No. 726,191. PATENTED APR. 21, 1903.

W. READLE.

VAPORIZING VALVE FOR EXPLOSIVE ENGINES.

APPLICATION FILED JAN. 17. 1901.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

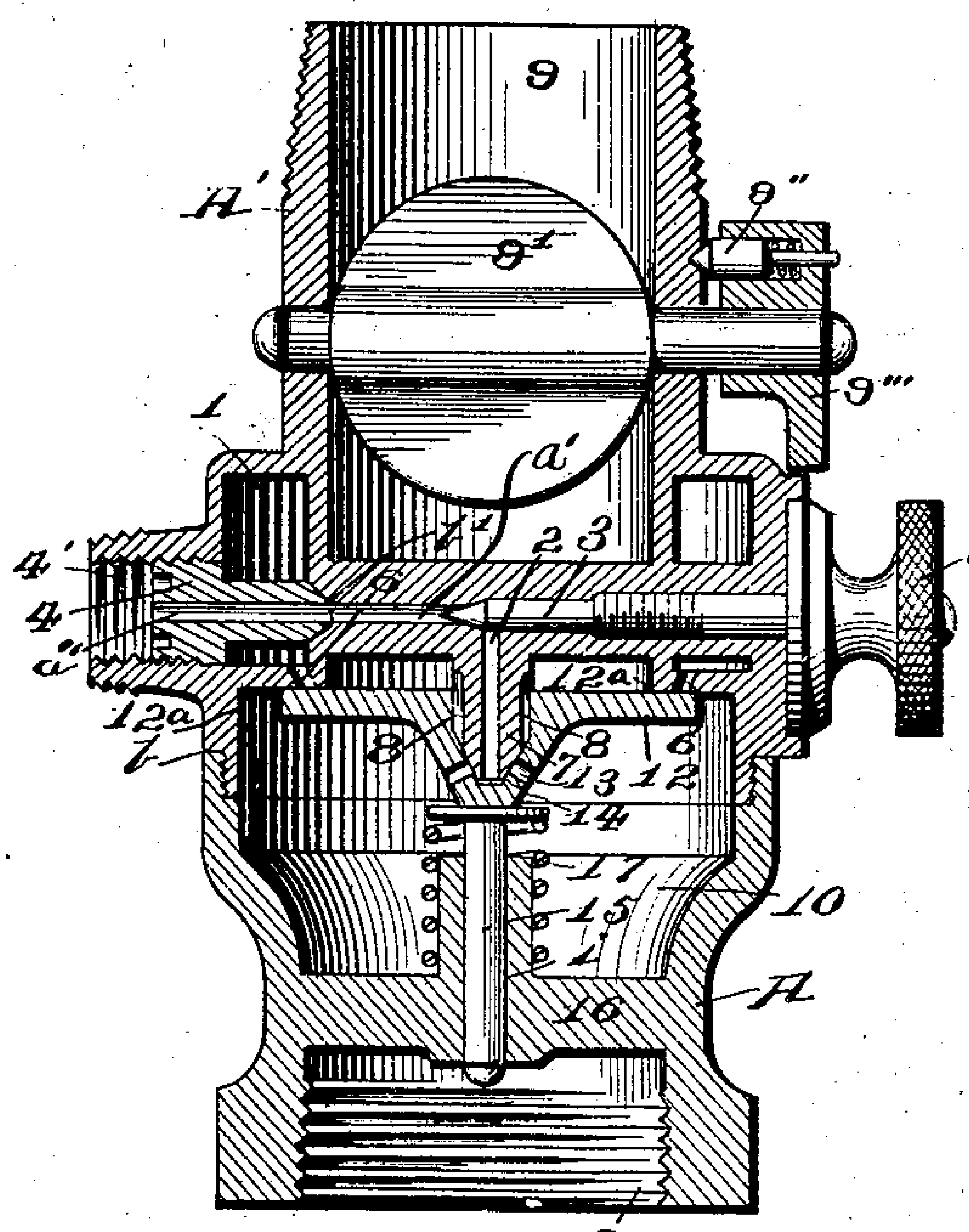


Fig. 4.

