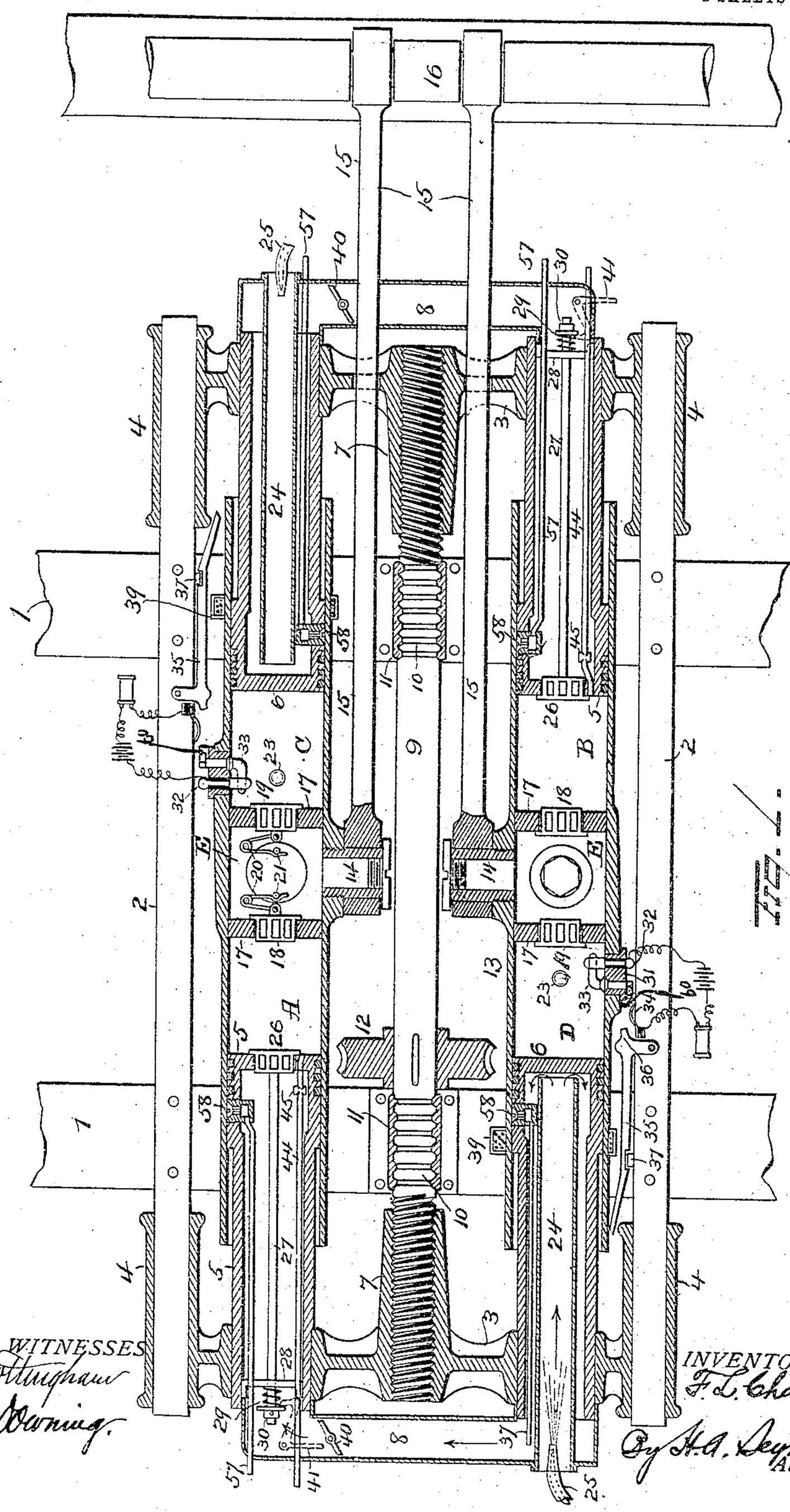
No. 765,814. PATENTED JULY 26, 1904.

F. L. CHAMBERLIN.

EXPLOSIVE ENGINE.

