H. C. SUCKERT.

TWO CYCLE EXPLOSION ENGINE.

APPLICATION FILED JAN. 2, 1906. RENEWED SEPT. 19, 1907.

907,196. **Patented Dec. 22, 1908.**

3 SHEETS—SHEET 1.

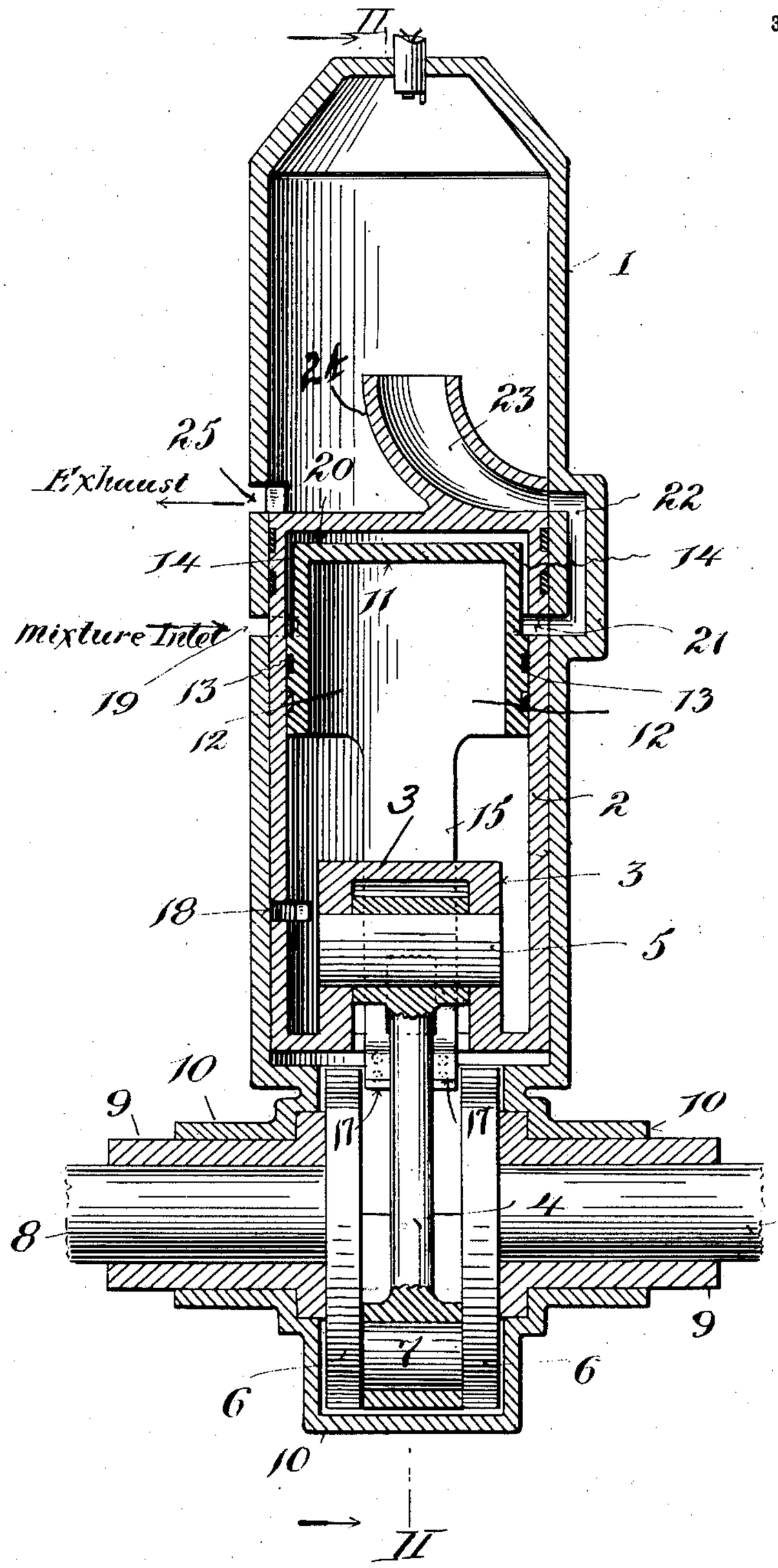

Fig. 1.

