J. G. UTZ.

EXPLOSION ENGINE.

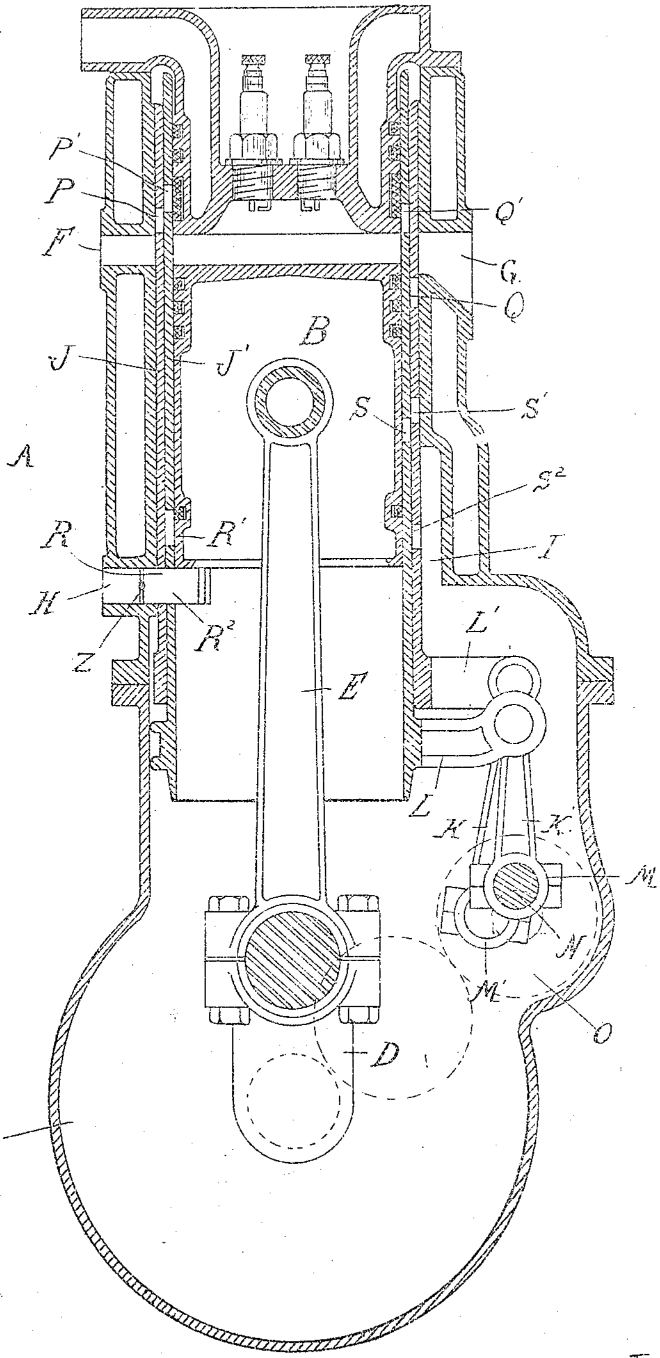
APPLICATION FILED DEC. 22, 1908.

1,015,101.

Patented Jan. 16, 1912.

2 SHEETS—SHEET 1.

Fig 1.



