No. 679,053. Patented July 23, 1901.

L. M. JOHNSTON.

VAPORIZER FOR EXPLOSIVE ENGINES.

(Application filed June 5, 1899.)

(No Model.)

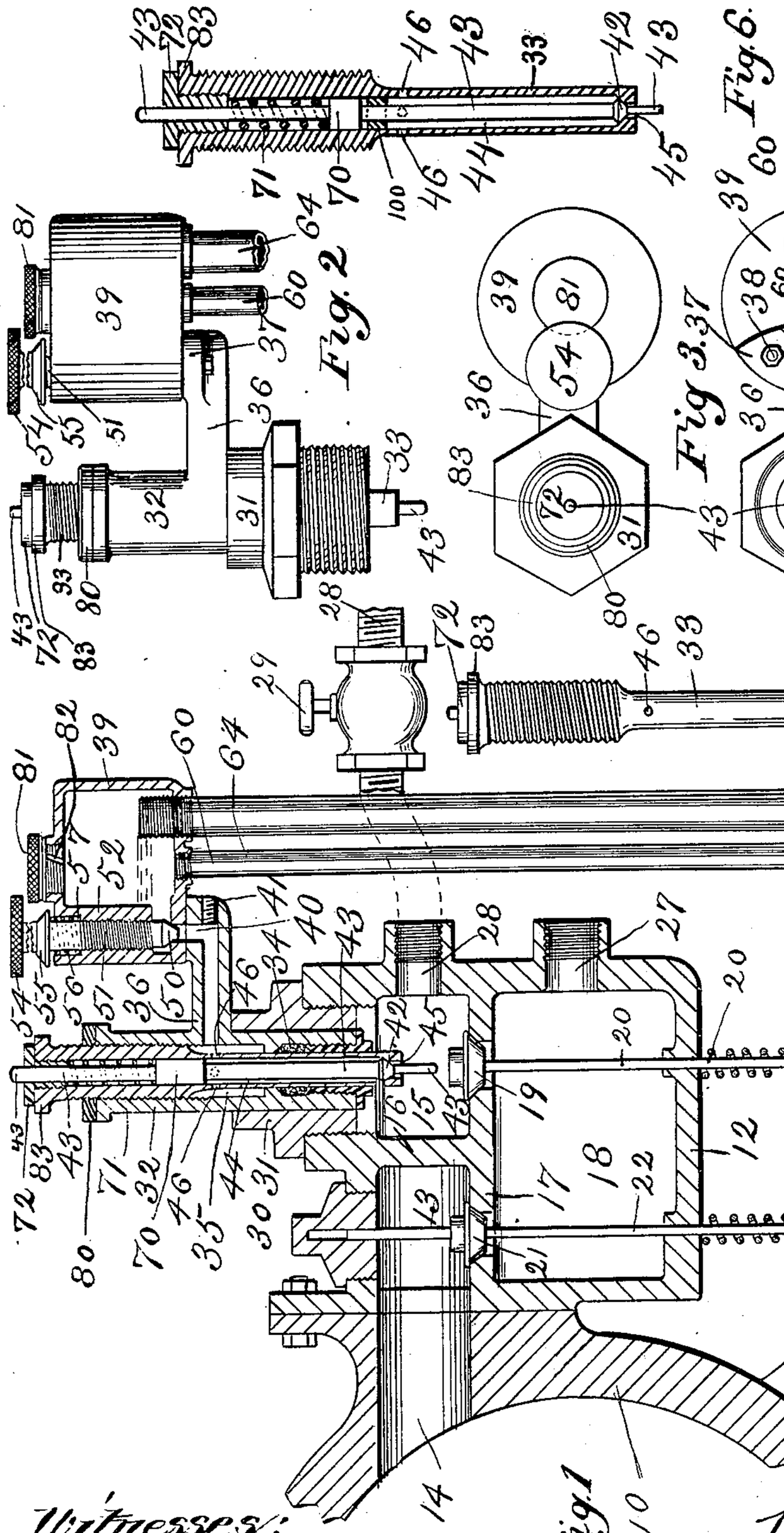

Fig. 1.