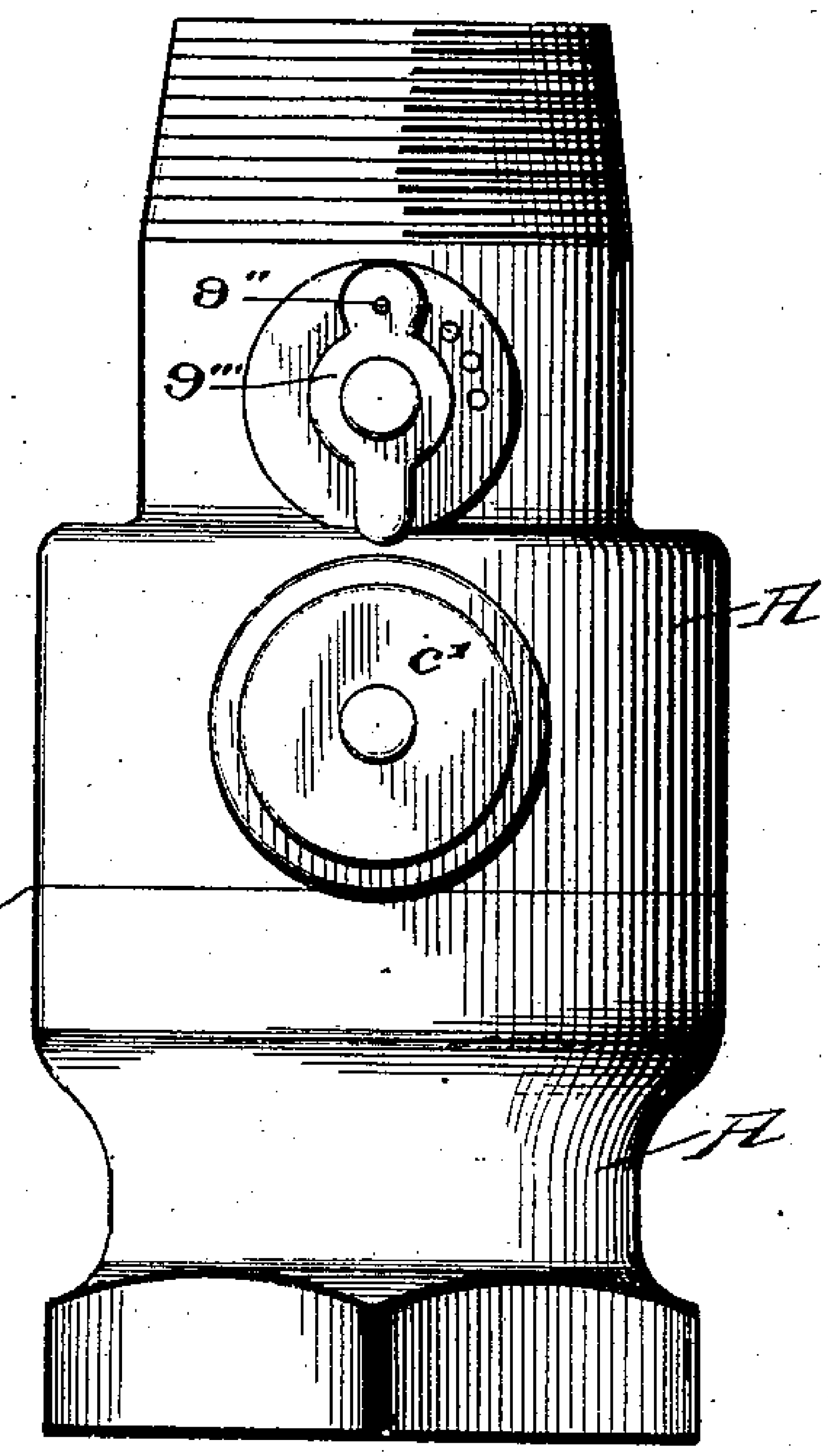
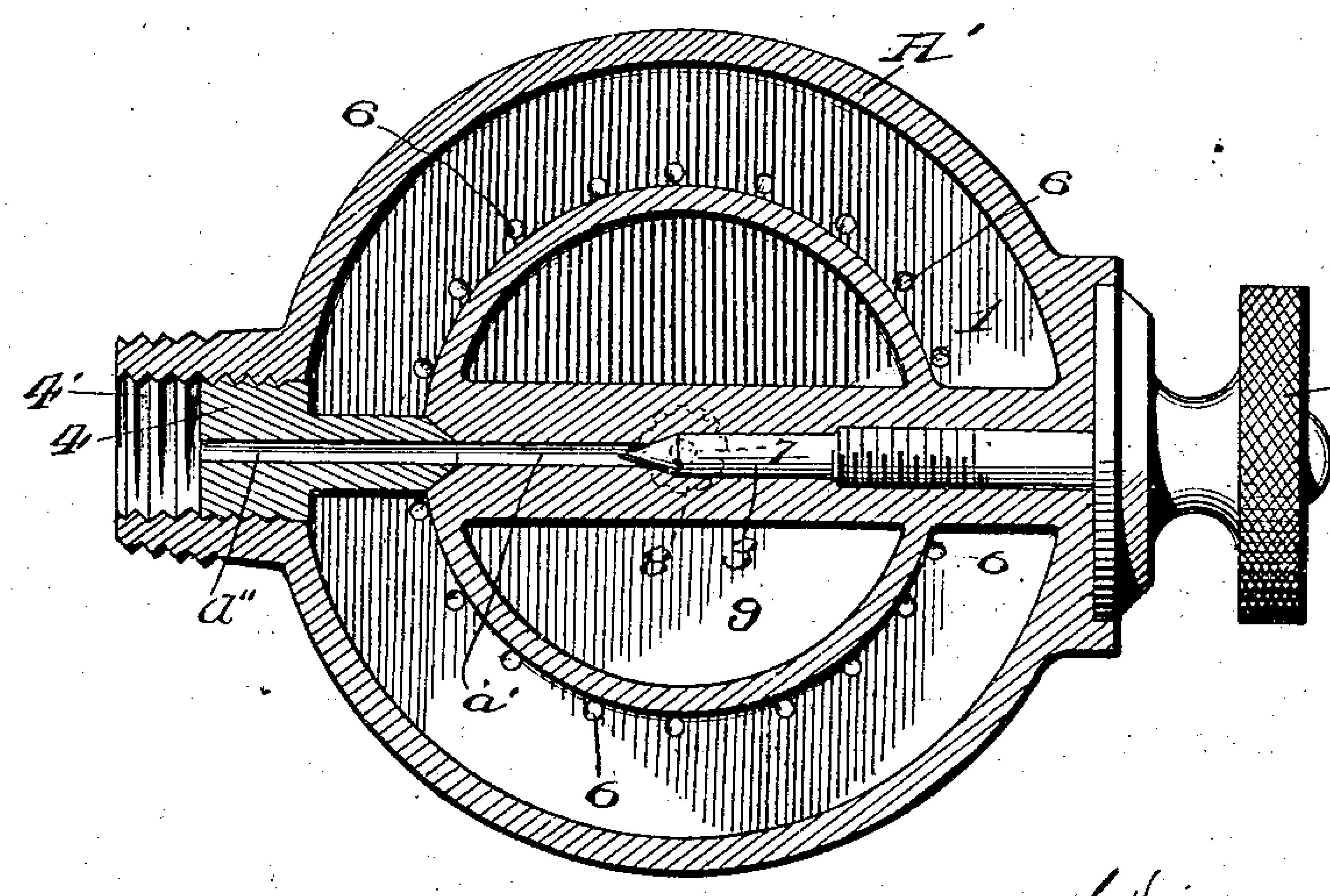