Witnesses

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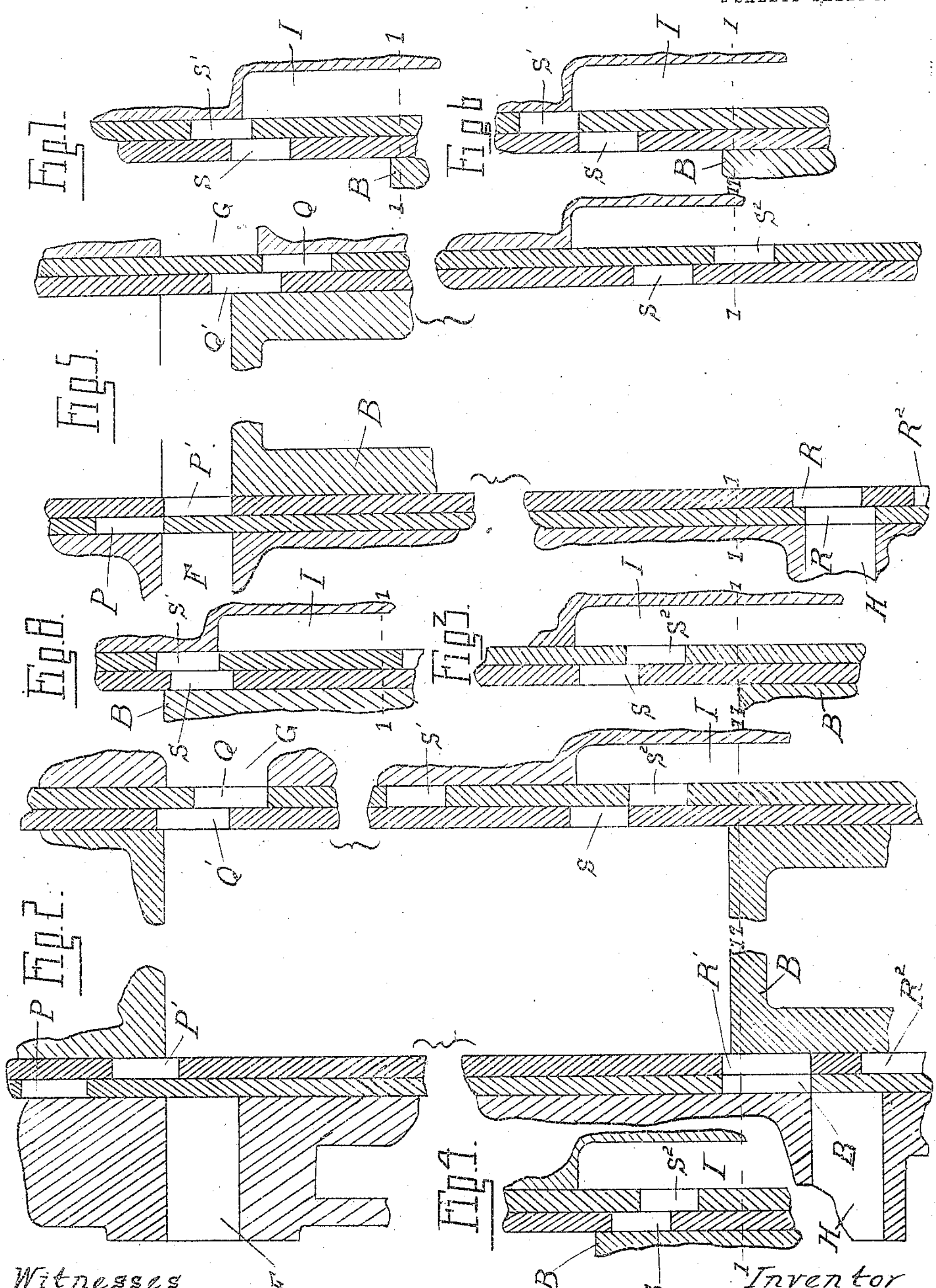

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UNITED STATES PATENT OFFICE.

JOHN G. UTZ, OF DETROIT, MICHIGAN, ASSIGNOR TO CHALMERS-DETROIT MOTOR COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN.

EXPLOSION-ENGINE.

1,015,101. Specification of Letters Patent. Patented Jan. 16, 1912.

Application filed December 22, 1908. Serial No. 468,752.

To all whom it may concern:

Be it known that I, John G. Utz, a citizen of the United States of America, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Explosion-Engines, of which the following is a specification, reference being had therein to the accompanying drawings.

The invention relates to explosion engines of that type in which air is compressed in the crank case and is used for the double purpose of scavenging the cylinder and for augmenting the explosive charge.

In the operation of explosion engines of the four-cycle type, the charge of explosive gases is limited by reason of the restriction of the valve ports and the small time interval in which the charge must be drawn in. This results in reducing the pressure of the incoming gases to below atmosphere, and consequently reduces the force of the explosion. The defect may be partially remedied by increasing the pressure of air or explosive mixture above atmospheric pressure before introducing it into the cylinder, but the small time interval and restricted area of the valve port still tend to limit the quantity of gas introduced. Furthermore, if the combustible gases and the compressed air are introduced into the cylinder at different points or at different times an additional valve is required, with increased complication in the mechanism.

