No. 791,192. PATENTED MAY 30, 1905.

E. HAYNES.

CARBURETER FOR EXPLOSIVE ENGINES.

APPLICATION FILED AUG. 21, 1902.

Fig 1

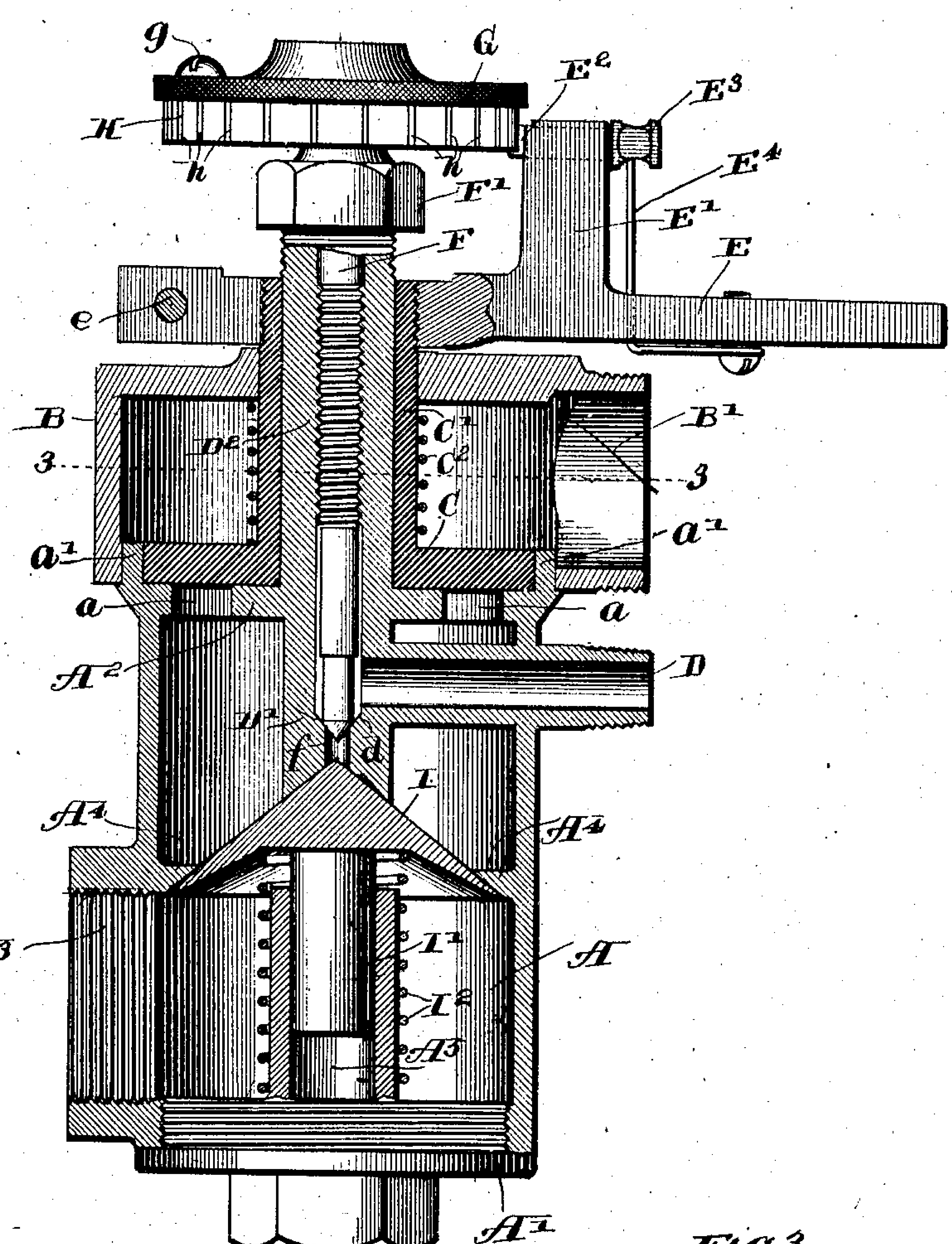


Fig 2

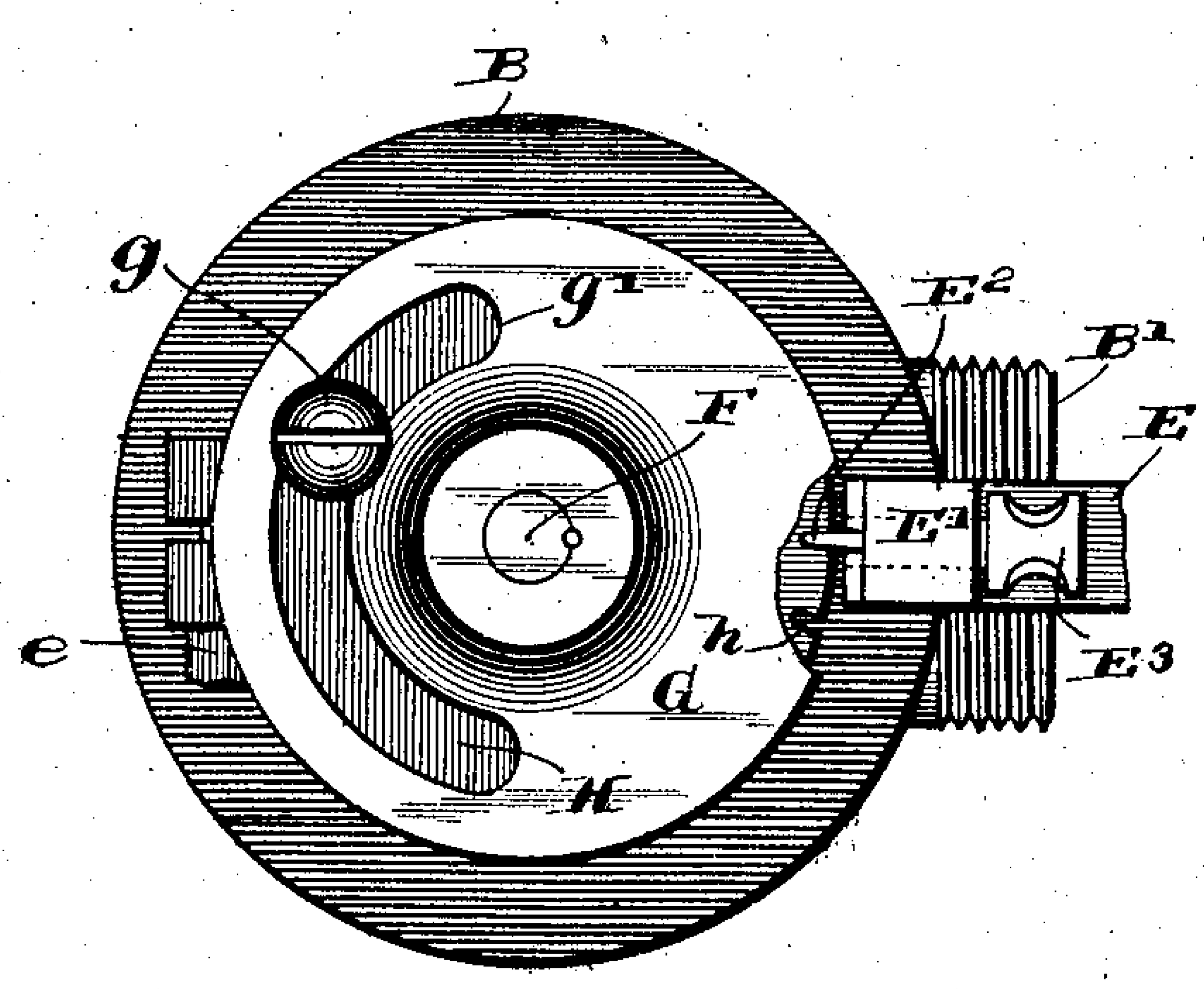
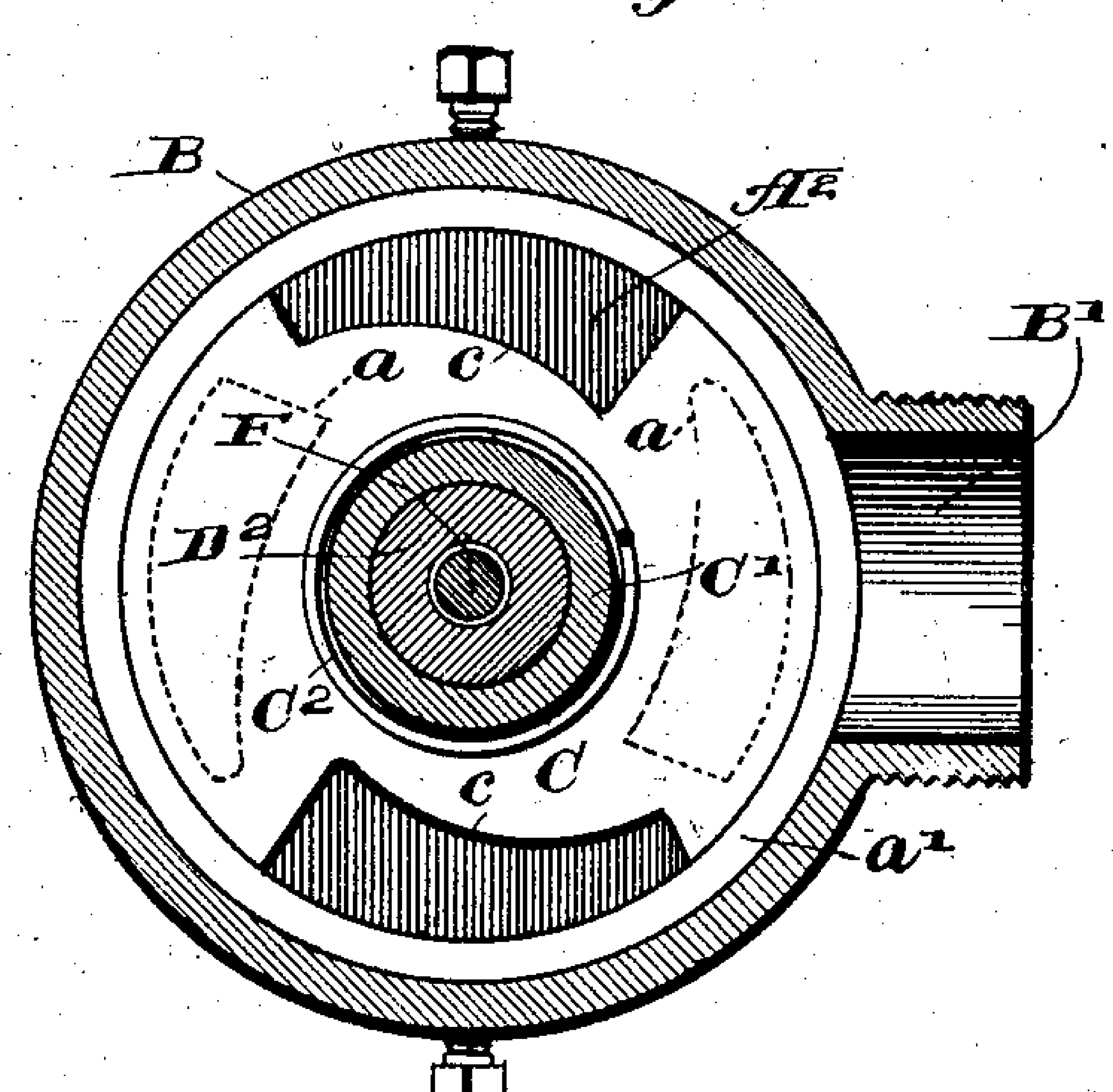


Fig 3



Witnesses:-

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UNITED STATES PATENT OFFICE.

