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APPARATUS FOR SUPPLYING EXPLOSIVE ENGINES WITH EXPLOSIVE MIXTURE.

APPLICATION FILED JULY 28, 1906.

Fig. 1.

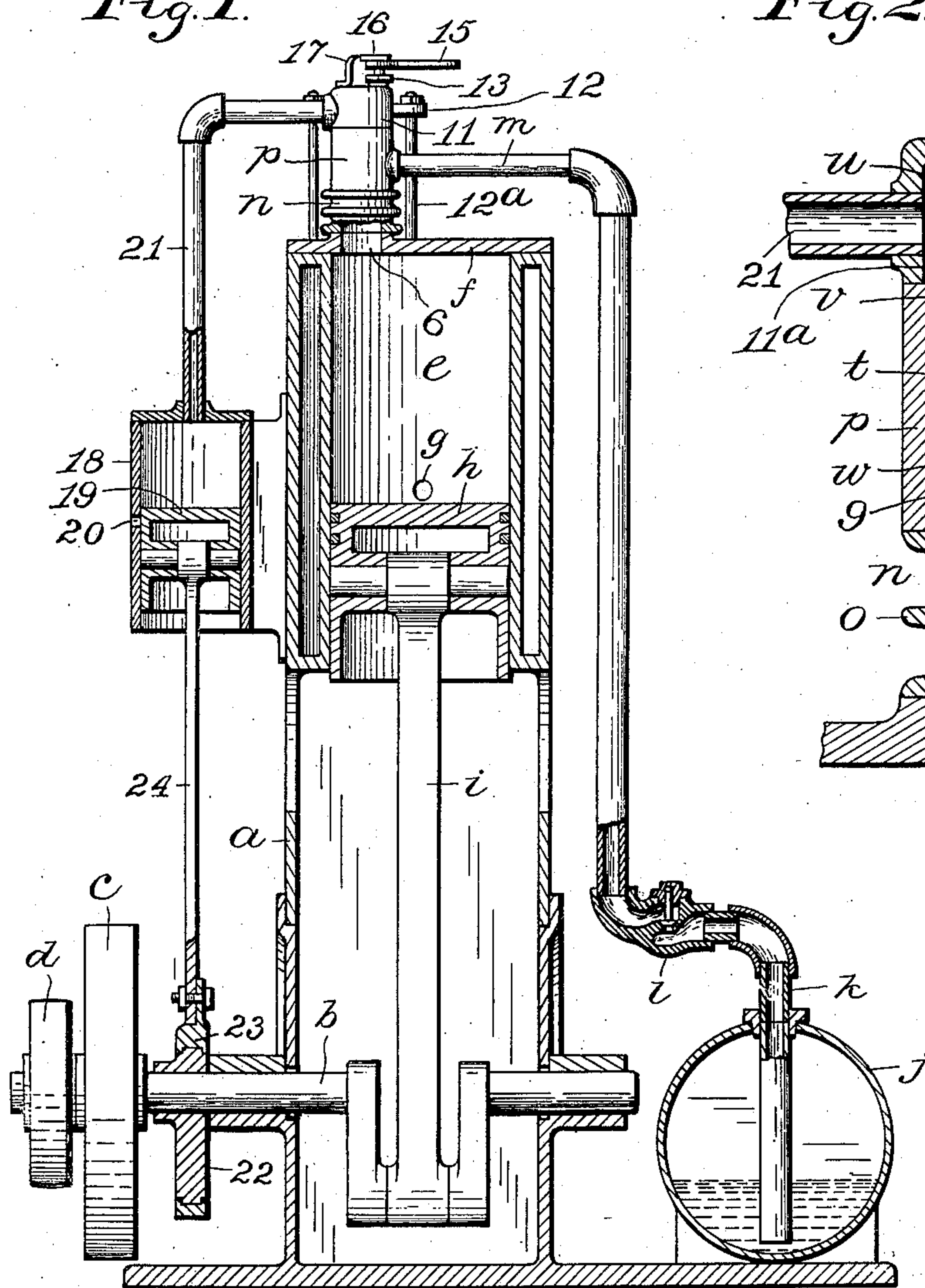


Fig. 2.