Fig. 2.



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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 5.

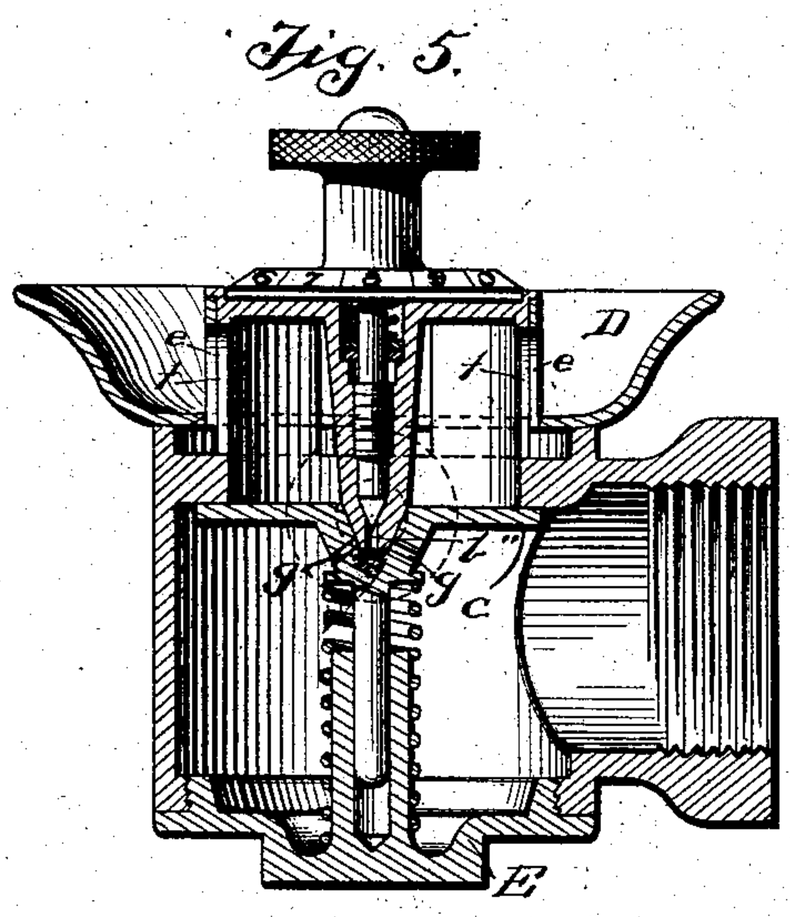


Fig. 6.

