W. WEEKS.

DUPLEX ENGINE.

APPLICATION FILED FEB. 15, 1916.

1,271,966.

Patented July 9, 1918.

2 SHEETS—SHEET 1.

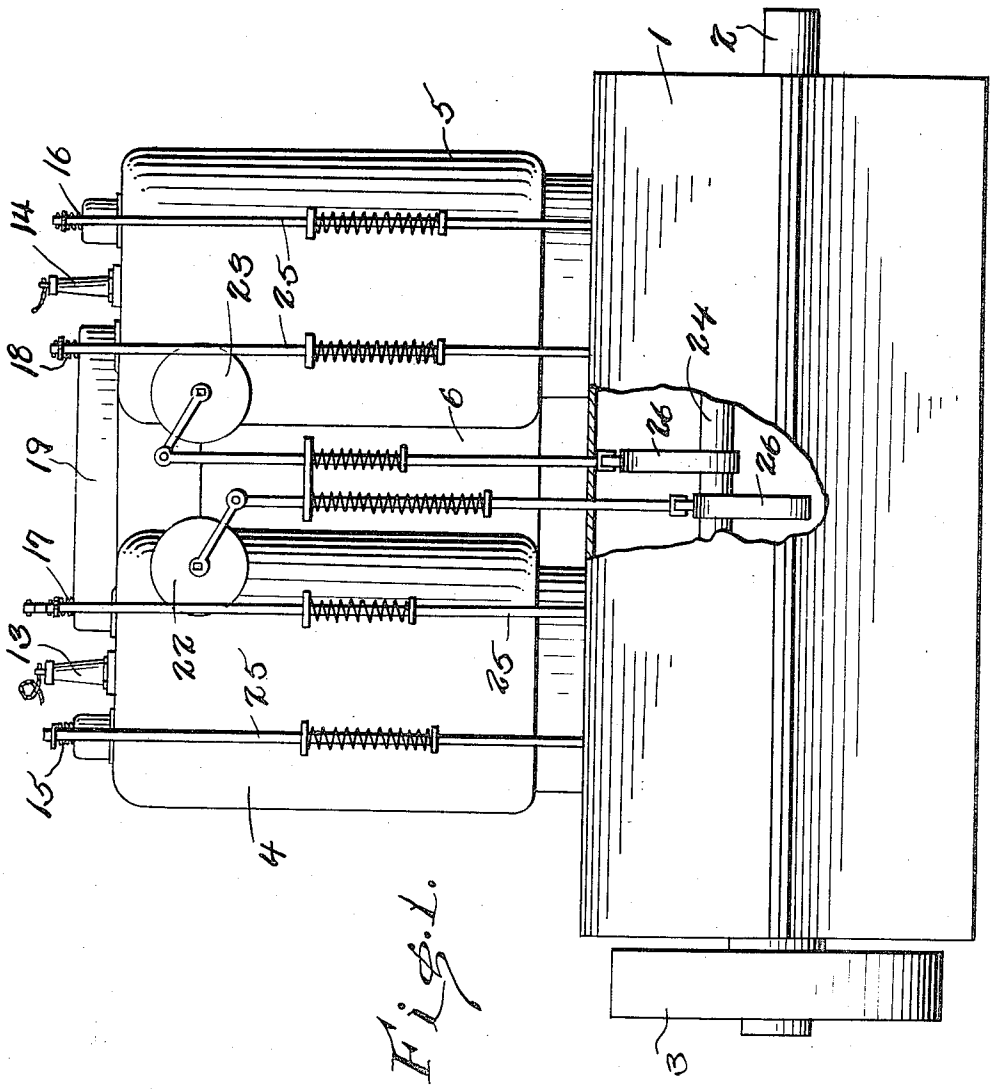


Fig. 1.

INVENTOR

WILLIAM WEEKS

WITNESSES

Howard F Costello

W. E Valk Jr.

BY Richard Owen.

ATTORNEY

W. WEEKS.

DUPLEX ENGINE.

APPLICATION FILED FEB. 15, 1916.

1,271,966.

Patented July 9, 1918.