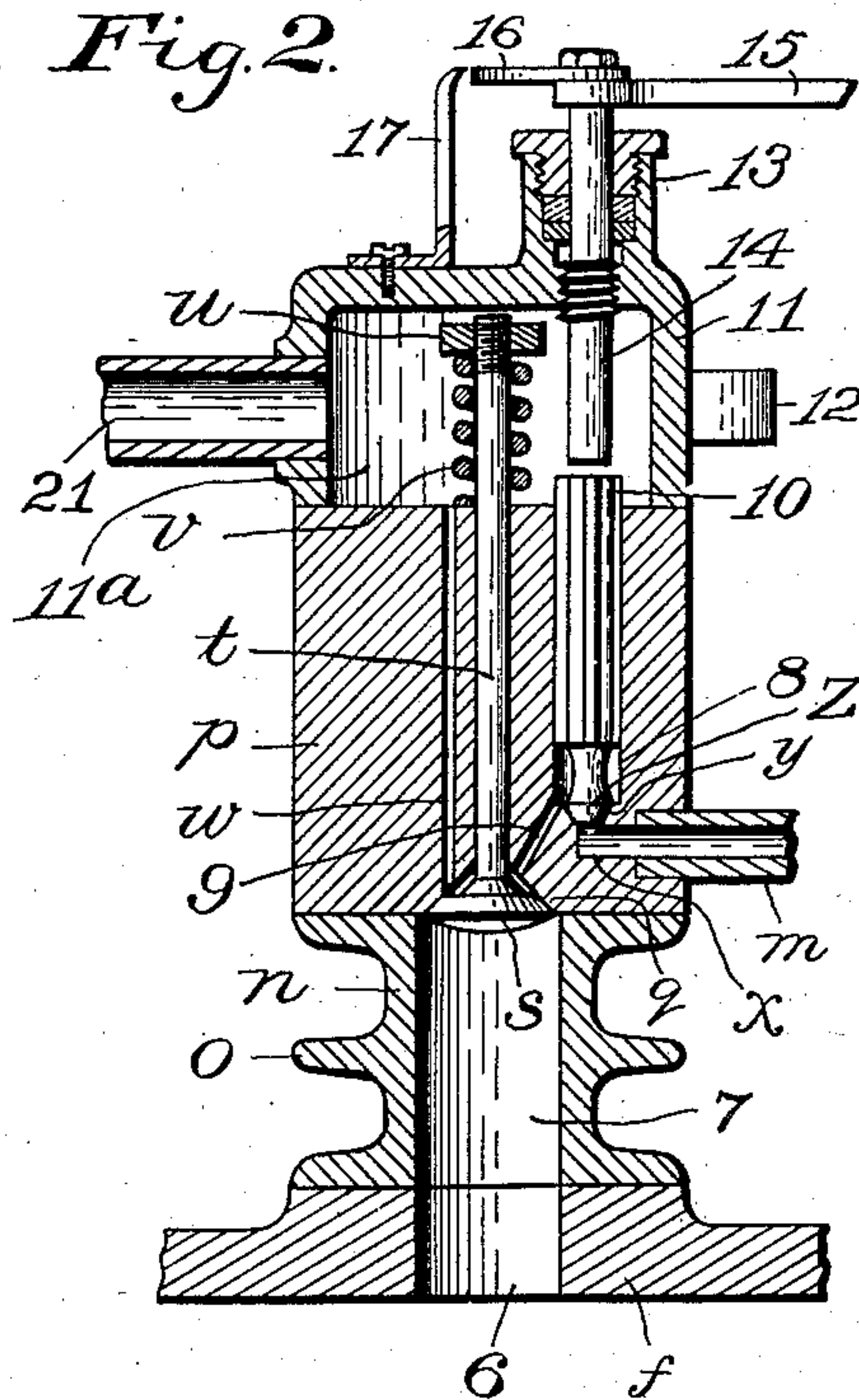


Fig. 3.