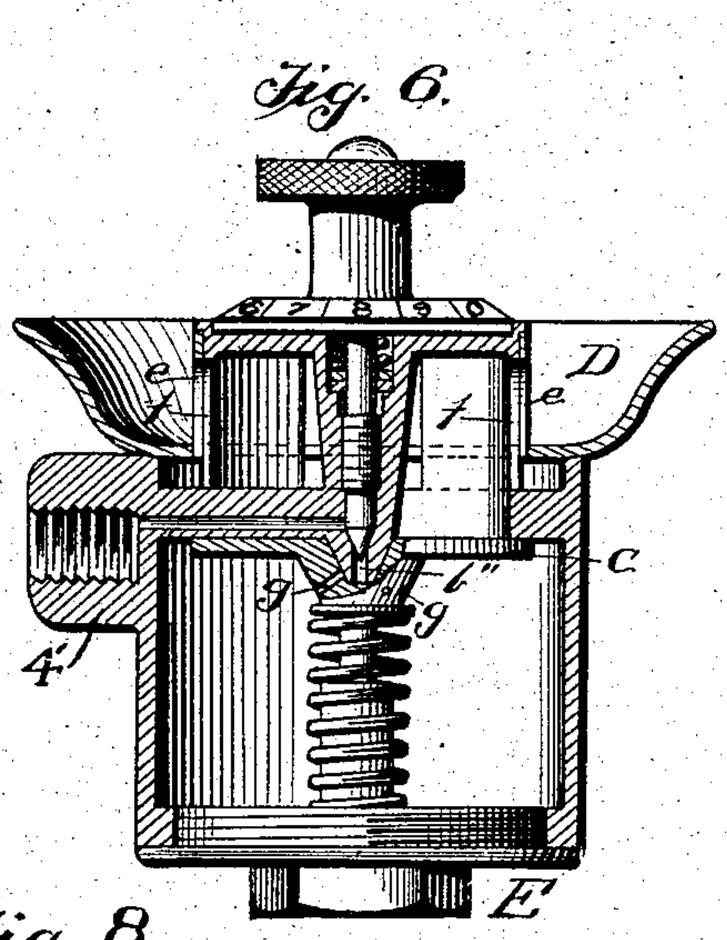
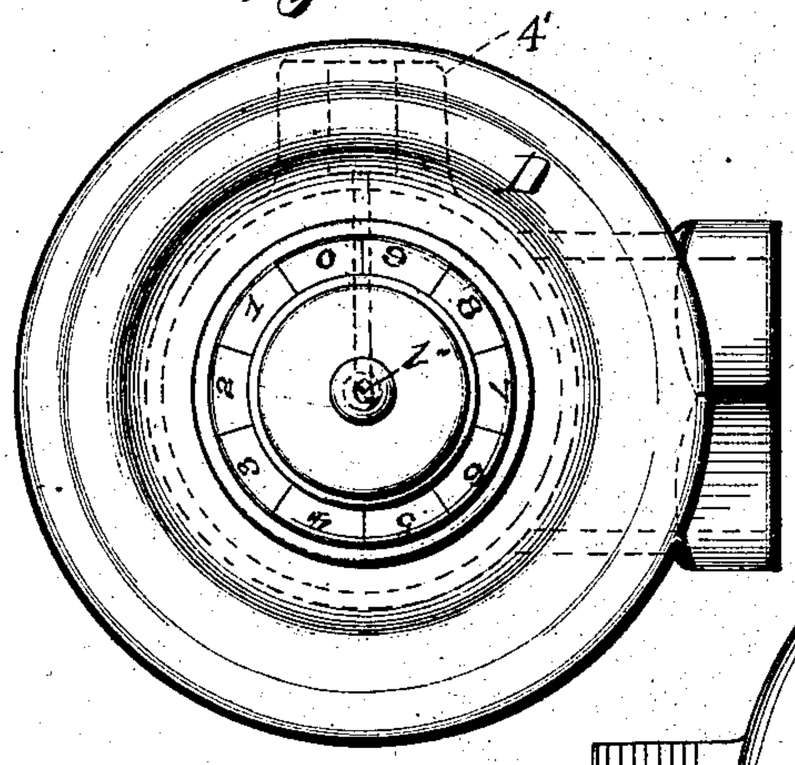


Fig. 8.

