C. T. BROWN.

EXPLOSION ENGINE.

APPLICATION FILED MAR. 4, 1907.

930,347. Patented Aug. 10, 1909.

Fig. 1.

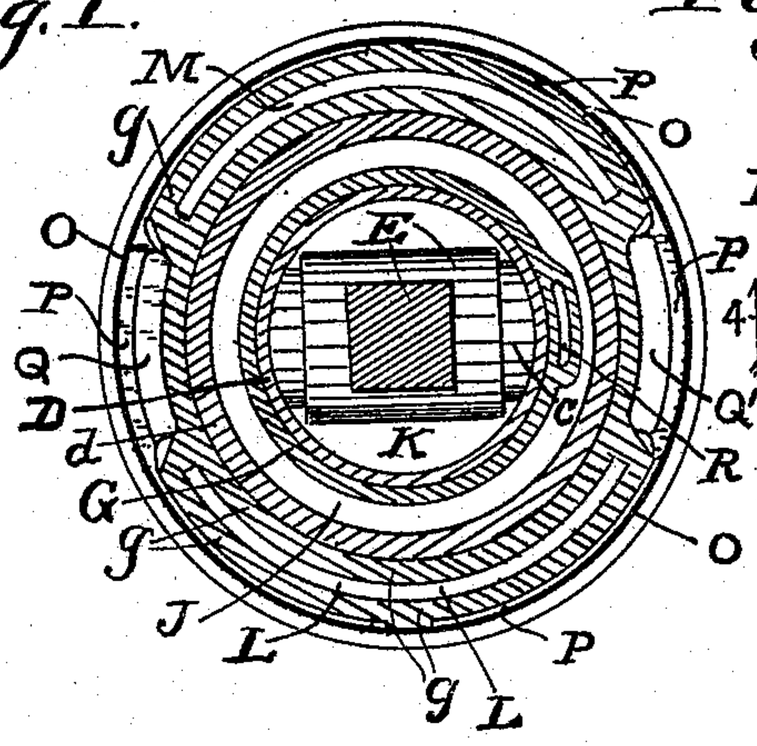


Fig. 2.

Fig. 3.