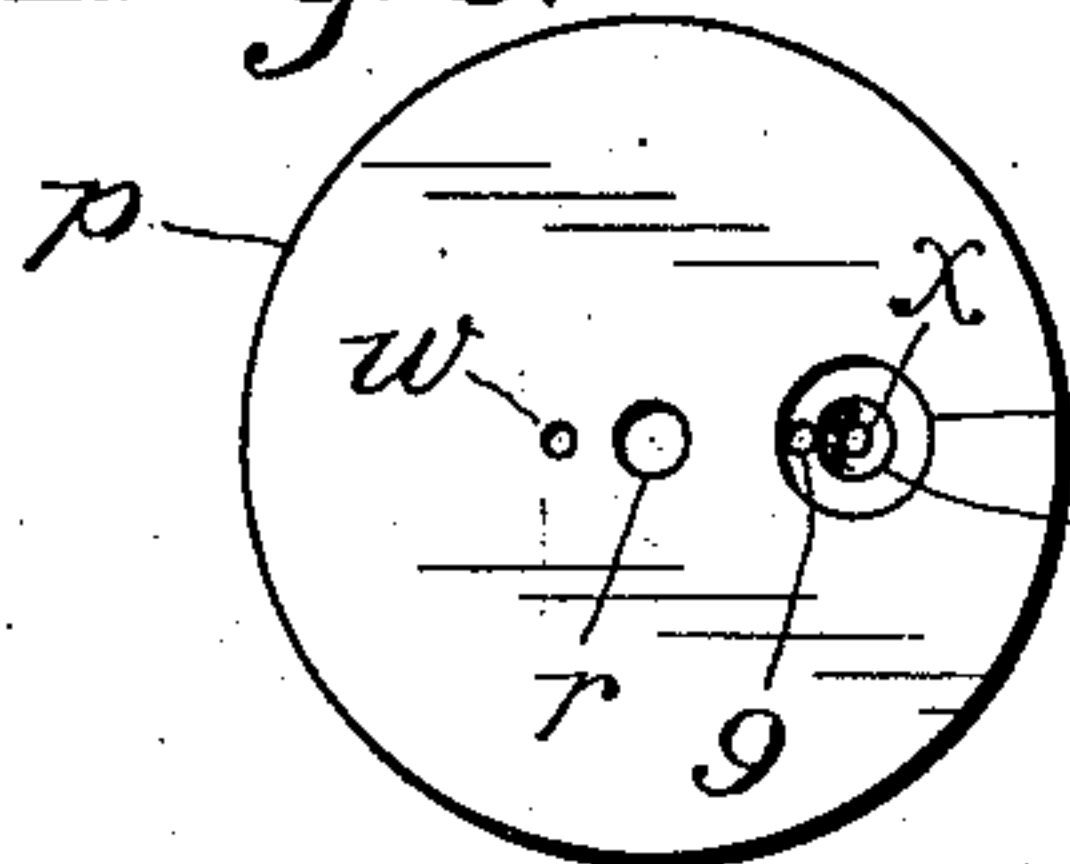


Fig. 4.