Fig. 7



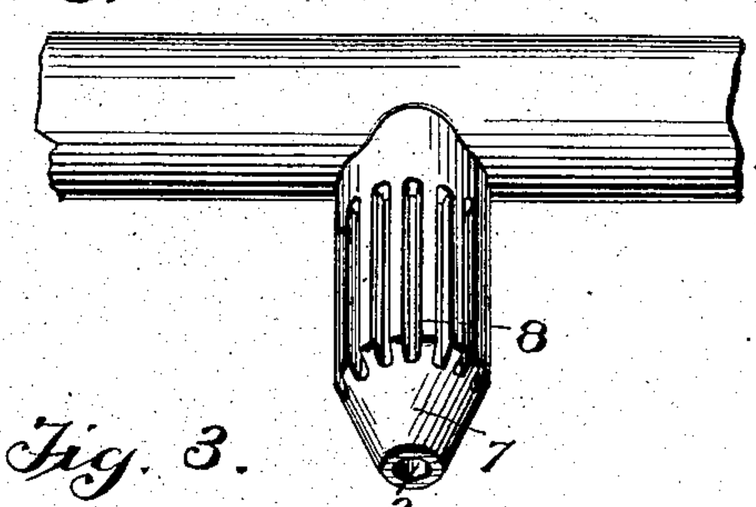
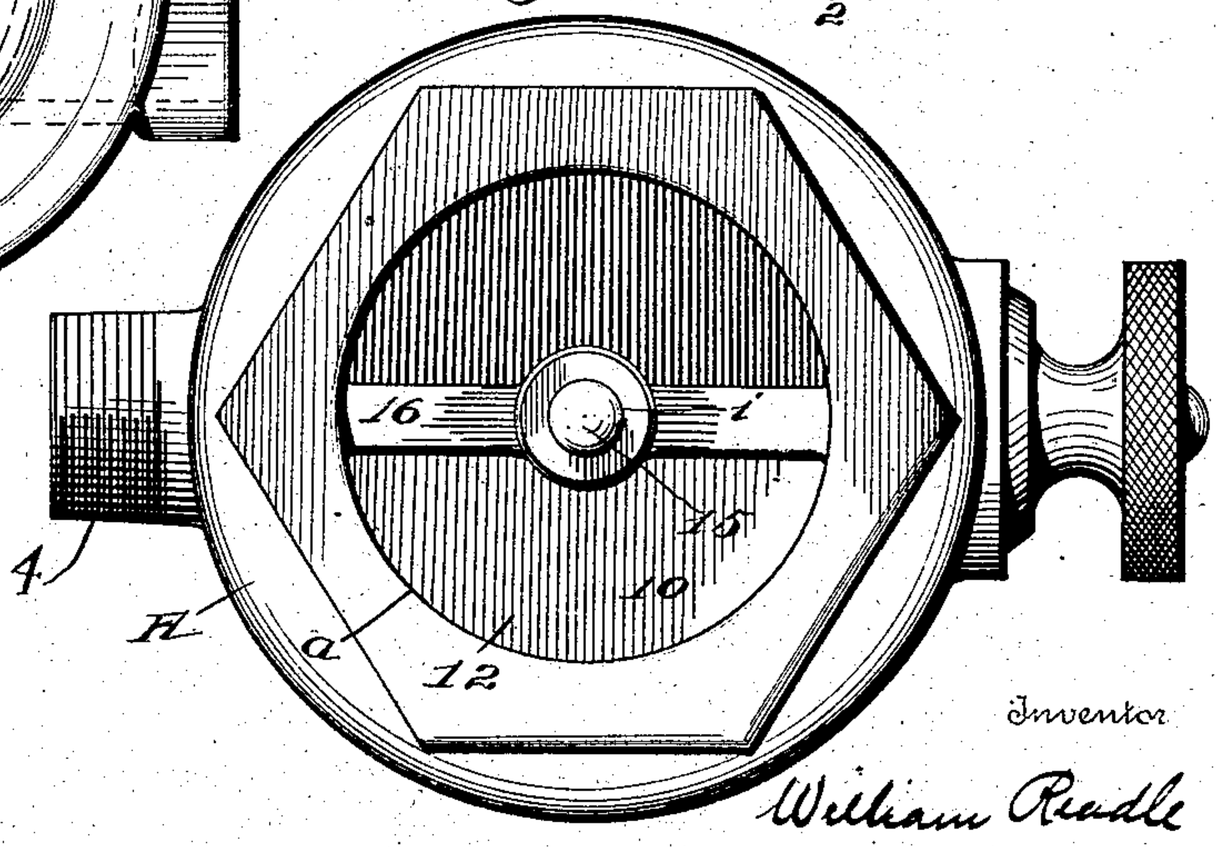


Fig. 3.



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UNITED STATES PATENT OFFICE.

WILLIAM READLE, OF ELMIRA, NEW YORK.

VAPORIZING-VALVE FOR EXPLOSIVE-ENGINES.

SPECIFICATION forming part of Letters Patent No. 726,191, dated April 21, 1903.

