

W. E. ADAMS.
INTERNAL COMBUSTION ENGINE.
APPLICATION FILED JUNE 24, 1909.

1,001,600.

Patented Aug. 29, 1911.

2 SHEETS-SHEET 1.

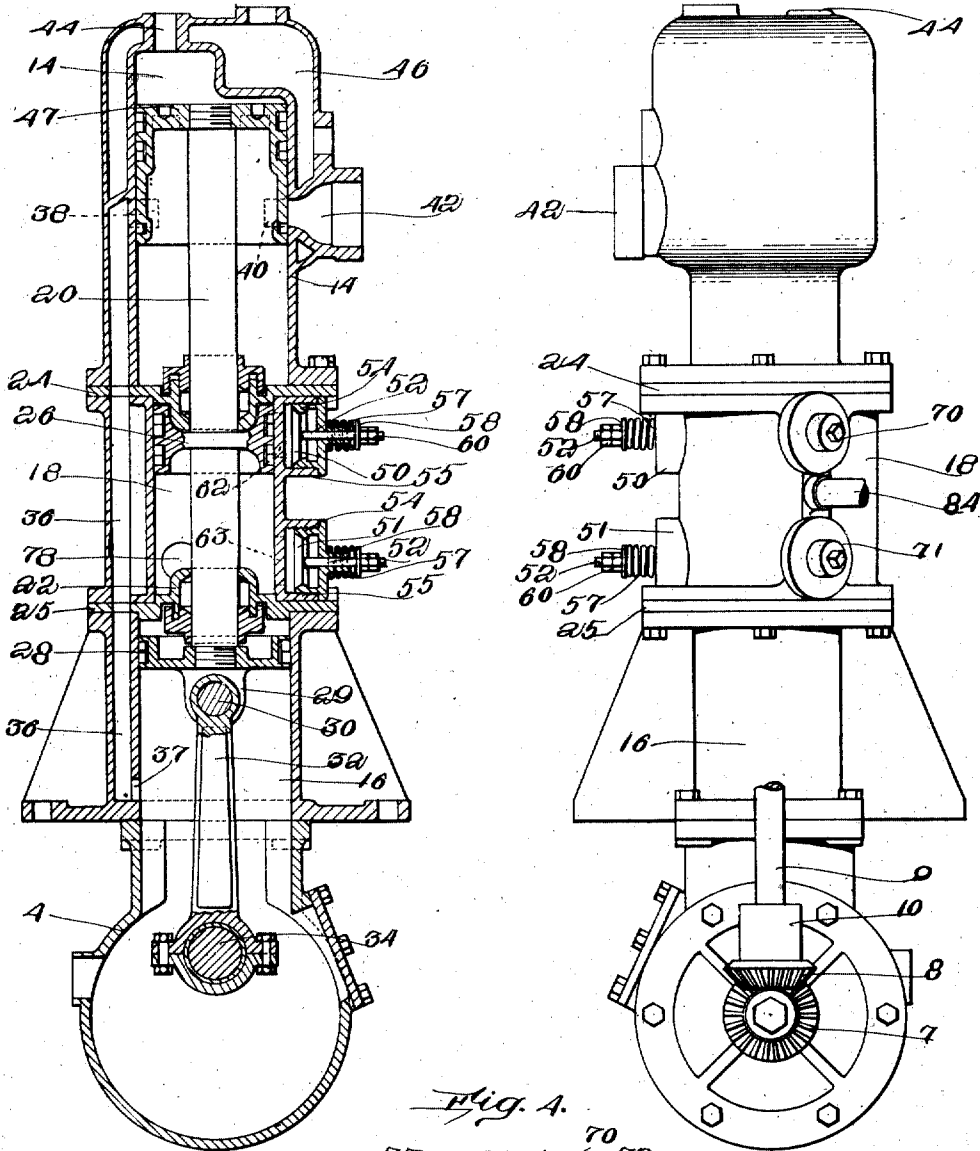


Fig. 1.