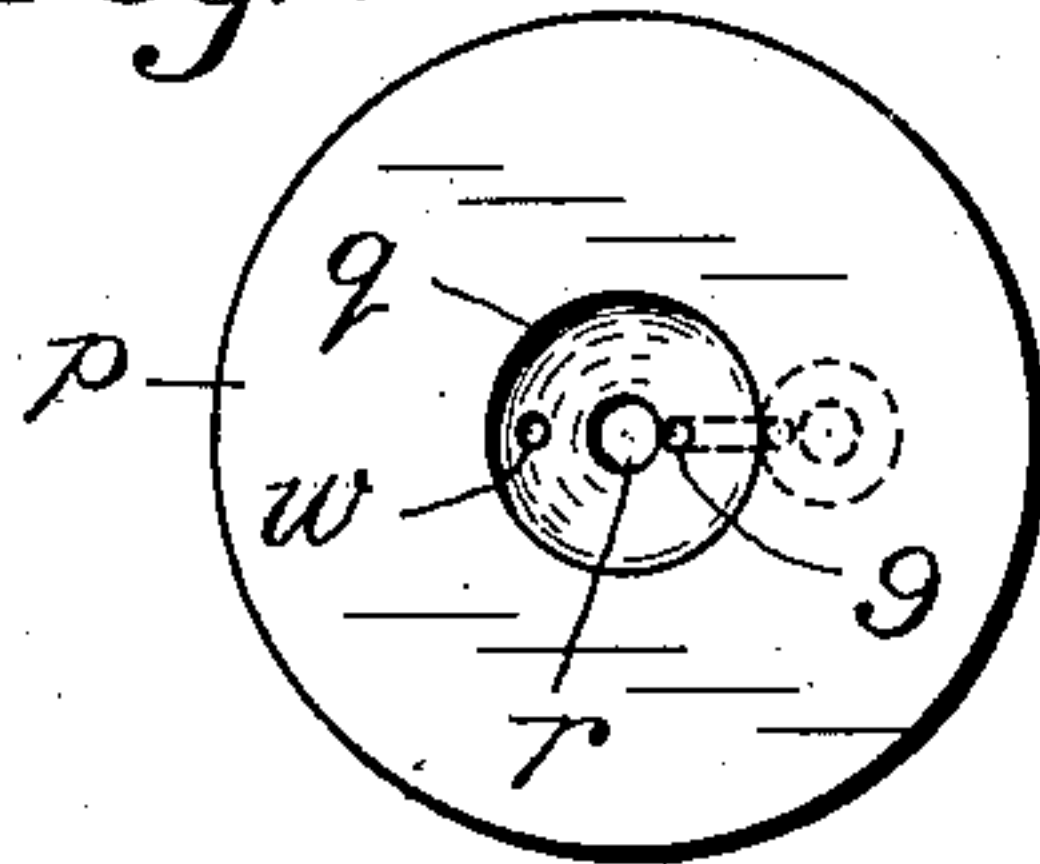
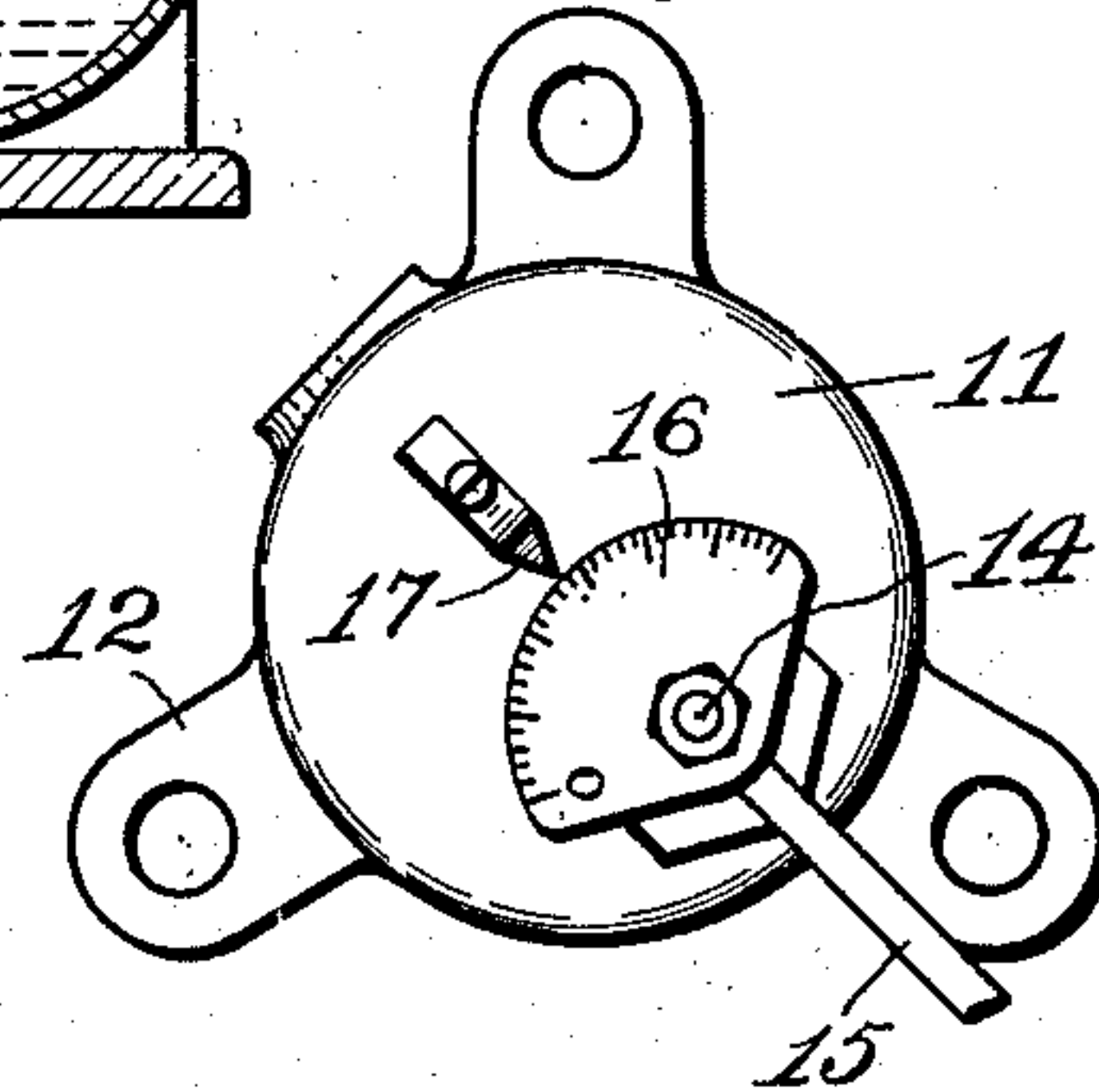


