No. 847,219. PATENTED MAR. 12, 1907.

C. W. AKERS.

VALVE CONTROLLING MECHANISM.

APPLICATION FILED NOV. 1, 1904.

2 SHEETS—SHEET 1.

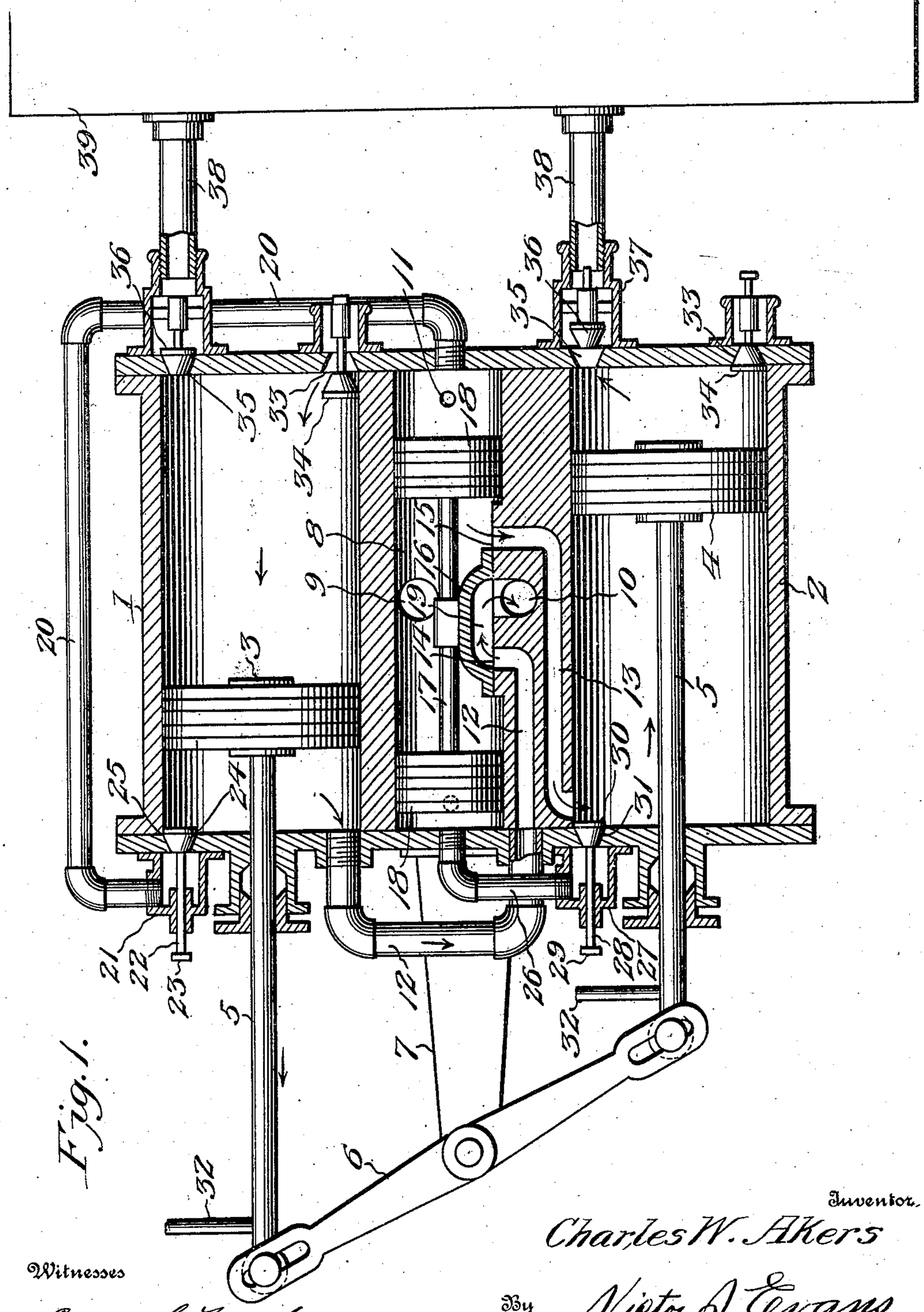

Fig. 1.