Fig. 4.

Fig. 3.

Witnesses:
A. C. Richardson.
R. A. Simonds

Inventor:
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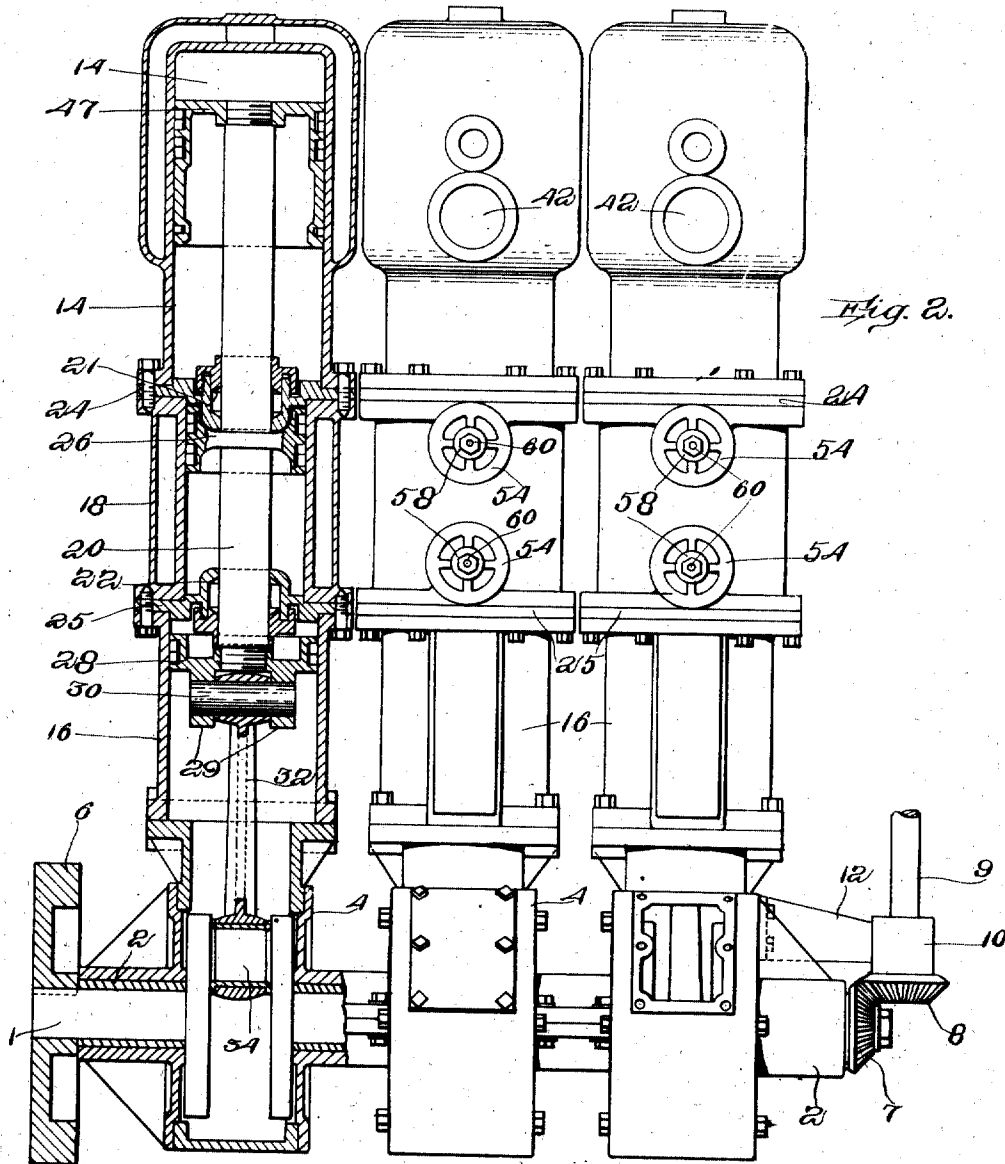
By
Phillips, Van Dusen & Smith Attys.

