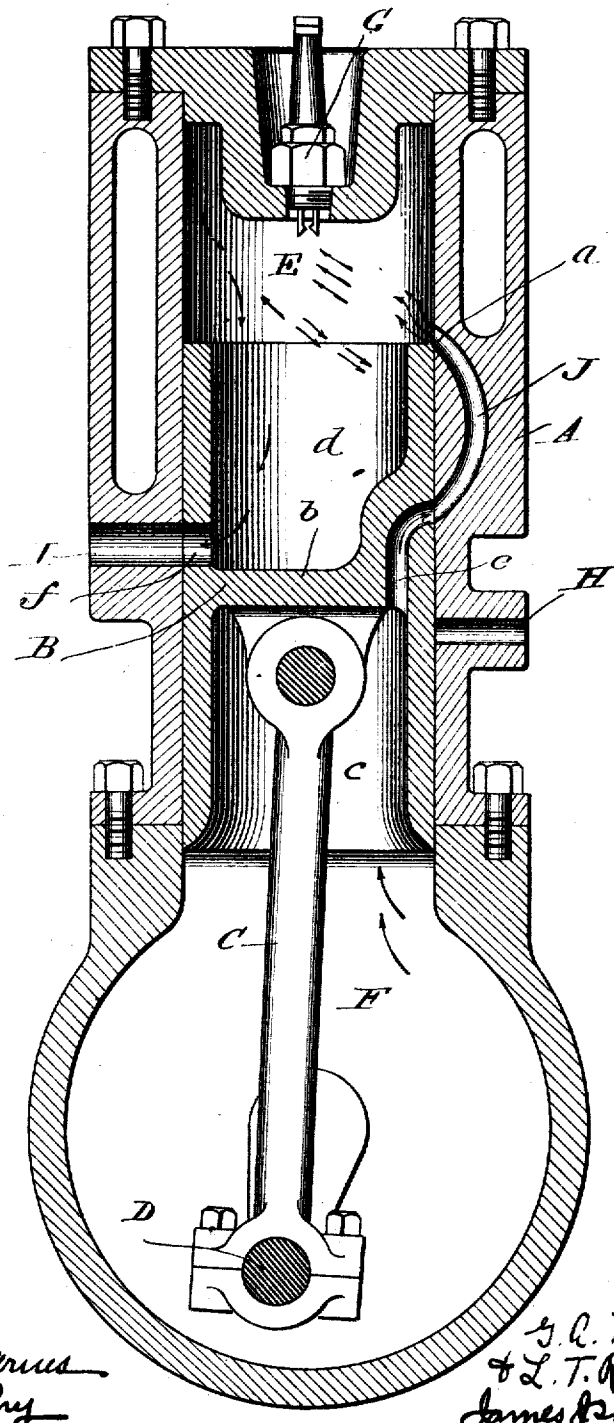
G. A. METCALF & L. T. ROCHELEAU.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED JUNE 16, 1911.

1,010,939. Patented Dec. 5, 1911.



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GEORGE A. METCALF AND LOUIS T. ROCHELEAU, OF WOONSOCKET, RHODE ISLAND.

INTERNAL-COMBUSTION ENGINE.

1,010,939. Specification of Letters Patent. Patented Dec. 5, 1911.

Application filed June 16, 1911. Serial No. 633,564.

To all whom it may concern:

Be it known that we, GEORGE A. METCALF and LOUIS T. ROCHELEAU, citizens of the United States, residing at Woonsocket, in the county of Providence and State of Rhode Island, have invented new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

This invention has to do with internal combustion engines of the two-cycle type; and it contemplates the provision of a valveless engine, of the kind stated, and one that has but few working parts, and is constructed with a view to assuring the thorough sweeping of products of combustion from the explosion chamber by the inrushing explosive mixture, the latter being materially advantageous inasmuch as it contributes to the reliability and capacity of the engine and economy in the operation of the same.

Other objects will be understood from the following description and claims when the same are read in connection with the drawing, accompanying and forming part of this specification, in which the figure is a vertical central section of an engine constructed in accordance with the invention.

Referring by letter to the drawing: A is the cylinder, and B the piston of the engine, the piston being, by preference, connected through the usual pitman C with the ordinary crank D. The cylinder is divided by the piston into an explosion chamber E and a compression chamber F, and at the center of the inner end of the explosion chamber is an ignition device G which is preferably, though not necessarily, electric. At H the cylinder is provided with a port for the admission of explosive mixture, and at I it has a port for the discharge of products of combustion. Located at the same side of the cylinder as the intake port H and diametrically opposite the exhaust port I is a passage J. This passage is formed in the wall of the cylinder and has both of its ends opposed to the path of the piston. It will be noticed that the upper or discharge end *a* of said passage J is disposed or directed toward the longitudinal center and inner end of the explosion chamber; also, that said end *a* is located in a plane about midway between that of the exhaust port I and that of the inner end of the explosion chamber, for important reasons hereinafter set forth. The piston is divided by a transverse partition *b* into a chambered portion *c* that communicates with the compression chamber F, and a chambered portion *d* that communicates with the explosion chamber E; the chambered portion *c* being provided with an outlet port *e* designed to register with the outer end of the passage J, and the chambered portion *d* being provided with an outlet port *f*, designed to register with the exhaust port I.