ELWOOD HAYNES, OF KOKOMO, INDIANA.

CARBURETER FOR EXPLOSIVE-ENGINES.

SPECIFICATION forming part of Letters Patent No. 791,192, dated May 30, 1905.

Application filed August 21, 1902. Serial No. 120,507.

To all whom it may concern:

Be it known that I, ELWOOD HAYNES, of Kokomo, in the county of Howard and State of Indiana, have invented certain new and useful Improvements in Carbureters for Explosive-Engines; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in carbureters designed for use with explosive-engines to produce a suitable explosive mixture of air and hydrocarbon vapor or air and gas; and the invention consists in the matters hereinafter set forth, and more particularly pointed out in the appended claims.

In the drawings, Figure 1 is a longitudinal axial section of a carbureter made in accordance with my invention. Fig. 2 is a plan view thereof with parts broken away. Fig. 3 is transverse section taken on line 3 3 of Fig. 1.

As shown in the drawings, A designates a mixing-chamber consisting of a hollow casing made cylindric, as herein shown, and provided near its lower end with an exit-passage A^3, adapted for communication with the explosive-cylinder of a gas-engine. The lower end of said chamber is closed by a removable screw-threaded plug A′. The upper wall A^2 of said chamber is shown as made integral with the cylindric wall thereof, and said upper wall is made flat and is provided with one or more air-ports *a* for admission to said chamber of air, two ports, located on diametrically opposite sides of the wall, being herein shown.

B designates an air-chamber which is located above and incloses the upper end of the mixing-chamber casing and is provided with an air-inlet opening B′. Said air-chamber is open at its lower end and fits over a narrow annular flange *a′*, inclosing the upper end of the wall of the mixing-chamber. The passage of air from said air-chamber to the mixing-chamber is controlled by a flat rotative valve C, which fits upon the flat upper face of the top wall A^2 of the mixing-chamber and within the annular flange *a′* of said wall. Said valve C is provided with ports *c*, Fig. 3, which are adapted to be brought into and out of register with the ports *a* by rotation of said valve. The air-valve is shown in the drawings as closed. The valve C is provided with an upwardly-directed stem C′, which is shown as made hollow and to which is affixed a lever E, which when assembled in the engine has suitable connection with the engine-governor, as will be hereinafter more fully explained. The valve is held on its seat by a spiral spring C^2, surrounding the hollow stem and interposed between the valve and the top wall of the air-chamber.

D designates the hydrocarbon-inlet of the carbureter, which communicates at its inner end with a hollow barrel D′, arranged axially in said mixing-chamber. As herein shown, said barrel is made integral with and extends downwardly from the top wall of the mixing-chamber. Said barrel is provided with an extension D^2, which extends upwardly from the top wall of the mixing-chamber through and beyond the hollow stem of the air-valve C. Said barrel and hollow stem extend upwardly through the top wall of the air-chamber B, the former extending beyond the latter. The upper end of said stem is screw-threaded, and the attached end of the lever is split and provided with a screw-threaded opening to receive the hollow stem. The lever is clamped upon the hollow stem by a clamping-bolt *e*, which extends through the split end of the lever, as shown most clearly in Fig. 2. Extending downwardly through said barrel and its extension is a rotative stem F, which has screw-threaded engagement with the barrel. Said stem is tapered at its lower end to form a tapered valve *f*, which engages an upwardly-facing conical seat *d* in said barrel, located just below the entrance of the hydrocarbon-inlet pipe thereto. The stem is reduced below its screw-threads to provide in the barrel around the stem a passage-way for the hydrocarbon fluid entering said barrel to permit the fluid to pass downwardly to the lower end of the barrel when the hydrocarbon-valve is open. The valve-stem F extends upwardly beyond the top of the barrel D^2

and is adapted for attachment thereto of an actuating device for the valve, the valve being moved toward and from its seat by rotation of the stem. A stuffing-box F′ surrounds the stem at the upper end of the barrel to prevent the escape of hydrocarbon fluid between said parts.