Witnesses

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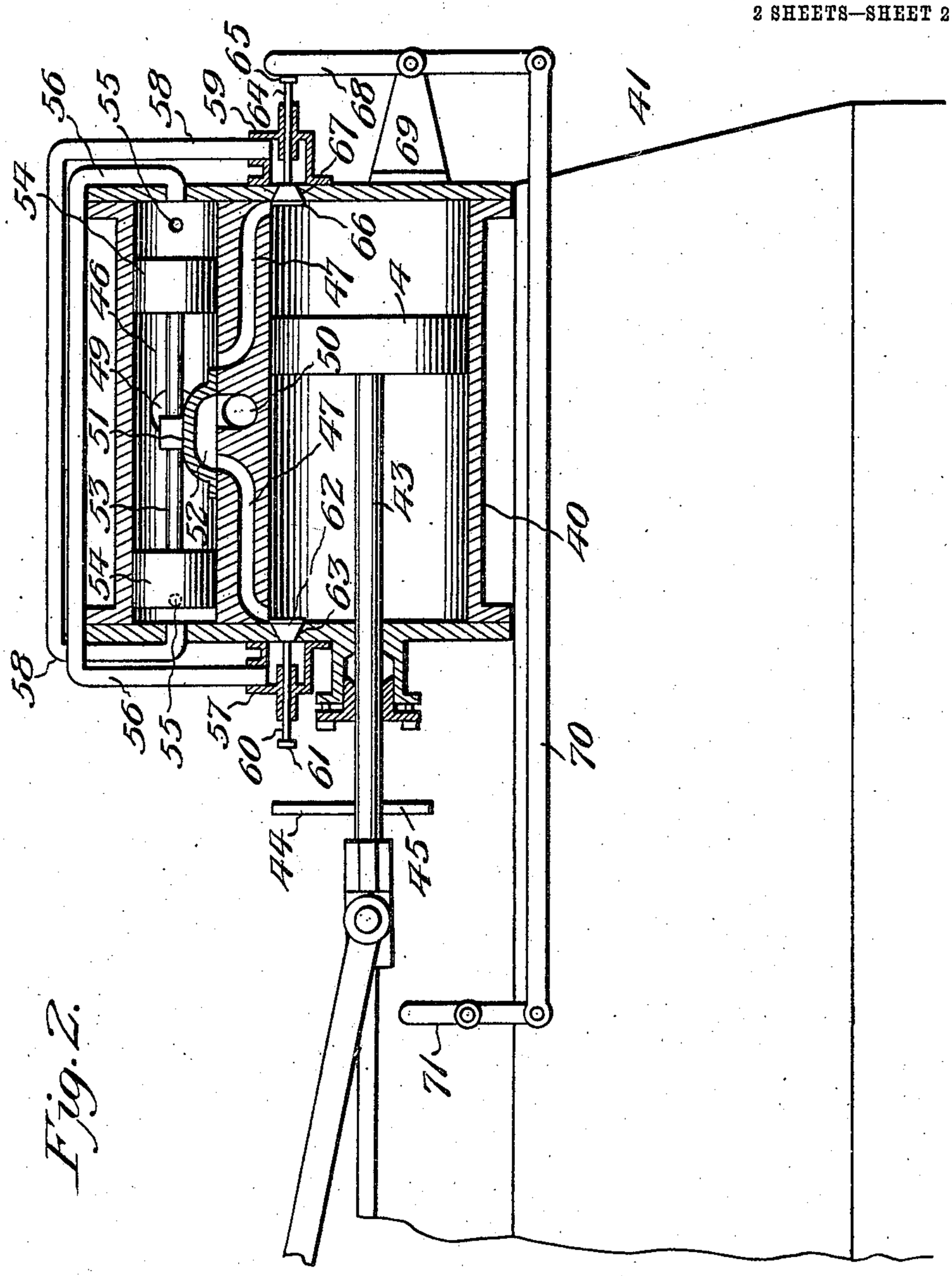

Fig. 2.

Witnesses

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UNITED STATES PATENT OFFICE.

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VALVE-CONTROLLING MECHANISM.

No. 847,219. Specification of Letters Patent. Patented March 12, 1907.

Application filed November 1, 1904. Serial No. 230,999.

To all whom it may concern:

Be it known that I, CHARLES W. AKERS, a citizen of the United States, residing at Bluefield, in the county of Mercer and State of West Virginia, have invented new and useful Improvements in Valve-Controlling Mechanism, of which the following is a specification.

My invention has relation to improvements in air-compressors embodying a duplex compression-engine; and it consists in the construction and arrangement of parts, as will be hereinafter described, and particularly pointed out in the claim.

In the accompanying drawings, Figure 1 is a central horizontal sectional elevation of an air-compressor embodying the invention. Fig. 2 is a central vertical sectional elevation of a single-cylinder engine, showing the invention applied thereto.

