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E. T. McKAIG.

MIXING APPARATUS FOR EXPLOSION OR GASOLENE ENGINES.

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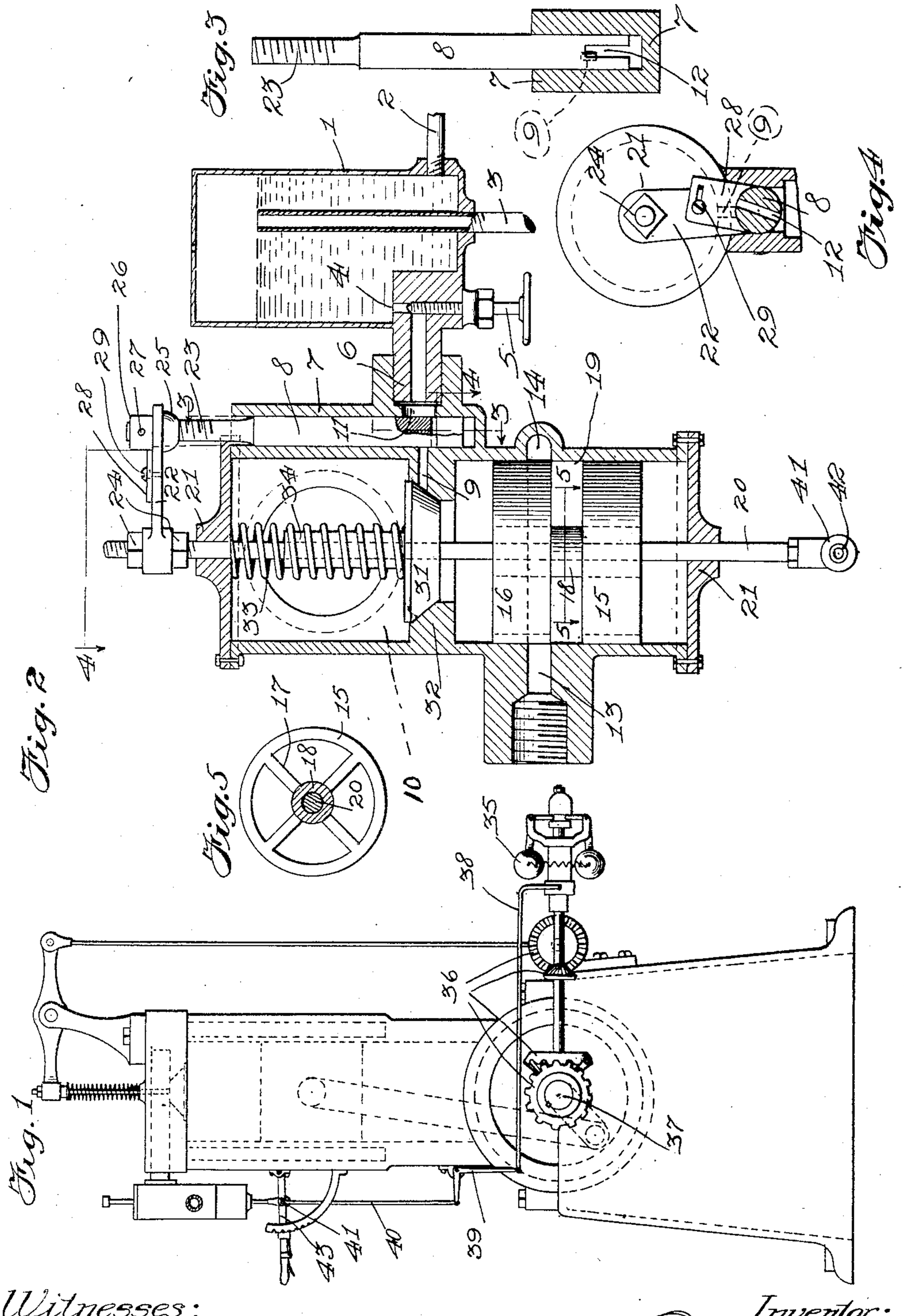

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UNITED STATES PATENT OFFICE.

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MIXING APPARATUS FOR EXPLOSION OR GASOLENE ENGINES.

SPECIFICATION forming part of Letters Patent No. 779,490, dated January 10, 1905.

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To all whom it may concern:

Be it known that I, EDDY T. McKAIG, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Mixing Apparatus for Explosion or Gasolene Engines, of which the following is a full, clear, and exact specification.

My invention relates to that type of explosion or gasolene engines in which the gasolene or other explosive and the air for supporting the combination thereof are mixed before admission to the cylinder of the engine, and the improvements have more especial reference to the means for regulating the air and fuel supply proportionately; and the invention has for its primary object to provide improved and efficient means whereby the speed of the engine may be governed or controlled by varying the amount of the explosive mixture admitted to the cylinder for each impulse of the engine without varying the proportions of air and explosive.