Fig. 2.

Fig. 3.

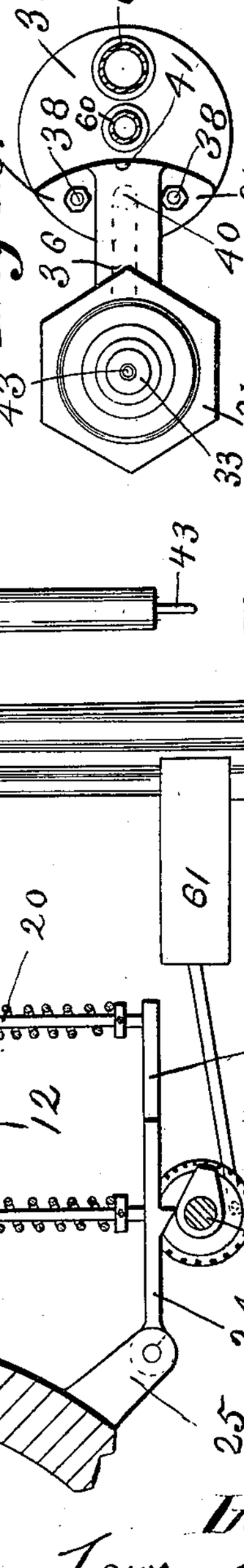

Fig. 4.

Fig. 5.

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UNITED STATES PATENT OFFICE.

LAWRENCE M. JOHNSTON, OF DAYTON, OHIO.

VAPORIZER FOR EXPLOSIVE-ENGINES.

SPECIFICATION forming part of Letters Patent No. 679,053, dated July 23, 1901.

Application filed June 5, 1899. Serial No. 719,511. (No model.)

To all whom it may concern:

Be it known that I, LAWRENCE M. JOHNSTON, of Dayton, county of Montgomery, and State of Ohio, have invented a certain new and useful Improvement in Gasolene-Feed Attachments 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, in which like numerals refer to like parts.

My present invention relates to improvements in gasolene attachments for explosive-engines which will be simple, durable, convenient, and efficient, which can be readily attached to any engine, and which can be retained in position upon an engine which is for the time being using gas or other explosive mixture coming from a different source than said gasolene attachment.

Said invention consists in the details of construction, arrangement, combinations, subcombinations of the parts, and in such further matters as are hereinafter described, and pointed out in the claims.

In the drawings, Figure 1 is a central vertical sectional view taken through a portion of the cylinder, the mixing-box attached thereto, the connections between the gasolene attachment and the storage-tank, and the means for pumping said gasolene from said tank being shown in dotted lines. Fig. 2 is an exterior side elevation view of the gasolene attachment removed from the mixer-box. Fig. 3 is a top plan view thereof. Fig. 4 is a bottom plan view thereof. Fig. 5 is an exterior view of the member containing the gasolene-valve for said gasolene attachment, and Fig. 6 is a central vertical sectional view of member 33 and its contained parts with a stationary head between valve 42 and the projection 70 of stem 43 and above the inlet-openings 46.

