

No. 722,774.

PATENTED MAR. 17, 1903.

F. W. TOEDT.
EXPLOSIVE ENGINE.

APPLICATION FILED FEB. 28, 1902.

NO MODEL.

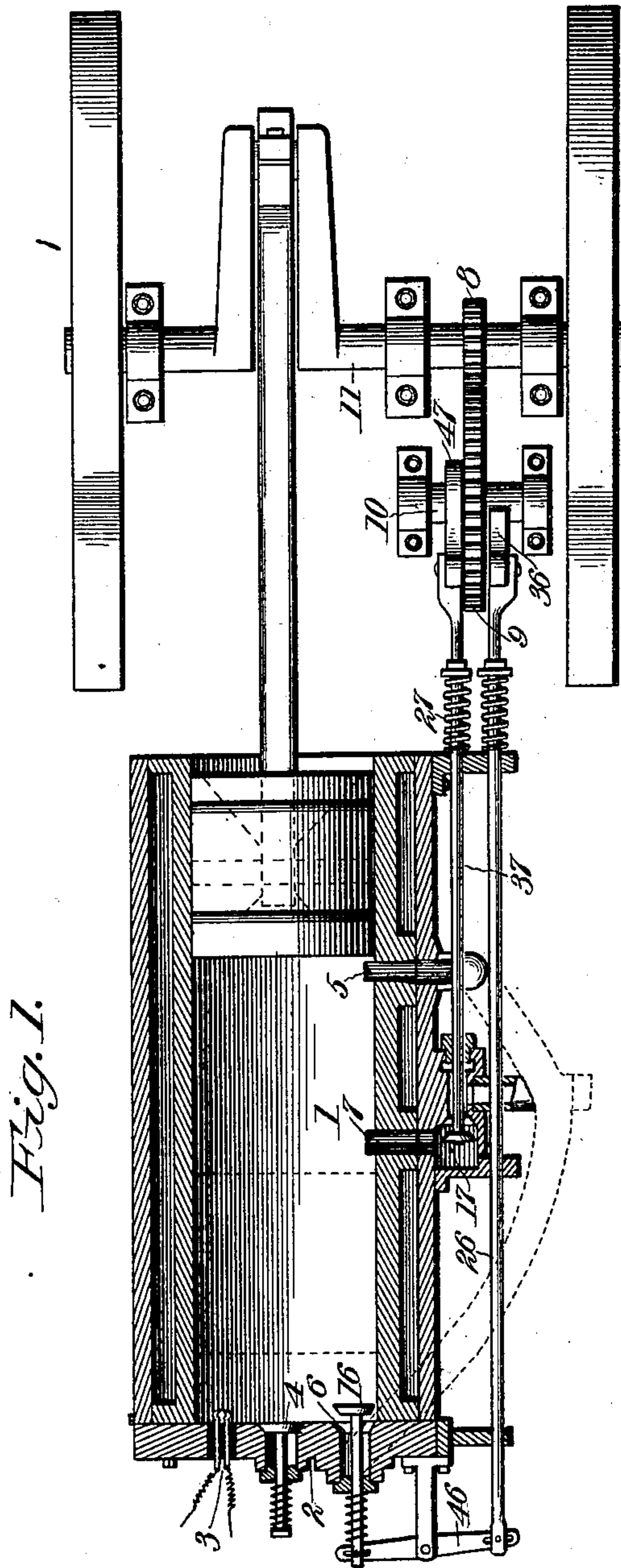


Fig. 1.