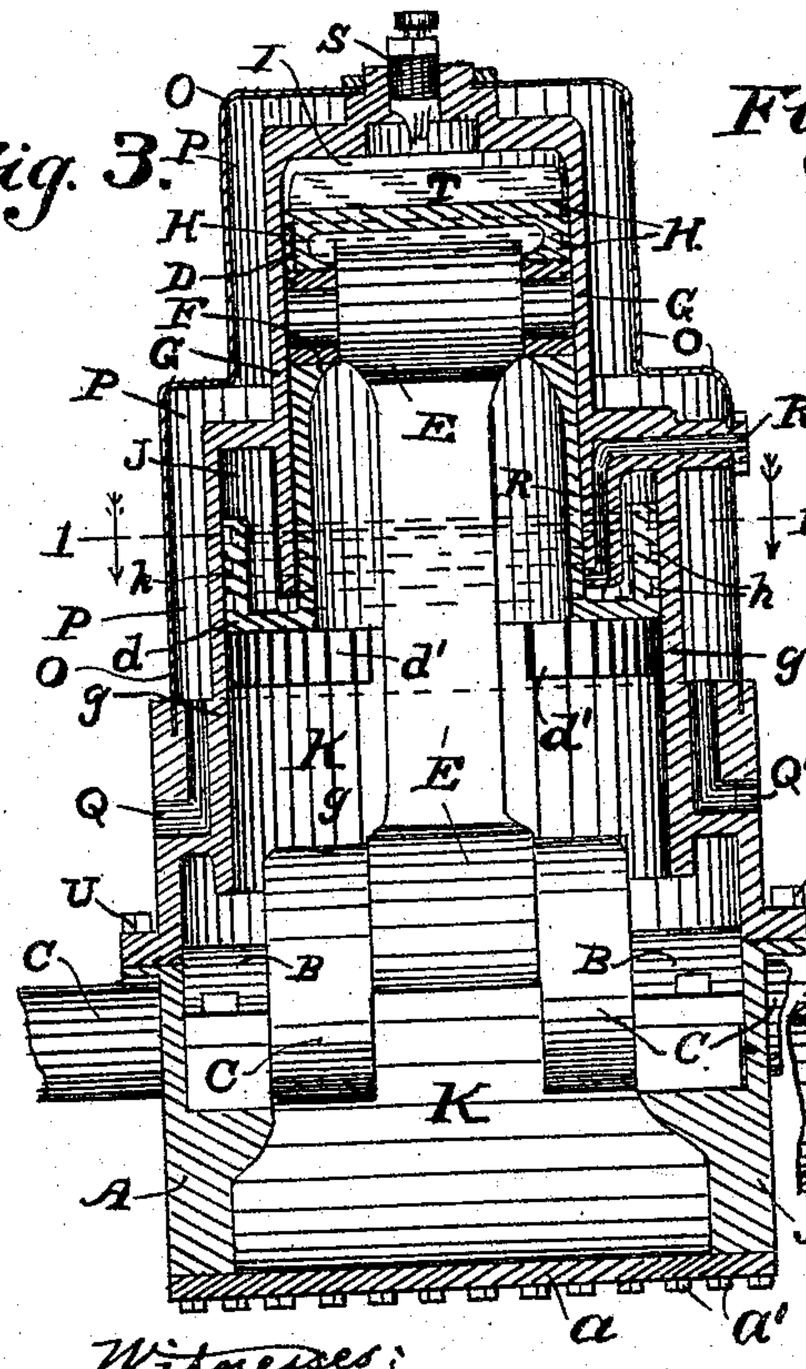
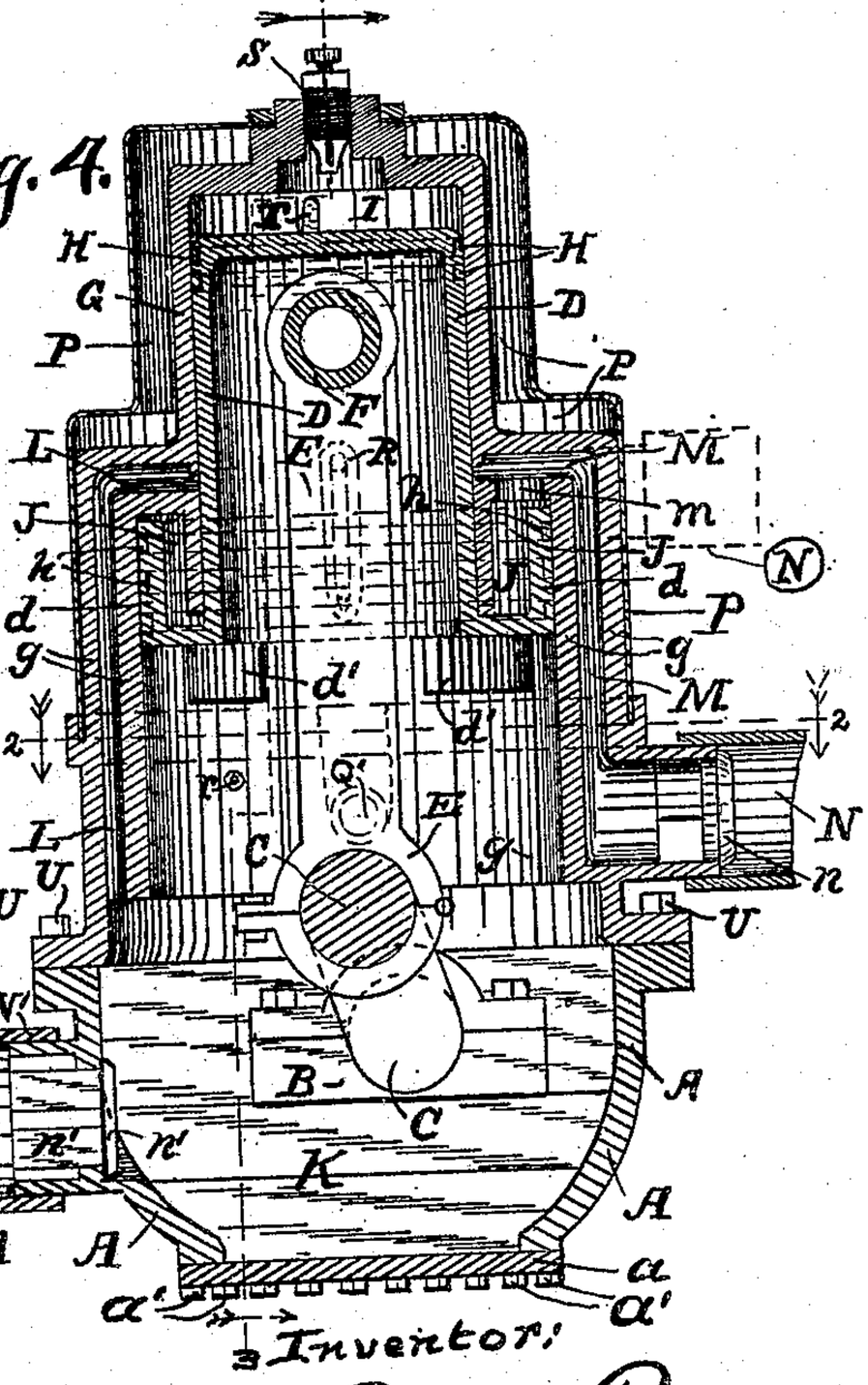


