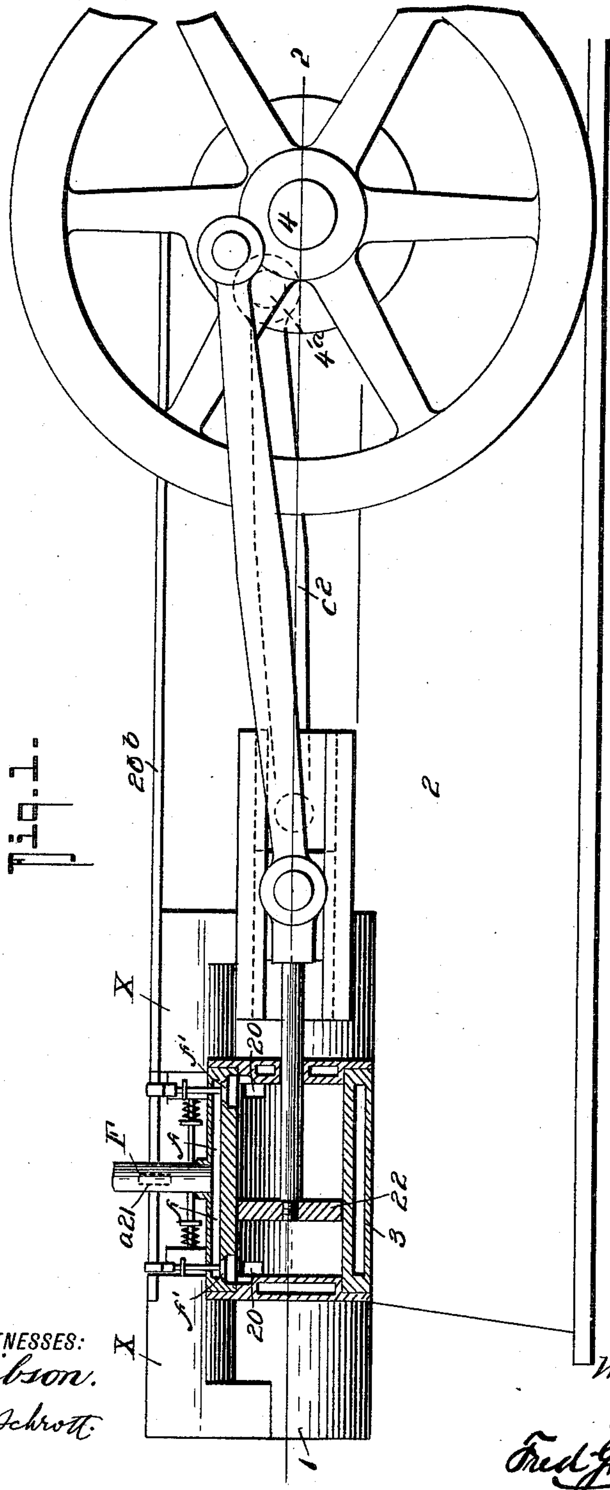
W. J. WRIGHT.
EXPLOSIVE ENGINE.
APPLICATION FILED FEB. 7, 1906.

1,006,165. Patented Oct. 17, 1911.

3 SHEETS—SHEET 1.

Fig. 1.



