a fuel-pipe, 16, the latter having communication with the air chamber, 17, through the plug-valve, 8.

In Fig. 1, the fuel pipe 16 is shown as leading downwardly from the chambered rear side, 6, of the casing, but this particular location of said pipe 16 is immaterial, because it may extend horizontally from the rear side of the casing as shown by Fig. 2.

Within the chamber, 17, is arranged an air valve, 18, which is shown in the form of a flap valve mounted for swinging movement as distinguished from a sliding movement, but it is to be understood that we do not desire to confine ourselves to a special valve of the swinging type, because we may employ any suitable kind of air admission valve adapted to be opened by suction from an engine and and connected operatively with the rocking plug forming the fuel-valve. Said air valve occupies normally a closed position for cutting off the admission of air to the chamber, 17, and it is adapted to be opened solely by the inrush of air when the engine operates to create a suction through the carbureter for the intake of the combustible mixture or vapor that constitutes the explosive charge. Said air valve may be of any suitable or preferred construction, but as shown it is provided with a suitable facing, 19, such as a leather washer, with an arm, 19ª, and a disk-shaped member, 20. The arm serves as a means for mounting the air valve for movement on a horizontal axis, and in the form of construction shown by Figs. 1 and 2, said valve is adapted to be connected by the arm with the fuel valve, to make the latter serve as the axis of movement of the air valve, or the air valve may be mounted independently of the fuel-valve, as in the construction of Fig. 3. According to either method of mounting the air valve, it serves as the means for controlling the movement of the fuel-valve, and said air valve is held to its closed position by the operation of a retractor which, in the present instance, is represented in the form of a spring, whereby the air valve is adapted to also serve as a check valve in keeping the pressure of the engine from backing up, especially when the carbureter is used in connection with a two cycle explosive engine, and it also acts as a check valve in case of "back fire" in the engine.

The disk or member, 20, of the air valve is clamped with the washer, 19, to the metallic body of the valve, 18, said washer being interposed between the valve-body and the member 20. This member is of less diameter than the washer and the valve-body, and it is provided with a flange, 20^b, the latter being tapered from the free edge of the valve toward the hinged side thereof. Said flange of the valve member projects into the space, 5^b of the casing provided between the valve seat and the perforated baffle, and said flange is arranged to play in the space, 5^b, so that when the washer 19 leaves the valve seat on the initial opening movement of the valve, that portion of the flange, 20^b at the free end of said valve will close the air passage for a very limited time, thus giving the fuel plug valve an opportunity to open by the time that the flange 20^b leaves the space, 5^b, of the casing, whereby the fuel and air are admitted to the chamber 17 in a way to secure the immediate admixture of the fuel with the air and thus produce a proper combustible vapor. When the air valve is returned toward its seated position, the fuel valve is entirely closed to shut off the inflow of fuel before the air valve is fully seated, the flange, 20^b cutting off the flow of air prior to the operation of seating the air valve.

The casing, 5, is provided in its chamber 17 with a ledge or shoulder, 21, which forms the seat for the air valve, 18, and between this valve and the air inlet is arranged a means for dividing or splitting the inrushing current of air in order to split the same into fine streams, the better to absorb or take up the fuel that is admitted to the chamber 17 by opening the fuel valve, the fuel being allowed to spread or diffuse itself over the spreader and thus placed directly in the path of the divided streams of air, in order to secure a perfect admixture of the fuel and air. This dividing or spreading means is represented by Figs. 1 and 3 of the drawings as a baffle plate, 22, of any desired cross sectional shape, and it is provided with a multiplicity of perforations through which the air is adapted to pass when the air valve is opened.

The extended rear side, 6, of the casing is provided with a number of bearing openings, 23, for the accommodation of the fuel valve, 8, the latter being in the form of a tapering plug to more effectually prevent leakage of the hydrocarbon used as fuel in devices of this class. One end of this valve plug is provided with a milled head, 24, while the other end is extended to produce a cylindrical shank, 25, the latter being formed with a male thread at its extremity. The extended rear side, 6, of the casing is formed with a space or cavity, 26, between two of the bearing openings, 23, which space is spanned by a part of the tapering plug or fuel valve. On this part of said valve is fitted the end portion of the arm, 19^a, of the air valve, said arm projecting into the space or cavity, 26, and being made fast in a suitable way to the fuel-valve, as for example by a set screw, 19^b, thereby making the fuel valve turn or rock with the air valve, so that the two valves are operatively connected for conjoint movement and the air valve is mounted direclty on the fuel valve. By fitting the valve plug, 8, in the bearing openings, 23, which are provided on opposite sides of the point of attachment of the arm 19^a to said plug, leakage of hydrocarbon, admitted to the carbureter, is prevented through the chambered part 26 of the casing.