Means are provided for simultaneously opening and closing the air and hydrocarbon valves, and said means are so constructed that the position of one of said valves may be varied with respect to the other, whereby the proportions of air and hydrocarbon in the mixture may be varied to suit the requirements of each particular instance. Said regulating means are, furthermore, so designed that when proper proportions of air and hydrocarbon have been established the same proportions may be maintained, notwithstanding the large or small volume of the mixture used.

The means herein shown for regulating the air and hydrocarbon valves in the manner set forth is as follows: The valve-stem F is provided at its upper end with a rigidly-attached disk G, constituting a flange. It is not necessary that said flange have the form of a complete circular disk. Mounted loosely on said stem below said flange is a disk H, which is adapted to be locked to the flange by means of a screw *g* passing downwardly through the flange and engaging a screw-threaded opening in the disk. The screw *g* extends through a curved slot *g′* in the flange G, said slot being concentric with the axis of the disk. With this construction, therefore, the disk H when released from said flange G may be adjusted angularly with respect to said flange for a purpose hereinafter to be described. When the disk H is attached to the flange G by the screw *g*, said disk is rigid with the valve-stem by reason of the fixed relation of the flange G to said stem.

The shaft F is rotated from the lever E to open and close the hydrocarbon-valve in unison with the similar movements of the air-valve by the following construction: Said lever E is provided with a vertical arm E′, which is provided near its upper end with a transverse opening in which is mounted a longitudinally-reciprocating detent E^2, which is adapted to enter one of a number of marginal notches or slits *h* in the disk H. Said detent is provided with a thumb-piece E^3, by which it may be retracted from the notches, and the detent is held normally in engagement with said notches by means of a spring E^4, which is attached to said arms and bears inwardly against the detent in the manner clearly shown in Fig. 1. With this construction (it being remembered that the lever E is attached rigidly to the hollow stem C′ of the valve C) when the detent is engaged with one of the notches *h* of the disk H and the disk H and flange G locked together it will be obvious that the swinging of said lever on its axis will effect rotative movement of both the air and hydrocarbon valves, thus opening in unison the passage for the air and the hydrocarbon fluid.

When it is desired to vary the proportions of the hydrocarbon and air of the mixture, this result is effected as follows: The detent E^2 is released from the disk H, after which the stem F, through the medium of the flange G, may be rotated to move the hydrocarbon-valve relatively to the air-valve toward or from its seat, depending upon whether the supply of hydrocarbon is to be increased or decreased. After the independent adjustment of the valve has been thus effected the detent E^2 is reëngaged with one of the peripheral notches of the disk H, after which the valves are moved simultaneously and in unison by the lever E. It will be observed that the angular adjustment described has advanced the hydrocarbon-valve or retracted it, depending upon the direction of its angular adjustment with respect to the air-valve. If desired, the air-valve may be angularly adjusted after the detent E^3 has been released, with the accomplishment of the same results as before stated. Should the adjustment described be not sufficiently accurate to produce the proper proportions of the mixture, the disk H may be released from the flange G by unfastening the screw *g* and angularly adjusted a fractional part of the distance between the adjacent notches *h* of the disk H. A considerable range of relative adjustment of the valves is provided in order to insure perfect seating of valves, which are made in large number and which may slightly vary in their contour and dimensions. In this manner I am enabled to vary in wide limits the air and hydrocarbon constituents of the mixture, and at the same time when the desired proportions are established am enabled to maintain such proportions, notwithstanding that a greater or less volume of the mixture may be used as varying conditions may require.

