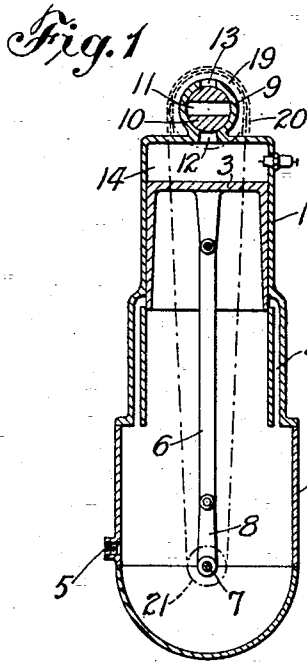
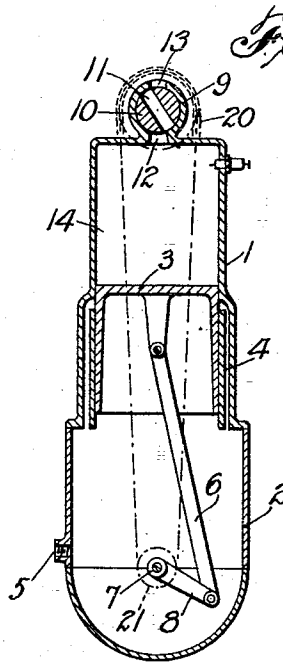
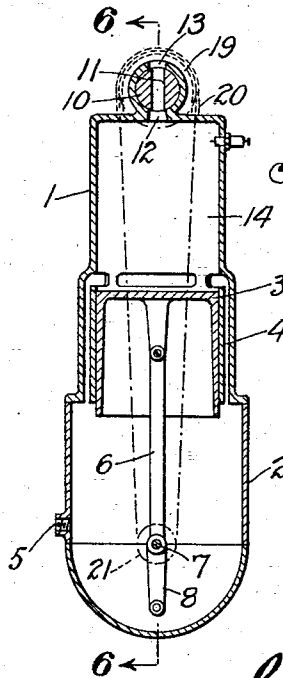


G. D. EIGHMIE.
INTERNAL COMBUSTION ENGINE.
APPLICATION FILED MAY 27, 1915.

1,186,299.

Patented June 6, 1916.

2 SHEETS—SHEET 1.

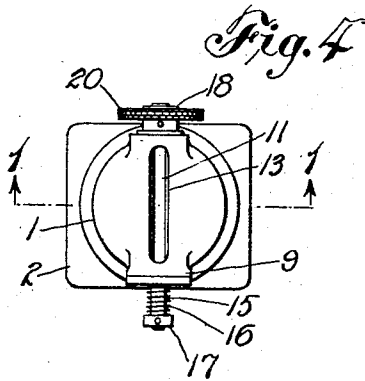
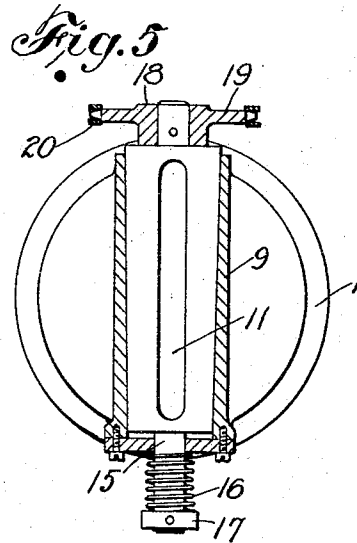
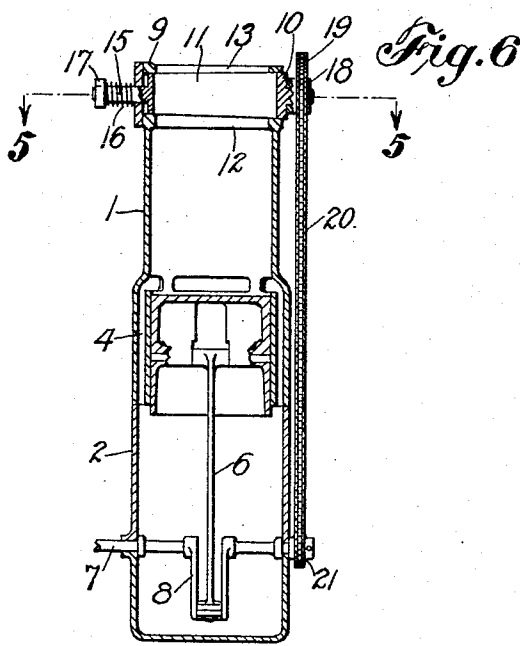


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UNITED STATES PATENT OFFICE.