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UNITED STATES PATENT OFFICE.

WILLIAM E. ADAMS, OF SALEM, MASSACHUSETTS.

INTERNAL-COMBUSTION ENGINE.

1,001,600.

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To all whom it may concern:

Be it known that I, WILLIAM E. ADAMS, a citizen of the United States, residing at Salem, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Internal-Combustion Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to a combined internal combustion engine and air compressor.

One object of the invention is to provide a combined internal combustion engine and air compressor which is entirely free from valve gearing.

A further object is to provide a device of the character above mentioned which is compact and simple in construction, efficient in operation and economical in the cost of production and maintenance.

To the above ends the present embodiment of the invention comprises a two-cycle internal combustion engine having a compression chamber and an explosion chamber which communicate with one another and are located at opposite ends of an air compressor. The compression and explosion chambers and the air compressor cylinder are mounted in alinement and each is provided with a piston mounted upon a common piston rod. In the present instance a three-cylinder engine is shown but it should be understood that the invention is in no wise limited thereto but is adapted for an engine having any number of cylinders.

The several features of the invention will be clearly understood from an inspection of the accompanying drawings and the following detailed description of the construction shown therein.

In the drawings, Figure 1 is a central, vertical section of one unit taken through the air admission valves; Fig. 2 is a front elevation with one of the units in section; Fig. 3 is an end elevation as viewed from

the right-hand side of Fig. 2; and Fig. 4 is a fragmentary vertical, sectional view taken through the discharge valves of the air compressor.

As shown in the drawings, the combined engine and air compressor comprises three units which are identical in construction and the description of one will suffice for all. The crank shaft 1 is journaled in suitable bearings 2 which are formed on the crank casings 4. A fly wheel 6 is mounted upon one end of the crank shaft and a beveled gear 7 is mounted upon the other end and meshes with a similar gear 8 which is mounted upon a vertical shaft 9 journaled in a bearing 10 formed on a bracket 12 secured to the engine frame. The shaft 9 may be connected to drive any suitable form of commutator or spark timer (not shown).

The engine comprises an upper cylinder 14 which forms an explosion chamber and a lower cylinder 16, which, together with crank casing 4, form a compression chamber. Located between the upper and lower cylinders of the engine is an intermediate cylinder 18 which forms the air compressor cylinder. A piston rod 20 extends through the cylinder 18 and into the cylinders 14 and 16. This piston rod passes through suitable stuffing boxes 21 and 22 formed on the cylinder heads 24 and 25 which separate the cylinder 18 from the upper and lower cylinders of the gas engine. A piston 26 is mounted upon the piston rod 20 within the cylinder 18, and two sets of inlet and discharge valves are provided, thus constituting the air compressor a double acting compressor. A piston 28 is secured to the lower end of the piston rod 20 within the cylinder 16 and is provided with depending lugs 29 which receive a shaft or wrist pin 30 about which the upper end of the connecting rod 32 is journaled. The lower end of said connecting rod is journaled about the crank 34.

A passage 36 is formed in the walls of the lower, intermediate and upper cylinders and is provided at its lower end with a lateral port 37 which affords communication with

the compression chamber. The upper cylinder 14 is provided with a port 38 which communicates with the passage 36. The explosive charge is introduced into the crank casing 4 in a well known manner and compressed by the piston 28 upon its downward stroke and forced through the port 37, passage 36 and port 38 into the explosive chamber 14 above the piston 47 which is mounted upon the upper end of the rod 20. An exhaust port 40 is formed in the walls of the cylinder 14 and communicates with a passage 42 whereby the products of combustion may be discharged. A spark plug may be mounted in the opening 44 at the upper end of the cylinder 14, and said cylinder is provided with a water jacket 46. The air compression chamber 18 is entirely closed from communication with either the explosion chamber 14 or gas compression chamber 16 and has its inlet and exhaust ports entirely independent of the said chambers.