It will be observed by reference to Fig. 3 of the drawings that the advanced ends of the ports of the valve C, with respect to the direction of rotation of said valve, are made narrower than at the other ends and that the ports in the upper wall A^2 of the mixing-chamber are correspondingly formed. This formation of the ports is provided to produce a gradual opening of the air-valve to accord with the gradual opening of the hydrocarbon-valve. In this manner I am enabled to absolutely maintain a predetermined proportion of the constituents of the mixture without regard to the volume of the same being used at any given time.

A check-valve I is interposed between the end of the barrel D′ and the exit-opening A^3 of the carbureter leading to the explosion-cylinder of the engine. Said check-valve is provided with a tapered face and engages a conical-shaped seat in the end of said barrel and when seated cuts off the flow of gasolene to the mixing-chamber. Said valve is made of greater diameter than the barrel and engages near its outer margin when seated against the barrel an inclined annular seat formed on the margin of a flange A^4 in the mixing-chamber. When said valve is seated, therefore, it not only cuts off the supply of gasolene to the mixing-chamber, but prevents the passage of air from the upper to the lower end of the mixing-chamber. Said valve is provided with a stem I′, which has telescopic engagement with a hollow stud A^5, formed integral with the plug A′, constituting the lower wall of the mixing-chamber. A spring I^2, surrounding said hollow stud and bearing at one end against the valve and at its other end against the plug, acts to hold said valve seated.

In the operation of the carbureter in connection with an explosive-engine the outlet-passage A^3 for the mixture is connected with the explosion-cylinder, and at each outward movement of the piston the vacuum created in the cylinder and the lower end of the mixing-chamber opens the check-valve I′ and admits a charge of admixture of air and hydrocarbon. When the valve is released from the seat at the end of the barrel B′, the fluid hydrocarbon flows downwardly over the inclined face of the valve in a thin film and is taken up by the air rushing downwardly over the same to form the explosive mixture, the extended surface of the valve I and the discharge of the liquid hydrocarbon in a thin film thereover promoting a prompt and effective mixture of the air and gasolene.

The carbureter shown may be used for mixing a hydrocarbon, such as gasolene, with air or may be employed for mixing with air a stable gas or for mixing other gases or gaseous mixtures, and in either event the operation of the adjusting mechanism is the same.

It is obvious that the form of the device herein shown may be varied without departing from the spirit of my invention, and I do not wish to be limited to such structural details except as hereinafter made the subject of specific claims.

I claim as my inventtion—

1. A carbureter comprising a mixing-chamber provided with a hydrocarbon-inlet passage and with an air-inlet passage, concentrically-arranged valves, one for controlling the hydrocarbon-inlet passage and the other for controlling the air-inlet passage, means for simultaneously opening or closing both valves, and means for adjusting the opening and closing positions of said valves relatively to each other.

2. A carbureter comprising a mixing-chamber provided with a hydrocarbon-inlet passage and with an air-inlet passage, valves controlling said passages provided with concentrically-disposed stems, one of which is tubular and surrounds the other, and a lever affixed to one of said stems and having detachable connection with the other stem, whereby both valves may be simultaneously opened or closed and means whereby one of the valve-stems may be angularly adjusted with respect to the other.

3. A carbureter comprising a mixing-chamber provided with a hydrocarbon-inlet passage and with an air-inlet passage concentrically disposed with respect to the hydrocarbon-inlet passage, concentrically-disposed valves for controlling the said passages, and means for simultaneously adjusting said valves relatively to their seats.

4. A carbureter comprising a mixing-chamber provided with a hydrocarbon-inlet passage and with an air-inlet passage concentrically disposed with respect to the hydrocarbon-inlet passage, concentrically-disposed valves for controlling the said passages, means for simultaneously adjusting said valves relatively to their seats, and means for varying the positions of said valves relatively to each other.