APPLICATION FILED MAY 14, 1903.

NO MODEL. 2 SHEETS—SHEET 1.



WITNESSES

E. Nottingham

G. F. Downing.

INVENTOR

F. L. Chamberlin

By H. A. Seymour

Attorney

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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2.

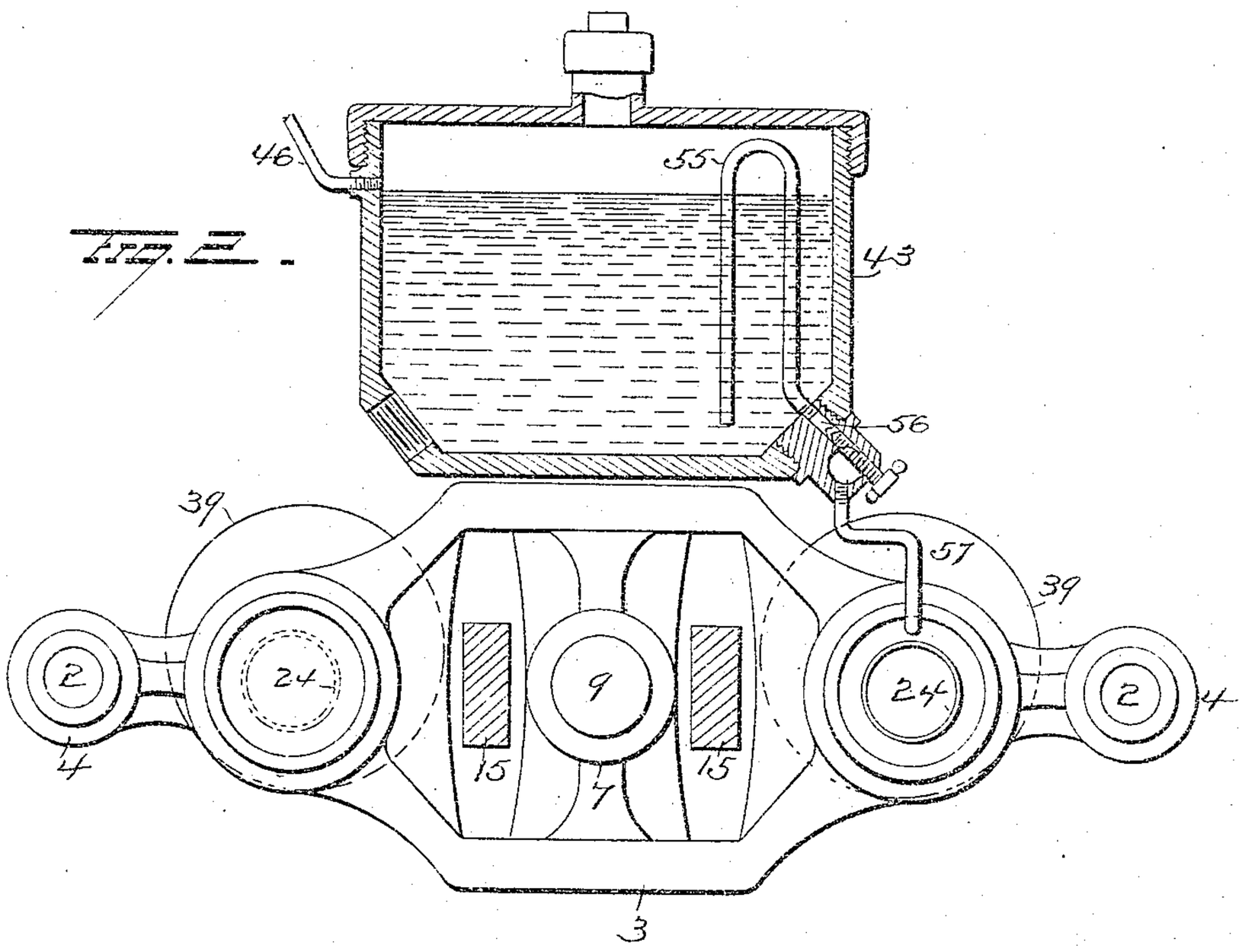
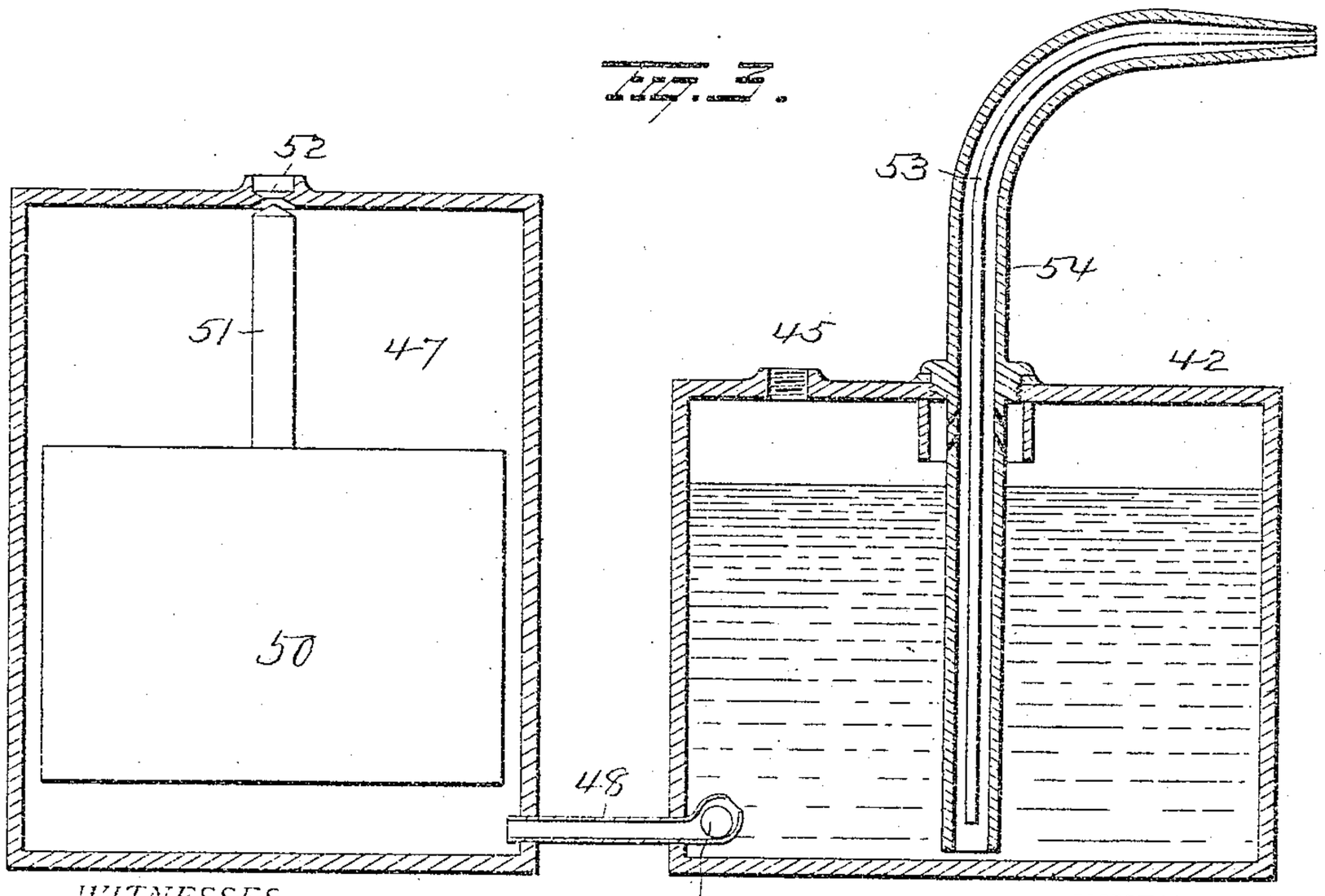


Fig. 5.



WITNESSES

E. Whittingham

G. F. Downing.

INVENTOR

F. L. Chamberlin

By A. G. Seymour

Attorney

No. 765,814. Patented July 26, 1904.