In the drawings, 10 represents the explosion-cylinder, of ordinary construction, a portion of which is shown in Fig. 1; 12, the mixer-box, attached by bolts or otherwise to said cylinder and having a chamber 13 registering with inlet-port 14 of said cylinder 10. In this instance opposite and on the same plane with said chamber 13 is a supplemental explosive-mixture receiving or supply chamber 15, separated from said chamber 13 by a wall 16, integral with a bottom wall 17, common to said chambers 13 and 15. In this instance below said chambers 13 and 15 is a mixing-chamber 18. The chamber 15 is adapted to be connected with chamber 18 by means of a valve 19, having a spring-pressed rod 20, in this instance extending through the lower wall of the mixing-chamber 18, while said chamber 18 is connected with said chamber 13 by a valve 21 upon a spring-pressed rod 22, in this instance passing through the lower wall of the chamber 18. Said valve-stems 20 and 22 are in this instance adapted to engage, respectively, with levers 23 and 24, pivotally mounted in projections 25 of the cylinder 10, and said levers 23 and 24 are adapted to be operated by different cams upon a cam-shaft 26, adapted to be driven by the engine. Leading into the chamber 18 is a pipe or opening 27, adapted to convey air or some other mixing agent to said mixing-chamber 18, and leading into the chamber 15 is a pipe or opening 28, adapted to convey gas or other explosive material to said chamber 15 from a source of supply different from said gasolene attachment, said pipe or opening 28 being provided with a valve 29 to close said pipe or opening when the explosive material is being supplied from said gasolene attachment. In this instance threaded into the top of said chambers 13 and 15 are plugs 30 and 31, respectively provided with surfaces for the reception of a wrench. In this instance removably mounted in the plug 31 is a tubular member 32, having a valve member 33, Figs. 1 and 5, threaded in this instance in the upper end thereof, while the lower end of said valve member 33 is slidingly and revolubly mounted in the lower end of said member 32 in suitable bearings therein, said bearings being formed in this instance of a suitable stuffing-box 34, Fig. 1, to make said bearings water or gasolene tight. Between the threads of the stuffing-box ends of said member 32 is formed a well or cavity 35, from which leads a pipe or opening 36, Figs. 1, 2, 3, and 4. Said pipe or opening 36 is formed in this instance by a laterally-projecting tubular arm provided in this instance on the upper edge of its outer end with lateral projections 37, Figs. 2 and 4, through which bolts 38 are passed to secure thereto

a small supplemental gasolene-supply tank 39. Said supplemental gasolene-supply tank is connected to said opening 36 in this instance by a vertical opening 40, Figs. 1 and 4, and in this instance to perfectly and readily form and connect said openings 36 and 40 with each other, the opening 36 is formed from the outer end of its arm into the cavity or well 35 of member 32, and the opening 40 is formed from the inner wall of tank 39 to the opening 36, and screw 41, Figs. 1 and 4, inserted in the mouth of said opening 36 to prevent the escape of the gasolene or other explosive agent employed in said supply apparatus.

The valve member 33 is in this instance tubular and is provided on its lower end with a valve-seat receiving a valve 42, Fig. 1, upon a stem 43, the diameter of valve 42 being less than that of the tubular cavity 44 through member 33, from which said valve and valve-seat are adapted to close the outlet, and the lower projecting end of the valve-stem 43 is less in diameter than the opening 45, leading from the valve-seat to the lower end of member 33 and into the chamber 15. The cavity 44, Fig. 1, is connected with the cavity 35 by means of a series of openings 46, being at a distance above the bottom of cavity 35, so that gasolene passing through opening 36 to cavity 35, thence through opening 46 into cavity 44, and thence upon the raising of valve 42 through opening 45 into chamber 15 will deposit any sediment therein in the bottom of the cavity 35, which sediment may readily be removed by unscrewing member 33 vertically out of the member 32 and then removing said sediment after the tank 39 has been disconnected from the opening 40 by means of the tapering end 50 of screw 51 being adjusted into the tapering mouth of opening 40 to stop the flow of the liquid therethrough. Said screw 51 is in this instance threaded through a projection 52, Fig. 1, upon one of the vertical walls of said tank 39, said screw being provided on its upper end with an operating-wheel 54, below which in this instance is a flange 55 upon said screw 51, against which is adapted to bear a spring 56, confined between a projection of said tank 39 and said flange 55 to prevent the jar of the engine from loosening or changing the adjustment of the screw 51, said spring 56 being in the instance shown in Fig. 1 mounted at its lower end in a recess 57 in the top of said projection 52 of tank 39. Leading into the bottom in this instance of said tank 39 is a pipe or opening 60, Figs. 1 and 2, connecting with a suitable pump 61, (shown in Fig. 1,) which pump 61 is adapted to be operated by a part of the engine, such as shaft 26 in this instance, while said pump 61 is connected to a large gasolene-supply tank 62, located at some distance from the engine and outside of the building, by a pipe or opening 63, both of which are shown in Fig. 1. In this instance leading into the bottom of said tank 39 and extending a desirable distance therein is an overflow pipe or opening 64, leading to said tank 62, so that when the pump 61 is operated to bring the liquid from tank 62 through pipes 63 and 60 to the supplemental supply-tank 39 until said liquid reaches such a height in said tank 39 as the mouth of said outlet pipe or opening 64 said liquid will keep up a constant circulation between said large supply-tank 62 and the small supplemental tank 39. Above said openings 46 through the walls of members 33 is a projection 70 on valve-stem 43, fitting and slidably mounted in the tubular cavity 44 through said member 33, and in this instance against the top of said projection rests a spring 71, Fig. 1, whose upper end is confined in this instance by an adjusting member or screw 72, threaded in this instance into the top of member 33 and provided with an opening therethrough, in which the upper end of valve-stem 43 is slidably mounted.