Fig. 5.



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APPARATUS FOR SUPPLYING EXPLOSIVE-ENGINES WITH EXPLOSIVE MIXTURE.

No. 865,767.

Specification of Letters Patent.

Patented Sept. 10, 1907.

Application filed July 28, 1906. Serial No. 328,208.

To all whom it may concern:

Be it known that I, CHARLES G. DEAN, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented
5 new and useful Improvements in Apparatus for Supplying Explosive-Engines with Explosive Mixture; and I do declare the following to be a full, clear, and exact description of the invention, reference being had to the accompanying drawings, and to the letters and
10 figures of reference marked thereon, which form a part of this specification.

This invention relates to explosive engines of the class that commonly are known as oil-engines, which derive their power from explosive mixture composed
15 of oil and atmospheric air mixed and exploded under compression in the engine cylinders or explosion-chambers thereof, the invention having reference more particularly to the apparatus for supplying and mixing the elements of the explosive mixture and delivering
20 the mixture to the engines for use.

The object of the invention is primarily to provide the most simple and effective apparatus for supplying explosive engines with explosive mixture, which apparatus shall be as free as may be from the valves and
25 devices that ordinarily wear rapidly and cause trouble and expense in operation; all to the end that cost of production may be reduced to the minimum, and economy in a high degree attained in operation; a further object being to provide an improved durable and economical vaporizer for the explosive mixture.
30

An object specifically is to improve the construction and arrangement of the valves and chambers and the air and oil ducts of the air-pump claimed in Letters Patent No. 745,578, granted to me December 1, 1903, so
35 that said features of construction shall be arranged as compactly as possible for mixing the oil and air and vaporizing the mixture for delivery to the explosion chamber of the engine, the aim being in the present invention to combine all of the essential valves for the
40 purpose in a single casing, wherein mixing and vaporizing may take place through the action of a single air-pump.

The invention consists in apparatus comprising a vaporizer, oil-reservoir, air-pump and connecting conduits arranged in a novel and useful manner with respect to an explosive engine. The invention consists also in an improved vaporizer, and an improved air-pump utilizing the vaporizer. And, the invention consists further in the novel parts and in the combinations
50 and arrangements of parts, as hereinafter particularly described and referred to in the claims comprising parts hereof; said invention being broadly illustrated and claimed in said Patent No. 745,578.

Referring to the drawings, Figure 1 is a vertical central sectional view, partly in elevation, of an upright
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explosive engine with which the invention is connected; Fig. 2, a vertical central sectional view of the improved vaporizer which practically forms part of the air-pump for supplying the engine in impulses with explosive mixture; Fig. 3, a top plan of the main body
60 part of the vaporizer separated from the other parts thereof; Fig. 4, a plan view of the main body part inverted; and Fig. 5, a top plan view of the vaporizer.