Referring to the drawings, 1 and 2 designate the cylinders of a duplex compression-engine, there being disposed for reciprocation within said cylinders pistons 3 and 4, carried by rods 5, connected at their outer ends to a walking-beam or cross-head 6, in turn pivoted at its longitudinal center to a support 7, affixed to the cylinders.

Arranged between the cylinders 1 and 2 is a steam-chest 8, provided with an inlet-port 9 and an exhaust-port 10 and having, respectively, adjacent its opposite ends supplemental exhaust-ports 11, communicating with the external atmosphere, the steam-chest being adapted for communication with the cylinder 1 through the medium of a passage or duct 12 and with the cylinder 2 by a passage or duct 13, the ducts 12 and 13 having ports 14 and 15 entering the steam-chest 8.

Arranged for reciprocation within the chest 8 is a slide-valve 16, adapted for alternately opening and closing the ports 14 and 15, this valve being carried by a rod or member 17, having at its ends heads 18, which fit snugly within the chest and serve, respectively, to alternately close the ports 11, while the valve 16 is provided, as usual, with a steam space or passage 19 for establishing communication between one or the other of the ports 14 and 15 and the exhaust-port 10.

Leading from one end of the steam-chest 8 is a pipe or duct 20, which communicates with the front end of cylinder 1 through the medium of a stuffing-box 21, inclosing a valve-rod 22, provided at its outer end with a head 23 and at its inner end with a valve 24, designed for normally closing a port 25 in the cylinder-head, while leading from the other end of the steam-chest is a pipe or duct 26, communicating with the forward end of the cylinder 2 through the medium of a stuffing-box 27, in which is arranged for reciprocation a valve-stem 28, having at its outer end a head 29 and at its inner end a valve 30, designed for normally closing a port 31 in the adjacent head of the cylinder, there being carried by the piston-rods 5 adjacent their outer ends fixed arms or abutments 32, adapted for contact, respectively, with the heads 23 29 to open the corresponding valves 24 and 30 at the completion of the instroke of the pistons.

The cylinders 1 and 2 are each provided at their inner ends with an air-inlet port 33, normally closed by an inwardly-opening valve 34 and with an egress-port 35, normally closed by an outwardly-opening valve 36, arranged within a stuffing-box 37, from which a pipe or duct 38 leads to a compressed-air tank or reservoir 39.

In practice, supposing the parts occupy the positions illustrated in Fig. 1, steam will enter the chest 8 through inlet-port 9 and thence through duct 13 to the cylinder 2 for driving the piston 4 forward, as indicated by the arrow, while the piston 3 within the cylinder 1 will at the same time be moved upon its outstroke. As the piston 3 moves outwardly the valve 34, leading to the cylinder 1, is opened, thus permitting the piston to draw a charge of air into said cylinder, while the air previously drawn into the cylinder 2 is upon the instroke of piston 4 compressed and expelled through port 35 and duct 38 into the tank 39. At the completion of the instroke of piston 4 abutment 32 on its rod 5 contacts with the head of valve-stem 27, thus opening the valve 30 and permitting a percentage of the steam within the cylinder 2 to pass through the pipe or duct 26 into the forward end of chest 8 for acting on the adjacent head 18 to shift the valve 16. The valve when shifted opens the previously-closed port 14 and establishes communication between port 15 and exhaust-port 10, whereupon the steam within the cylinder 2 may upon the outstroke of piston 4 be exhausted through duct 13 and port 10, as usual, it being understood, of course, that at the beginning of the outstroke of piston 4 the valve 30 immediately closes, thereby cutting off communication between the cylinder 2 and steam-chest 8. The valve 16 having

been shifted, steam entering at the port 9 will find its way through duct 12 into the cylinder 1 for effecting the instroke of piston 3, thus compressing the charge of air within the cylinder and expelling it through port 35 and duct 38 into the air-tank in the manner just described, it being obvious that at the beginning of the instroke of the piston valve 34 will be closed. At the completion of the instroke of piston 3 abutment 32 operates the valve 24, thus permitting a percentage of the steam within the cylinder to pass through duct 20 to the steam-chest for again shifting the valve 16, the steam which had previously entered the forward end of the steam-chest for moving the valve being upon the reverse movement of the latter compressed by the adjacent head 18 and exhausted through the port 11 prior to said port being closed by the head 18. When the member 17 has completed its valve-shifting movement—say, for example, to the position illustrated in Fig. 1—the forward port 11 will be closed by the adjacent head 18, while at the same time there will be confined in the steam-chest sufficient air or steam to serve as a cushion for preventing contact of the head 18 with the end of the steam-chest.