5. A carbureter comprising a mixing-chamber provided with a hydrocarbon-inlet passage and with an air-inlet passage, valves controlling said passages provided with concentrically-disposed stems, one of which is tubular and surrounds the other, a lever affixed to one of said stems a part on the other stem which is capable of angular adjustment thereon, and detachable interlocking connections between said angularly-adjustable part and said lever.

6. A carbureter comprising a mixing-chamber provided with an exhaust-passage, with a hydrocarbon-inlet passage and with an air-inlet passage, concentrically-disposed valves in said chamber for controlling said hydrocarbon and air inlet passages, means for simultaneously moving said valves relatively to their seats, means for varying the positions of said valves relatively to each other, a check-valve located in said chamber between said hydrocarbon-passage and the exhaust-passage, and seats formed in said chamber and at the exit end of the hydrocarbon-passage against which said check-valve seats when closed.

7. A carbureter comprising a mixing-chamber provided with an exhaust-passage, and with concentrically-disposed air and hydrocarbon inlet passages, valves for controlling said passages, means for simultaneously moving said valves relatively to their seats, means for varying the positions of said valves relatively to each other, a conical check-valve located in said chamber, an annular seat in said casing, against which said check-valve seats near its outer margin, and a seat formed at the exit end of the hydrocarbon-passage against which the tapered end of said check-valve seats when the outer margin thereof is seated against said annular seat.

8. A carbureter comprising a mixing-chamber provided with an exit-passage and with a wall provided with air-inlet ports, a rotative

valve seated against said wall and provided with corresponding ports, a hollow stem on said valve, a lever fixed to said hollow stem, a hydrocarbon-inlet passage, a valve for controlling said passage, said valve being provided with a stem which extends outwardly through the hollow stem of the air-valve, a part on the outer end of said hydrocarbon-valve stem, and a detent on said lever adapted for interlocking engagement with said part.

9. A carbureter comprising a mixing-chamber provided with an exit-passage, and provided with a wall having air-inlet ports, a rotative valve fitted against said wall and provided with corresponding ports, said valve being provided with a hollow stem, a lever fixed to said hollow stem, a barrel located axially in said mixing-chamber, and communicating with an inlet-passage for hydrocarbon, said barrel being provided with an extension which extends outwardly through the hollow stem of the air-valve, a screw-threaded stem in said barrel provided with a tapered end which engages a conical seat in said barrel to control the supply of hydrocarbon to the mixing-chamber, a part on the outer end of said hydrocarbon-valve stem which is provided with marginal notches, and a detent carried by said lever which is adapted for engagement with said notches.

10. A carbureter comprising a mixing-chamber provided with an exit-passage and provided with a wall having air-inlet ports, a rotative valve fitted against said wall and provided with corresponding ports, said valve being provided with a hollow valve-stem, a lever fixed to said hollow valve-stem, a barrel located axially in said mixing-chamber, and communicating with an inlet-passage for hydrocarbon, said barrel being provided with an extension which extends outwardly through the hollow stem of the air-valve, a screw-threaded stem in said barrel provided with a tapered end which engages a conical seat in said barrel to control the supply of hydrocarbon to the mixing-chamber, said stem being provided at its outer end with a part having marginal notches, a detent carried by said lever which is adapted for engagement with said notches, and a check-valve located between the end of the said barrel and said exhaust-passage, said valve being adapted to close said barrel, and an annular seat in the mixing-chamber which is adapted for engagement by said valve to cut off the escape of air from said mixing-chamber.