Similar reference characters in the different figures of the drawings designate corresponding elements or
65 features of construction.

In the drawings *a* designates the frame, *b* the crank-shaft, *c* the balance-wheel, *d* drive-pulley, *e* the cylinder having a head *f* and exhaust port *g*, *h* the piston, and *i* the pitman, of an explosive engine, all or either
70 part of which may be variously constructed. In the present case the vaporizer is connected to the head of the cylinder where explosions may take place, but in case an explosion-chamber be provided the vaporizer would be attached thereto.
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In construction an oil-reservoir *j* is mounted on the frame of the engine or other convenient place, preferably at a lower level than that at which the vaporizer and the air-pump cylinder are to be placed. A conduit *k* is attached to the oil-reservoir and extends into
80 and nearly to the lowermost part thereof, the conduit being provided with a check-valve *l* that is arranged near the top of the oil-reservoir; the check-valve, however, being unnecessary when it may not be desired to retain the oil for a long time in the conduit. A conduit
85 *m* is connected to the check-valve for conducting the oil for the explosive mixture to the vaporizer. If the check-valve be omitted the conduits *k* and *m* should obviously be connected together.

The improved vaporizer body part is preferably composed of three parts, a cylindrical base part *n* being
90 formed of suitable metal and provided with radiating wings or projections *o* so that the base part may become cool rapidly in the atmosphere, the base part being joined at one end thereof to the head *f* of the engine-cylinder at an opening 6 that is formed therein, there
95 being a central opening 7 in the base part in which final mixing of the vaporized oil and air may take place to pass through the opening 6 into the cylinder. The base part *n* may be variously designed in shape to suit
100 requirements if it is to be attached to an explosion-chamber or to a horizontal cylinder.

A cylindrical main body part *p* is joined at one end thereof to the free end of the base part *n* and has a valve-seat *q* in its joint end and a guide opening *r* extending
105 through the body part at the axis thereof, the valve-seat extending about the axis and facing towards the opening 7 of the base part. The body part *p* is preferably composed of steel as is also a valve *s* which is provided to normally rest on the valve-seat and to admit
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the explosive charges and resist the forces of the explosions thereof, the valve having a stem *t* extending through and guided in the opening *r*. The stem *t* is provided at its end with an adjusting nut *u*, and a spring *v* is pressed between the nut and the adjacent end of the part *p* to hold the valve *s* removably on its seat *q*. The body of the valve *s* is recessed so as to provide an annular clearance space about the body thereof that joins its stem *t*, and if desired, the valve-seat *q* may also be recessed opposite to the recess of the valve.

An air-duct *w* extends from a part of the valve-seat *q* that is opposite the recess of the valve through the part *p* to the opposite end thereof for the passage of air, but in lieu thereof an air-passage may be provided alongside of the stem *t*. A guide-bore 8 extends longitudinally nearly through the part *p* and is joined at its inner end by an inlet port *k* with which the conduit *m* is connected, there being a valve-seat *y* at the junction of the bore and the port on which is a valve *z* having guide wings 10 by which the valve is guided in the bore. An oil port 9 extends from the bore 8 to a part of the valve-seat *q* that is opposite to the recess of the body of the valve *s*. The valve *z* serves as a check-valve for the pump (which will be described) to admit oil from the conduit *m* and prevent the return of the oil thereto. The vaporizer includes also a cap 11 which is joined to the part *p* so as to cover the end of the stem *t* and the spring *v*, also covering the end of the valve *z* and providing an air-chamber 11^a with which the duct *w* communicates. The cap has ears 12 that are engaged by bolts 12^a that hold the parts *n*, *p* and 11 together and secures the vaporizer body to the cylinder head *f*. The cap 11 has a packing-box 13 through which extends a regulator stem 14 that is screwed into the cap opposite to the end of the body of the valve *z* for regulating the admission of oil to the vaporizer, the stem having a handle 15 provided with an indicator dial 16 opposite which is a pointer 17 that is secured to the cap 11.