Witnesses
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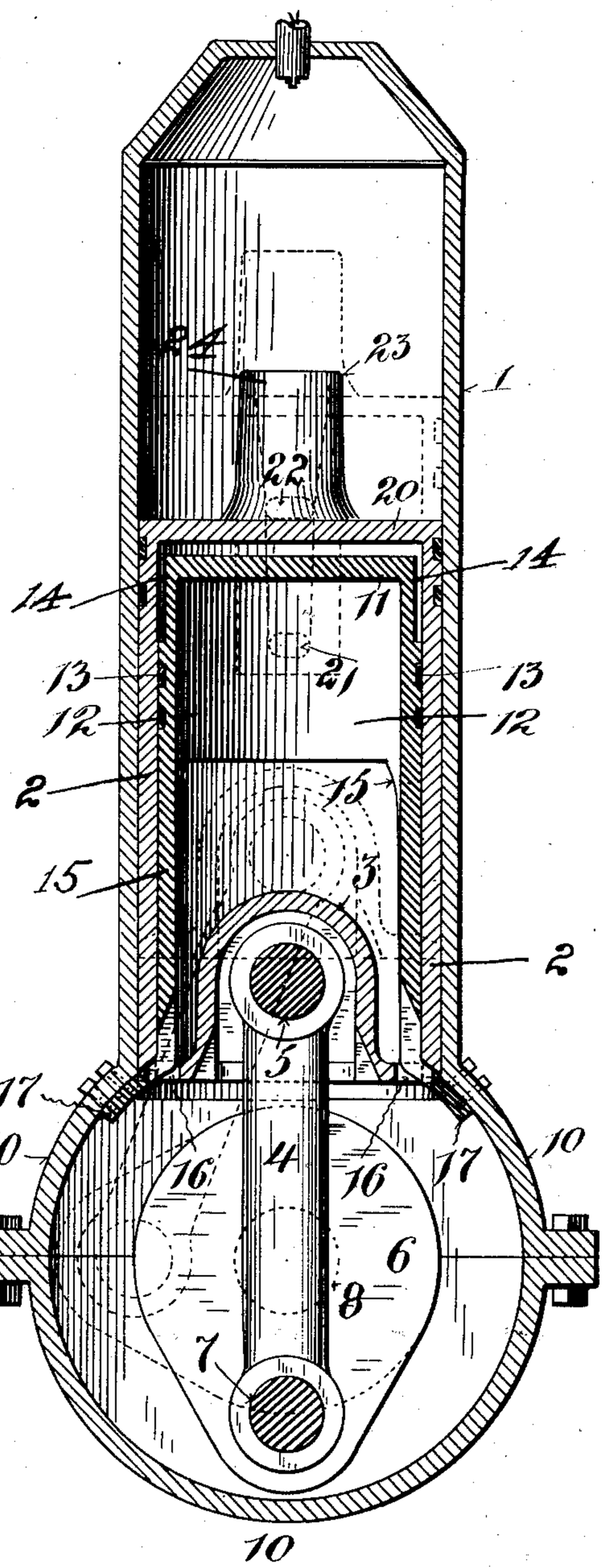
3 SHEETS—SHEET 2.

Fig. 2.