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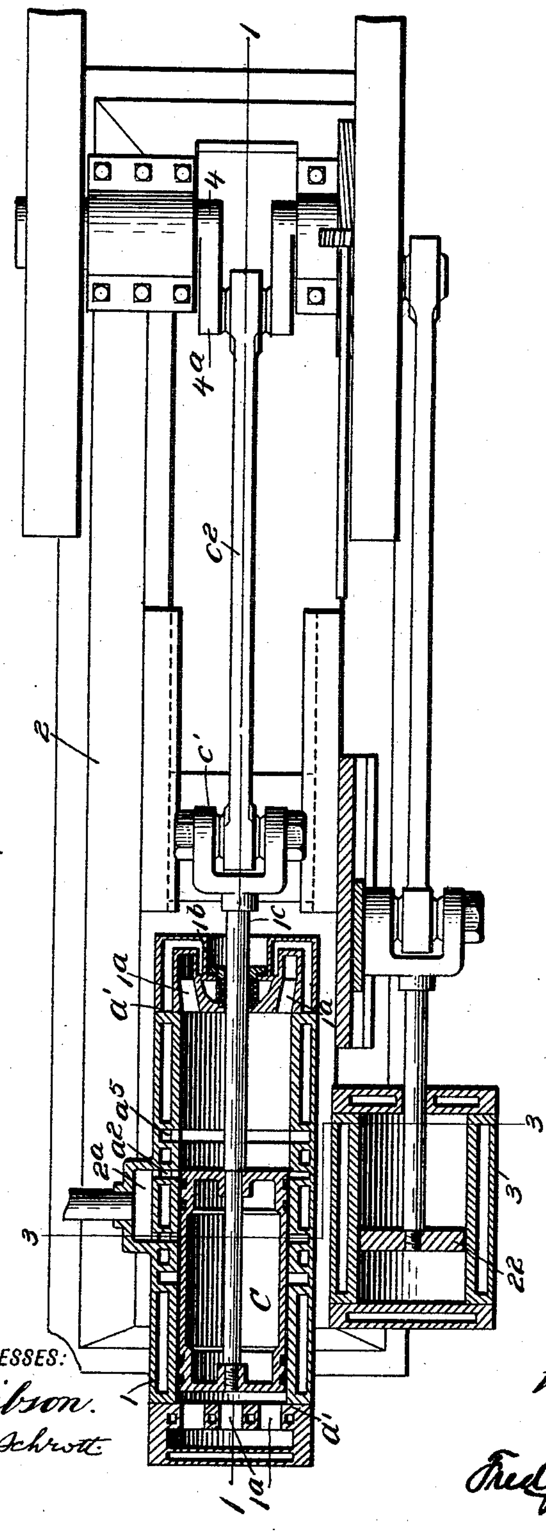
3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 3.

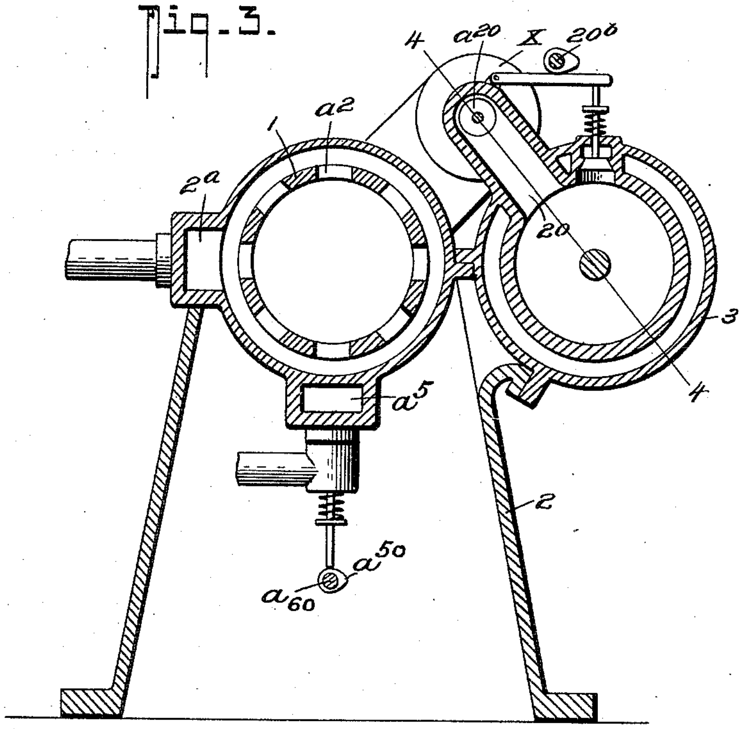
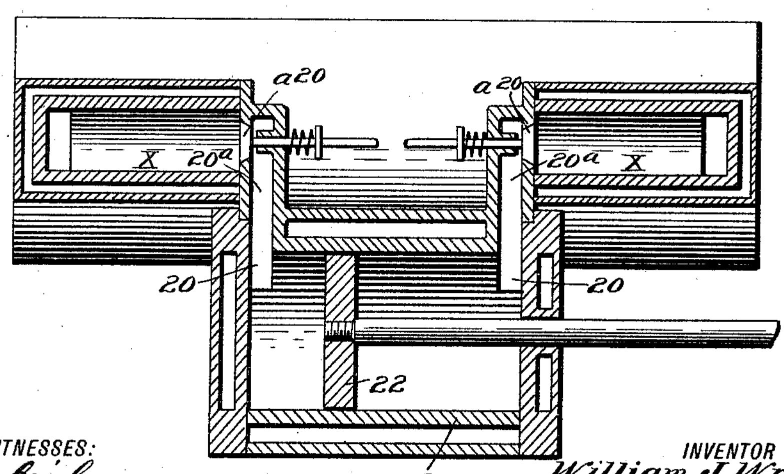