Another object of my invention is to provide improved and simple means whereby the fuel or gasolene valve may be readily adjusted relatively to the port which it controls, so as to make the mixture weaker or richer, as may be necessary.

With these ends in view my invention consists in certain features of novelty in the construction, combination, and arrangement of parts by which the said objects and certain other objects hereinafter appearing are attained, all as fully described with reference to the accompanying drawings, and more particularly pointed out in the claims.

In the said drawings, Figure 1 is a side elevation of an explosion-engine provided with my improvements. Fig. 2 is a vertical sectional view of the mixing apparatus, hereinafter explained. Fig. 3 is a detail view of the gasolene or explosive controlling-valve, showing it in connection with a part of its housing. Fig. 4 is a plan view of the mixing apparatus with the gasolene-cup removed, and Fig. 5 is a detail cross-section of the air-valve on the line 5 5, Fig. 2.

1 is a cup for receiving gasolene or other explosive, which is provided with a supply-pipe 2, which may be connected with a pump or any suitable source of supply, and an overflow-pipe 3, which maintains a uniform level of the gasolene in cup 1. The cup is also provided with an outlet 4, controlled by a suitable stop-cock 5 for entirely closing the outlet when it is desired to stop the engine. The outlet 4 communicates, by means of nipple 6 or any other suitable expedient, with a valve-housing 7, which is preferably cylindrical in cross-section and elongated vertically to a point above the level of the gasolene in cup 1, so that by no possibility can the gasolene rise in the housing 7 to an extent permitting it to leak out. Within the valve-housing 7 is arranged a cylindrical valve 8, which is very long as compared with its diameter, so as to avoid the necessity of employing packing and which is adapted to control a gasolene-port 9, leading from the housing 7 into a mixing cavity or chamber 10. The valve 8 controls the port 9, closing it more or less as the conditions require by covering it or intercepting the passage between the port 9 and port 11 in the opposite side of the housing, which places the housing in communication with the nipple 6, and the gasolene which passes the valve 8 and enters the mixing chamber or cavity 10 must first pass through a recess or slot 12 at or near the lower end of the valve 8, and it can enter the port 9 only when the slot 12 registers wholly or partially with said port. Hence it is evident that the amount of gasolene entering the mixing chamber or cavity 10 may be varied at will either by raising the valve 10 while the slot 12 is in line with the port 9 or by rotating the valve so as to bring the slot 12 wholly or partially into register with the port 9. In Fig. 3 the upper corner of the slot 12 is shown as in register with the lower corner of the port 9, making a very small passage for the gasolene, which will be still further decreased should the valve 8 descend or increased should it rise without necessarily rotating the valve in its housing.

In practice I prefer to utilize the reciprocatory motion of the valve 8 for varying the speed of the engine after the proper mixture has been attained by the rotary adjustment of the valve 8, and I will now describe the pre-

ferred means of accomplishing these results and will also describe the means whereby the amount of air entering the mixing chamber or cavity 10 is varied in proportion with the variation in the amount of gasolene entering said cavity.

As better shown in Fig. 2, the lower side of the mixing chamber or cavity 10 is provided with an air-inlet port 13, which preferably communicates with a groove 14, surrounding the inner wall of the mixing-chamber, and arranged in the chamber is a piston-valve, which is shown as composed of two rings 15 16, connected together by webs or spokes 17, extending longitudinally thereof and formed on a hub 18, the rings 15 16 being located a distance apart so as to leave a space 19 between them which is adapted to register wholly or partially with the port 13 and groove 14, and thus admit air to the mixing-chamber through the rings. The hub 18 is secured to a stem 20, which slides freely through suitable bearings 21 in the ends of the mixing-chamber 10 and is secured at one end of an arm 22, whose other end is secured to an extension 23 of the valve 8. These connections are accomplished by clamping one end of the arm 22 between two jam-nuts 24, threaded on the rod 20, and its other end between a nut 25, threaded on extension 23, and a collar 26, secured by pin 27 or other suitable means to extension 23 and having a plate 28, which is attached by screw 29 to arm 22. By this means it will be seen that when the rod 20 is raised the air and gasolene valves will be simultaneously opened and the supply of air and gasolene thereby uniformly increased, and when the stem 20 is lowered the supply will be uniformly decreased and entirely shut off, should the conditions require, but without varying the relative proportions of air and gasolene. Should it be found necessary, however, to alter these proportions, the desired result may be accomplished to a nicety by loosening the screw 29 and pushing the plate 28 to one side or the other, so as to rotate valve 8 and bring the slot 12 more or less into register with the port 9. In order that plate 28 may be thus removed, it is slotted, as shown at 30, where screw 29 passes through.