Fig. 4.



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EXPLOSION-ENGINE.

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To all whom it may concern:

Be it known that I, CHARLES TURNER BROWN, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Explosion-Engines, of which the following, when taken in connection with the drawing accompanying and forming a part hereof, is a full and complete description, sufficient to enable those skilled in the art to which it pertains to understand, make, and use the same.

This invention relates particularly to gasolene or alcohol engines of the kind known in the art as two cycle engines.

The object of the invention is to obtain a two cycle engine in which the discharge of exploded gases and the charge of gases suitable, when compressed, to be exploded, will be quickly and certainly effected from and into the explosion chamber of the engine. And a further object of the invention is to obtain an engine of the kind named which has a considerable range of working capacity and which is easily controlled to vary the work done thereby.

The manner in which I effect the objects sought by me is shown in the constructions illustrated in the drawing referred to, in which—

Figure 1 is a horizontal section of the several cylindrical parts of the engine, on line 1—1 of Fig. 3, viewed in the direction indicated by the arrows. Fig. 2 is a horizontal section on line 2—2 of Fig. 4, viewed in the direction indicated by the arrows. Fig. 3 is a vertical section, on line 3—3 of Fig. 4, viewed in the direction indicated by the arrows; and Fig. 4 is a vertical section on line 4—4 of Fig. 2, viewed in the direction indicated by the arrows.

A reference character applied to designate a given part is used to indicate such part throughout the several figures of the drawing, wherever the same appears.

The principal features of the invention are contained in the constructions whereby there is obtained 1st., a reduced pressure chamber of varying size, at each explosion in the explosion chamber, into which reduced pressure chamber the exploded gases are discharged from the explosion chamber, when the piston is near the end of its forward movement, and which reduced pressure chamber is of sufficient capacity, at the time of the discharge thereinto of exploded gases, to contain such gases at a pressure not greater than the pressure such gases are subjected to in the explosion chamber at the time of the discharge thereof therefrom; and 2nd., a compression chamber of varying capacity in which, at the time of its smallest cubical capacity, so large a volume of explosive gases is contained that when the pressures of the gases in such compression chamber and in the explosion chamber is equalized by the opening of a passageway between such compression and explosion chambers, the pressure in both thereof is greater than atmospheric pressure.

Additional features are hereinafter specifically referred to and described.

A is the shell of the crank case of the engine, preferably consisting of side and end walls and the removable bottom *a*.

a', *a'* are the bolts or cap screws by means of which the bottom *a* is secured to the side and end walls.

B, B are the journal bearings of the crank shaft of the engine, and C is the crank shaft.

D*d* is the piston, and E is the connection between crank shaft C and piston D*d*. The lower end of the piston D*d* is cut out at *d'*, *d'*, *d'* at points where necessary to permit such lower end to extend into the crank case or shell A and not come into contact with the journal bearings of the crank shaft or with the connection E.

F is a pivot by which the connection E is attached to the piston D*d*, and is preferably a hollow pin of the kind usually employed.