At one side of the cavity, 26, the extended rear part, 6, of the casing is provided with a chamber, 27, into which is fitted a gland, 28, the latter being screwed on the shank, 25, of the valve-plug, 8, said gland being engaged by a check nut, 29, that is also screwed on the shank of the plug-valve. Within the chamber, 27, is arranged a coiled spring, 30, that fits loosely around the plug valve and acts against the gland 28, for the purpose of holding the fuel valve snugly in the seat provided therefor in the casing, said seat including the bearing openings, 23. It is evident that the tension of the spring may be regulated by adjustment of the gland in one direction or the other on the shank of the valve, 8, and this gland is prevented from turning accidentally out of its adjusted position by the check nut.

The valve plug, 8, is provided with a bore or passage 31 which extends lengthwise through a part of the valve and through the headed end, 24, thereof. Said valve is furthermore provided with a plurality of transverse passages, 32, which intersect with the longitudinal bore, 31, thereof; said passages 32 being disposed in the staggered or disalined relation lengthwise of the valve, as shown by Fig. 4.

In the construction shown by Fig. 2, that part of the extended rear side, 6, of the casing in which the valve 8 is seated, is provided with a number of fuel passages, 33, with which the passages 32 of the fuel valve are adapted to register.

As shown by Fig. 2, the fuel passages, 33, of the casing are of graduated sizes to increase in diameter from one end passage to the other of the series, whereas the passages 32 of the plug valve, 8, are uniform in diameter and arranged in the staggered order; but this relative arrangement of the fuel passages in the casing and in the fuel-valve may be reversed by making the passages in the casing of uniform diameter and those in the plug of graduated diameters. In the arrangement shown by the drawings, the passages of the fuel-valve are adapted, when it is moved to an open position, to register successively with the passages of the casing in order to admit a gradually increasing quantity of fuel to the chamber 17 dependent upon the area of the air inlet afforded by the air valve when it is opened. As the air valve assumes a partially opened condition by the inrush of air, the fuel valve 8 is turned to bring its first passage 32 into register with the large passage, 33, of the casing, and on the continued opening movement of the air valve, the plug valve 8 turns further around in its seat so as to bring two or more of the passages 32 successively into register with the passages, 33, the first passage or passage, 32, remaining in communication with the larger passage or passages 33 in a way to avoid cutting off the supply of fuel through the passages first opened and to increasingly admit fuel to the chamber 17 on the continued opening movement of the two valves, thereby admitting the proper quantity of fuel in proportion to the air supplied to the chamber for securing a proper combustible vapor.

Fuel is admitted to the extended rear part, 6, of the casing by the pipe, 16, to pass through one or more of the coincident passages in said casing and the valve, 8, according to the number of passages in each series which are brought into service by the opening movement of the fuel valve by the operation of the air valve, but normally the two valves 8 and 18 occupy closed positions, in order to cut off the passage of air, the ingress of fuel, and any possible back pressure or back firing from the engine. A spring, 34, is mounted on a pin or bolt, 35, the latter being secured in the rear chambered part 6 of the casing, one end of said spring acting against the air valve, or its arm, while the other end of the spring is seated against the casing, see Fig. 1.

The regulating stem, 36, is externally threaded for a part of its length, and it is provided with a plurality of annular collars forming a like number of annular grooves or channels, 37, said stem being also provided with a milled head, 38. In case the fuel passages through the valve plug 8, are of uniform size, the grooves 37 must be also of uniform width; but if the fuel passages in the valve plug are of graduated sizes, then it is necessary to make the annular grooves vary in width correspondingly to said passages although it will be understood that we reserve the right to construct the valve plug, the regulating stem, and the passages in the casing in a way to secure the desired admission and control of the fuel to be supplied to the chamber 17.