2 SHEETS—SHEET 2.

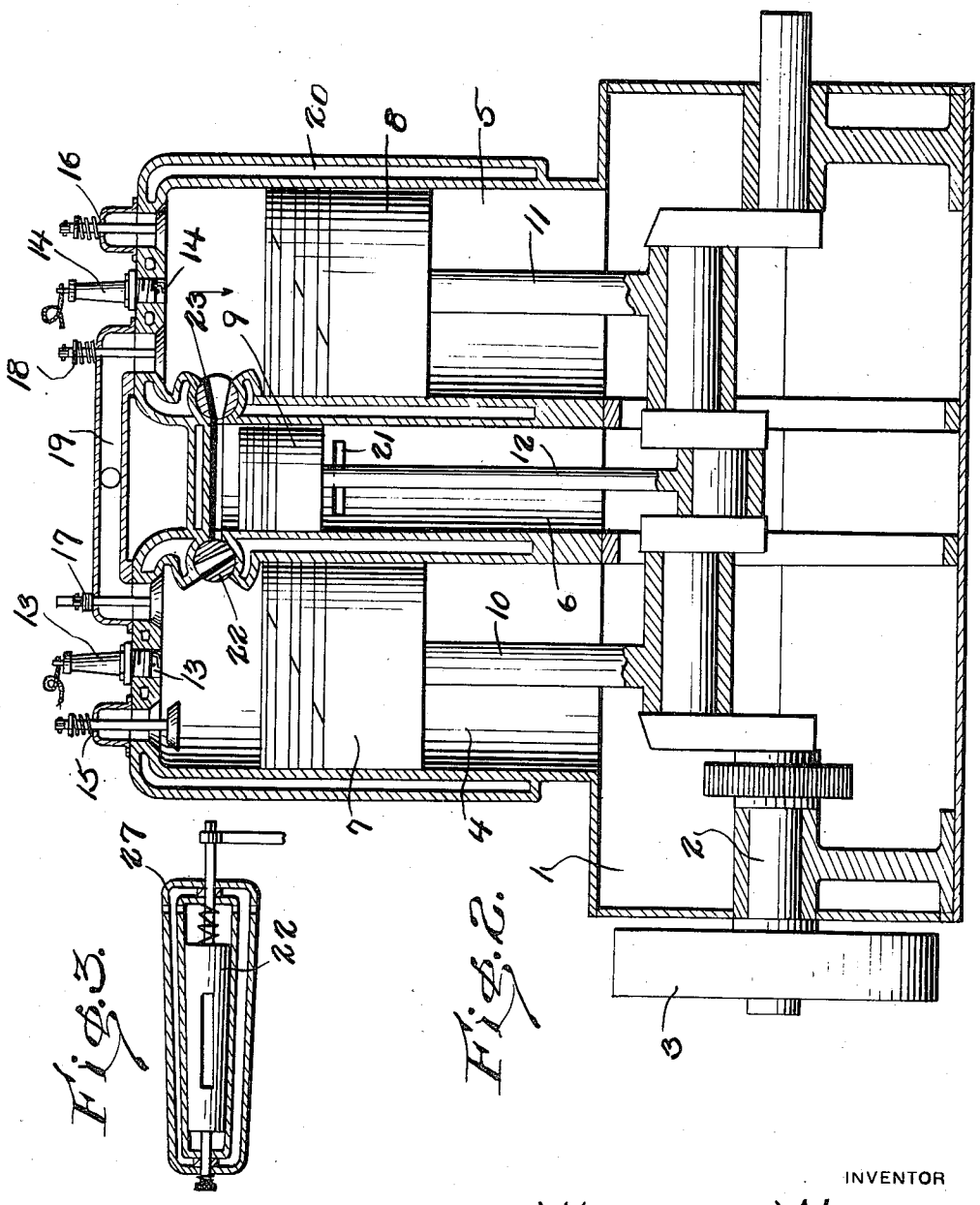


Fig. 3.

Fig. 2.

INVENTOR

WILLIAM WEEKS

WITNESSES

Howard Hostello

W. Ebalk Jr.

BY Richard B. Owen.

ATTORNEY

UNITED STATES PATENT OFFICE.

WILLIAM WEEKS, OF CHICAGO, ILLINOIS.

DUPLEX ENGINE.

1,271,966. Specification of Letters Patent. Patented July 9, 1918.

Application filed February 15, 1916. Serial No. 78,455.

To all whom it may concern:

Be it known that I, WILLIAM WEEKS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Duplex Engines, of which the following is a specification.

My invention relates to internal combustion engines of the duplex type in which two alternately acting pistons are employed to propel the crank shaft of the engine.

An object of the invention is to reduce shocks in the engine by permitting a slight compression in one of the cylinders at each upward stroke.

A further object of my invention is to so construct and arrange the main or working cylinders of the engine with respect to an auxiliary cylinder as to provide communication therebetween.

I further contemplate a novel valve arrangement, and an operating mechanism therefor, whereby the auxiliary piston may be caused to operate on a two-cycle principle, and the working piston on the four-cycle principle, the several pistons coöperating to continuously drive the crank shaft, a portion of the exhaust gases being utilized to move the auxiliary piston, and as a result, obtain a maximum of power at the expenditure of a minimum quantity of fuel.

The above and additional objects are accomplished by such means as are illustrated in their preferred embodiment in the accompanying drawings, described in the following specification and then more particularly pointed out in the claim which is appended hereto and forms a part of this application.

In describing my invention in detail, reference will be had to the accompanying drawings wherein like characters denote like or corresponding parts throughout the several views, and in which:—

Figure 1 is a side elevation of my improved duplex engine, the crank case being broken away to illustrate the operating mechanism for the oscillatory intermediate valves;

Fig. 2 is a detail longitudinal sectional view of said engine, and

Fig. 3 is a detail longitudinal sectional view of one of the said oscillating intermediate valves.

