No. 798,817. PATENTED SEPT. 5, 1905.

R. P. MOODIE.

ENGINE.

APPLICATION FILED APR. 23, 1904.

2 SHEETS—SHEET 1.

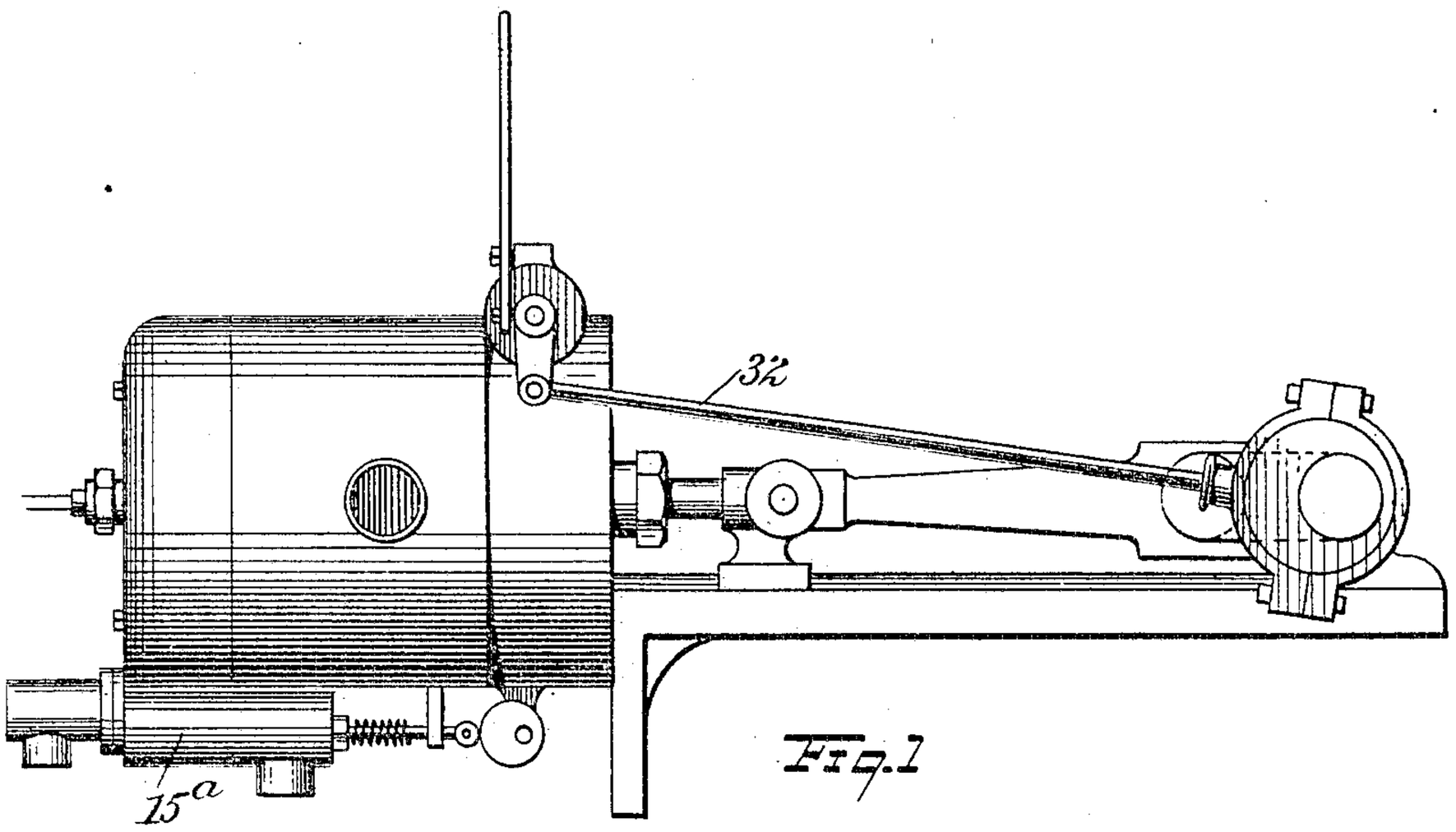