In order to supply oil and air to the vaporizer and the explosive mixture to the engine, a pump-cylinder 18 having only one head is secured to the engine-cylinder (or may be arranged elsewhere) and has a piston 19 and also an inlet-port 20 in its wall to be opened by the piston at the extreme of its outward stroke, the port being arranged at a distance from the cylinder head nearly as great as the stroke of the piston. A pump-barrel 21 connects the cylinder 18 with the chamber 11^a of the vaporizer. An eccentric 22 is secured to the crank-shaft *b* and has a strap 23 to which an eccentric-rod 24 is attached that is connected to the piston 19 of the pump. The eccentric is so set on the crank-shaft that it will produce lead of the piston 19 equal to about one-fourth of its travel in advance of the piston *h*.

Various structural modifications and changes in position of the various parts may be made other than heretofore mentioned to conform to different constructions of engines.

In practical use the out-strokes of the piston 19 will produce partial vacuum in the cylinder 18 and also in the pump-barrel 21 and the air-chamber 11^a, causing the valve *z* to lift and admit oil to the bore 8 in small quantities, depending upon the amount of lift of the valve as determined by means of the regulator stem 14,

and the oil may pass out of the bore through the port 9. The in-strokes of the piston 19 will cause compression of the air that may enter the port 20 into the cylinder, so that the valve *z* will close, and air will pass from the chamber 11^a through the port *w*, forcing the valve *s* open and mixing with and vaporizing the oil that may have been admitted by the valve *z*. The explosions of the mixture may be caused by well known means. When the valve *l* is employed it will serve as the foot-valve of the pump, the intermediate valve *z* serving solely as a regulating valve for the admission of the oil in the required quantities, the conduit *m* in such case being substantially a part of the pump barrel. In either case the vaporizing occurs around the edges of the valve *s* as the oil and air is forced into and through the opening 7, the latter being but slightly greater in diameter than the valve.

Having thus described the invention, what is claimed as new is—

1. A vaporizer including a vaporizer body having an air chamber in one end and a valve seat in the opposite end portion thereof, a valve spring-pressed to the seat, there being an oil-chamber about the valve between the seat and the air-chamber, the vaporizer body having two open passages therein between the air-chamber and the oil-chamber and an oil-supply duct leading to one of the passages, and a check-valve normally closing the oil-supply duct to be opened for admitting oil to the oil-chamber. 85
2. A vaporizer including a vaporizer body having an air-chamber in one end and a valve seat in the opposite end portion thereof, a valve spring-pressed to the seat, there being an oil-chamber about the body of the valve, the said vaporizer body having an air duct therein between the air-chamber thereof and the oil-chamber and also an oil-port communicating with the oil-chamber and the air-chamber, an oil-supply pipe connected with the oil-port, and a check-valve to admit oil from the pipe to the port and prevent return of the oil to the pipe. 90
3. A vaporizer including a body having an air chamber in one end and a valve seat in the opposite end portion thereof, an air-pipe connected with the air chamber, a valve on the seat and having a stem extending into the air chamber, a nut on the stem, and a spring on the stem engaging the nut, there being an oil-chamber around the body of the valve, and the vaporizer body having an oil port therein leading to the oil-chamber and also an air-duct extending from the air-chamber to the oil chamber. 95
4. A vaporizer including a body having two separated valve seats and also an air chamber therein, there being separate ducts from the seats to the air chamber, and a port from one duct to the other duct, an air-pipe connected with the air chamber, a movable regulating valve on one of the seats, a spring-pressed valve on the other one of the seats, an oil-conduit leading to the regulating valve, and a regulator stem adjustable opposite to the regulating valve limiting the movements thereof. 100
5. Apparatus for supplying explosive-engines with explosive mixture including an oil reservoir, a pump-cylinder and piston, a vaporizer body having two separated valve seats and also an air chamber therein, the body having also two separate ducts therein, either duct extending from the air chamber to either one of the valve seats, a pump-barrel connected to the pump-cylinder and also with the air chamber of the vaporizer body, a movable regulating valve on one of the seats, a spring-pressed valve on the other one of the seats, an oil-conduit connected to the oil-reservoir and also with the regulating valve, the vaporizer body having a port therein between the regulating valve and the spring-pressed valve, and a regulator stem adjustable in the body opposite to and limiting the movements of the regulating valve. 105
6. Apparatus for supplying explosive-engines with explosive mixture including an oil-reservoir, a pump-cylinder, a movable piston in the cylinder, and a vaporizer body having communication with the oil-reservoir and also with the pump-cylinder and provided with a movable regulating 110