In operation the valves 19 and 21 are raised at suitable times, so that the piston working in the cylinder draws the explosive mixture from chamber 15 into chamber 18 to be mixed with air or other suitable mixing agent coming through pipe or opening 27. Thence said mixture is drawn from chamber 18 through the open valve 21 and into the cylinder 10 to be exploded. The explosive mixture is fed to chamber 15 either through pipe or opening 28 or through the opening in the gasolene attachment. When said chamber 15 is fed through pipe or opening 28, the flow of gasolene to chamber 15 can be cut off either by unscrewing the member 33 and raising it to such a height in the member 32 that the bottom of valve-stem 43 will not be engaged by the valve 19 when raised to its highest point or said flow of gasolene may be cut off by the adjustment of screw 51, so that its tapering end 50 snugly fits in the tapering mouth of the passage-way 40 from the tank 39, and when it is desired to supply the chamber 15 with explosive mixture only through the gasolene attachment the valve 29 in pipe or opening 28 is closed. However, if it is desired to supply explosive mixture to said chamber 15 from both said sources of supply the valves or mechanisms of each source of supply are adjusted so as to supply the requisite amount of explosive material to said chamber 15.

The amount of gasolene or other liquid adapted to be supplied to chamber 15 may be regulated to any desired extent by the vertical adjustment of member 33 with relation to the member 32, so that the valve 42, and its valve-stem 43 mounted in said member 33, are raised to a greater or less extent by the opening and closing of the valve 19, and the quantity of explosive mixture adapted to be admitted to chamber 15 may be thereby regulated to a nicety to give the desired power or to accommodate the different qualities or mixtures of explosive material. Threaded upon and near

the top in this instance of member 33 is a lock-nut 80, adapted to engage in this instance the top of member 32 to lock said member 33 in the desired relation with number 32, so that the vibrations of the engine cannot change the adjustment of said member 33.

The gasolene attachment thus described may be attached to any make of engine simply by making the plug 31, in which the member 32 is removably mounted, either larger or smaller to accommodate the opening to chamber 15, into which said plug is adapted to be fitted.