Referring now to the drawings by numerals, 1 designates the crank case, 2 the crank shaft, 3 the fly wheel, 4 the left hand working cylinder, 5 the right hand working cylinder, 6 the intermediate or auxiliary cylinder, 7 the piston for the cylinder 4, 8 the piston for the cylinder 5, 9 the piston for the cylinder 6, 10 the piston rod connecting the piston 7 and the crank shaft 2, 11 the piston rod connecting the piston 8 and the crank shaft 2, 12 the piston rod connecting the piston 9 and the crank shaft 2, 13 the spark plug for the cylinder, 4, 14 the spark plug for the cylinder 5, 15 the intake valve mechanism for the cylinder 4, 16 the intake valve mechanism for the cylinder 5, 17 the exhaust valve mechanism for the cylinder 4, 18 the exhaust valve mechanism for the cylinder 5, and 19 an exhaust passage way open to the respective cylinders, that is, cylinders 4 and 5. Said cylinders 4, 5 and 6 are jacketed as indicated at 20, the intermediate cylinder 16 being equipped with an exhaust port 21, whereby, during reciprocation of the piston 9 upon the two cycle principle, the burnt gases in said cylinder 6 may be permitted to escape.

Intermediate oscillatory valves 22 and 23 are interposed respectively between the cylinders 4 and 6 and the cylinders 5 and 6, the said valves, like the valves 15, 16, 17 and 18 (of the common type) being operatively associated and connected with a valve operating shaft 24 mounted to extend parallel with the crank shaft 2. Each valve is equipped with a spring pressed valve operating rod 25 and with an associate cam 26, the cams 26, being mounted on the shaft 24 to reciprocate the several valve rods and consequently open and close the respective valves at such times as may be required to a proper operation of the engine.

Upon reference to Fig. 3, it will be observed that the oscillatory intermediate valves 22 and 23 are each jacketed as indicated at 27, said valves as hereinbefore stated, being located diametrically opposite with respect to the cylinder 6 and at the top thereof to alternately open and close communication between said cylinder 6 and the working cylinders 4 and 5. By constructing the crank shaft 2 as illustrated in Fig. 2, it is evident that the stroke of the piston 9 is shorter than the stroke of the coacting pistons 7 and 8.

Pistons 7 and 8 alternately operate, that is, piston 8 is set to execute its power stroke

while piston 7 its intake stroke, and vice versa. Each of the several pistons, 7, 8 and 9 reciprocate in unison.

In operation, and assuming the parts to be in the position shown in Fig. 2, and an explosion to be taking place in the top of cylinder 5, the force of the explosion will be divided between pistons 8 and 9 in proportion to their diameters and the pistons will be moved downward. During downward movement of the pistons a charge will be drawn into the top of cylinder number 4.

Upon the return upward movement of the piston the burnt gases in cylinders numbers 5 and 6 will be exhausted, partly through exhaust manifold 19 and partly through exhaust port 21 until said port 21 is lapped by the cylinder 9. At this moment the valve 23 is closed so that the gases thus confined in the top of cylinder number 6 will be compressed, and the movement of the piston will thus be cushioned to prevent shocks to the engine.

At this moment an explosion will take place in the top of cylinder number 4. and simultaneously therewith the valve 22 will be opened so that the force of said explosion will be taken up jointly by pistons 7 and 6 in proportion to their diameters whereby to move the pistons downward and to permit piston 8 to draw in a fresh charge in the top of cylinder number 5. Upon the return movement of the piston the process described above will be repeated, at each upward movement of the piston a small quantity of exhaust gases being compressed in the top of cylinder number 6 for the purpose described.

From the foregoing, taken in connection with the accompanying drawings, it will be noted that the intermediate auxiliary piston 9 is designed to operate on the two cycle principle while the working pistons 7 and 8 are operated upon the four cycle principle; that all of the several pistons move in unison, the action on the piston 8, however, (during the intake stroke of the piston 7), causing the crank shaft 2 to be propelled.

In reduction to practice, I have found that the form of my invention, illustrated in the drawings and referred to in the above description, as the preferred embodiment is the most efficient and practical; yet realizing that the conditions concurrent with the adoption of my device will necessarily vary, I desire to emphasize the fact that various minor changes in details of construction, proportion and arrangement of parts may be resorted to, when required, without sacrificing any of the advantages of my invention, as defined in the appended claim.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent, is:—

In an internal combustion engine, the combination of a pair of main cylinders, pistons operating therein, an intake valve for each cylinder, an exhaust manifold connecting said cylinders, an exhaust valve for each cylinder controlling communication to said manifold, a crank shaft having a major offset portion, rods connecting said pistons to said offset, a minor offset portion in said major offset portion, directed oppositely so as to produce a swing of less radius than the major offset, an auxiliary cylinder having a normally open exhaust port, a piston operating therein, a rod connecting said piston with the minor offset, whereby all of the pistons are moved in unison in the same direction, an oscillatory valve in each main cylinder controlling the communication between said cylinders and the auxiliary cylinder, an operating means for said oscillatory valves whereby the main pistons may operate alternately on an explosion stroke and on the four cycle principle and the auxiliary cylinder receive a portion of the charge alternately from each main cylinder at each working stroke of said auxiliary piston and exhaust the spent gases therefrom at each return stroke of said auxiliary piston.

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

WILLIAM WEEKS.

Witnesses:
PATRICK W. CAREY,
JOHN H. HENDRICKSON.