G*g* is the cylinder of the engine.

Parts D*d* of the piston are of different diameters, (D being of smaller diameter) and parts G*g* of the cylinder are also of different diameters, to correspond, respectively, with the diameters of the piston. Piston D*d* is fitted in the cylinder G*g* to move longitudinally, in the ordinary way.

H, H, and *h*, *h*, are, respectively, the spring rings of the piston D*d*.

I is the explosion chamber of the engine, and J is the reduced pressure chamber thereof.

K is a chamber the walls whereof consist of shell A, part *g* of the cylinder G*g*, and the movable piston D*d*. On the upward movement of the piston D*d* explosive gases are drawn into the chamber J from a suitable source of supply, as say, through check valve *n'* hereinafter described; on the downward movement of such piston the explosive gases

in such chamber K are compressed to above atmospheric pressure; and on the uncovering of the inlet end of the passage way L (when piston D*d* is near the end of its forward movement), such compressed gases are delivered into the explosion chamber I, (or a part of said compressed gases are so delivered), from such chamber K, and I therefore term this chamber K the compression chamber of the engine. The discharge end of the passage way L is covered by part D of the piston D*d*, except when such piston is near the end of its forward movement, at which time such part D of such piston passes beyond such end of the passage way, thereby opening the end thereof into the explosion chamber, and such inlet end remains open until such part D of the piston, on its return movement again covers it.

M is the outlet from explosion chamber I and is opened and closed by part D of piston D*d* in the same manner and nearly at the same time as the inlet end of passage way L is opened and closed thereby. Outlet M communicates (through branch passage way *m*) with the reduced pressure chamber J and with the discharge pipe N.

n is a check valve in pipe N, to permit the flow of gases from the reduced pressure chamber J through such pipe N to waste.

N′ is a pipe discharging into compression chamber K, and *n*′ is a check valve permitting the flow of gases through pipe N′ into such chamber K. Check valves *n* and *n*′ are respectively arranged to permit the flow of gases in one direction only. The inlet end of the pipe N′ is in communication with a suitable source of supply of explosive gases.

Where water is used for cooling the engine, O is the water jacket, P is the water chamber, Q the water inlet and Q′ the water outlet, respectively.

R, *r* are oil inlets by means of which parts D and *d* of the piston D*d* are, respectively, lubricated.

S is a spark plug.

T is a deflector on the top of part D of piston D*d*, by means of which explosive gases entering the explosion chamber I from the inlet end of passage way L are directed toward the top of such explosion chamber and not permitted to flow directly across such chamber into the outlet M.

U, U, are cap screws attaching the part *g* of cylinder G*g* to shell A.

The operation of the engine is as follows;—Piston D*d* being in its initial position, (as illustrated in Figs. 3 and 4 of the drawing), upon the cranking of the engine such piston will descend until the top of part D thereof is below the inlet end of passage way L and below the outlet M. As the piston descends the reduced pressure chamber J is enlarged in substantially the same ratio that the explosion chamber I is enlarged, and at the same time the compression chamber K is reduced in size. The diameter of part *d* of the piston D*d* (in part *g* of the cylinder G*g*), being larger than the diameter of part D thereof in the explosion chamber I, a larger volume of air, under pressure, may be obtained in such compression chamber K, at the time the inlet end of passage way L is uncovered by such descent of the piston, than can be at such time contained, at the same pressure, in the explosion chamber. When the passage ways L and M are uncovered the pressure in the explosion chamber I being greater than the pressure in the reduced pressure chamber J a sudden flow of the gases from such explosion chamber is induced into such reduced pressure chamber, through outlet M and branch *m*, while at the same time a flow of the contents of the compression chamber K into the explosion chamber I, is induced through such passage way L. The cubical capacity of the reduced pressure chamber J at the time the outlet M is closed by the return movement of the piston E may be, say, not less than the cubical capacity of the explosion chamber I at such time and hence all the contents of the explosion chamber may be contained in such reduced pressure chamber at a pressure not greater than obtains at such time in such explosion chamber; and the cubical contents of the compression chamber K at the time the passage way L is opened to permit the discharge of the contents of the compression chamber into the explosion chamber being greater than the cubical capacity of the explosion chamber at the same pressure, the pressure in the compression chamber K is above atmospheric pressure at the time the pressure in the compression chamber and the explosion chamber is equalized by the flow of gases from such compression chamber into the explosion chamber. As the piston returns from its extreme forward position to its initial position the contents of the reduced pressure chamber J are expelled through branch *m*, outlet M and discharge pipe N, the contents of the explosion chamber I are compressed and a fresh supply of explosive gases is drawn into compression chamber K. When an explosion of the compressed gases in the explosion chamber is effected by an electric spark in spark plug S, in the ordinary way, the engine will be actuated. When the engine is operating the discharge of exploded gases and the receiving, compression and explosion of fresh charges of gases are obtained at each revolution of the crank shaft.

