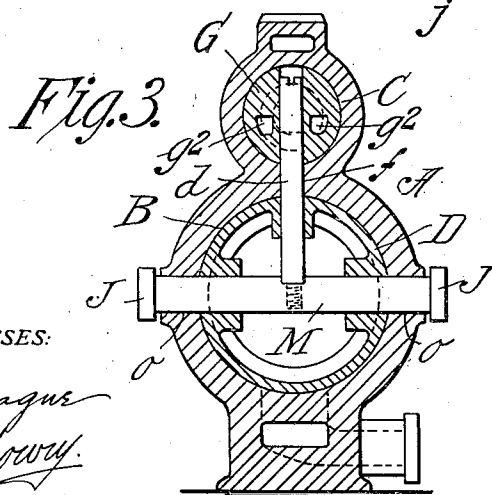
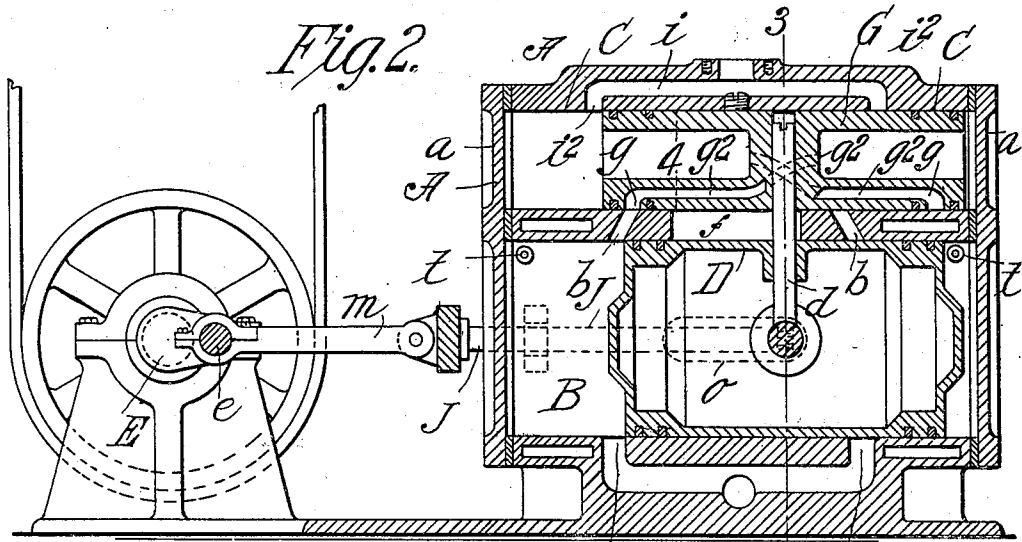
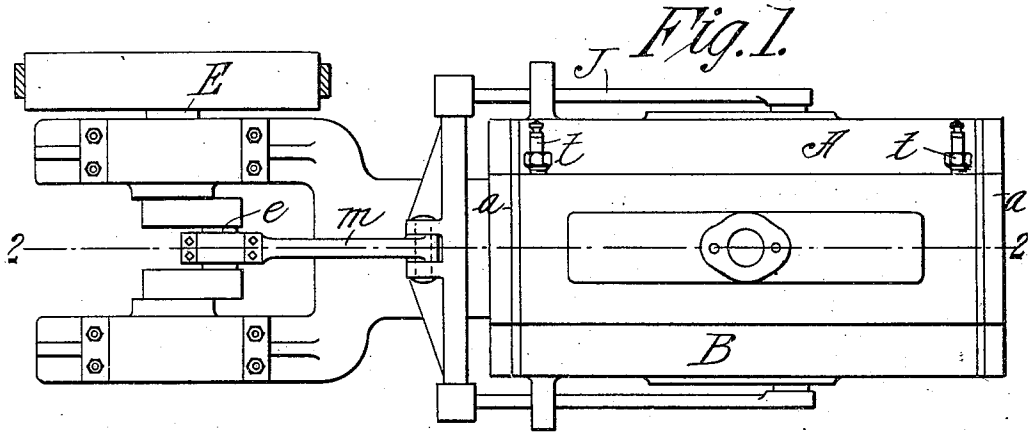


J. A. S. ANDERSON.
EXPLOSIVE ENGINE.
APPLICATION FILED FEB. 20, 1912.

1,055,693.

Patented Mar. 11, 1913.



WITNESSES:
H. L. Sprague
R. M. Mowry

INVENTOR,
J. A. S. Anderson,
BY *Wm. J. Bell*
ATTORNEY.

UNITED STATES PATENT OFFICE.

JOHN ALBERT S. ANDERSON, OF SPRINGFIELD, MASSACHUSETTS.

EXPLOSIVE-ENGINE.

1,055,693.

Specification of Letters Patent.