UNITED STATES PATENT OFFICE.

FRANKLIN L. CHAMBERLIN, OF CLEVELAND, OHIO.

EXPLOSIVE-ENGINE.

SPECIFICATION forming part of Letters Patent No. 765,814, dated July 26, 1904.

Application filed May 14, 1903. Serial No. 157,136. (No model.)

To all whom it may concern:

Be it known that I, FRANKLIN L. CHAMBERLIN, a resident of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in 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 improvements in explosive-engines, and more particularly to that class of engines in which the pistons are normally stationary and the cylinders reciprocate thereon, the object of the invention being to provide improvements of this character of the two-cycle type in which one end of the cylinder constitutes an engine and the other a pump to supply air-gas to the engine.

A further object is to provide improved means for lubricating the pump and engine pistons and cylinders.

A further object is to provide improvements of this character in which a single connecting-rod serves for the engines and pumps.

A further object is to provide an improved engine which can be most effectually air or water cooled.

A further object is to provide an improved arrangement of valves to govern the supply of air-gas.

A further object is to provide an improved engine in which the positions of the engine and pump pistons can be changed to vary the compression and power of the engine and which can be entirely removed from the cylinders when desired.

With these objects in view the invention consists in certain novel features of construction and combinations and arrangements of parts, as will be more fully hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a view in longitudinal horizontal section, illustrating my improvements. Fig. 2 is an end view of the engine, showing the connecting-rods or pitmen and lubricant-supply tank in section; and Fig. 3 is a view illustrating a form of carbureter which may be effectually employed.

1 1 represent bars of an automobile-frame on which my improved engine is supported, and while my improvements are especially adapted for use on automobiles and boats they are also equally well adapted for a great many other uses.

On the bars 1 longitudinal parallel rods 2 are secured, and the engine-frame is mounted on the rods. The engine cross-frames 3 are exactly alike at both ends and comprise castings having elongated sleeves 4, supported on rods 2. Each of these frames 3 has secured therein parallel hollow cylindrical pistons 5 and 6, the former a pump-piston and the latter an engine-piston, and pipes or conduits 8 connect these hollow pistons, as shown.

Each frame 3 is provided at its center with an integral threaded sleeve 7 to receive the screw-threaded ends of a rod 9, the threads at the ends of said rod being, respectively right and left, so that when the rod is revolved the pistons will be moved longitudinally toward each other or apart. The rod is held against longitudinal movement by means of peripheral flanges 10 thereon turning in housings 11 on bars 1, and a worm-gear 12 is secured on said rod and operated by a suitable worm (not shown) when it is desired to adjust the position of the pistons.

Cylinders 13 are mounted on the alined pump and engine pistons 5 and 6 and are common to both, and these cylinders 13 have crank-pins 14 on one side connected by pitmen 15 with the arms of crank-shaft 16, so that as the cylinders are reciprocated on the pistons the crank-shaft will be driven thereby and the pumps operated, as will hereinafter appear. The cylinders are provided at their central portions with heads 17, spaced apart, forming a chamber E between them, and these heads have ports closed by check-valves 18 and 19, and springs 20 are connected at one end with said valves and are located in the chamber E and their other ends bear against pins 21. The valve 18 opens from the pump A into the chamber E and the valve 19 opens into the engine C, but prevents any return of the explosive mixture to the chamber or pump, and the opening movement of said valve 19 is limited by a plug 23, screwed

into the cylinder, and this plug can be removed to permit examination of the interior of the cylinder.

Each engine-piston 6 has a tube or pipe 24 projecting thereinto up to near the head of the piston, and into these pipes 24 air-gas is discharged by a nozzle 25, connected with a suitable supply. This air-gas then passes around the outside of pipe 24 between the same and the wall of the piston 6 and around through pipes or passages 8 to the pump-pistons 5, which latter have check-valves 26 in their heads. These valves 26 are secured on rods 27, mounted in a suitable spider 28 in the piston, and a spring 29 is mounted on each rod 27 between the spider and a nut 30 thereon to normally hold the valve on its seat. The air-gas escapes past the valves 26 and is forced through valves 18 and 19 to the engines, as will more fully hereinafter appear.