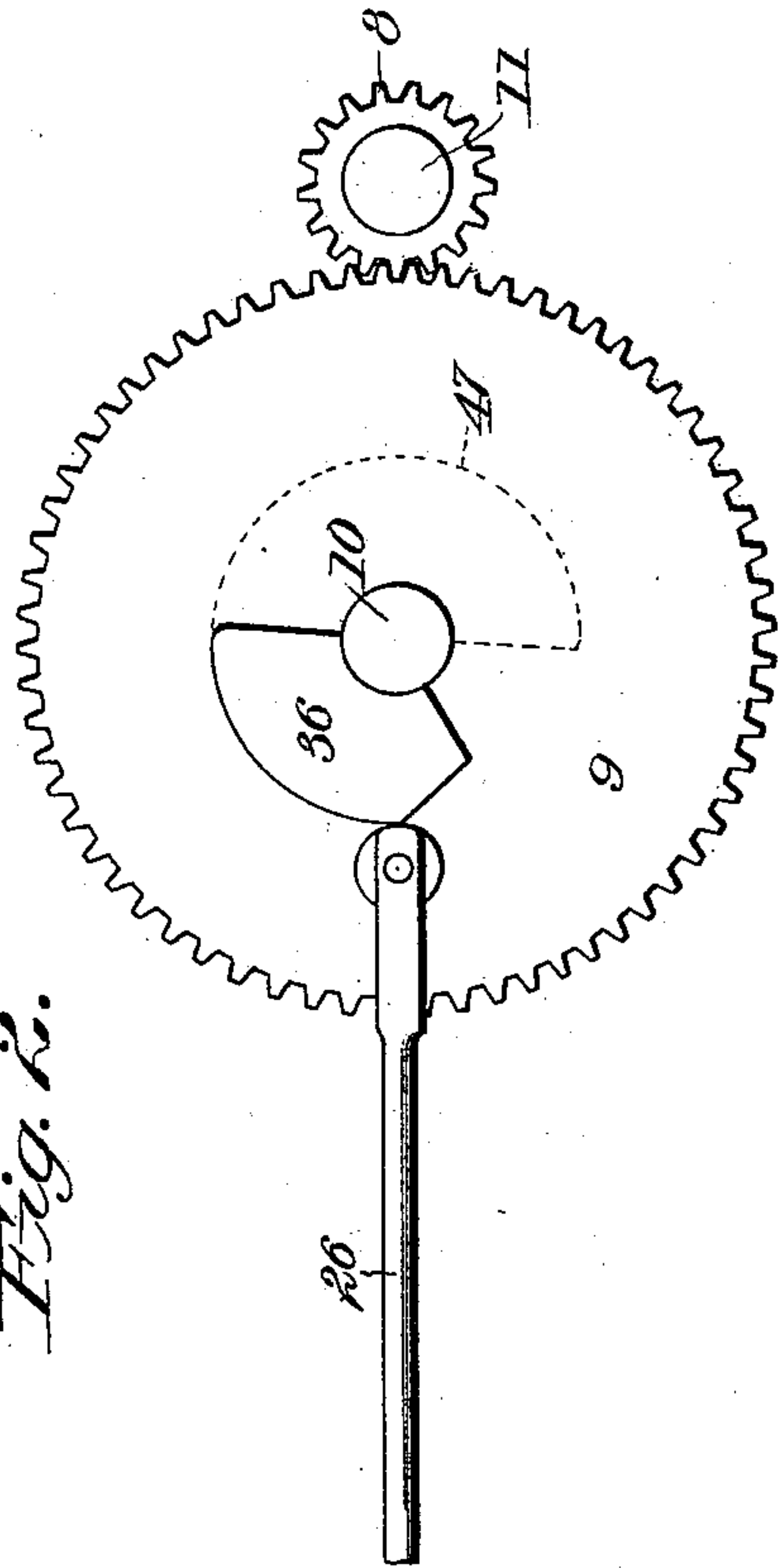


Fig. 2.

Witnesses
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UNITED STATES PATENT OFFICE.

FREDERICK W. TOEDT, OF HAMBURG, IOWA.

EXPLOSIVE-ENGINE.

SPECIFICATION forming part of Letters Patent No. 722,774, dated March 17, 1903.

Application filed February 28, 1902. Serial No. 96,083. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK W. TOEDT, a citizen of the United States, residing at Hamburg, in the county of Fremont and State of Iowa, have invented new and useful Improvements in Explosive-Engines, of which the following is a specification.

This invention relates to certain new and useful improvements in four-cycle single-piston and cylinder gas-engines, the object being to provide an engine of this type with a longer stroke than is usual to utilize the full force of the charge; also, to provide means whereby the cylinder may be more readily cleared of the residue from the exploded charge and to facilitate the introduction of air into the cylinder as the gas is drawn therein, likewise expelling the surplus air before a thorough admixture with the gas; also, compressing the air and gas.

With the foregoing ends in view the invention consists in the combination of a single cylinder and piston gas-engine of the four-cycle type of valved ports—one for supplying the cylinder with gas, one near the piston-head, which is opened only when the cylinder is being cleared of the spent gases, a relief-port near the center of the cylinder, the valve of such port being closed only during the power-stroke, and a valveless exhaust-port which is overrun by the piston when it has nearly completed its outward stroke, as will be hereinafter set forth.

The invention also consists in the construction and combination of the parts, as will be hereinafter set forth and specifically claimed.

In an engine made in accord with my invention the valve mechanism is such that the exhaust-port near or through the head of the cylinder is opened only when the piston is moving toward the head of the cylinder to clear it of the products of the exploded charge, the port being closed during the other movement of the piston. The valve of the relief-port is operated so that such port is closed only during the power-stroke, the valve of the relief-port being held off of its seat during the other three movements of the piston.

In the accompanying drawings, which illustrate one embodiment of my invention, Figure 1 is a plan view, partly in section, the pis-

ton being shown and the valves positioned as at the commencement of the fourth movement, which clears the cylinder of the spent gases from the previously-exploded charge, and Fig. 2 is a side elevation showing one approved form of valve-gear.