The pipe N and check valve *n* are not necessarily located at the point shown by full lines in Fig. 4, as such pipe and check valve may be placed at the point indicated by broken lines in such Fig. 4, if preferred.

In case the check valve *n* is not used in

pipe N substantially atmospheric pressure will, at all times, obtain in reduced pressure chamber K and the discharge of exploded gases from explosion chamber I will be effected by the higher pressure, of the gases entering such explosion chamber through passage way L from compression chamber K.

Having thus described my invention what I claim and desire to secure by Letters Patent is;—

1. The combination of a piston of two diameters, a cylinder of corresponding diameters, such piston longitudinally movable in the cylinder, and a closed crank case, the part of the cylinder of smaller diameter provided with passage ways communicating, respectively, with the part of the cylinder of larger diameter and with the crank case, and the part of the cylinder of larger diameter provided with a discharge passage way, such piston and cylinder arranged so that when the piston is near the end of its forward movement the ends of the passage ways from the part of the cylinder of smaller diameter are uncovered; substantially as described.

2. The combination of a piston of two diameters, a cylinder of corresponding diameters, such piston longitudinally movable in the cylinder, a closed crank case, the part of the cylinder of smaller diameter provided with passage ways in communication, respectively, with the part of the cylinder of larger diameter and with the crank case, and the part of the cylinder of larger diameter provided with a discharge passage way, the crank case provided with an inlet passage way and a check valve to such inlet passage way arranged to permit the flow of gases into the crank case, and such piston and cylinder arranged so that when the piston is near the end of its forward movement the ends of the passage ways from the part of the cylinder of smaller diameter are uncovered; substantially as described.

3. The combination of a piston of two diameters, a cylinder of corresponding diameters, such piston longitudinally movable in the cylinder, a closed crank case, the part of the cylinder of smaller diameter provided with passage ways in communication, respectively, with the part of the cylinder of larger diameter and with the crank case and the part of the cylinder of larger diameter provided with a discharge passage way, a check valve in such discharge passage way arranged to permit the flow of gases from the part of the cylinder of larger diameter, and the crank case provided with an inlet passage way, a check valve to such inlet passage way arranged to permit the flow of gases into the crank case, and such piston and cylinder arranged so that when the piston is near the end of its forward movement the ends of the passage ways from the part of the cylinder of smaller diameter are uncovered; substantially as described.

4. In a two cycle explosion engine, the combination of means to obtain an explosion chamber provided with a movable wall, means to obtain a reduced pressure chamber provided with a movable wall the capacity of said reduced pressure chamber not less than the capacity of the combustion chamber, and means to obtain a compression chamber of greater cubical capacity than the explosion chamber, such compression chamber provided with a movable wall of greater area than the movable wall of the explosion chamber, means to provide communication between the compression chamber and the explosion chamber on the outward movement of the movable wall of such explosion chamber, means to establish communication between the explosion chamber and the reduced pressure chamber on such outward movement of such movable wall of the explosion chamber, and means to cut out communication between the compression chamber and reduced pressure chambers, respectively, and the explosion chamber on the inward movement of such movable wall, means to establish a discharge passage way from the reduced pressure chamber and means to control the same to permit the flow of gases from such reduced pressure chamber, and means to provide an inlet to the compression chamber and means to control the same to permit the flow of gases into the compression chamber; substantially as described.

CHARLES TURNER BROWN.

In the presence of—
CORA A. ADAMS,
ALFRED N. TAGERT.