It will furthermore be seen that my invention admits the gasolene or other fluid in a tubular stream to the end of valve-stem 43 directly into the top of the valve 19, so that said tubular stream may be spread by the raised end of said valve 19 into a tubular stream of a much larger diameter, and consequently much thinner, and thence into the mixing-chamber 18 in a very thin tubular stream of a relatively large diameter, so that said liquid may be exposed to almost the whole volume of air or other mixing agent in chamber 18, supplied by pipe or opening 27, and much more readily reduced to a gas and passed to the cylinder through the open valve 21. In this instance through the top of tank 39 is formed an opening in which is mounted in this instance a removable plug 81, Figs. 1, 2, and 3, so that said plug 81 may be removed from its opening and the condition or flow of gasolene in said tank 39 may be inspected, while in this instance in the side of said plug 81 is formed a slot 82, Fig. 1, extending partially the length of said plug 81 and adapted to be closed when said plug 81 is in this instance screwed down upon its opening in the tank 39; but when said plug 81 is partially unscrewed from its opening in said tank 39 said slot 82 is adapted to be connected with the atmosphere upon the outside of tank 39, so as to prevent the forming of a vacuum in said tank 39 by the flow of the gasolene therein through the opening 40 or the pipe 64. The upper end in this instance of member 33 is provided with a projection 83, Figs. 1, 2, 3, and 5, which is either knurled or suitably formed for the reception of a wrench, so that said member 33 may be readily adjusted to different positions, and said nut 80 thereon is likewise knurled or formed to receive a wrench or other operating-tool. It is therefore apparent that my invention forms a neat, simple, and convenient apparatus at a minimum cost, which may readily be attached to any engine by an ordinary mechanic.

It will be observed that the valve 42, admitting the gasolene, is quickly raised by the valve 19, causing the gasolene or other explosive liquid above said valve 42 and surrounding said stem 43 to be forced under a slight pressure around said valve 42 and through the end of member 33, thus starting the flow of gasolene or other explosive through the end of the member 33 by pressure, and where greater pressure is desired a ring 100, Fig. 6, may be secured within the bore 44 of member 33 at a point immediately above the gasolene-inlet openings 46, through the center of which ring 100 the valve-stem 43 freely slides, and the valve 42 when raised places the gasolene or other liquid explosive contained within said bore 44 below said ring 100 under pressure, which pressure is relieved by the passage of the gasolene in a tubular stream from the end of member 33 until the valve 42 has been raised to its full height, during which time a very small amount of the fluid is being forced out of the inlet-openings 46; but after said valve 42 has been raised to its full height and the pressure of the gasolene herein relieved by flowing through the lower end of the member 33 in a tubular stream under pressure the downwardly-flowing gasolene in the bore 44 of member 33 begins to act siphon-like upon the gasolene in the chamber 35, connected with tank 39, and further quantities of gasolene are drawn therefrom and passed in a tubular stream through the lower end of said member 33 until valve 42 is closed by the closing of the valve 19 in this instance. It will thus be seen that the flow of gasolene or other explosive is started under pressure as soon as valve 42 is raised, that the remainder of gasolene to form each charge of explosive material is drawn from tank 39 by the siphon-like action started under pressure, as before stated, and that each time the valve 42 is raised a definite quantity of the explosive mixture is forced in a tubular stream into the chamber 15, thus starting the siphon-like action, which continues until the valve 42 is closed.

Having now so fully described my invention as to enable others skilled in the art to freely make and use the same when this exclusive grant shall cease to operate, what I claim, and desire to secure by Letters Patent, is—

1. In an explosive-engine, the combination with the engine, a supplemental receiving-chamber and a mixing-chamber, the one above the other; an inlet-valve seated in the dividing-wall between said chambers, a supply-valve in the wall of said supplemental receiving-chamber vertically opposite said inlet-valve, a liquid-supply tank, a pipe connection between said tank and said supply-valve, means for operating said inlet-valve, means for operating said supply-valve from said inlet-valve, an opening leading into said mixing-chamber, a separate opening leading from said mixing-chamber to the cylinder of the engine and a valve seated in said separate opening, substantially as specified.

2. In an explosive-engine, the combination with a mixing-chamber, a supplemental receiving-chamber having valve connection with said mixing-chamber, a liquid-supply tank, mechanism intermediate said liquid-tank and the supplemental chamber whereby the liquid contents of said tank are con-

trollably fed to said supplemental chamber, of means intermediate the engine and said valve connection whereby the valve is opened and the contents of the supplemental chamber permitted to enter the mixing-chamber, substantially as shown and for the purpose described.