Fig. 1

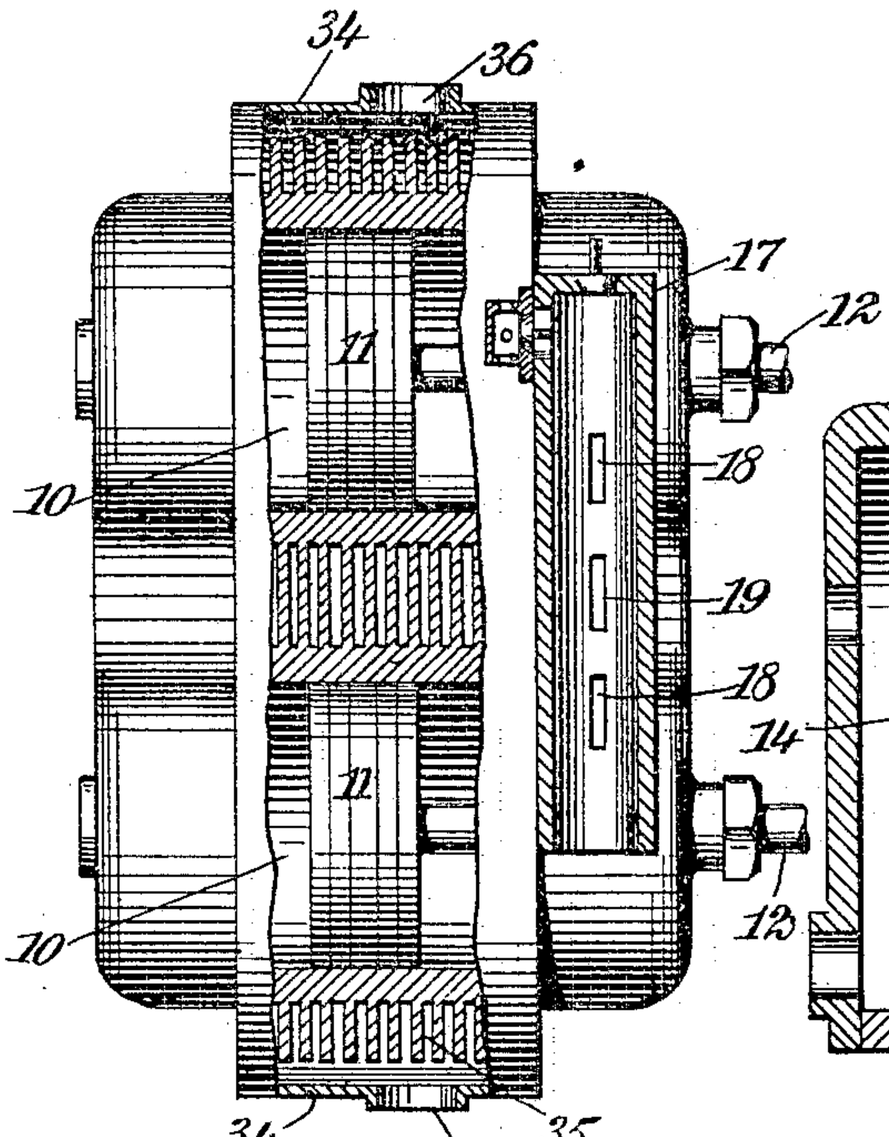

Fig. 2

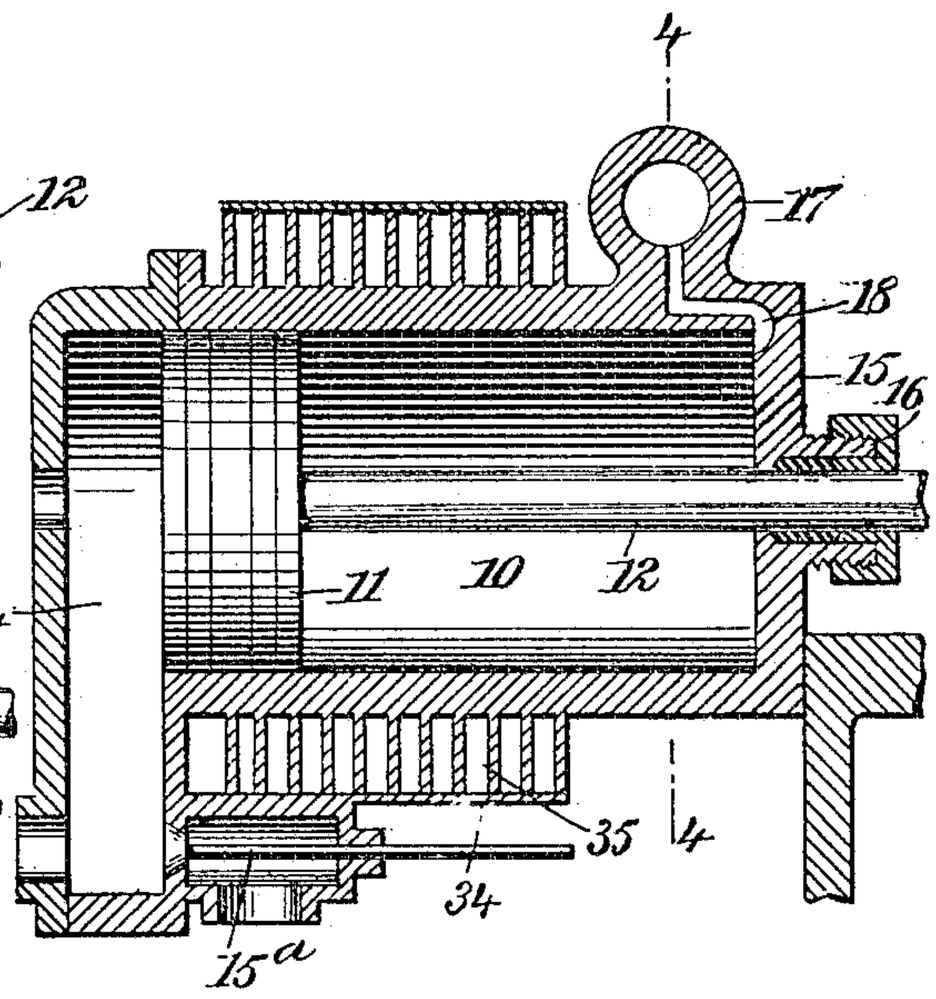

Fig. 3

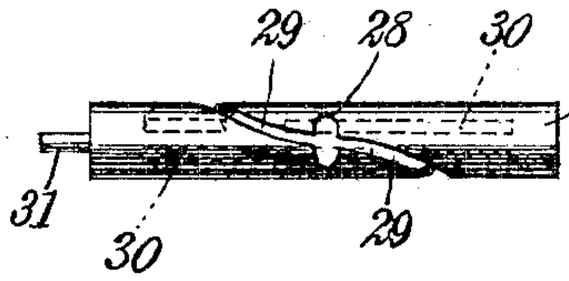

Fig. 5

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Isaac B. Owens.

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2 SHEETS—SHEET 2.