In each cylinder 13 between the heads 17 and the piston 6 a plug 31 is screwed and is made with insulated bearing for the stationary electrode 32 and a movable electrode 33 that is not insulated. These electrodes are normally held in contact by a light spring 60. The electric circuit is complete or closed only while the knob 32 is in contact with the spring 34. This spring is insulated in its support and is connected by electric wire to the battery or source of electricity, the other terminal wire from the battery being grounded to the frame or engine. The lever 35 is pivoted to the frame and the free end 36, which is to be engaged by the lever end of the movable electrode 33 to separate the electrodes and make a spark to explode the charge. The lever 35 is notched at one side, as shown, to receive a wedge 37, by means of which the spark can be advanced or retarded at will. The spark is advanced automatically when the end of elongated sleeve 4 engages the inclined end of lever 35.

To throttle the passage of air-gas to the engines, I may provide butterfly-valves 40 in the passages 8 or I might provide levers 41 to limit the opening movement of the pump-valves 26.

In Figs. 2 and 3 I illustrate a carbureter 42 and lubricant-supply tank 43 for supplying hydrocarbon spray and lubricant, respectively, to the engine and pumps, as will be now described, and I would have it understood that when I refer to "air-gas" I employ the term in its broadest sense, as any form of gas might be used. Pipes 44 communicate with the heads of the pump-pistons 5 and receive the air-pressure due to the reciprocating cylinders thereon. These pipes are provided with check-valves 45 to govern the pressure, and the air is conveyed to the carbureter-inlet 45 and the inlet 46 of the lubricant-tank.

The carbureter 42 has an automatic supply-tank 47 connected with the carbureter-chamber by a pipe 48, near the bottom thereof, in which a ball-valve 49 is located. In this supply-tank 47 a float 50 is provided and has a stem 51 for closing the inlet 52 thereof, through which gasolene or other liquid hydrocarbon is supplied. This float serves to maintain a uniform level of the liquid in chamber 42, and into the top of the latter project pipes 53 and 54, the former smaller than the latter and surrounded thereby. The outer pipe 54 has air-inlets above the liquid-level, so that a portion of the air enters the same and the pressure forces the liquid through the inner pipe 53, and they intermingle and are discharged in a fine spray through the nozzles 25, as above explained.

The air-pressure in lubricant-tank 43 forces the oil up through a curved outlet-pipe 55, through a valved outlet 56, and through pipes 57 to outlets 58 in the walls of the pistons 5 and 6 to lubricate both the pistons and cylinders.

For convenience in describing the operation of my improvements I will designate the pumps A and B and the engines C and D.

The operation of my improvement is as follows: We will suppose an explosion has just taken place in engine C. As the cylinders 13 move to the left the pressure of the exploded gases will hold valve 19 on its seat, and when the cylinder moves far enough the products of combustion will exhaust through the muffled exhaust-chamber 39. The pressure in pump-chamber B is utilized to operate the carbureter and lubricant-supply. The movement to the left of the other cylinder 13 will serve to draw the air-gas past valves 26 in pump B, and the reverse movement of the cylinder will force the explosive mixture past valves 18 and 19 to the engine D, in which it will be compressed by the movement of the cylinder and exploded by the spark made by my improved sparking mechanism above described. The operation of both pairs of engines and pumps is precisely alike and the operation of the engines also operates the pumps to supply the air-gas thereto.

Instead of making the muffler-chambers eccentrically, as above described, I might mount them concentrically, and I might dispense altogether with the valves in the engine and admit the explosive mixture through ports in the pistons.

With my improvements as the cylinders reciprocate they will be effectually cooled by their rapid movement through the air, and the pistons are cooled by their contact with the incoming air-gas and may also be water or air cooled in any approved manner, and the cylinders may be water-cooled, if desired.

A great many changes might be made in the general form and arrangement of the parts described without departing from my invention, and hence I do not confine myself to the precise details set forth, but consider myself

at liberty to make such slight changes and alterations as fairly fall within the spirit and scope of my invention.

