H. E. COFFIN.

EXPLOSION ENGINE.

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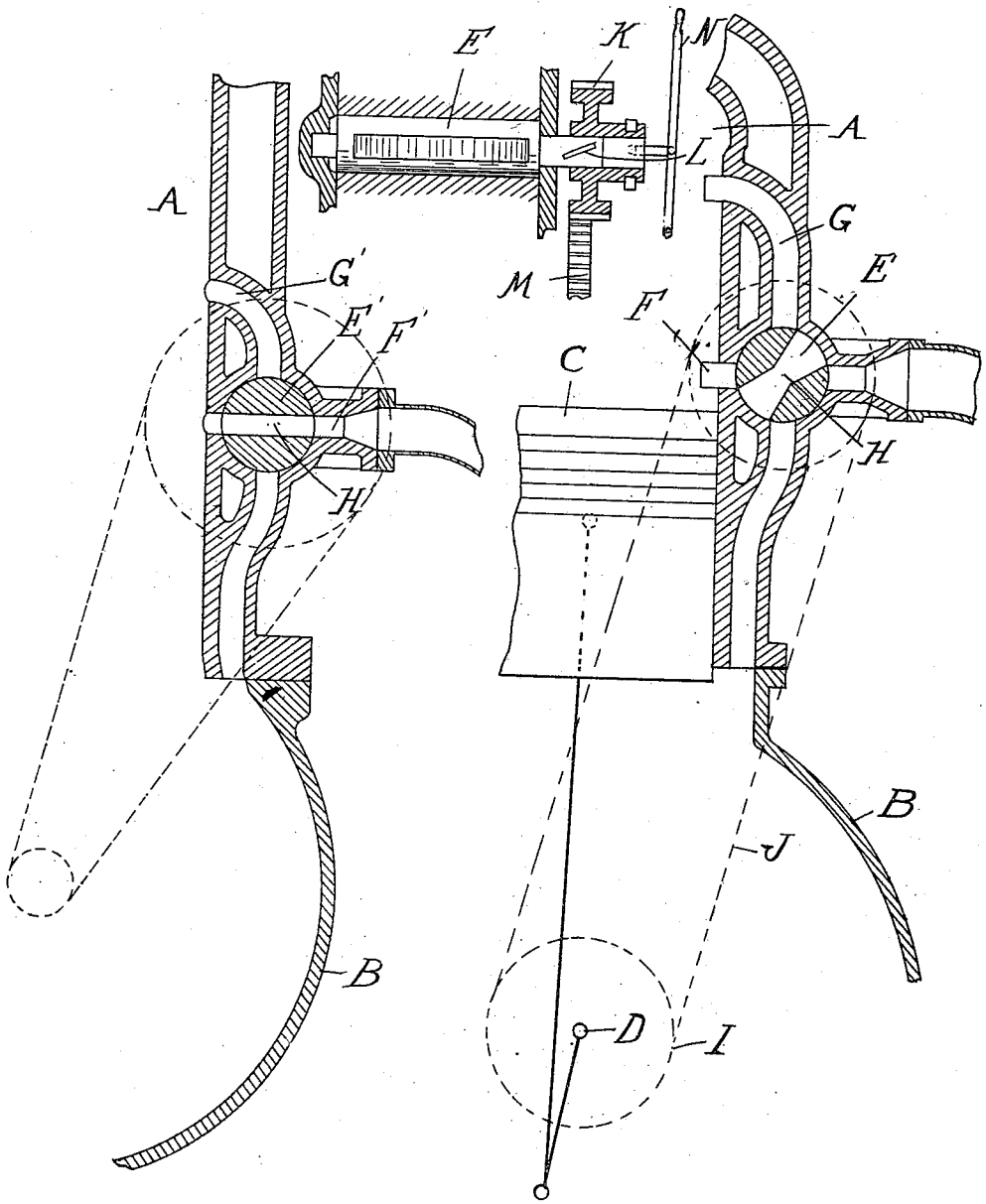
**1,011,748.**

Patented Dec. 12, 1911

Fig. 2. Fig. 3. Fig. 1.




Witnesses

W. R. Ford

F. J. Belknap

Inventor

Howard E. Coffin

By Whittemore, Hulbert & Whittemore

Attys.

# UNITED STATES PATENT OFFICE.

HOWARD E. COFFIN, OF DETROIT, MICHIGAN, ASSIGNOR TO THE CHALMERS MOTOR COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN.

## EXPLOSION-ENGINE.

1,011,748. Specification of Letters Patent. Patented Dec. 12, 1911.

Application filed April 9, 1909. Serial No. 489,013.

*To all whom it may concern:*

Be it known that I, HOWARD E. COFFIN, 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, and has particular reference to the construction and arrangement of the valve as hereinafter set forth.

In the drawings—Figure 1 is a longitudinal section partly in diagram through an engine of the two-cycle type to which my improvement is applied; Fig. 2 is a similar view illustrating the valve as applied to a four-cycle engine; and Fig. 3 is a section at right angles to Figs. 1 and 2 illustrating a modified construction.