In Fig. 2 I have illustrated a single-cylinder engine, in which 40 designates the cylinder sustained by a base or support 41 and having a reciprocatory piston 42, carried by a piston-rod 43, equipped adjacent its outer end with oppositely-extended fixed arms or abutments 44 45, the engine being provided with a steam-chest 46, adapted to communicate with opposite ends of the cylinder 40 through the medium of passages or ducts 47 48 and having an inlet-port 49 and an exhaust-port 50. Arranged for reciprocation within the steam-chest is a slide-valve 51, adapted for alternately closing the ports 47 48 and having a steam-space 52, designed to establish communication between either of said ports and the exhaust-port 50, this valve being carried by a reciprocatory rod or member 53, equipped at its ends with heads 54 for alternately closing exhaust-ports 55, as in the construction heretofore described. Communicating with and leading from one end of the steam-chest 46 is a pipe or duct 56, which communicates with the forward end of the cylinder 40 through a stuffing-box 57, while leading from the other end of the steam-chest is a pipe or duct 58, communicating with the rear end of the cylinder 40 through a stuffing-box 59. Arranged for reciprocation within the stuffing-box 57 is a valve-stem 60, provided at its outer end with a head 61 and at its inner end with a valve 62, adapted for normally closing a port 63 in the adjacent head of the cylinder, there being arranged in the stuffing-box 59 a similar valve-stem 64, having a head 65 and carrying a valve 66, designed for closing a port 67 in the adjacent cylinder-head. Contacting with the head 65 of the valve 66 is one end of an actuating member or lever 68, centrally pivoted to a support 69 and pivotally connected at its other end with a longitudinally-slidable operating member or rod 70, in turn connected with a pivoted member or lever 71, lying in the path of the arm or abutment 45.

In practice, supposing the parts to be in the position illustrated in Fig. 2, steam entering through the port 49 to the steam-chest finds its way through passage 48 into the rear end of the cylinder, thus effecting the outstroke of piston 42. At the completion of the outstroke abutment 45 will contact with member 71, and thus through the medium of rod 70 and lever 68 open valve 66, thereby permitting a percentage of steam to escape from the cylinder and pass through duct 58 into the forward end of the steam-chest, where it will act upon the adjacent head 54 to shift the valve 51, it being apparent that when the valve is shifted passage 48 will be in communication with the exhaust-port 50 and passage 47 opened. Steam then travels from the chest 46 through passage 47 for effecting the instroke of the piston, at the completion of which latter the arm 44 contacts with the outer end of stem 60, thereby opening valve 62 and permitting a percentage of steam to travel through duct 56 and enter the rear end of the steam-chest, thus to act upon the adjacent head 54 for again shifting the valve. Upon each movement of the valve the dead steam contained in the chest in the line of travel of the valve will be compressed by one of the heads 54 and exhausted through the corresponding port 55 until the latter is closed by the head, a percentage of air or steam being, however, confined by the head to serve as a cushion for preventing contact of the head with the end of the chest, as heretofore explained. It is apparent that by controlling the exhaust of steam from the chest through the ports 55 the movement of valve 51 may be controlled for varying the supply of steam to the engine-cylinder, thus regulating the speed of the engine and dispensing with the usual governor.

From the foregoing it is apparent that I produce a simple mechanism in which the valve within the steam-chest will be positively and automatically shifted for admitting steam alternately to the cylinders of a double-acting engine or to opposite ends of a single-cylinder engine. In attaining these ends it is to be understood that various minor changes in the details herein set forth may be resorted to without departing from the spirit of the invention.

Having thus described the invention, what is claimed as new is—

In a device of the class described, a pair of cylinders, pistons movable therein, a steam-

chest having inlet and exhaust ports and provided with passages leading to the respective cylinders, a valve movable in the chest and adapted for bringing said passages alternately into communication with the exhaust, said valve being equipped with heads fitted in the chest, a duct leading from one end of the chest to the forward end of one of the cylinders, a second duct leading from the other end of the chest to the forward end of the other cylinder, valves disposed in the ducts for controlling communication between the same and the respective cylinders, and abutments carried by the piston-rods for automatically operating the controlling-valves at the completion of the instroke of the piston, whereby steam from the cylinders is admitted to and for moving the valve in the chest.

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

CHARLES W. AKERS.

Witnesses:
C. C. HINES,
F. S. ELMORE.