11. A carbureter comprising a mixing-chamber provided with an exit-passage, and with a wall provided with air-inlet ports, a rotative valve seated against said wall and provided with corresponding ports, said valve being provided with a hollow stem which extends outside of the device, a lever fixed to said stem, a barrel located axially in said mixing-chamber and provided with an extension which extends outwardly through and beyond said hollow stem of the air-valve, a screw-threaded stem in said barrel provided with a tapered point which engages a conical seat in said barrel, a hydrocarbon-inlet passage leading to said barrel above said seat, a flange on the upper end of said hydrocarbon-valve stem, a disk which is capable of angular movement on said stem and adapted to be locked to said flange, said disk being provided with a plurality of marginal notches, and a detent on said lever adapted to severally engage said notches.

12. A carbureter comprising a mixing-chamber provided with an exit-passage for the carbureted air and with a wall provided with ports, a rotative valve seated against said wall and provided with corresponding ports, said valve being provided with a hollow stem which extends outside of the device, a lever fixed to said hollow stem, a barrel located axially in said chamber and provided with an extension which extends upwardly through and beyond the hollow stem of the air-valve, a screw-threaded stem in said barrel provided with a conical point adapted to engage a seat in said barrel, an inlet-passage for the hydrocarbon-opening into said barrel above said seat, a flange on the outer end of said hydrocarbon-valve stem, a freely-rotative disk on said stem, said flange being provided with a curved slot concentric with its axis, a screw extending through said slot and into the disk for locking said disk to the flange, and a detent on said lever adapted for interlocking connection with said disk.

13. A carbureter device comprising a mixing-chamber provided with an exit-passage, an air-chamber provided with an air-inlet passage, a wall or partition between said air and mixing chambers provided with ports, a rotative valve seated against said wall and provided with corresponding ports, said air-valve being provided with a hollow stem which extends outwardly through the wall of said air-chamber, a lever fixed to said extended part of said valve-stem, a barrel located centrally over said mixing-chamber and provided with an extension which extends upwardly through and beyond the hollow stem of the air-valve, a screw-threaded stem in said barrel provided with a conical point adapted to engage a seat in said barrel, a hydrocarbon-inlet passage communicating with said barrel above said seat, a part on the upper end of said valve-stem which is normally fixed thereto but capable of angular adjustment thereon, and a detent on said lever adapted for interlocking connection with said part on the valve-stem.

14. A carbureter comprising a mixing-chamber provided with an exit-passage and with concentrically-located inlet-passages for hydrocarbon and air, concentrically-located valves for controlling said inlet-passages, means for simultaneously opening or closing

both valves, means for varying the opening and closing positions of the valves relatively to each other, and a check-valve located between the hydrocarbon-passage and said exit-passage of the mixing-chamber, adapted, when seated, to cut off the supply of hydrocarbon to the mixing-chamber and also to cut off the passage of air from the mixing-chamber to the exit-passage.

15. A carbureting device comprising a mixing-chamber provided with an exit-passage, and with a wall provided with ports, a rotative valve seated against said wall and provided with corresponding ports, a hydrocarbon-inlet passage leading to said mixing-chamber, a valve for controlling said hydrocarbon-inlet passage, and means for giving simultaneous movement to said hydrocarbon and air valves to adjust the same, the ports of said air-valve being made tapered at their advanced ends, with respect to the direction of rotation of said valve.

16. A carbureter comprising a mixing-chamber provided with a hydrocarbon-inlet passage, and with an air-inlet passage, concentrically-located valves, one for controlling the hydrocarbon-inlet passage, and the other for controlling the air-inlet passage, a single lever for simultaneously opening or closing both valves and swinging on an axis concentric with the axes of the valves, and means for varying the opening and closing positions of said valves relatively to each other.

17. A carbureter comprising a casing; a mixing-chamber in said casing having a fuel-inlet and an air-inlet; valves controlling said fuel and air inlets; concentric shafts for operating said valves; means connected with one of said shafts for simultaneously opening or closing both of said valves; and means for adjusting said valves relatively to each other substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses, this 12th day of August, A.D. 1902.

ELWOOD HAYNES.

Witnesses:
E. E. SANDERS,
M. C. WYGANT.