Application filed January 17, 1901. Serial No. 43,663. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM READLE, a citizen of the United States, residing at Elmira, in the county of Chemung and State of New York, have invented certain new and useful Improvements in Vaporizing-Valves for Explosive-Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to an improvement in vaporizing-valves for hydrocarbon, and more particularly for use in connection with illuminating, producer, natural gases, or gasolene, the primary object of the invention being to provide means for thoroughly mixing and vaporizing natural and manufactured gases or gasolene with an adequate quantity of air on its way to the combination-chamber or place where it is to be utilized for explosive or other purposes.

My invention further consists in improved adjustable means for effectually controlling and regulating the amounts of air and hydrocarbon to the valve; and the invention consists in certain novel features of construction and combinations of parts, which will be hereinafter more fully described, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a sectional view of the valve employed for natural, illuminating, or producer gases or gasolene. Fig. 2 is a horizontal section of the same. Fig. 3 is a plan view. Fig. 4 is a view in elevation, taken at right angles to the view shown in Fig. 1. Figs. 5 and 6 are vertical sections of a modified form of construction, the two figures being taken at right angles to each other. Fig. 7 is a plan view of this modified construction, and Fig. 8 is an enlarged detail of the hydrocarbon-duct.

Referring to the construction shown in Figs. 1, 2, 3, and 4, A represents the valve shell or casing, it being furnished with an internal screw-thread *a* at its lower end, by which it is attached to the engine or other object to which it is to be applied. For convenience the shell or casing of this construction is made in two parts, secured together at the joint *b*, which joint affords a means of access to the interior useful in assembling the parts of this form of valve. The upper section A′ is provided with an air-inlet port 9, closed by means of a damper 9′. Surrounding the lower end of this air-inlet port is an annular reserve-chamber 1. Passing across the port at its lower end is a hydrocarbon-duct *a*′, one end of which extends through the reserve-chamber to the outer wall of the casing A′ and is adapted to receive a regulating needle-valve 3 having a threaded stem, by means of which it is screwed in and out. The opposite end of the hydrocarbon-duct is in communication with the reserve-chamber 1 and is provided with a flared or conical seat or opening *b*′. Depending from and communicating with the hydrocarbon-duct *a*′ is a fluted stem 7, preferably located at or approximately at the center of the device discharging the hydrocarbon. This stem terminates in a cone. The needle-valve regulates the amount of hydrocarbon passing from duct *a*′ to the duct 2 of the stem 7, the valve being manipulated by means of a thumb-plug *c*′, located on the outer projecting end of the needle-valve.

The casing in both constructions shown is provided with a screw-threaded projecting nipple 4′, adapted to be connected to the hydrocarbon-supply. In Fig. 1 this projecting nipple 4′ is adapted to receive an externally-screw-threaded removable plug 4, the bore *a*″ of which is in alinement and communicating with the duct *a*′. This plug is adjustable in the projecting nipple 4′ and passes across the reserve-chamber 1, its inner end conically shaped to fit the conical seat *b*′ of the hydrocarbon-duct. The outer end of the plug is enlarged to fit the diameter of the nipple 4′, the adjustment of the plug being effected by inserting a suitable instrument for the purpose into recesses formed in its outer enlarged end, as shown. Its function is obvious. When the valve is used with gasolene, the plug is screwed tightly home, as shown in Fig. 1, thus absolutely cutting off communication with the reserve-chamber 1, as the latter is unnecessary when gasolene is used; but when natural or other gas is the hydrocarbon employed this plug may be either removed altogether or screwed back from the conical seat *b*′, so that the bore of the plug as well as the hydrocarbon-duct are

both in communication with the reserve-chamber 1.

The interior of the shell or casing is subdivided into two chambers by the discal portion of a valve 12, which is normally seated upon an annular flange 12^a. The upper of these chambers will for convenience be termed an "air-chamber" and the lower one the "mixing" or "vacuum" chamber. An annular series of gas inlets or perforations 6 is made in this flange into the reserve-chamber 1 for the escape of gas therefrom into the mixing or vacuum chamber, and the discal portion of the valve 12 normally or when seated closes these perforations. Air is fed into the valve through the upper end 9, and its supply may be controlled by the damper 9', and this in turn is locked by the spring-actuated catch 9'', seated in a shouldered aperture 20 in the handle 9'''. The air thus admitted is intermingled and thoroughly mixed with the hydrocarbon by issuing in two annular jets, one of which is around the outer periphery of the discal portion of the valve 12 just beneath or contiguous to the annular series of gas inlets or perforations 6 and the other through the flutings 8 8 in the stem 7 and the inlets or perforations 13 in the conical seat 14 of the valve 12. The valve 12 is provided with a stem 15, which is guided and centered in its reciprocations by the way *i*, drilled through the web 16 of the lower section A of the shell or casing. The valve 14 is normally held seated by the spring 17, its discal portion closing the perforations 6 and its conical seat in engagement with the conical lower end of the stem 7, so as to shut off communication between the bore 2 of the stem and the flutings 8 8 and the inlets or perforations 13.