3. In an explosive-engine, the combination with the cylinder, of an intermediate or secondary liquid-supply tank, a supplemental receiving-chamber situated in a lower horizontal plane than said secondary liquid-supply tank and having valve connection therewith, said supplemental receiving-chamber also having connection with an independent gas-supply, a mixing-chamber provided with an air-inlet and adapted to have communication with the supplemental receiving-chamber and the cylinder at predetermined intervals, and mechanism intermediate the engine and valve connections between said liquid-supply tank, supplemental chamber, mixing-chamber, and the cylinder, whereby the same are actuated and a predetermined quantity of explosive gas communicated to the igniting end of said cylinder, substantially as shown and in the manner described.

4. In an explosive-engine comprising the cylinder, a mixing-chamber, and an explosive-receiving chamber, the combination with a liquid-tank having valve connection with said receiving-chamber, of spring-controlled valves between said cylinder, mixing-chamber, and explosive-receiving chamber, and means intermediate said revoluble shaft and the depending stems of said spring-controlled valves to intermittingly contact with said depending stems, the vertical axes of the valve intermediate the liquid-tank and receiving-chamber, and the valve intermediate the receiving and mixing chambers being coincident, so that when the shaft is revolved the spring-controlled valves will be actuated and one of said valves in turn will actuate the liquid-tank valve, substantially as shown and in the manner described.

5. In an explosive-engine, the combination with a revoluble shaft and the cylinder, of a mixing-chamber, an explosive-supply chamber, a valve between said two chambers, a valve between said mixing-chamber and the cylinder, a liquid-explosive inlet vertically above said first valve, a valve for controlling said liquid-supply inlet, a stem therefor of less diameter than and passing through the center of said liquid-inlet opening, said stem projecting in the path of movement of said first valve, and means including said revoluble shaft for operating said first valve whereby when said first valve is operated the liquid-supply valve is adapted to be operated to admit the liquid in a tubular stream around the stem of said liquid-supply valve and upon and around said first valve into the mixing-chamber, substantially as specified.

6. In an explosive-engine, the combination with the cylinder, of a mixing-chamber, an explosive-supply chamber, a valve controlling an opening between said two chambers, a valve between said mixing-chamber and the cylinder, a liquid-explosive inlet vertically above said opening controlled by said first valve, a valve for controlling said liquid-supply inlet, a stem therefor passing through the center of said liquid-inlet opening and projecting in the path of and to be operated by said first valve, and means for adjusting said valve-stem closer to or farther away from said first valve for regulating the operation of and the quantity of liquid adapted to be admitted by said liquid-supply valve to flow over the top of said first valve and into said mixing-chamber, substantially as specified.

7. In an explosive-engine, the combination with the cylinder, of a mixing-chamber, an explosive receiving or supply chamber, a valve between said two chambers, a valve between said mixing-chamber and the cylinder, a liquid-explosive inlet vertically above said first valve, a valve seated in said inlet comprising two tubular members, the one within the other, a portion of the diameters of said tubular members being such as to form a circumferential chamber or cavity to receive the inflow of liquid, said inner member provided with ports at a point coincident with said cavity, a stem passing through the center of said liquid-inlet opening and adapted to be operated by said first valve, and means for vertically adjusting said liquid-inlet and its valve, valve-seat and valve-stem closer to or farther from said first valve for regulating the operation of and the quantity of said liquid adapted to be admitted by said liquid-supply valve, substantially as shown and described.

8. In an explosive-engine, the combination with the cylinder, of a mixing-chamber, an explosive-supply chamber, a valve controlling an opening between said two chambers, a valve between said mixing-chamber and the cylinder, a tubular member leading into said explosive-supply chamber vertically above said opening controlled by said first valve, a valve and valve-stem seated in said tubular member, said valve-stem passing loosely through the mouth of said tubular member and extending into the path of movement of said first valve, a liquid-supply tank, and a connection between said tank and the bore of said tubular member, substantially as specified.