Fig. 4.



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UNITED STATES PATENT OFFICE.

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EXPLOSIVE-ENGINE.

1,006,165. Specification of Letters Patent. Patented Oct. 17, 1911.

Application filed February 7, 1906. Serial No. 299,896.

To all whom it may concern:

Be it known that I, William J. Wright, residing at Franklin, in the county of Venango and State of Pennsylvania, have invented a new and Improved High-Compression High-Speed Explosive-Engine, of which the following is a specification.

My present invention which relates generally to improvements in explosive engines, more specifically has for its object to provide a simple and economical construction of engine, adapted to work under high compression and high speed, in which the maximum energy of the explosion mixture or working charge is obtained, and the parts are designed for accurate adjustment and coöperative arrangement.

In its generic nature my present invention comprises a first or working cylinder and a second compressing and pumping cylinder, each of said cylinders having a piston connected to the same crank shaft, with the connection for the second cylinder arranged to operate in advance of the working piston, the working piston and the inlet and exhaust ports in the working cylinder being relatively so arranged as to provide for an explosion at the end of each stroke of the working piston.

In its more complete form my present invention embodies a first and a second cylinder, the first cylinder acting as the working cylinder, each of said cylinders having a piston whose connections with the crank shaft and its relation to the inlets and exhaust ports of the first cylinder are such, that the working charge is being primarily compressed for one end of the working cylinder as a prior primarily compressed working charge is receiving a final high compression in the other end of the working cylinder, preparatory to exploding.

Again, my present invention includes other subordinate features of construction, among them a special construction of exhausting means whereby to positively clear the explosion chambers of the working cylinder of such burned mixture as might remain therein as the piston begins its back movement to again compress a new charge, and certain details and combination of parts, all of which will hereinafter be fully explained, pointed out in the appended claims and illustrated in the accompanying drawings, in which:—

Figure 1, is a longitudinal section of my high speed high compression engine taken substantially on the line 1—1 on Fig. 2. Fig. 2, is a horizontal section, parts being in plan view of the same on the line 2—2 on Fig. 1. Fig. 3, is a transverse section thereof on the line 3—3 on Fig. 2. Fig. 4, is a longitudinal section of the combined compressing and pumping cylinder and the valved working agent or explosive mixture feed chambers connected therewith.

In the practical construction of my present engine, I prefer to arrange the first and second cylinders in the manner best shown in Figs. 2 and 3, by reference to which it will be noticed, the first or working cylinder 1 is centrally mounted on the bed frame 2 and the other cylinder 3 is disposed in the horizontal plane of cylinder 1 and mounted on one side of the frame 2.