The stem, 36, is fitted in the longitudinal bore, 31, of the valve plug, to have threaded engagement therewith, and to bring the grooved portions thereof into registration with the passages of the valve, the headed end 38 of said stem being exposed beyond the corresponding end of the valve. On said stem is screwed a check nut, 39, adapted to abut the end of the fuel valve and to prevent accidental displacement of the stem within the valve. By screwing back the check nut, the stem 36 may be screwed into or out of the fuel valve more or less, for regulating the position of its grooved portion with relation to the passages, 32, of the plug, 8, and provision is thus made for effecting a variation in the effective area of the ports formed by the passages 32 in the fuel valve, whereby the volume of fuel supplied by the valve 8 to the carbureter may be regulated to a nicety.

In the construction shown by Fig. 3 of the drawings, the air valve and the fuel valve are mounted independently of each other, although they are connected operatively in order to make the fuel valve controllable by the air valve as contemplated by this invention. According to this embodiment of the invention, the arm, 20ª of the air valve is mounted on a pin or bolt, 40, which is provided in the rear chambered part of the casing, and around this pin is fitted the coiled spring, 41, one end of which acts against the air valve, while the other end is seated against the casing. The fuel valve is fitted to its seat in parallel relation to the axis of movement of the air valve, and the two valves are coupled by an arm, 42, the latter being fast with the fuel valve, said arm being connected by a link, 43 with the air valve. The link, 43, is pivoted to the air valve and to the arm of the fuel valve at points which are separated for a distance equal to that between the axes of motion of the air valve and the fuel valve, and thus the arms, 19ª and 42 of the two valves are kept in parallel relation in the opened and closed positions of said valves, thereby insuring the proper conjoint movement of the two valves.

We do not confine ourselves to the described means for effecting the endwise adjustment of the regulating stem in the fuel valve, nor to the grooved form of the stem, because in Fig. 6 of the drawings we have shown another form of construction which secures the desired end. Instead of screwing the stem by a rotary motion directly into the fuel valve, and providing said stem with annular grooves, we may provide the stem, 44, with transverse bores, 45, the latter being staggered similarly to the fuel passages of the fuel valve and being either of uniform size or of graduated sizes correspondingly to the fuel passages of the plug, 8. This stem is splined, at 46, to the fuel valve, in order to limit it to endwise movement in said valve, and said stem is externally threaded, at 47. An adjusting nut, 48, has threaded engagement with the threaded part, 47, of the stem, said nut being provided with a head 49 and with a flange, 50, the latter abutting the end of the plug valve and held or confined loosely thereon by the heads of screws, 51, that are fastened to the end portion of the plug, 8. Said nut is thus mounted on the fuel valve in a way to turn freely thereon, but it is held against endwise displacement. By rotating the nut in one direction or the other, the stem is moved endwise in the fuel valve, but the spline holds the stem against rotation, whereby the bores of the stem may be adjusted more or less into registration with the passages of the fuel valve, for regulating the effective area of the valve passages and consequently determining the quantity of fuel admitted by said valve, when opened either partially or wholly, to the carbureter. The stem and the nut are confined in their adjusted positions by a check nut 52, the same being screwed on the threaded part of the stem and engaging with the adjusting nut.

In Fig. 1 of the drawings we have shown the extended rear part of the casing as being provided with a removable cleaning plug, 53, and the fuel pipe, 16, is arranged vertically, but these details are unimportant and may be varied at will, as for example, by arranging the fuel pipe in a horizontal position and attaching it to the rear side of the casing, see Fig. 3.

The operation of our invention will be readily understood from the foregoing description taken in connection with the drawings. Normally, the air valve and the fuel valve are closed, either by the back pressure from the engine or by the spring, but at a proper time, the suction of the engine causes an inrush of air that opens the air valve, the inward movement of which rocks the fuel valve to an open position proportionately to the like position of the air valve, thus admitting fuel to the chamber 17, which quickly flows or spreads itself over the inner surface of the chamber and over the perforated baffle, so as to be diffused in a manner which facilitates its absorption by the air, the latter being divided or split into thin streams by the perforated baffle, thereby securing a thorough admixture of the air and fuel to produce a perfect combustible mixture or vapor. When the suction ceases, the spring acts to quickly return the air valve to its closed position, and the return movement of the air valve is communicated to the fuel valve, the flange of said air valve acting to exclude the air just after the fuel valve closes.