The numeral 10 indicates a vacuum-chamber in communication with the cylinder of the engine and located partly in the two sections of the shell or casing, with the valve 14 operating therein. Valve 14 remains closed so long as the tension of the spring 17 is in excess of the suction created by the receding piston in the vacuum-chamber 10. In other words, with each forward stroke of the engine-piston the suction created causes a downward or inward movement of the valve 14, thus simultaneously opening the annular series of perforations 6 and 13 and the hydrocarbon-duct 2, so that air and hydrocarbon are finely divided, distributed, and intermingled with each forward movement of the valve in an adequate quantity and suitably proportioned to create a highly-combustible vapor in the cylinder preparatory to each successive explosion. Immediately upon the return stroke of the piston being made the suction-power of the partial vacuum created is lost and the spring seats the valve over all of the air and gas openings until the operation is repeated.

In the modified construction shown in Figs. 5, 6, and 7 all of the essentials of the valve hereinbefore described are retained and only slight alterations are resorted to, and notably the following: The needle-valve is in alinement with the discharge-orifice of the hydrocarbon-channel *b''*, and in this construction the air-feed is controlled by an adjustable cup or funnel D and the registering openings *e* and *f*. In this present valve the plug 4, reserve-chamber 1, and perforations 6 are wholly dispensed with, the plug 4 because the present valve is intended for use with gasolene only, and consequently no reserve-chamber, as 1 in the other construction, is needed, and for the same reason the perforations 6 6 are unnecessary, and in lieu thereof the entire charge of hydrocarbon in the present construction finds exit through the hydrocarbon-chamber *b''* at a single point, where it intermingles with air discharging through the perforations *g* and is further intermingled with a disruptive circular current of air coming in over the outer periphery of the disk *c* of the valve, as indicated by the arrows. A removable valve-head E affords access to the vacuum-chamber *h*. Connection with the engine is afforded at the side, as shown in Figs. 5 and 7.

My improved valves are applicable to any form of explosive-engine and would find a field of usefulness in the rapidly-growing art of so-called "motor-vehicles" or "automobiles."

It is evident that slight additional changes might be made in addition to those described in the form and arrangement of the several parts described without departing from the spirit and scope of my invention, and hence I do not wish to limit myself to the exact construction herein set forth; but,

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination with a valve shell or casing comprising an air and a vacuum chamber, the air-chamber having a hydrocarbon-duct leading and discharging thereinto, the duct provided with external air-passages, means for controlling the supply of hydrocarbon, and an air-inlet, of a valve for intermittently closing communication between the two chambers, the valve having centrally-located apertures therethrough and constructed and adapted to close and open the hydrocarbon-duct and external air-passages whereby two separate currents one of intermingled air and hydrocarbon and the other of air are admitted to the vacuum-chamber one around the outer edge of the valve and the other through the apertures formed therein.

2. A valve-casing provided with air and hydrocarbon inlets, means located in the hydrocarbon-inlet for regulating the supply, a pivoted plate for regulating the supply of air, a valve dividing the casing into air and vacuum chambers, the valve provided with a series of openings, the hydrocarbon-duct provided with external passages, the valve adapted to

close the ends of the passages and the discharge-mouth of the duct, the duct adapted to close the openings in the valve, the construction permitting the entrance of two separate circular currents one of air and the other of hydrocarbon and air, to the vacuum-chamber.

3. The combination with a casing having an air and a hydrocarbon duct leading thereinto, the latter duct terminating in a conical discharge end provided with external grooves, of a valve provided with a conical seat adapted to be received upon the conical duct, the valve provided with apertures in its seat which are closed by the end of the duct, the valve operating to close the ends of the grooves and the mouth of the duct, and forming a division between the air and vacuum chambers, whereby when the valve is opened the air is permitted entrance to the vacuum-chamber through the grooves on the duct and the openings in the valve.

4. The combination with a shell and a reciprocating valve therein which subdivides the shell into air and vacuum chambers, the valve provided with apertures therein, of a hydrocarbon-duct discharging into the air-chamber and provided with external grooves, an air-inlet and a reserve-chamber surrounding the air-chamber and communicating therewith, the valve adapted to close and open the communications leading from the reserve-chamber and the hydrocarbon-duct, whereby to admit a plurality of separate currents of air and hydrocarbon commingled into the vacuum-chamber.

5. The combination with a shell or casing, a hydrocarbon-duct therein, a reserve-chamber and means for supplying the reserve-chamber with hydrocarbon or of cutting out the chamber, of a vacuum-chamber and means for establishing communication between the reserve-chamber and vacuum-chamber, and a valve located in the vacuum-chamber for opening and closing the hydrocarbon-duct and the means through which communication is had between the reserve and vacuum chamber.