9. In an explosive-engine, the combination with the cylinder, of a mixing-chamber, an explosive-supply chamber, a valve between said two chambers, a valve between said mixing-chamber and the cylinder, a tubular member leading into said explosive-supply chamber vertically above said first valve, a valve and valve-stem seated in said tubular member, said valve-stem passing loosely through the mouth of said tubular member and adapted to be engaged by said first valve, a liquid-supply tank, a connection between

said tank and the bore of said tubular member, and means for vertically adjusting said tubular member with its valve and valve-stem with reference to said first valve and its connection with said tank, substantially as specified.

10. In an explosive-engine, the combination with the cylinder, of a mixing-chamber, an explosive-supply chamber, a valve between said two chambers, a valve between said mixing-chamber and the cylinder, a tubular member leading into said explosive-supply chamber vertically above said first valve, a valve and valve-stem seated in said tubular member, said valve-stem passing loosely through the mouth of said tubular member and adapted to be engaged by said first valve, a liquid-supply tank, a second tubular member surrounding said first tubular member, a cavity between said tubular members, a connection between said tank and said cavity, a connection between said cavity and the bore of said second tubular member, means for operating said first valve, and means independent of said valve-operating means for relatively adjusting said stem and said first valve closer to or farther from each other, substantially as specified.

11. In an explosive-engine, the combination with the cylinder, of a mixing-chamber, an explosive-supply chamber, a valve between said two chambers, a valve between said mixing-chamber and the cylinder, a tubular member leading into said explosive-supply chamber vertically above said first valve, a valve and valve-stem seated in said tubular member, said valve-stem passing loosely through the mouth of said tubular member and adapted to be engaged by said first valve, a liquid-supply tank, a second tubular member surrounding said first tubular member, a connection between said tank and the bore of said second tubular member, a connection between the bore of said first tubular member and the bore of said second tubular member, and said first tubular member being vertically adjustable with reference to said second tubular member and said first valve, substantially as specified.

12. In an explosive-engine, the combination with the cylinder, of a mixing-chamber, an explosive-supply chamber, a valve between said two chambers, a valve between said mixing-chamber and the cylinder, a tubular member leading into said explosive-supply chamber vertically above said first valve, a valve and valve-stem seated in said tubular member, said valve-stem passing loosely through the mouth of said tubular member and adapted to be engaged by said first valve, a second tubular member surrounding said first tubular member and passing through the wall of said explosive-supply chamber, a stuffing-box in the lower end of said second tubular member adapted to engage the lower end of said first tubular member, a threaded connection between the upper ends of said first and second tubular members, a cavity in said second member and surrounding said first member intermediate said threaded and stuffing-box ends, a tubular connection leading from the top of said cavity in said second member to a supply-tank, one or more openings through the walls of said first member for connecting the cavity in said second member with the tubular cavity in said first member, a valve-seat near the bottom of said tubular cavity in said first member, a spring-pressed valve for said seat, and the stem of said valve passing loosely through the mouth of said tubular cavity toward said first valve, substantially as specified.

13. In an explosive-engine, the combination with an engine, of an inlet-valve moving vertically upon a projection as a guide, a mixing-chamber, a liquid-supply tank, a separate valve intermediate said tank and mixing-chamber, a relatively small opening between said tank and said separate valve, said separate valve being vertically above the opening controlled by said inlet-valve, a projection intermediate said valves, means for operating said inlet-valve, and a cavity between said separate valve and said opening leading to said tank into which cavity said separate valve is operated, means stationarily held in said cavity and surrounding the valve-stem whereby when said inlet-valve is operated the liquid is placed temporarily under pressure in said cavity and forced out upon said inlet-valve after which the liquid in said tank flows through said cavity and onto said inlet-valve until said separate valve is closed, substantially as specified.

In witness whereof I have hereunto set my hand this 19th day of April, 1899.

LAWRENCE M. JOHNSTON.

Witnesses:

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F. M. BURNHAM.