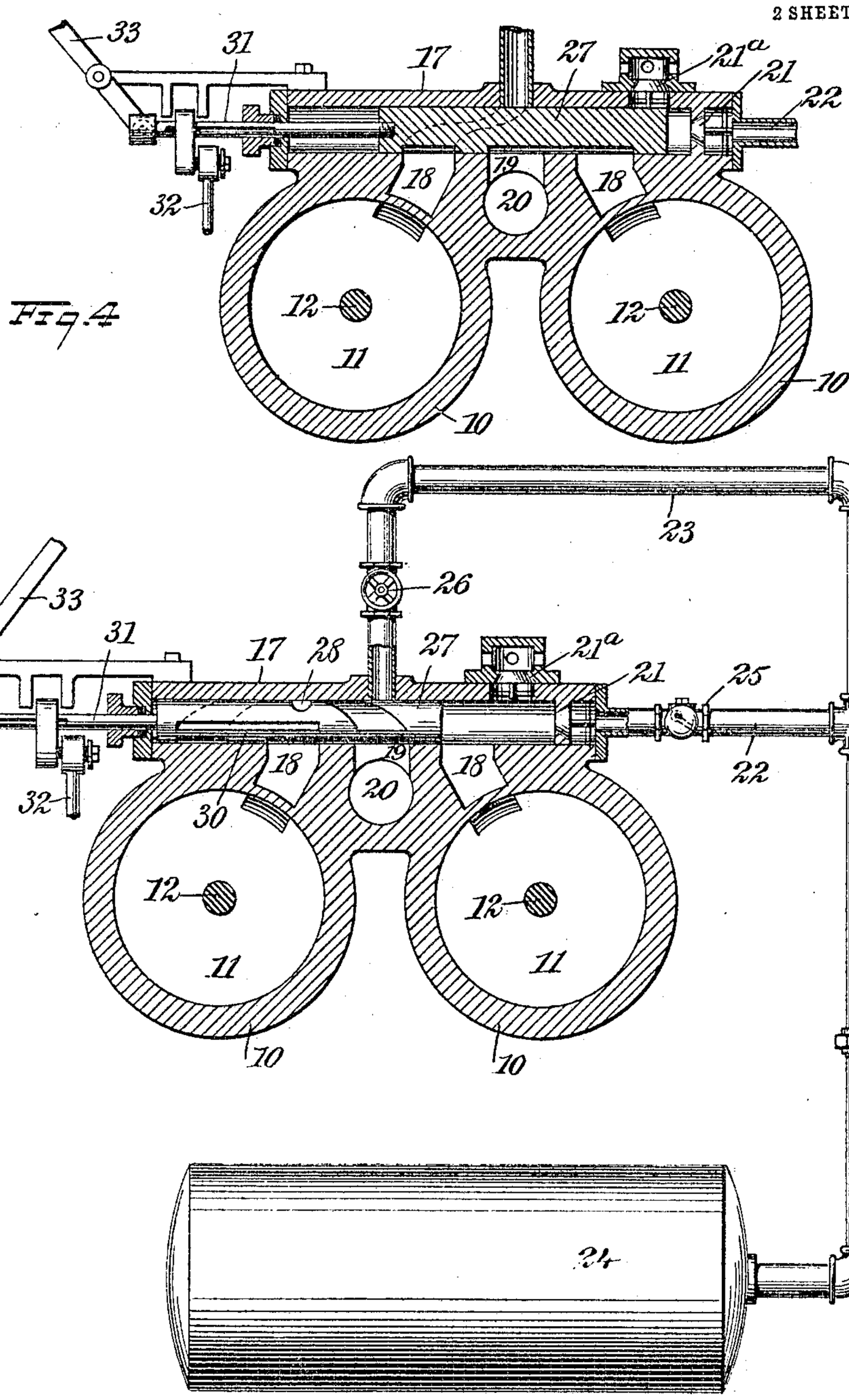

Fig. 4

Fig. 5

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UNITED STATES PATENT OFFICE.

ROBERT P. MOODIE, OF RENFREW, CANADA, ASSIGNOR OF ONE-HALF TO JAMES E. H. BARNET, OF RENFREW, ONTARIO, CANADA.

ENGINE.

No. 798,817. Specification of Letters Patent. Patented Sept. 5, 1905.

Application filed April 23, 1904. Serial No. 204,543.

To all whom it may concern:

Be it known that I, ROBERT P. MOODIE, a subject of the King of Great Britain, and a resident of Renfrew, in the Province of Ontario and Dominion of Canada, have invented a new and Improved Engine, of which the following is a full, clear, and exact description.

This invention relates particularly to a novel mechanism for starting engines. It is especially adapted to single-acting engines, such as the usual internal-combustion machines.