Although we have shown and described the casing as having graduated fuel passages, and the fuel valve as being provided with staggered passages of uniform size, or vice versa, it should be understood that we also reserve the right to use graduated passages in the casing and graduated passages in the fuel valve, thus providing for the control of the fuel supply to the chamber 17 under proper conditions in the service of the carbureter.

In the service of the carbureter in connection with automobile engines, we find that it is desirable to provide means for regulating the quantity of fuel admitted by the fuel valve plug independently of the operation of the fuel valve itself, and to this end, we extend or increase that part of the casing in which the fuel passages 33 are provided, as shown by Fig. 8, in order that an additional bore or valve seat, 55, may be provided in the casing. This bore or valve seat accommodates the regulating stem or valve, 56, which may be mounted for rotary adjustment and provided with annular grooves, as in the construction of Figs. 2 and 5, or it may be provided with transverse bores and fitted to the casing for slidable adjustment, as in the construction of Fig. 6. In case the independent regulating valve is used, the plug valve, 8, is simply provided with the staggered transverse passages, such as heretofore described, and said valve 8 is provided at its exposed end with a key 58, or the like, whereby it may be manipulated by hand in starting the engine, if desired, although said fuel valve is controlled automatically by the play of the air valve when the carbureter is in service. It is to be understood that the separate fuel regulating valve, 56, may be provided with a milled head and check nut for its adjustment, or with a rotary nut and check nut, as in Figs. 2 and 6 respectively, but we reserve the right to provide any suitable means for adjusting the regulating stem from the automobile, as desired. The regulating stem or valve 56 may be either cylindrical, or it may be conical similar to the plug of the fuel valve. Of course, the fuel-valve plug operates in unison with the air valve, so that it is subject to considerable wear which is taken up automatically by the action of the spring, 30, but there is very little wear, if any, on the regulating stem or valve, because the latter may be adjusted at intervals, such as made necessary by atmospheric changes.

For preventing excessive motion of the air valve, we may employ an adjustable stop, 59, shown by Fig. 7 in the form of a screw which finds a threaded bearing, 60, in the casing 5. Said screw terminates adjacent to the air valve, to limit the inward swinging movement thereof, but it may be adjusted toward or from the air valve, to increase or decrease its amplitude of movement as conditions may require.

It is customary in some engines to employ a throttle in the suction connection between the carbureter and the engine, and in Fig. 7 we have indicated the position of the throttle valve at 61. This throttle valve may be adjusted to increase or diminish the volume of carbureted vapor adapted to be supplied to the engine, thus controlling the force of the explosion and effecting a regulation in the speed of the engine.

Changes in the form, size, proportion and minor details of construction may be made without departing from the spirit or sacrificing the advantages of our invention, and we therefore reserve the right to make such alterations as fairly fall within the scope of the invention as defined by the annexed claims.

What we claim as new and desire to secure by Letters Patent is:—

1. In a carbureter, a fuel valve provided with a plurality of fuel passages, adjustable means coöperating with said valve for varying the area of said passages, and means operated by a suction draft through the carbureter for operating the fuel valve.

2. In a carbureter, a fuel valve provided with a plurality of graduated fuel passages, means coöperating with said fuel passages for varying the area of the fuel inlet, and means for operating said valve.

3. In a carbureter, a casing provided with a plurality of fuel passages, a fuel valve having a plurality of fuel passages in registration with said passages of the casing, means coöperating with said passages of the valve for varying the quantity of fuel admitted to said casing, and means for operating the fuel valve.

4. A carbureter having a casing, an air valve, a tapered fuel valve having a plurality of openings and seated in said casing and adapted to be rocked by said air valve when the latter is opened by a suction draft through said casing, and an adjustable stem for regulating the effective area of the port

formed by said perforations in the fuel valve.

5. A carbureter comprising a casing, a fuel-valve mounted in said casing for rocking movement therein, a suction-operated member movable in the casing, and means connecting said member with said fuel valve, whereby the fuel valve is operated by the suction operated member.

6. A carbureter comprising a casing having a chamber and a fuel-valve seat, a fuel valve fitted to said seat for rocking movement therein, an air valve pivoted in the casing for swinging movement in said chamber thereof, and means connecting the fuel valve and the air valve whereby the fuel valve is rocked by the swinging movement of the air valve.