In operation the lift of the fuel-valve 8 will be the same as the air-valve at all times, and when the former valve is in its initial or starting position it is supposed to close the fuel-port 9; but said valve 8 may be so adjusted longitudinally that the same lift at one time will give a wider opening than at another time, and this longitudinal adjustment being supplemented by the simultaneous rotary adjustment the variation in the port-opening may be effected with great nicety.

The mixing-chamber 10 is preferably divided off from the housing of the air-valve 15 16 by a check-valve 31, which closes downwardly upon a seat 32, and the gasolene-port 9 preferably passes through this seat, so as to be closed at one end by the valve 31, which is normally forced to its seat by any suitable cushion or spring 33 pressing between the upper side of the valve and the under side of the upper end of mixing-chamber 10 and surrounding a guide-stem 34 on the valve 31, the stem 34 being sleeved loosely upon the rod 20, so as to permit the valve 31 to lift during the inspiration-stroke of the engine independently of the rod 20, which is moved only to vary the engine speed. This reciprocatory motion of rod 20 may be effected in any desired way—such, for example, as an ordinary ball or centrifugal governor 35, suitably connected by gears 36 to engine-shaft 37 and acting upon a rod 38, which is connected to one arm of a bell-crank 39, whose other arm is connected by rod 40 with a perforated lug 41 on the end of rod 20 by means of a pin 42, thus automatically regulating the size of the charge according to the speed of the engine; but should it not be desired to employ the governor the pin 42 may be withdrawn for disconnecting the rod 40 from the rod 20 and the rod 20 then connected to a hand-lever 43 by means of pin 42.

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

1. In a mixing apparatus for an explosion-engine the combination of a mixing chamber or cavity having air and fuel inlet ports, parallel piston-valves arranged side by side for controlling said ports respectively, means connecting said valves together whereby they may be moved in unison, and means for longitudinally adjusting one of said valves independently of the other, substantially as set forth.

2. In a mixing apparatus for an explosion-engine the combination of a mixing chamber or cavity having inlet-ports for fuel and air, a valve for controlling said air-port, a cylindrical valve-housing connected to said mixing-chamber by said port, and arranged to one side of and parallel with said chamber, a cylindrical valve in said housing controlling said port and having a recess adapted to register with said port, means connecting said valves together, means for moving said valves longitudinally and means for adjusting said second valve rotatably, substantially as set forth.

3. In a mixing apparatus for explosion-engines the combination of a mixing chamber or cavity having air and fuel inlet ports, a valve-seat in said chamber through which said fuel-port enters said chamber, a check-valve on said seat, a valve controlling said air-port, a fuel-valve controlling said fuel-port, a stem secured to said air-valve and passing loosely through said check-valve, and an adjustable connection between said air and fuel valves.

4. In a mixing apparatus for an explosion engine the combination of a mixing-chamber

having air and fuel inlet ports, a piston-valve controlling said air-port, a reciprocatory rod passing through said valve and chamber, a second valve for controlling said fuel-port and an adjustable connection between said second valve and rod, substantially as set forth.

5. In a mixing apparatus for an explosion engine the combination of a mixing chamber or cavity having air and fuel inlet ports, a vertically-elongated cylindrical valve-housing connected to said chamber by said fuel-port and connected with a source of fuel, a cylindrical valve arranged in said housing and having a slot adapted to register with said fuel-port, an air-valve for controlling said air-inlet port, means for moving said cylindrical valve and air-valve in unison and means whereby said cylindrical valve may be adjusted rotatably and longitudinally independently of said air-valve, substantially as set forth.

6. In an explosion-engine the combination of a mixing chamber or cavity having air and fuel inlet ports, parallel valve-stems and valves thereon for controlling said ports respectively, a rigid connection between said valve-stems whereby they will reciprocate in unison, a plate secured to the stem of said fuel-valve for rotating it and means adjustably securing said plate to said rigid connection, substantially as set forth.

7. In a mixing apparatus for an explosion-engine the combination of a mixing chamber or cavity having air and fuel inlet ports and an outlet-port for the mixture, a check-valve having a seat interposed between said air-port and outlet-port and in which seat said fuel-port is formed, a valve controlling said air-port, a stem or rod to which said valve is secured, passing through said check-valve and movable independently thereof, a reciprocatory valve controlling said fuel-port and a rigid connection between said stem or rod and reciprocatory valve, said stem or rod and reciprocatory valve being arranged lengthwise of each other, substantially as set forth.

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