According to the embodiment of the invention here shown the engine is arranged to have the motive force act against one face of the piston in the usual manner. At the opposite end of the cylinder, however, the rod is passed through a stuffing-box or its equivalent, and this end of the cylinder is employed at times as a compressor and at other times as a power-cylinder to start the engine, these operations being controlled by a peculiarly-arranged valve. In this manner the engine when running may be made to compress air or other elastic fluid, which may be stored and at some other time employed to start the engine upon a second or further operation thereof.

The invention resides in certain novel features of structure and organization, which will be hereinafter fully set forth.

Reference is had to the accompanying drawings, which represent an embodiment of the invention in which it is applied to a single-acting two-cylinder internal-combustion engine, in which drawings like characters of reference indicate corresponding parts in all the views, and in which—

Figure 1 is a side elevation of the engine. Fig. 2 is a plan view thereof with parts broken away and showing also the compressing and starting valve casing in section. Fig. 3 is a longitudinal section taken through one of the cylinders of the engine. Fig. 4 is a cross-section on the line 4 4 of Fig. 3. Fig. 5 is a cross-section on essentially the same line, showing the parts in another position; and Fig. 6 is a detail view of the starting and compressing valve.

10 indicates the cylinders of the engine, 11 the pistons, and 12 the piston-rods. The cylinders are provided at or adjacent to the heads 14 with the usual valve devices, 15ª, and in this respect the engine may operate in any usual or desired manner.

At the heads 15 of the cylinders stuffing-boxes 16 are arranged, and through these boxes the piston-rods pass to their connection with the crank-shaft. At the ends of the cylinders adjacent to the heads 15 the compressing and starting operations are performed. Suitably arranged on the cylinders and extending across the same adjacent to the heads 15 is a valve casing or chest 17, which has ports 18 therein, respectively communicating with the cylinders 10, and a port 19, communicating with an exhaust-passage 20, the port 19 being located intermediate the ports 18, as shown best in Fig. 2. The valve-casing 17 is also provided at its right-hand end with an outwardly-opening check-valve 21 and an inwardly-opening check-valve 21ª. The check-valve 21ª admits air into the engine to be compressed, and the check-valve 21 carries off the compressed air to a pipe 22, which leads to a pipe 23, passing to a reservoir 24. (See Fig. 5.) 25 indicates a check-valve in the pipe 22, acting to prevent the return of pressure to the valve 21. The pipe 23 passes beyond the branch 22 and enters the valve-casing 17 at approximately the middle thereof. Said pipe 23 is provided with a throttle-valve 26 at a point between the valve-casing and the branch pipe 22.

Operating within the valve-casing 17 is a combined rocking and reciprocal valve 27. This valve is cylindric in form and is provided at its upper side, at approximately its middle, with a cavity 28, intended at all times to register with the pipe 23. From said cavity spiral grooves 29 pass, respectively, toward the ends of the valve and downward to the under side thereof. The valve is also formed in its under side with two grooves 30, disposed longitudinally of the valve, as shown in Fig. 6. The valve 27 has a stem 31, to which is connected any desired mechanism, an example of which is indicated at 32, for imparting a continuous rocking movement to the valve. The valve-stem is also connected with a lever 33, whereby manually to reciprocate the valve.

The valve is moved reciprocally from the position shown in Fig. 4 to that shown in Fig. 5. When the valve is thrown over to the right, as in Fig. 4, and assuming that pressure is stored in the reservoir 24, the engine may be started by this pressure. In this event the ports 29 of the valve lead from the pipe 23 respectively into transverse line with the