It is the object of the invention to obtain a simple construction and arrangement of valve, which will control—first, the exhaust port—and, second, a transfer passage connecting the crank case with the cylinder. Where applied to an engine of the two-cycle type, this valve alone will control the operation of the engine, but with a four-cycle type of engine it is preferably employed as an auxiliary to the main valve, and performs the function of controlling an auxiliary exhaust, and the transfer of the compressed air from the crank case to the cylinder to augment the explosive charge.

As illustrated in Fig. 1, A is the engine cylinder, B the crank case, C the piston, and D the crank shaft. E is the valve which is preferably of the rotary type, and is seated in the engine case at one side of the cylinder. F is an exhaust passage extending transversely through the engine casing, and G is a longitudinally-extending passage which connects the engine cylinder with the crank case. These passages cross the seat of the valve in directions transverse to each other, and thus may be alternately opened by the registration therewith of the transfer port H in the valve. The valve E is preferably rotated at crank-shaft-speed, and may be driven from the latter by any suitable intermediate connection—such as the sprockets I and chain J. The timing is such that the exhaust port F is first opened and closed, and then the transfer port G is opened while the piston is still at the lower end of its stroke to permit of the passage of the explosive charge from the crank case to the cylinder. If desired, the timing of the opening of the exhaust port may be controlled by the movement of the piston C, instead of by the valve E, but, as illustrated, the piston will uncover the port F at precisely the same time that the valve E comes into registration therewith.

The construction illustrated in Fig. 2 is a four-cycle engine, which may be provided with any suitable construction of main inlet and exhaust valves (not shown). It has been found that increased power may be obtained from such an engine by providing an auxiliary exhaust port for more quickly reducing the pressure within the cylinder, and further that an increase in power may be obtained by the injection of air compressed in the crank case into the cylinder in conjunction with the explosive mixture. Both functions are performed by the valve E′ which is arranged to control the transversely-extending ports F′ and G′, the former constituting the auxiliary exhaust, and the latter the transfer passage for the compressed air to augment the explosive charge. The valve E is preferably driven from the crank shaft, but is so timed that a quarter turn of the valve corresponds to a full revolution of the crank shaft. Thus the cross port H′ in the valve E will register with the ports F′ G′ alternately after each revolution, opening each of said ports once in every two revolutions of the crank shaft. It will be understood that the port F′ is opened at the proper point in the power stroke of the piston and that after the scavenging stroke and during the suction stroke the port G′ will be opened to transfer the augmenting air.

Both of the constructions above described have the advantage that the axes of the rotary valve may be arranged parallel to the crank shaft so as to permit of a direct drive connection from the one to the other. Furthermore, the exhaust and transfer ports may be located at any point desired and still may be controlled by the same valve.

In Fig. 3 I have shown a modified construction, in which the valve is capable of being shifted angularly to advance or retard its operation. Various constructions may be employed for this purpose, but, as

illustrated, the valve E is connected to a drive gear K by a spiral key L. The gear K forms a member of a train M driven from the crank shaft and the width of the gear K is sufficient to permit of lateral adjustment and to still remain in mesh with the adjacent gear. Thus by laterally shifting the gear K, as by the lever N, a rotation of the valve is effected, which will alter its time of operation.

While I have described the valve E as controlling the transfer and exhaust ports, it is obvious that this control may be effected in conjunction with other means. Thus the piston may be employed to time the opening of the ports and particularly the exhaust port, while the rotary valve will perform the function of closing the port. In such modifications, the rotary valve will still control the ports in the sense in which that term is employed in the claims.

What I claim as my invention is:

1. In an explosion engine, the combination with a crank case forming a compression chamber, of a cylinder having a transfer passage connecting with said crank case, and an exhaust port, and a single valve controlling said transfer and exhaust ports.

2. In an explosion engine, the combination with a crank case forming a compression chamber, and a cylinder having a connecting passage with said crank case, and an exhaust passage, of a single rotary valve controlling said exhaust and transfer passages.

3. In an explosion engine, the combination with a crank case forming a compression chamber, and an engine cylinder having a connecting passage with said crank case, and an exhaust port, of a rotary valve controlling both of said passages arranged with its axis parallel to the crank shaft, and a direct drive connection between said crank shaft and valve.

4. In an explosion engine, the combination with a crank case forming a compression chamber and a cylinder having a connecting passage with said crank case, and an exhaust port, both formed in the wall of the cylinder, of a rotary valve seated in the wall of said cylinder and controlling both of said passages.

5. In an explosion engine, the combination with a crank case forming a compression chamber, of a cylinder having formed in the wall thereof a transfer port connecting with said crank case, and a transversely-arranged exhaust port, and a rotary valve seated in the wall of said cylinder to alternately open said exhaust and transfer ports.

6. In an explosion engine, the combination with a crank case forming a compression chamber, of a cylinder having a transfer passage connecting with said crank case, and an exhaust port, and a valve having a single port controlling said transfer and exhaust ports.

7. In an explosion engine, the combination with a crank case forming a compression chamber, of a cylinder having a connecting passage with said crank case, and an exhaust passage, and a rotary valve having a single passage controlling said exhaust and transfer passages.

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

HOWARD E. COFFIN.

Witnesses:

LENA M. CARLE,

C. O. EGERTON.