GEORGE D. EIGHMIE, OF NEW YORK, N. Y.

INTERNAL-COMBUSTION ENGINE.

1,186,299.

Specification of Letters Patent.

Patented June 6, 1916.

Application filed May 27, 1915. Serial No. 30,721.

To all whom it may concern:

Be it known that I, GEORGE D. EIGHMIE, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention refers to internal combustion engines.

The present object is to simplify the construction of explosive motors of this class and promote their reliability and efficiency.

The invention is concerned more particularly with motors of the two-cycle type, in which the explosive mixture is compressed and where the exhaust after the explosion is exhausted to the atmosphere.

The invention consists essentially, therefore, in a two-cycle internal combustion engine having an annular port leading from the crank case to the explosion chamber, which port is covered and uncovered by the piston during the reciprocations of the latter; while in the opposite end of the cylinder is arranged a rotary exhaust valve which is operated by a suitable connection with the motor shaft.

The invention further comprises and includes numerous details and peculiarities in the construction, arrangement and combination of the various parts, substantially as will be hereinafter described and claimed.

In the accompanying drawing illustrating my invention: Figure 1 is a vertical section of my improved gas engine, on the line 1, 1 of Fig. 4, the parts being in the position that they assume at the moment of the explosion; Fig. 2 is a similar vertical section showing the parts in the position taken when the exhaust valve is beginning to open to allow the exit of the spent products of the explosion; Fig. 3 is a similar vertical section when the engine is on its dead center with the exhaust valve wide open and the inlet port also wide open, the position being that which the parts take just before the piston begins to cover the annular port and the exhaust valve to close; Fig. 4 is a top plan view showing the exhaust opening and the exhaust valve casing; Fig. 5 is an enlarged sectional plan view of the exhaust valve on the line 5, 5 of Fig. 6; Fig. 6 is a sectional side view of my improved gas engine on the line 6, 6 of Fig. 3, showing particularly the

connection between the exhaust valve and the main shaft.

Similar characters of reference designate corresponding parts throughout the different figures of the drawing.

1 denotes the cylinder and 2 the crank case of my improved internal combustion engine. In the wall of the cylinder is an annular port 4 leading from the crank case 2 into the lower end of the explosion chamber 14, which is in the upper interior part of the cylinder 1. This port may be longer or shorter, as desired, and preferably extends entirely around the cylinder, so as to have a circular opening into the crank chamber 2, into which a large quantity of the explosive mixture may rapidly pass, said annular port 4 having likewise a circular delivery mouth in the interior of the explosion chamber 14. Obviously the part of the cylinder which forms the inner wall of the port 4 will be supported by suitable ribs or bridging connections with the main wall of the cylinder.

The explosive mixture enters the crank case 2 at any suitable point, as for instance, the lateral opening 5. Within the cylinder 1 is a vertically-reciprocable piston 3, to which is pivoted a connecting rod 6, the opposite end of which is pivoted to the crank arm 8 belonging to the main crank shaft 7, which is suitably mounted and passes horizontally through the crank case 2. In the upper end of the cylinder 1 is a port 12, of any convenient length, which leads into a valve casing 9 supported on the end of the cylinder 1 or made integral therewith. Within valve casing 9 is a rotary valve 10 having a slot or passage 11 running longitudinally and transversely through it and adapted to coincide at certain times during the revolution of the valve 10 with the port 12 and also with an outlet port 13 which is formed in the casing 9 at a point opposite to the port 12, said port 13 running substantially the entire length of the valve casing 9, and leading directly into the atmosphere, so that the exploded gas finds quick exit into the atmosphere when the valve 10 is turned into such a position that its passage 11 connects the ports 12 and 13. The valve 10 is preferably inclined or conical in form (as shown in Fig. 6) and the interior of the casing 9 is correspondingly inclined, so that the valve 10 may be held to its seat with a tight fit which will prevent any leakage.