The working cylinder 1 in my present case, by reason of the high compression I obtain in each end thereof and consequent intense heat, has specially designed ends so as to practically withstand the requirements, and for such purpose I form the body of the cylinder of the usual annular water jacket construction and the ends, also water jacketed, with a series of concentrically arranged feed inlets 1^a 1^a that communicate with supplemental chambers X X in which the explosions occur and which are also surrounded by water spaces. In one end, the working cylinder has a stuffing box or gland 1^b to accommodate the piston rod 1^c of the piston C and in the said end the space X is shaped to have, in practice, the same internal area as the space X at the other end, to provide for uniform charges of the explosive mixture at each end of the piston. The piston C of the usual form is, however, of such length that at each reciprocal stroke its heads travel close up to the ends a' of the working cylinder whereby to drive the entire charge into the supplemental spaces X X and the piston rod 1^c connects with the cross head c' which joins with the pitman c^2 that connects with the crank 4^a on the shaft 4, as clearly shown in the drawings.

Midway thereof, the cylinder 1 has a pair of sets of very narrow exhaust ports a^2 a^2, one set being disposed to one side of the center and the other correspondingly on the other side of the center, and both sets a^2—a^2 discharge into a single exhausting space 2^a to atmosphere, as clearly shown in Fig. 2. The exhausts a^2 are so disposed that they are uncovered at the extreme end of the strokes in opposite direction of the piston 1, in practice about the last twentieth of the stroke movement, such arrangement being provided to obtain the maximum expansive force of the exploded charge. Since the exhausts a^2 are closed under the first return (for example, twentieth part) movement of the piston C, and as the feed of a new charge of working agent is turned to enter the cylinder 1 in front of the piston C on its return stroke, immediately after the exhausts a^2 are closed, to provide for positively exhausting any remaining burned mixture in that end last exploded, the cylinder 1 is formed with two sets of supplemental exhausts a^5—a^5 of much greater width than exhausts a^2, which exhausts are mechanically opened by cams a^{50} on a shaft a^{60} (see Fig. 3) which shaft a^{60} may be operated from the crank shaft in the same manner as is the shaft 20^b, or in any other desired way. The exhausts a^5—a^5 are held open until the piston passes over and closes them, after which they are again automatically closed.

It should be stated that the working agent is fed into the cylinder 1 in front of the piston, immediately after the piston has traveled forward enough to close off the main exhausts a^2 and by reason of the new charge now entering and flowing toward the piston C, and the said piston traveling toward the new charge, it follows that any burned residuum contained in the cylinder 1 after the piston starts on its back or compression stroke, will be forced or banked in front of the piston and be caused to positively flow out through the exhausts a^5, and by reason thereof the cylinder will be positively cleaned and recharged by pure mixture, which, it should be stated, is led into the cylinder under a primarily compressed condition to be finally subjected to a high compression by the piston as it passes forward from the exhaust a^5 toward the igniting end of the cylinder.

To accomplish the primary compression and proper feed of the charge to the working cylinder in a simple, positive and highly effective manner, I connect the second supplemental or compressing and pumping cylinder with the first or main cylinder through intermediate valved fluid spaces, the arrangement of which is best shown in Fig. 4, from which it will be noticed the cylinder 3 has a discharge port 20 at each end and each of the ports 20 communicates with a fluid space 20^a—20^a, which spaces are normally closed by valves a^{20}—a^{20} that are alternately and mechanically opened at predetermined times by suitable devices actuated from the crank shaft, for example, by a double cam a^{21} on a shaft 20^b geared with the crank shaft to make one revolution at each revolution of the crank shaft.

F designates the explosive mixture feed pipe that has laterals f—f having back check valves f'—f' and which discharge into the opposite ends of the cylinder 3, said valves on the suction stroke of the piston 22 opening to admit a charge of working mixture into the cylinder 3.