Patented Mar. 11, 1913.

Application filed February 20, 1912. Serial No. 678,820.

To all whom it may concern:

Be it known that I, JOHN ALBERT S. ANDERSON, a citizen of the United States of America, and resident of Springfield, in the county of Hampden and State of Massachusetts, have invented certain new and useful Improvements in Explosive-Engines, of which the following is a full, clear, and exact description.

This invention relates to an improved double acting explosive engine, that is one in which the cylinder has a reciprocatory piston therein which is operative to compress the gas in the opposite ends of the cylinder, which gas when ignited is effective to alternately drive the piston from one end of the cylinder to the other.

The objects of the invention are to provide in combination with the piston cylinder a reciprocatory valve which is operative to insure the admission of the gas alternately at opposite ends of the cylinder and to give an initial or partial compression to the gas preparatory to the admissions thereof at the opposite ends of the cylinder.

The initial compression of the gas insured by the operation of the reciprocatory valve followed by the further compression in the cylinder by the reciprocatory piston therein causes a better gaseous explosive charge or mixture to be fired and the reciprocatory valve also causes positive alternated admission of the gas, at the proper times therefor, into the opposite ends of the cylinder so that full or ample explosive charges are always provided against the opposite ends of the piston.

Another object is to provide improved means for insuring the concurrent reciprocatory movement of the cylinder piston and the piston like valve.

Another object is to provide improved means externally of the cylinder and having connection with the piston therein for the transmission of the power exerted by the piston in the strokes thereof to the rotary engine shaft. And another object is to so construct and combine the parts that the double acting engine is one of extreme simplicity, comprising few components, and susceptible of inexpensive manufacture.

The invention is described in conjunction with the accompanying drawings and is set forth in the claims.

In the drawings:—Figure 1 is a plan view of the improved double acting explosive en-

gine; Fig. 2 is a vertical longitudinal section of the same. Fig. 3 is a vertical cross sectional view of the engine as taken on line 3—3, Fig. 2. Fig. 4 is a cross sectional view of the piston like valve as taken about on the line 4, Fig. 2.

Similar characters of reference indicate corresponding parts in all of the views.

In the drawings, A represents the engine body having a main cylinder B therein closed at its opposite ends; and the engine body has a cylindrical bore C which is also closed at its opposite end,—the same plates or heads *a a* which close the cylinder ends serving to also close the ends of the bore C. *b b* are a pair of ports which lead from separated portions in the length of the bore to separated portions in the length of the cylinder.

The reciprocatory piston which is of considerable length but nevertheless shorter than the cylinder chamber, is of a length greater than the distance between the said ports *b b*, and it is adapted in its stroke a suitable time after the closing of one of the ports *b* to open the other of said ports.

G represents the valve of cylindrical form fitted in the said bore for longitudinal reciprocation therein, the same being connected to, and to move in unison with the piston through means of the bar or stud *d* connected rigidly centrally to the piston, extending at right angles to the axis thereof through the longitudinal slot *f* in the wall of the engine body which separates the cylinder chamber B from the bore C which is axially parallel therewith, such bar or stud centrally penetrating or engaging the piston-like valve. The said cylindrical valve has sidewise opening ports *g g* near the opposite ends thereof adapted for alternate registration with said cylinder-and-bore connecting ports *b b*,—their distance of separation being greater than the distance between such ports *b b* as shown in Fig. 2; and these ports are continued in passages *g², g²*, which extend longitudinally through, and open to the end compression chambers G' of the cylindrical valve which are respectively opposite from the locations of the sidewise opening ports *g* of which they are continuations.

Inasmuch as the middle portion of the cylindrical valve is penetrated by the stud or bar *d* which has connection with the cylinder piston, the course of the passages *g², g²*, is rendered somewhat tortuous.

i represents a gas inlet passage or channel formed longitudinally in the wall of the body which incloses the cylindrical bore C, said passage terminating in the ports i^2 , i^2 , which inwardly open to the bore,—the distance of separation between these ports i^2 , i^2 , being less than the length of the cylindrical valve so that the latter has alternating opening and closing coaction therewith.

j j represent exhaust passages leading from the cylinder toward, but suitably distant from, opposite ends of the cylinder so that the piston D has admission and cut off coaction therewith in substantially the same manner as with the gas admission ports b b .

E represents the crank shaft of the engine, the same here being represented as having but a single crank e . To this crank a yoke J is connected by pitman rod m , said yoke having a straddling relation to the cylinder, and it has connection centrally and transversely with the cylinder piston through means of the cross bar M tightly fitted through the piston, its trunnion like extremities with which the yoke connects being freely movable in longitudinal openings or slots o through the opposite sides of the engine body, and which slots are internally closed by the opposite sides of the piston.