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

1. In a combined engine and pump, the combination of a single cylinder comprising an engine in one end and a pump in the other, and a single pitman connecting this cylinder with a crank-shaft, substantially as set forth.

2. In a combined engine and pump, the combination of a single reciprocating cylinder, a stationary engine-piston in one end of the cylinder, a stationary pump-piston in the other end of the cylinder, and a pitman connecting said cylinder with the crank-shaft, substantially as set forth.

3. In a combined engine and pump, the combination of a single reciprocating cylinder, a stationary engine-piston in one end of the cylinder, a stationary pump-piston in the other end of the cylinder, means for adjusting the pistons in the cylinder or entirely removing them, and a pitman or connecting-rod pivotally secured to the cylinder at or near its center, substantially as set forth.

4. In a combined engine and pump, the combination of a single reciprocating cylinder, a stationary engine-piston in one end of the cylinder, a stationary pump-piston in the other end of said cylinder, means for adjusting the pistons in the cylinder, said pump adapted to force an explosive mixture into the engine and lubricant to both pistons, substantially as set forth.

5. In an engine, the combination with a frame, of two pairs of normally stationary pistons in alinement, single cylinders having central heads and mounted on the alined pistons, one piston in each cylinder being an engine-piston and the other a pump-piston, pitmen connecting the cylinders with a crank-shaft, means for directing an explosive charge into the hollow engine-pistons, and pipes connecting the engine-pistons and pump-pistons, so that the latter can draw the explosive mixture from the engine-pistons and force it into the cylinders between the engine-pistons and cylinder-head to be exploded therein.

6. In an engine, the combination with a frame, of two pairs of normally stationary pistons adjustably supported on said frame, a cylinder on each pair of pistons forming an engine at one end and a pump at the other end, means for making a spark in the engines, and said pumps adapted to direct an explosive charge into the engines, substantially as and for the purpose set forth.

7. In an engine, the combination with a frame, of four normally stationary pistons adjustably mounted on said frame and arranged in pairs in alinement with each other, cylinders mounted to reciprocate on the alined pistons, heads in said cylinders spaced apart forming chambers between them, valves in said pump-pistons and in the cylinder-heads to permit the explosive charge to be forced by the pump-pistons into the engines, and sparking mechanism on the cylinders to make a spark and explode the charge after it has been compressed by the engine-pistons, substantially as and for the purpose set forth.

8. In an engine, the combination with a frame, of four normally stationary pistons secured on said frame and arranged in pairs in alinement with each other, cylinders mounted to reciprocate on the alined pistons one of which is an engine-piston and the other a pump-piston, a cylinder-head in the center of each cylinder dividing it into an engine and a pump cylinder, a valve in said heads through which an explosive charge is forced by the pump into the engine, valves in the pump-pistons to permit the explosive mixture to be drawn into the pump-chambers, and pipes communicating with the pump-pistons through which pressure is conveyed to generate the explosive mixture and convey the same to the engine.

9. In an engine, the combination with a reciprocating cylinder having a central head or partition therein, of a normally stationary engine-piston in one end of said cylinder, a normally stationary pump-piston in the other end of said cylinder, a valve in the pump-piston to admit an explosive charge, a valve in the cylinder-head to permit the explosive charge to be forced into the engine by the pump, means for making a spark in the engine to explode the charge, and means for forcing lubricant to the pistons, substantially as set forth.

10. In an engine, the combination with a frame, of reciprocating parallel cylinders, normally stationary hollow cylindrical pistons in the opposite ends of said cylinders, heads or partitions in the central portions of said cylinders dividing them into a pump-chamber at one end and an engine-chamber at the other end, pipes connecting the respective parallel engine and pump pistons, means for directing an explosive mixture into the hollow engine-pistons from which it is drawn by the pump-piston parallel therewith and forced by said pump-piston into the engine-chamber in the same cylinder, and mechanism to explode the charge in said engine-chambers.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

FRANKLIN L. CHAMBERLIN.

Witnesses:
W. S. FURNAL,
A. E. PETERSON.