With the present construction, the engine is so organized as to secure the easy transfer of a volume of air compressed in the crank case to the explosion chamber, and at a time when this chamber is fully expanded—that is, when the piston is near the extreme downward position of its stroke. A largely augmented charge is thus introduced which proportionately increases the power of the engine.

The invention therefore consists in the construction for accomplishing the result, as above specified; further in the peculiar valve construction; and, further, in the peculiar construction, arrangement and combination of parts as hereinafter set forth.

In the drawings—Figure 1 is a vertical central section through the engine; Figs. 2, 3, 4, 5, 6, 7 and 8 are diagrammatic sections illustrating the valves in different positions of adjustment.

A is the cylinder of the engine, B the piston therein, C the crank case, D the crank and E the connecting rod between the crank and piston.

F is the inlet port for the explosive mixture and G the exhaust port. The crank case C is employed as a compression chamber and is provided with an air inlet port H, and also a transfer port or passage I through which the compressed air is admitted to the explosion chamber. For controlling these various ports and passages, I employ a slide valve preferably of the piston type, which is preferably arranged to surround the piston and intermediate the same and the cylinder. This permits of forming ports of large area which are opened by a relatively small travel of the valve and angular movement of the crank, so that a large volume of air may be quickly transferred from the crank case to the cylinder. As shown, the piston valve is formed of two relatively movable concentric sleeves J J′, which are of a length greater than the travel of the piston, and which control all of the ports F, G, H and I. These sleeves are actuated by suitable means, such as the connecting rods K K′, which are pivotally secured to bracket arms L L′ upon the sleeves, and engage cranks or eccentrics M M′ on the shaft N. This shaft N is driven from the crank shaft by suitable two-to-one gearing O, so as to complete one revolution in each cycle. The cranks or eccentrics M M′ are preferably set 90° apart, and so as to be alternately at the end and exact middle of the stroke for each complete stroke of the piston. This arrangement is advantageous, as it results in placing the greatest acceleration of the movement of one of the sleeves opposite the greatest retardation of movement of the piston, thereby securing a quick opening of the valve ports at the opposite ends of the piston.

The inlet port F for the explosive mixture is controlled by ports P P′ respectively in the valve members J and J′, and the exhaust port G is correspondingly controlled by cooperating ports Q Q′ in said members, all of said ports being opened and closed once in each cycle. The air inlet port H and transfer port I are preferably opened twice in each cycle—once for scavenging the exhaust products from the cylinder, and the second time for introducing the augmenting charge of air. This double opening of the said ports is effected by providing the sleeve J with a port R coöperating alternately with the ports R′ and R^2 in the sleeve J′ for opening the port H and the sleeve J′ is further provided with a port S coöperating alternately with ports S′ and S^2 in the sleeve J for opening communication with the port I. These ports are so positioned as to produce the proper timing effect, as will be hereinafter set forth.