7. A carbureter comprising a casing having means for admitting air thereto, a rocking fuel valve, and an air valve mounted on the fuel valve, the latter constituting the axis of movement of the air valve.

8. A carbureter comprising a casing having a chamber and a fuel-valve seat, an air valve pivoted to said casing for swinging movement in the chamber thereof, a fuel-valve occuping said seat of the casing and adapted to turn axially therein, means connecting said air valve with said fuel valve for rocking the latter by the swinging movement of the air valve, and means for keeping the air valve closed.

9. In a carbureter, a casing having a plurality of fuel passages, a fuel valve provided with fuel passages adapted to register with said passages of the casing, a stem coöperating with one group of said passages for varying the area of the fuel inlet to the casing, and means for adjusting said stem.

10. In a carbureter, a casing, a rocking fuel valve seated in said casing, said valve having a plurality of fuel passages and an axial bore, a suction-operated element for actuating said fuel valve, a stem in the axial bore of the fuel-valve and coöperating with the passages thereof for regulating the area of the fuel inlet to the casing, and means for adjusting said stem.

11. A carbureter comprising a casing having a fuel-valve seat and a plurality of graduated fuel-passages, a rocking fuel valve fitted to said seat and provided with passages arranged to register with those of the casing, and an air valve connected operatively with the fuel valve.

12. A carbureter comprising a casing having a fuel-valve seat and a plurality of fuel passages, a rocking fuel-valve fitted to said seat and provided with a plurality of ports which are disposed in disalined relation and are adapted for successive registration with the passages of the casing, and an air valve connected operatively with the fuel valve.

13. A carbureter having a casing, a fuel valve having a bore and a plurality of ports, an endwise movable stem occupying the bore and having ports adapted for registration with those of the fuel valve, and an air valve connected with the fuel valve.

14. A carbureter having a casing, a rocking fuel valve having a plurality of transverse passages, a stem fitted to the fuel valve for movement therewith and capable of an endwise adjustment with respect to said transverse passages in the valve for regulating the effective area of the port therein, and an air valve connected operatively with the fuel valve.

15. A carbureter comprising a casing having a suction connection and an air inlet, a rocking fuel valve, an air valve mounted on the fuel valve, a perforated baffle between the air inlet and the fuel valve, and means for normally seating both valves.

16. A carbureter comprising a casing, a tapering fuel valve seated in said casing for rocking movement therein, a swinging air valve, means whereby the swinging movement of the air valve is communicated to the fuel valve for rocking the latter on its axis, and means acting on one of said valves for holding both of them in closed positions.

17. A carbureter comprising a casing having a plurality of graduated fuel passages, a rocking fuel valve provided with staggered or disalined ports which are adapted for registration successively with the passages of the casing, means for regulating the effective area of the ports in the fuel valve, and an air valve controllable by suction through the casing and connected operatively with the fuel valve.

18. In a carbureter, a casing, an air valve adapted to be opened by a suction draft through the casing, an axially-turning valve for admitting fuel to the casing, and means connecting the two valves whereby a suction draft on the air valve operates both valves simultaneously to open the air and fuel inlets to said casing.

19. A carbureter having a rocking fuel valve provided with a plurality of transverse ports, means for regulating the effective area of the ports in said valve independently of the rocking movement thereof, and a suction operated air valve connected operatively with the fuel valve for rocking the latter.

20. In a device of the class described, a valve having transverse fuel passages of graduated cross sectional area, means internally of said valve for varying the area of said passages, and means for operating said valve.

21. In a device of the class described, a tapering valve having transverse fuel passages, means internally of said valve for varying the area of said passages, and a swinging member operated by a suction draft for automatically rocking said tapering valve.

22. In a device of the class described, a casing having a plurality of fuel passages of graduated cross sectional area, a valve provided with a plurality of fuel passages adapted to register with the passages of the casing, adjustable means coöperating with said valve for varying the area of the fuel passages therein, and means independent of the aforesaid adjusting means for operating the fuel valve.

In testimony that we claim the foregoing as of our invention we have signed our names in the presence of two subscribing witnesses.

EDWIN F. ABERNETHY.
GEORGE H. ABERNETHY.

Witnesses:
CORNELIUS P. McLAUGHLIN,
PERCY J. EDWARDS.