The cylinder 1 is of the open-end type, has the usual water-jacket and a head 2, which carries electrodes 3 or other igniting means, a valved gas-inlet port 4, the valve of which is held upon its seat by a spring of such strength that it may be raised from its seat by suction within the cylinder. The exhaust-port 5 is near the open end of the cylinder and is overrun by the piston on the limit of its stroke away from the cylinder-head. Through the head of the cylinder is a port 6, having a valve 16, which is held on its seat by spring-pressure, the valve being moved off its seat by a push-bar 26, which is moved against the action of a spring by a cam 36 on the shaft 10, the shaft being geared to the main shaft 11, so as to make one revolution while the main shaft is making four. The cam 36, contacting with a roller on the bar 26, reciprocates the same and oscillates a lever 46, which engages the valve-stem of the valve 16 to move such valve off of its seat and open the port 6, such port being opened only when the piston is clearing the cylinder. To effect such movement, the cam 36 has a working surface of ninety degrees. The relief-port 7 is located near the center of the cylinder and has a seat for a valve 17, which is held upon its valve-seat by a spring 27, mounted on the rod 37. The rod has a roller which engages the working face of a cam 47, which is attached either to the gear-wheel 9 or directly upon the shaft 10. The working face of the cam 47 is two hundred and seventy degrees, and the cam is so positioned that the valve 17 is held off its seat during the first, second, and fourth movements of the piston, the valve being closed by the spring during the third movement or power-stroke. The port 5 is overrun by the piston, and said port is valveless and may be connected by a pipe or way with the ports 6 and 7. The crank-shaft 11 has a gear-wheel 8, which meshes with a larger gear-wheel 9, said gears being of such size that while the

crank-shaft makes four revolutions the shaft 10 will be driven so as to make one turn or revolution.

Fig. 1 of the drawings shows the piston positioned as at the commencement of the fourth movement of the piston, the ports 5, 7, and 6 being open, and as the piston moves toward the head of the cylinder the cylinder will be cleared of its contents. At the completion of the fourth movement of the piston port 6 is closed. During the first outward movement of the piston gas or other explosive mixture is drawn into the cylinder through the port 4, and after the piston has overrun port 7 air is taken in through said port. During the first part of the second movement of the piston a small quantity of air which has not been intermixed with the gas or explosive mixture is expelled through the port 7, and the charge is compressed after the piston overruns the port 7. The explosive mixture or gas mixed with air is drawn into the cylinder through the port 4, the valve thereof being lifted from its seat by suction. After the charge has been compressed it is ignited to produce the power-stroke, the ports 6 and 7 being closed during such power-stroke and are opened at the commencement of the next movement of the piston. Before the completion of the stroke of the piston which clears the cylinder of the products of combustion the piston will have overrun the port 5.

In an engine constructed as shown I utilize the full force of the explosion by having a longer stroke than is usual, and by having ports arranged and operated as shown the return movement of the piston is not checked. The engine is also simple in construction and is not liable to get out of order.

I claim—

1. In a single cylinder and piston explosive-engine, a cylinder, a piston, and a valved gas-intake port through the head of the cylinder, in combination with a valved exhaust-port through the head of the cylinder, a valve actuated to close the port during three movements of the piston and hold it open during the other movement, a port near the center of the cylinder, a valve for said port which is held open during three movements of the piston and is held closed during the power-stroke of the piston, a valveless exhaust-port beyond the valved exhaust-port such valveless port being overrun by the piston, substantially as set forth.

2. In an explosive-engine, a cylinder having a gas-intake port, and a valved clearance-port adjacent thereto, means for holding the valve of said clearance-port closed during three movements of the piston, a valved exhaust-port near the center of the cylinder which is overrun by the piston, means for holding the valve of the exhaust-port closed during the power-stroke of the piston, and a valveless clearance-port near the limit of the outward stroke of the piston which is overrun by the piston, substantially as set forth.

3. In an explosive-engine, a cylinder which is open at one end, a head attached to the closed end, a valved gas-inlet port through the head, a valved clearance-port adjacent to the gas-inlet port, valve-operating mechanism between the valve of the clearance-port, and a driven shaft, the mechanism being constructed to hold the valve closed during the power-stroke and while the piston is compressing the charge, a valved exhaust-port near the center of the cylinder which is overrun by the piston, valve-operating mechanism therefor constructed to hold the valve on its seat during the power-stroke of the piston, and a valveless port positioned near the open end of the cylinder which is overrun by the piston, substantially as shown and for the purpose set forth.

4. In combination with an explosive-engine having valved clearance-ports, one through the head of the cylinder and the other through the cylinder near its center, of valve-operating mechanism comprising a shaft which is driven at a lower speed than the shaft of the engine, cams on the shaft, bars held in engagement with the cams and connected to the valves, the parts being organized so that both the valves will be held on the valve-seats of the ports during the power-stroke of the engine, the valve of the port through the head of the cylinder being held on its seat while the charge is being compressed and off of its seat during the other strokes of the piston, the other valve being held off its seat except during the power-stroke, substantially as set forth.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

FREDERICK W. TOEDT.

Witnesses:

L. E. STOW,
N. H. HOPKINS.