In operation, assuming the piston is at the end of its rightward stroke and is about to move to the left,—the gas or charge will be admitted through the port i^2 into the left hand end of the valve bore C. This charge will become compressed as the cylinder piston moving to the left carries the piston-like valve with it in a corresponding direction; and so soon as the parts D and G have moved to their extreme left, the right hand port g which is in communication through the continuing passage e andwise through the piston valve will come to registration with the right hand cylinder bore connecting port b so that the gas which has become compressed in the left hand end of the bore becomes expelled into the right hand end of the cylinder, the piston of which is uncovered to the right hand port b .

At the time the piston D has been moving to the left its first action has been to close the left hand port so that the gas therein,—which as manifest has been admitted under compression from the right hand end of the bore C,—becomes confined or closed against escape, and under the action of the piston is still further compressed to the maximum degree.

The charge is fired in the ordinary manner, t t representing spark plugs in conjunction with which the ordinary spark circuit apparatus and connections are provided.

The action described is repeated in alternation, as manifest, so long as the engine continues running,—it, of course, being

clearly understood that the piston acts substantially as a valve for the opening and cut off of the exhaust through the ports f f .

I claim:—

1. In a double acting explosive engine in combination, an engine body having a main cylinder therein, having a cylindrical bore parallel with such cylinder and provided with ports opening from separated portions of the bore to separated portions of the cylinder, a reciprocatory cylinder-piston longer than the distance between said ports, and adapted in its strokes after the closing of one of the ports to open the other of said ports, the cylindrical valve having end compression chambers, longitudinally reciprocatory in said bore,—connected, and to move in unison with, the piston,—having sidewise opening ports therein, adapted for alternate registration with said cylinder-and-bore connecting ports, and continued longitudinally through, and opening at the end compression chambers of such cylindrical valve which are respectively opposite from the locations of the sidewise opening ports thereof, means for the admission of gas into the opposite ends of said bore, means for the exhaust of the cylinder, and means externally of the cylinder and connected with the piston for the transmission of the power exerted by the piston.

2. In a double acting explosive engine, in combination, an engine body having a main cylinder therein, having a cylindrical bore parallel with such cylinder, and provided with ports opening from separated portions of the bore to separated portions of the cylinder, the reciprocatory cylinder-piston longer than the distance between said ports, and adapted in its strokes after the closing of one of the ports to open the other of said ports, a cylindrical valve having end compression chambers, reciprocatory in said bore,—and connected, and to move in unison with the piston, having sidewise opening ports therein, adapted for alternate registration with said cylinder and bore connecting ports, and continued longitudinally through, and opening at the end compression chambers of such cylindrical valve respectively opposite from the locations of the sidewise opening ports thereof, a gas inlet passage in the body having ports opening in the said bore at different portions in the length thereof, and with which said cylindrical valve has alternating opening and closing coaction, and exhaust passages leading from opposite end portions of the cylinder.

3. In a double acting explosive engine, in combination, an engine body having a main cylinder therein, having a cylindrical bore parallel with such main cylinder, provided with a longitudinal slot connecting the cylinder and bore and provided with ports be-

yond the opposite ends of said slot and which connect the bore and cylinder, a reciprocatory piston in said cylinder, longer than the distance between said ports, and operative to alternately open and close the same, a cylindrical valve having end compression chambers longitudinally reciprocatory in said bore having sidewise opening ports therein for alternate registration with said cylinder and bore connecting ports and continued longitudinally through and opening at the end compression chambers of such cylindrical valve which are respectively opposite from the locations of said sidewise opening ports, a member rigidly connected with the cylinder piston extending through said slot and having a rigid connection with the cylindrical valve, means for the admission of gas into the opposite ends of said bore, means for the exhaust of the cylinder, and means externally of the cylinder and connected with the piston for the transmission of the power exerted by the piston.

4. In combination, a cylinder body having a piston chamber and a valve chamber parallel therewith, said cylinder having an exhaust port located medially of its ends and

passages extending from said exhaust port and communicating with the opposite ends of the piston chamber, the upper portion of the wall of said piston chamber dividing the valve chamber therefrom and having a longitudinal central slot and fuel passages located endwise thereof, a piston movable in the piston chamber and adapted to close one of the exhaust passages and one of the fuel passages and to open the remaining exhaust and fuel passage, a valve movable in the valve chamber and having end chambers, and passages extending each from one end chamber through the wall of the other end chamber and spaced from each other and adapted to communicate with said upper passages in the piston chamber wall; a rod connecting the piston to the valve through said slot, means for supplying fuel to the opposite ends of the valve chamber.

Signed by me at Springfield, Mass., in presence of two subscribing witnesses.

JOHN ALBERT S. ANDERSON.

Witnesses:

G. R. DRISCOLL,
WM. S. BELLOWES.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."