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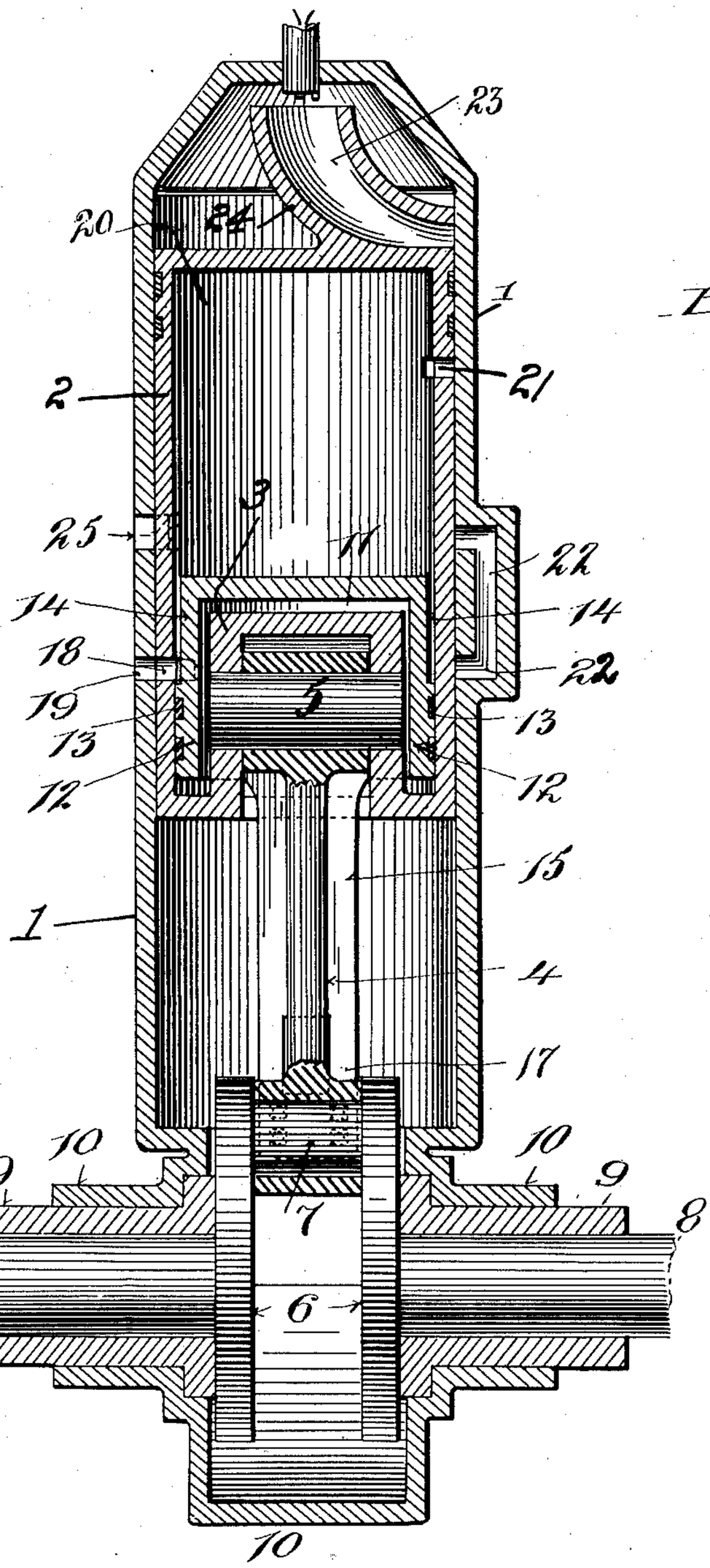

Fig. 3.

Witnesses
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UNITED STATES PATENT OFFICE.

HAROLD C. SUCKERT, OF NEW YORK, N. Y.

TWO-CYCLE EXPLOSION-ENGINE.

No. 907,196. Specification of Letters Patent. Patented Dec. 22, 1908.

Application filed January 2, 1906, Serial No. 294,063. Renewed September 19, 1907. Serial No. 393,692.

To all whom it may concern:

Be it known that I, HAROLD C. SUCKERT, a citizen of the United States, residing in the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Two-Cycle Explosion-Engines, of which the following is a specification, reference being had therein to the accompanying drawings, in which—

Figure 1 is a longitudinal vertical sectional view taken on a plane parallel with the axis of the driving shaft; Fig. 2 a sectional view taken on the line II—II of Fig. 1; and Fig. 3 a view similar to Fig. 1, showing the piston at the other end of its stroke.

One of the main objects of this invention is to provide means for initially compressing the charge of mixture which is to be delivered into the explosion chamber, and to deliver said compressed charge at such a position of the piston and in such a manner that the burned gas is driven from the explosion chamber by the inrushing charge of fresh mixture.

Another object of the invention is to deliver this compressed charge of gas into the explosion chamber at a time when said charge is at its highest initial compression so that said charge will rush into the explosion chamber and recharge it with fresh gas in the shortest possible time.

These features of the invention are of great importance for the reason that in engines of the two-cycle type it has heretofore been extremely difficult to secure a full discharge of the burned gas and a full recharge of the explosion chamber with fresh mixture.