valve operated by means of the piston to admit oil from the oil-reservoir to the body and serving as a foot-valve for the pump-cylinder to prevent the oil from returning to the oil-reservoir, means for limiting the movement of the regulating valve, and a spring-pressed valve within the body acted on by the alternative movements of the air-pressure from the piston to mix and vaporize the oil.

7. Apparatus for supplying explosive-engines with explosive mixture including an oil-reservoir, a conduit having a check-valve therein and connected with the oil-reservoir, a pump-cylinder with a piston therein, a pump-barrel attached to the pump-cylinder, and a vaporizer body connected with the conduit and having an air-chamber connected with the pump-barrel, the vaporizer body having an inlet-valve normally closing the conduit provided with a regulator controlling the extent of the movement thereof to open the conduit, and an outlet valve in the body spring-pressed to its seat and movable therefrom for discharging oil and air from the vaporizer body.

8. The combination with an explosion-chamber, of a vaporizer having communication with the explosion-chamber and comprising a base part, a main body part and a cap having an air-chamber therein, the main body part having a guide-bore therein and also a guide opening therethrough extending from the air-chamber and a duct between the guide-bore and the guide-opening, an inlet valve in the guide-bore, a combined outlet and vaporizing valve at the end of the guide-opening controlling the passage through the duct and outlet from the air-chamber to the explosion-chamber, an oil-supplying duct leading to the inlet-valve, and a pump-barrel connected with the air-chamber of the vaporizer.

9. The combination with an explosion-chamber, of a vaporizer body having communication with the explosion-chamber and provided with an inlet-valve, an oil-supplying conduit leading to the inlet-valve, an adjustable regulator opposite to the inlet-valve to control the extent of movement thereof, an indicator for the regulator, an outlet-valve normally seated and retaining oil and air in the vaporizer body, a pump-barrel connected to the vaporizer body, and a pump-cylinder with a piston therein and connected to the pump-barrel for operating the valves alternately.

10. In a vaporizer, the combination of a main body part and a cap part joined together forming an air-chamber, the main part having a guide-bore therein and also a guide-opening therethrough extending from the air-chamber and a port between the guide-bore and the guide-opening, an inlet duct communicating with the guide-bore, a regulating valve seated in the guide-bore, a valve seated at the outer end of the guide-opening and having a stem extending through the guide-opening, and an air-pipe connected with the air-chamber.

11. In a vaporizer, the combination of a main body part and a cap part joined together forming an air-chamber, the main part having a guide-bore therein and also a guide-opening therethrough extending from the air-chamber, a port between the guide-bore and the guide-opening, an inlet-duct communicating with the guide-bore, and an air-duct extending from the air-chamber to the farther end of the guide-opening, a regulating valve seated in the guide-bore, and a valve seated at the junctions of the guide-opening, the port and the air-duct.

12. In a vaporizer, the combination of a main body part and a cap part joined together forming an air-chamber, the main part having a guide-bore therein and also a guide-opening therethrough extending from the air-chamber, a port between the guide-bore and the guide-opening, an inlet-duct communicating with the guide-bore, and an air duct extending from the air-chamber to the farther end of the guide-opening, a regulating valve seated in the guide-bore, a vaporizing valve seated at the junctions of the guide-opening, the port and the air-duct, a spring normally holding the vaporizing valve to its seat, a base part joined to the main part and having an opening to receive the vapor from the vaporizing valve, a regulator mounted on the cap part and adjustable opposite to the regulating valve, an oil-reservoir connected with the inlet duct, and a pump-barrel connected with the air-chamber.

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

CHARLES G. DEAN.

Witnesses:

WM. H. PAYNE,
E. T. SILVIUS.