6. The combination with a shell or casing, a vacuum-chamber, a reserve-chamber, an air-chamber, an air-inlet, a hydrocarbon duct and plug for opening or closing the reserve-chamber to the hydrocarbon-supply, said reserve-chamber having means of communication between it and the vacuum-chamber, of a valve having a perforated center and a discal portion adapted to normally close the perforations in the wall between the reserve and vacuum chambers, the hydrocarbon-duct having a fluted stem, a spring for keeping the valve normally closed, the valve when in closed position operating to close the mouth of the duct and the fluted air-passages thereon, and the duct adapted to close the perforations in the valve.

7. The combination with a shell or casing subdivided into an air and a mixing or vacuum chamber, a flange at the point of subdivision having an annular series of hydrocarbon inlets or perforations, and a hydrocarbon reserve-chamber from which the inlets or perforations lead, of a hydrocarbon-duct having a fluted stem, and a valve located in the mixing or vacuum chamber, the valve adapted to reciprocate whereby it alternately opens and closes the hydrocarbon-duct and the fluted passages, said valve having a discal portion which simultaneously opens or closes the hydrocarbon inlets or perforations and permits the entrance of air contiguous thereto, said valve provided with a perforated seat normally closed by the duct-stem and adapted to discharge intermingling air and hydrocarbon into the mixing or vacuum chamber, when the valve is withdrawn from the duct-stem by the vacuum created by the piston in the vacuum-chamber, the plenum created therein operating to close the valve and prevent the entrance of air and hydrocarbon into the vacuum-chamber.

8. A valve-casing comprising air and vacuum chambers and provided with an air-inlet and a grooved hydrocarbon-duct, the vacuum-chamber of larger area than the air-chamber, whereby a shoulder is formed at the juncture of the air and vacuum chambers, a disk valve reciprocating in the vacuum-chamber, and adapted to bear against the shoulder to separate the air and vacuum chambers, the valve being of smaller diameter than the vacuum-chamber and larger in diameter than the air-chamber, the hydrocarbon-duct having a conical end adapted to be received in and closed by a perforated seat formed in the valve, the hydrocarbon-duct in turn adapted to close the perforations in the valve, a pivoted adjustable member for controlling the supply of air to the air-chamber, the air from the air-inlet having access to the entire surface of the disk valve and the seat formed therein when the latter has been withdrawn into the vacuum-chamber, whereby two separate currents, one of air and the other of intermingled air and hydrocarbon are admitted to the vacuum-chamber around the periphery of the disk valve and through the perforations in the seat respectively.

9. A vaporizing-valve for explosive-engines, consisting of a casing formed in two removable parts, a hydrocarbon-duct, means for controlling the supply of hydrocarbon thereto, an air-inlet, and means for regulating the amount of air admitted to the valve, the last-named means automatically locked in any adjusted position, a discal valve in the casing which valve subdivides the casing into air and vacuum chambers, a web located in the vacuum-chamber on which the valve is mounted, the valve located beneath and fitting over the mouth of the hydrocarbon-duct, the duct provided with a plurality of external grooves, the valve provided with a series of perforations adjacent to its center,

means for automatically retaining the discal valve on its seat upon the hydrocarbon-duct, the duct closing the perforations in the valve, the valve adapted to close the duct and the grooves thereon, the last-named means adapted to be overcome during the instroke of the piston whereby two separate circular currents of intermingled hydrocarbon and air are drawn into the vacuum-chamber, around the periphery of the valve and through the perforations therein, respectively, the outstroke of the piston operating in connection with the automatic means to close the valve against the further introduction of air and gas.

10. In a valve, the combination with an air-inlet, of a hydrocarbon-duct, a reserve-chamber contiguous to the discharge end of the duct, the discharge end capable of adjustment whereby to bring the reserve-chamber into use or to place it out of use as a reservoir for the hydrocarbon.

11. A valve-casing provided with an air-inlet and an externally-grooved hydrocarbon-duct, a disk valve provided with a conical seat having a circular series of perforations therein, the valve-seat adapted to fit over the conical end of the hydrocarbon-duct to close the latter, the sides of the hydrocarbon-duct in turn closing the perforations in the seat, when the valve is closed, means for controlling the supply of air and hydrocarbon, the air adapted to have access to the entire surface of the disk valve and seat when the valve is open to permit of the passage around the periphery of the disk valve of a circular current of air and to permit the passage through the circular series of perforations in the valve-seat of a second separate circular current of intermingled air and hydrocarbon.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM READLE.

Witnesses:
L. D. SHOEMAKER,
JOHN G. POTTER.