The piston 22, as before stated, is connected with the crank shaft to travel in advance of the piston in the working piston and the coöperative connection of the two pistons, the cylinders and the valved channels or ports are such, that while the working piston is traveling forward in one direction to effect the final or high compression of a charge primarily compressed in the pump cylinder and forced out into the working cylinder, the new charge drawn in back of piston 22 will, by reason of the piston 22 now traveling opposite to working piston, be compressing the working charge in the cylinder 3 which is held therein until the valve that closes off the fluid space 20^a for that end of cylinder is opened to allow the charge to flow into the working cylinder against the piston therein which has now begun its return movement and closed the ports a^2 at that end of the cylinder receiving the new charge. It will thus be seen, that while a primarily compressed charge is being subjected to a final or high compression, the piston will be acting as a compressor for effecting a primary compression to the new charge drawn into the cylinder, which charge however, does not go out to the working cylinder until the highly compressed charge has been exploded.

From the foregoing description, taken in connection with the drawings, the complete structure and the operation of my present invention, it is believed, will be readily understood.

Since the working charge is subjected to a primary compression before it enters the working cylinder, and as the valves in the intakes for the working cylinder are opened while the two pistons are yet traveling in the same direction, the compression is increased by reason of the two pistons traveling against both ends of the charge, which compression is again and highly increased as soon as the cylinder 3 is cut off from the end of the cylinder 1 in which the new charge has been fed by reason of the final movement of the working piston under the impulse of the explosion of the prior charge back of it.

By providing the ends of working cylinder with the supplemental chambers, ample means is provided for cooling the explosive ends of the cylinder since the water jacket substantially surrounds the sides and ends of the explosion chambers, without interfering with a free flow and the full expansive force of the exploded charges.

In the drawings I have arranged the several parts constituting my invention in a manner to permit a clear illustration thereof, but I desire it understood that in the practical construction of my present form of engine, the parts may be readily modified or otherwise coöperatively arranged without departing from my invention.

Having thus described my invention, what I claim is:

1. A double acting internal combustion engine comprising a working cylinder having heads provided with inlet ports, a working piston operating in said cylinder and dividing it into two sections, two distinct sets of exhaust ports for each section of said cylinder, at least one set for each section of the working cylinder being piston controlled, and means for controlling the other set of exhaust ports of each cylinder section.

2. An internal combustion engine comprising a main cylinder having a pair of heads provided with inlet ports and having two sets of centrally disposed main piston controlled exhaust ports, a piston working in said cylinder combined with supplemental valve controlled exhaust ports for said cylinder, and means connecting with said inlet ports of said working cylinder for imparting an initial compression to the working agent prior to its admission into the working cylinder.

3. A double acting internal combustion engine comprising a working cylinder having heads provided with inlet ports, a working piston operating in said cylinder and dividing it into two sections, two distinct sets of exhaust ports for each section of said cylinder, at least one set for each section of the working cylinder being piston controlled, means for controlling the other set of exhaust ports of each cylinder, and means connecting with said inlet ports of said working cylinder for imparting an initial compression to the working agent prior to its admission into the working cylinder.

4. In combination with the working or primary cylinder and the secondary cylinder, the cylinder pistons, the crank shaft connected to said pistons, the working cylinder having a valved intake port and a main exhaust port for each end and a supplemental exhaust port between the main exhaust ports and the intake ports for each end, automatic means for controlling the supplemental exhaust ports at predetermined times, the main exhaust ports being controlled by the working piston movements, the secondary cylinder having a valved feed inlet at each end and automatic means for alternately actuating the valves for the said inlet ports at predetermined times, as set forth.

5. In a gas engine of the character described, a main working cylinder and piston therein, said cylinder having an automatically opened valved intake port for each end, and a main exhaust port for each controlled by the movement of the working piston, and supplemental exhaust ports for each end that open after the main exhaust ports are closed, and a means actuated from the crank shaft for delivering a new charge under pressure against the forwardly moving end of the working piston after it closes the main exhaust whereby to drive out burned residuum through the supplemental exhaust, substantially as shown and described.

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