It will be apparent to those skilled in the art that if all or practically all of the burned gas is not discharged from the explosion chamber and a full supply of fresh mixture is not supplied to said chamber the effectiveness of the engine will be materially decreased.

In the present invention the fresh supply of mixture is initially compressed to a high degree, at a point close to the explosion chamber. It is then delivered into said chamber in such a manner that it is discharged forcibly, and directly, toward the spark plug, driving out through the exhaust ports the burned gas and delivering a supply of fresh mixture around the spark plug, thereby insuring proper ignition of each charge of gas.

Referring to the various parts by numerals, 1 designates the engine cylinder which may be of any suitable construction, and which, for convenience, is shown in the drawing without a cooling jacket. It will, of course, be understood, however, that any suitable form of cooling means may be employed. Within this cylinder is mounted the main piston 2 which is cylindrical, and is somewhat longer than pistons of the ordinary construction. The lower end of the piston is formed with an upward extending internal hood 3 into which projects the upper end of a piston rod 4, said rod being pivotally secured therein by means of a wrist pin 5. The lower end of this piston rod is connected to cranks 6 by means of a crank pin 7; and the cranks 6 are secured to the inner ends of the two sections 8 of the main shaft. This shaft is journaled in bearings 9 which are suitably mounted in the crank case 10.

Rigidly supported within the piston is a stationary compression-head 11. This head is cylindrical, and the lower portion of its cylindrical wall 12 fits within the piston and is provided with a packing ring 13, or other suitable means, to form a gas-tight joint therewith. The upper portion of said cylindrical part of the compression-head is slightly smaller in diameter than the interior diameter of the piston, as shown at 14, to form a slight annular air space around the upper part of said compression-head. This head is formed with depending supporting arms 15, which extend through slots 16 in the lower wall of the piston, the lower ends of said arms being secured to the rigid wall of the crank case, or to the cylinder, as shown at 17 in Fig. 2.

The piston is formed with an intake port 18 which, when said piston is at the end of its compression movement, registers with the intake port 19 to permit a supply of mixture to pass into the initial compression-chamber 20 which is formed within the piston and between the head of the piston and the compression-head. The piston is formed with an outlet port 21, which, when the piston is at the end of its working stroke, registers with the lower end of the port 22 in the cylinder. This port 22, at its upper end, will register with the discharge port 23 formed in the piston when the port 21 is in register with the lower end of said port 22. The port 23 is formed within an upwardly enlarging discharge-nozzle 24 formed on the upper end of the piston 2, the upper enlarged end of

said port being concentric with said piston, whereby the mixture will be discharged at the center of the explosion chamber a considerable distance above the exhaust port and will be directed toward the ignition plug. The cylinder is provided with an exhaust port 25 which is so arranged that it will be opened slightly before the port 21 registers with the lower end of the port 22 to permit the burned gas to partially exhaust before the fresh mixture is discharged into the explosion chamber.

The operation will be readily understood from the foregoing, but may be briefly described as follows:—When the piston has completed its compression stroke inlet port 18 will register with the mixture inlet 19 and permit mixture to flow into the initial compression-chamber 20 within the piston between the compression-head and the upper end of the piston. By the upward movement of the piston a partial vacuum has been formed in this chamber so that when said ports 18 and 19 register there will be a rapid flow of the mixture into said chamber. During the working stroke of the piston the mixture in chamber 20 will be compressed, the degree of compression depending upon the location of the compression-head, it being preferably so located that the mixture in said chamber will be compressed to a great degree. At the extreme end of the working stroke of the piston the port 21 will register with the lower end of the port 22 and the port 23 will register with the upper end of said port 22, thereby permitting the highly compressed charge of mixture in chamber 20 to flow through ports 21, 22 and 23 into the explosion chamber. Because of the great compression of the mixture there will be an extremely rapid discharge into the explosion chamber, the rapidity of the discharge depending upon the degree of compression of the gas in the chamber 20. The exhaust port 25 is so located that the discharge of burned gases from the explosion chamber will begin before the port 21 is in register with the lower end of port 22, so that the gas in the explosion chamber will be reduced to atmospheric pressure before the fresh charge of mixture is discharged into said chamber. By means of the upward enlarging port 23 the mixture from the chamber 20 will be directed toward the ignition plug. This will not only assist in the discharge of the remainder of the gas through the exhaust port, but will insure a supply of pure mixture at the point of ignition. It will thus be seen that I initially compress the mixture at a point as close as possible to the explosion chamber and then discharge said highly compressed gas into said chamber at the proper moment and at the proper point to assist in the discharge of the burned gases and to insure a full charge of fresh mixture.