In operation the parts are in the position illustrated in Fig. 1 at the moment of ignition, at which point a previously admitted and compressed explosive charge is retained in the explosion chamber by the closure of the ports F and G. The air inlet port H is also in open communication with the chamber of the crank case by the registration therewith of the ports R and R^2 of the sleeves J and J′, while the transfer port I is closed by said sleeves. During the downward stroke of the piston, the port H is first closed and the air which is at atmospheric pressure in the crank case is compressed. At the proper position in the downward stroke the exhaust port G is opened by a relative movement of the sleeves J J′ which bring the ports Q and Q′ into registration with each other and the port G. Subsequently, and when the piston has nearly completed its stroke, the ports S and S^2 will begin to register, which will permit the air compressed in the crank case to pass through the port I and into the cylinder above the piston, thereby displacing the products of combustion by a volume of fresh cool air. Fig. 2 of the drawings illustrates the parts in a position where the ports S and S^2 are upon the point of opening and it will be observed that in this position the piston is very near the completion of its downward stroke, the lowest point being indicated by a dotted line 1—1. Fig. 3 shows the position of the ports S and S^2 after the piston has completed its stroke and is in the same position on the return stroke as in Fig. 2. Fig. 4 illustrates the position of the parts when the ports S and S^2 are just closed by the upward movement of the piston. Thus it will be seen that the whole opening and closing movement of the ports S and S^2 is accomplished in a relatively short travel of the piston, and that consequently the full working stroke of the piston is maintained. In Fig. 5 is illustrated the position of the parts after the piston has completed the scavenging stroke, the exhaust ports Q, Q′ and G being closed and the inlet ports F, P and P′ upon the point of opening. The ports R′ and R are also in registration with the port H, so as to again establish communication between the crank case and the external atmosphere. As the piston descends, the inlet ports are opened, admitting the carbureted air or other explosive mixture, and at the same time the ports R and R′ are cut off by the piston and the air in the crank case is again compressed. When the piston reaches the same position, as illustrated in Fig. 2, the ports S and S′ begin to open, as illustrated in Fig. 6, and in Figs. 7 and 8, which correspond to the position of the piston in Figs. 3 and 4, said ports S and S′ are opened and again closed. Thus, it will be observed that the opening and closing of these ports S and S′ is in the same relation to the movement of the piston as the opening and closing of the ports S and S^2 in the first half of the cycle. While these ports are opened, the compressed air in the crank case is transferred to the cylinder above the piston, and is commingled with the previously admitted carbureted air entering through the ports P and P′, the latter having been closed to prevent expulsion of the charge. Upon the upward stroke of the piston, the augmented charge is compressed and is ignited when the parts are again in the position illustrated in Fig. 1.

If desired the port H may be controlled by a valve Z so as to vary the amount of air admitted through said port, the valve Z being adjusted in any suitable manner.

What I claim as my invention is:

1. In an explosion engine, the combination of a crank case forming a chamber, a cylinder, a piston therein, and a plurality of differentially moving ported sleeves surrounding said piston and controlling communication between said crank case and cylinder above the piston.

2. In an explosion engine, the combination of a cylinder having inlet and exhaust ports, a crank case forming a compression chamber, a piston in said cylinder, a plurality of differentially moving ported sleeves surrounding said piston and controlling said inlet and exhaust ports and communication between said crank case and said cylinder above the piston.

3. In an explosion engine, the combination of a cylinder, having inlet and exhaust ports, a crank case forming a compression chamber, a piston in said cylinder, a plurality of ported sleeves surrounding said piston, and means for actuating said sleeves to open and close said inlet and exhaust ports each once during the cycle and to open communication between said crank case and cylinder twice during the cycle.

4. In an explosion engine, the combination of a casing forming a cylinder, and a closed crank case constituting the compression chamber, said casing being provided

with exhaust, inlet and transfer ports, a piston in said cylinder, and a slide valve intermediate the piston and cylinder having ports coöperating with said first mentioned ports and timed in its operation to open and close said ports in sequence.

5. In an explosion engine, the combination of a crank case forming a compression chamber, a cylinder constituting the explosion chamber and having inlet and exhaust ports, said crank case having an inlet and a transfer passage leading from the crank case to the cylinder, and a slide valve controlling all of said ports.

6. In an explosion engine of the four-cycle type, the combination of a crank case forming a compression chamber and having an inlet, a cylinder constituting the explosion chamber and provided with inlet and exhaust ports arranged adjacent the head, there being a transfer port opening into the cylinder below the inlet and exhaust ports, and a slide valve controlling all of said ports.

7. In an explosion engine of the four-cycle type, the combination of a crank case forming a compression chamber and having an inlet, a cylinder constituting the explosion chamber and provided with inlet and exhaust ports arranged adjacent the head, there being a transfer port opening into the cylinder below the inlet and exhaust ports, and a plurality of ported sleeves arranged intermediate the cylinder and piston and having ports for controlling said inlet, exhaust and transfer ports.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN G. UTZ.

Witnesses:
NELLIE KINSELLA,
JAMES P. BARRY.