ports 18, and the ports 29 cover, respectively, the distance between the ports 18 and the exhaust-port 19. Consequently when the valve 27 is rocked the ports 29 are alternately connected with the ports 18, and when one of the ports 29 is in communication with its port 18 the opposite port 30 is in communication with the opposite port 18, placing the same in communication with the exhaust 19. Therefore when pressure is turned on by opening the throttle 26 the pressure will pass into the cylinders 10 and start the action of the engine. After the engine has been started the throttle-valve 26 should be closed, and then the pistons will run idly in the cylinders adjacent to the heads 15, the valve 27 continually rocking, however, to open communication between said ends of the cylinders and the exhaust 19 to prevent compression therein. If it be desired to compress air within the reservoir 24 after the engine has been started, the valve 27 should be thrown over to its leftward position. (Shown in Fig. 5.) The left-hand port 30 of said valve will then periodically connect the left-hand cylinder with the exhaust 19, so as to allow the piston of this cylinder to run idly without compression in the end thereof adjacent to the head 14. The corresponding end of the right-hand cylinder 10 will, however, be cut off from the exhaust, and this end of the cylinder will then act as a compressor, the air being admitted through the valve 21^a and expelled through the valve 21. It therefore follows in this arrangement that the pressure may be maintained in the reservoir 24 at all times and the engine started by this pressure whenever desired, these results being attained by the manipulation of the valve 27 under the action of the lever 33, the valve at all times rocking under the action of the devices 32, whereby to bring about the necessary coaction of the ports 18, 19, 29, and 30.

The cylinders 10 are provided with jackets 34, which communicate with each other according to the structure here shown and which inclose radiating ribs 35, suitably formed on the cylinder-walls. Said jackets are provided with inlet and outlet openings 36, and through these openings a current of air may be continually blown to keep the cylinders cool. This current of air may be taken from the reservoir 24 or from any other desired source, and in case the engine is adapted to a self-propelled vehicle the hot air passing from the jackets 34 may be run into a radiator in said vehicle to warm the interior thereof.

Since the foregoing description is of but a preferred embodiment of my invention, I desire it understood that various changes in the details of the apparatus may be resorted to without in any way departing from the spirit of my invention as expressed in the claims.

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

1. An engine comprising the combination with a cylinder and piston, of a valve-casing communicating with the cylinder, an inwardly-opening valve commanding an opening in the valve-casing, an outwardly-opening valve commanding a second opening in the valve-casing, a pressure-reservoir communicating with the second valve, means establishing communication between the pressure-reservoir and a third opening in the valve-casing at a point removed from the two valves first named, a third valve operating in the valve-casing, and means for operating the third valve, said valve being shiftable to establish communication between the two first-named valves and the cylinder, or to close the said communication and establish communication between the third opening in the valve-casing and the cylinder.

2. The combination with two cylinders and pistons therein, of a valve-casing communicating with said cylinders, a pressure-reservoir, means establishing communication between the pressure-reservoir and an intermediately-situated opening in the valve-casing, two valves commanding openings in one end of the valve-casing, one valve opening inwardly and the other opening outwardly, means establishing communication between the outwardly-opening valve and the pressure-reservoir, a third valve operating within the valve-casing, and means for actuating the third valve, said third valve being shiftable so as to distribute the pressure from the said intermediately-situated opening in the valve-casing to the two cylinders, or to close communication between said cylinders and said intermediately-situated opening and to open communication between the two first-named valves and one of the cylinders.

3. The combination with two cylinders and pistons operating therein, of a valve-casing communicating with the cylinders, a pressure-reservoir communicating with the valve-casing intermediate its ends, inlet and outlet valves commanding orifices in one end portion of the valve-casing, means establishing communication between the outlet-valve and the pressure-reservoir, and a valve operating in the casing and capable of connecting the pressure-reservoir with the cylinders to distribute the pressure therein and operate the pistons, or of moving to disconnect one of the cylinders and connect the other cylinder with the end of the valve-casing having the said inlet and outlet valves, whereby to permit the operation of the last-named cylinder as a compressor.

4. The combination with two cylinders and pistons working therein, of a valve-casing communicating with the cylinder, a pressure-reservoir, means establishing communication between the pressure-reservoir and an inter-

mediately-situated orifice in the valve-casing, inlet and outlet valves commanding orifices in one end of the valve-casing, means establishing communication between the outlet-valve and the pressure-reservoir, and a valve arranged to rock and to slide within the valve-casing, said valve being slidable to one position to distribute pressure to the cylinders from said intermediately-situated orifice, and to another position to cut off the cylinders from one orifice and connect one of the cylinders with said inlet and outlet valves.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ROBERT P. MOODIE.

Witnesses:
J. E. H. BARNET,
HORACE M. SANFORD.