The valve 10 is provided at one end with a stem 15 around which coils a spring 16 that is tensioned between one end of the casing 9 and a collar 17 on the stem 15, this spring having the function, therefore, of keeping the conical valve closely and tightly at all times upon its conical seat and taking up any wear that may occur during the movements of the valve 10. The opposite end of valve 10 is provided with a projection 18, which carries a sprocket wheel 19, around which passes a sprocket chain 20 leading to and engaging a sprocket wheel 21 on the main shaft 7. It will be evident, therefore, that as the main crank shaft 7 rotates, the sprocket wheel 20 will communicate motion to the exhaust valve 9 and causes the latter to be rotated synchronously with the reciprocation of the piston; and as the parts are all properly timed to accomplish the proper result, the exhaust valve will be closed by the time the explosion is taking place (as shown in Fig. 1) and will begin to open shortly after the explosion takes place (as shown in Fig. 2) its opening continuing until it is wide open and the spent products from the explosion are entirely ejected into the atmosphere, a process which obviously will be completed by the inrush through the port 4 of a new supply of explosive gas after the piston 3 has descended to a point where it uncovers the port 4 and allows a new charge of gas to enter. After the cylinder is again filled with a charge, the piston will rise to shut off the port 4, preventing any further admission of gas, and the exhaust valve will obviously close, and will remain closed until after the next explosion.

In the operation of a two-cycle gas engine of this kind, the lubricating oil can be introduced into the crank casing along with the explosive mixture so that the operation will be clean and without any sooty deposits. The design of the annular port between the crank casing and the cylinder is to provide a simple and convenient means for allowing the mixture to pass into the explosion chamber in advance of the piston. I wish to lay particular stress, however, upon the rotary exhaust valve with its long discharge port, which enables the combustion products to be rapidly delivered to the atmosphere, thus freeing the cylinder quickly and allowing it to fill promptly with the next incoming charge of gas and air. The timing of the rotation of the exhaust valve with the reciprocations of the piston by properly relating the sprocket wheels and chain, or

other communicating means, enables the operation to proceed with accuracy and great speed, and permits the development of an extremely high efficiency while at the same time subserving great economy in operation.

Many changes may be made in the construction, arrangement and precise form of the different parts without exceeding the scope of the invention. The rotary valve may be operated in a different way from that shown, for I do not wish to be confined to actuating it by means of a sprocket wheel and a chain connection with the main shaft, it being only necessary that it should operate in proper and harmonious relation with the movement of the piston. The proportions of the parts, the size of the annular port, the point at which the mixture is introduced into the engine from the carbureter, and the means for firing the charge, may have a great variety of different forms, and still my invention will adhere to its main ideas without any undue deflection therefrom.

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

1. In an internal combustion engine, the combination of a cylinder having an annular port entering the side of the cylinder, a casing on which the cylinder is mounted and with which the annular port communicates, a valve casing on the opposite end of the cylinder having a port entering the cylinder, and an oppositely-located port allowing the exhaust to pass out, a rotary slotted valve in said casing having an inclined form to correspond with the inner wall of the casing, and means for timing the movement of the rotary valve in correspondence with the movement of the piston.

2. In a gas engine, the combination with a cylinder having an annular port in the wall at one end which enters the explosion chamber, a piston reciprocating in the cylinder and covering and uncovering the port, a valve casing on the opposite end of the cylinder having a port entering the cylinder, and also an exhaust port, a valve within the casing having a longitudinal slot designed to communicate at times with both of said ports, means for keeping the valve tight on its seat in the casing, a crank shaft, a connecting rod between it and the piston, and means connecting the crank shaft and the rotary valve for simultaneous revolution.

In testimony whereof I affix my signature.

GEORGE D. EIGHMIE.