It will be seen that I provide a very simple two-cycle engine wherein gas may be initially compressed to the desired degree and at a point as close as possible to the explosion chamber, so that said highly compressed mixture may be delivered directly into said explosion chamber to rapidly and completely recharge it. Engines of this type have heretofore proved unsatisfactory for the reason that the explosion chamber has not been fully charged with fresh mixture, so much of the burned gases remaining therein as to prevent the proper ignition, and reducing the expansive force of the gas.

It will be readily understood that the form of my engine may be varied from that shown in the drawings, said drawings merely illustrating the broad principle of the invention, and I desire it understood that I do not wish to be limited to the form and construction shown.

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

1. A gas engine comprising a cylinder, a hollow piston therein, a cylindrical compression head within the piston and provided with bearing rings near its lower end, means for supporting said compression head from the lower end of the cylinder beyond the point of piston travel, mixture inlet ports being formed in the cylinder wall and in the piston and adapted to register when the piston has completed its compression stroke, whereby mixture will be admitted within the piston, outlet ports being formed in the piston and in the cylinder wall and adapted to register when the piston has completed its working stroke, the outlet port in the cylinder wall being connected by a suitable passage to the cylinder wall at a point above the compression head, whereby the mixture within the piston will be compressed on the working stroke of the piston and will be delivered into the cylinder when the piston has completed its working stroke, means carried by the piston to receive the said charge of compressed mixture and delivering it upward into the cylinder at the longitudinal center thereof.

2. A gas engine comprising a cylinder, a piston therein, means for reciprocating said piston, a stationary compression-head within the piston, an initial compression chamber being formed between said head and piston, means for permitting the mixture to flow into said compression chamber when the piston has completed its compression stroke, means to permit the compressed mixture to flow from said chamber into the explosion chamber when the piston has completed its working stroke, an upwardly enlarging discharge nozzle beyond the exhaust port, the end of said discharge nozzle being axially in line with the piston.

3. A two-cycle engine comprising a cylinder formed with inlet and exhaust ports in its wall, a hollow piston therein, said piston serving to open and close the exhaust port at the proper interval and formed with a mixture inlet port adapted to register with the inlet port in the cylinder wall when said piston has completed its compression stroke, a cylinder head supported within the piston and provided with bearing rings to form a tight connection between said piston and said head, said head forming an initial compression chamber into which the mixture flows through the inlet ports, an outlet port adapted to be placed in communication with the compression chamber and explosion chamber, the piston being provided with an outlet port adapted to place this latter port in communication with the compression chamber, said piston being also provided with an upwardly enlarging discharge port which is adapted to place the latter port in communication with the explosion chamber and to direct the initially compressed mixture upward in the center of the explosion chamber and toward the spark plug.

4. An explosive engine comprising a cylinder formed with inlet and exhaust ports in its wall, a hollow piston therein, said piston serving to open and close the exhaust port at the proper intervals and formed with a mixture inlet port adapted to register with the inlet port in the cylinder wall when said piston has completed its compression stroke, a compression head supported within the piston, said head forming an initial compression chamber into which the mixture flows from the inlet ports, an outlet port adapted to be placed in communication with the initial compression chamber and the explosion chamber, the piston being provided with a port adapted to place the latter port in communication with the initial compression chamber when the piston has completed its working stroke, a charge igniting means concentrically located in the explosion chamber at one end thereof, a concentric discharge nozzle carried by the piston and adapted to be brought into communication with the outlet port from the initial compression chamber when the piston has completed its working stroke, said discharge nozzle projecting toward the igniting means and arranged to extend in close proximity thereto when the charge is compressed, whereby the initially compressed fresh charge will flow toward the igniting means to the center of the cylinder, and a body of fresh mixture will be presented to the igniting means when the igniting means is operated.

In testimony whereof I hereunto affix my signature in the presence of two witnesses this 16th day of December, 1905.

HAROLD C. SUCKERT.

Witnesses:

WM. R. DAVIS,

EMMA KAUFMANN.