The operation is as follows: When the piston is at the innermost point of its traverse, explosive mixture enters the compression chamber F through the port H, and then an explosion takes place and forces the piston outward with the result that said explosive mixture is compressed. When the piston reaches the end of its outward stroke, registration of the port *e* with the passage J and registration of the port *f* with port I take place, and thereupon the fresh explosive mixture forcibly enters the explosion chamber E, and, by reason of the described disposition of the passage end *a*, is directed toward the longitudinal center and inner end of the explosion chamber. This causes the explosive mixture to strike first the inner end of the cylinder near the sparker, then the cylinder wall at a point diametrically opposite the passage end *a* and near the inner end of the explosion chamber, and from said point the explosive mixture rebounds and strikes the portion of the piston chamber *d* adjacent the passage J and fully occupies said chamber. From this it follows that before the piston closes the passage end *a* and the exhaust port I, the explosive mixture will have effectually swept all of the products of the previous explosion from the chamber E; also, that the products of combustion are forced before the explosive mixture from the inner end of the chamber E outward toward the exhaust port, so that all of the products of combustion must be exhausted before any of the explosive mixture can escape, and before the latter can take place the port I will have been closed. It will further be noted that because of the course the explosive mixture is caused to take in the explosion chamber E, the same will be put into close proximity with the ignition or sparking device G and will effectually sweep all products of combustion away from said point, thereby assuring perfect explosive mixture to receive the spark.

In addition to the advantages set forth,

it may be stated that the piston of the improved engine has a great bearing surface calculated to conduce to smooth running, and that the arrangement of the passage J adjacent the inner end of the piston, as shown, is advantageous because by reason of such arrangement the passage J is remote from the splash of oil in the compression chamber and crank case, and hence there is no liability of an excess of oil entering the explosion chamber with the explosive mixture.

Having described our invention, what we claim and desire to secure by Letters-Patent, is:

1. In an internal combustion engine of the two-cycle type, the combination of a cylinder, a piston, and an ignition device located at the inner end of the cylinder; the cylinder being divided by the piston into an explosion chamber and a compression chamber, and being provided with a port for the admission of explosive mixture to the compression chamber, a port for the discharge of products of combustion from the explosion chamber, and a passage having its ends opposed to the path of the piston and also having its inner end diametrically opposite the exhaust port and directed toward the longitudinal center and inner end of the explosion chamber and located in a plane substantially midway between that of the inner end of the cylinder and that of the exhaust port, and the piston being provided with a transverse partition and chambered portions at opposite sides of the same and being also provided with a port for connecting its inner chamber with the exhaust port, and a port for connecting its outer chamber with the outer end of the passage in the cylinder.

2. In an internal combustion engine, the combination of a cylinder and a piston; the cylinder being divided by the piston into an explosion chamber and a compression chamber, and being provided with a port for the admission of explosive mixture to the compression chamber, a port for the discharge of products of combustion from the explosion chamber, and a passage having an inner end opposed to the path of the piston and also having said inner end opposite the exhaust port and directed toward the longitudinal center and inner end of the explosion chamber and located in a plane intermediate that of the inner end of the cylinder and that of the exhaust port, and the piston being provided with means for establishing and interrupting communication between the explosion chamber and the exhaust port and being also provided with means for establishing and interrupting communication between the compression chamber and the outer end of the said passage in the cylinder.

3. In an internal combustion engine, the combination of a cylinder and a piston; the cylinder being divided by the piston into an explosion chamber and a compression chamber, and being provided with a port for the admission of explosive mixture to the compression chamber, a port for the discharge of products of combustion from the explosion chamber, and a passage having an inner end opposed to the path of the piston and also having said inner end opposite the exhaust port and directed toward the longitudinal center and inner end of the explosion chamber and located in a plane intermediate that of the inner end of the cylinder and that of the exhaust port; said passage being adapted to be supplied with explosive mixture from the compression chamber, and the piston being provided with means for establishing and interrupting communication between the explosion chamber and the exhaust port and being also provided with means for establishing and interrupting communication between the explosion chamber and the inner end of the said passage.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

GEORGE A. METCALF.
LOUIS T. ROCHELEAU.

Witnesses:
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EVELYN W. SPAULDING.