The air compression chamber is provided with two air inlet valves 50 and 51. Each valve is mounted upon a stem 52 and arranged to seat against the inner face of a cap 54 which is screw-threaded to fit the interior of a boss 55 formed on the cylinder 18. The outer face of the cap 54 is a skeleton as shown in Fig. 2. Embracing the valve stem 52 is a coiled spring 57 which rests at one end against the outer face of the cap 54 and its outer end rests against a collar 58 held upon the valve stem 52 by means of nuts 60. Ports 62 and 63 are formed in the walls of the cylinder 18 to admit the air which passes through the valves 50 and 51. The cylinder 18 is also provided with two discharge valves 70 and 71 which open outwardly, each mounted upon a valve stem 72 which passes through a cap 74 which is screw-threaded into a boss 75 formed upon the cylinder 18. A coiled spring 76 embraces the valve stem 72 and is interposed between a collar 77 on the valve stem and the outer face of the cap 74. Ports 78 and 80 afford a means of communication between the interior of the caps 72 and the air compressor cylinder. It will be noted that all of the valves for admitting the air and discharging the air from the air compressor are pressure operated. The caps 74 communicate with a T-shaped pipe 82 which is connected to a pipe 84 leading to a compressed air reservoir.

From the construction above set forth, it will be observed that upon the down stroke of the piston rod 20 the air upon the under side of the piston 26 will be compressed and discharged through the port 78, valve 71 and pipe 84, and air will be drawn into the cylinder 18 above the piston 26 through the valve 50. The explosive charge in the crank casing and cylinder 16 will be compressed

and forced through the port 37, passage 36 and port 38 into the explosion chamber 14 after the piston 47 uncovers the port 38, where it will be exploded after compression in said last mentioned chamber. Upon the up stroke of the piston rod 20 the air will be compressed upon the upper side of the piston 26 and discharged through the port 80, valve 70 and pipe 84, and air will be drawn into the cylinder below the piston 26 through the valve 51. Upon this upward stroke the new explosive charge will be drawn into the crank casing, as is well known, and the charge above the piston 47 will be compressed and exploded.

One feature of the above construction resides in the fact that there is no complicated valve gearing necessary to control the operation of the various valves and by locating the air compressor cylinder between the compression and explosion chambers of the engine, a double acting air compressor is provided which requires the minimum amount of space.

Having explained the nature and object of the invention and specifically described one form of device in which it may be embodied, what I claim is:—

1. A combined internal combustion motor and air compressor having, in combination, an explosion chamber, a gas compression chamber, means for affording communication between said chambers an air compression chamber located between said chambers and entirely closed therefrom, and pistons operating in all of said chambers, substantially as described.

2. A combined internal combustion motor and air compressor having, in combination, an explosion chamber, a gas compression chamber, means for affording communication between the gas compression chamber and explosion chamber, an air compression chamber entirely closed from the other two chambers, a piston rod passing through all of said chambers, a piston operating in each of said chambers, the pistons all being mounted upon the common piston rod, substantially as described.

3. A combined internal combustion motor and air compressor having, in combination, an explosion chamber, a gas compression chamber, means for affording communication between the two chambers, an air compression chamber between the said two chambers, and entirely closed from communication therewith, a piston rod passing through the said chambers, and a plurality of pistons mounted upon the rod, one piston being positioned in each chamber substantially as described.

4. A combined internal combustion motor and air compressor having, in combination, an explosion chamber, a gas compression

chamber, means for affording communication between the two chambers, a piston operating in the explosion chamber, an air compressor located between the two chambers and operated upon the movement of the piston in the explosion chamber, the air compressor adapted to deliver air to an external point which is independent of the

internal combustion motor, substantially as described.

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

WILLIAM E. ADAMS.

Witnesses:

FRED O. FISH,
WILLIAM J. SPERL.