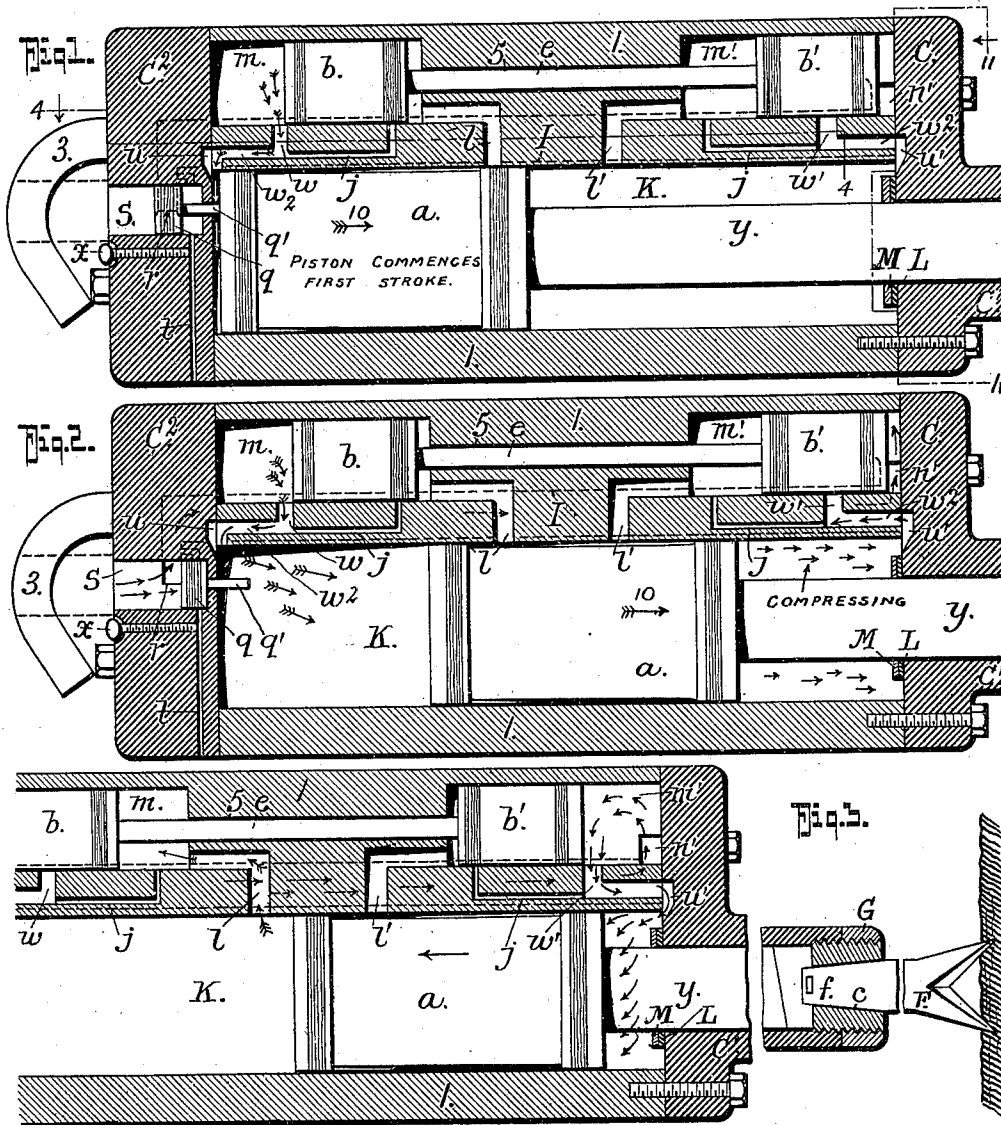


F. C. LOOMIS.
VALVE MECHANISM FOR ROCK DRILLS.
APPLICATION FILED APR. 17, 1909.

995,614.

Patented June 20, 1911.

3 SHEETS—SHEET 1.



WITNESSES:

J. Theodore Schott.
M. E. Linnich

INVENTOR
F. C. Loomis.

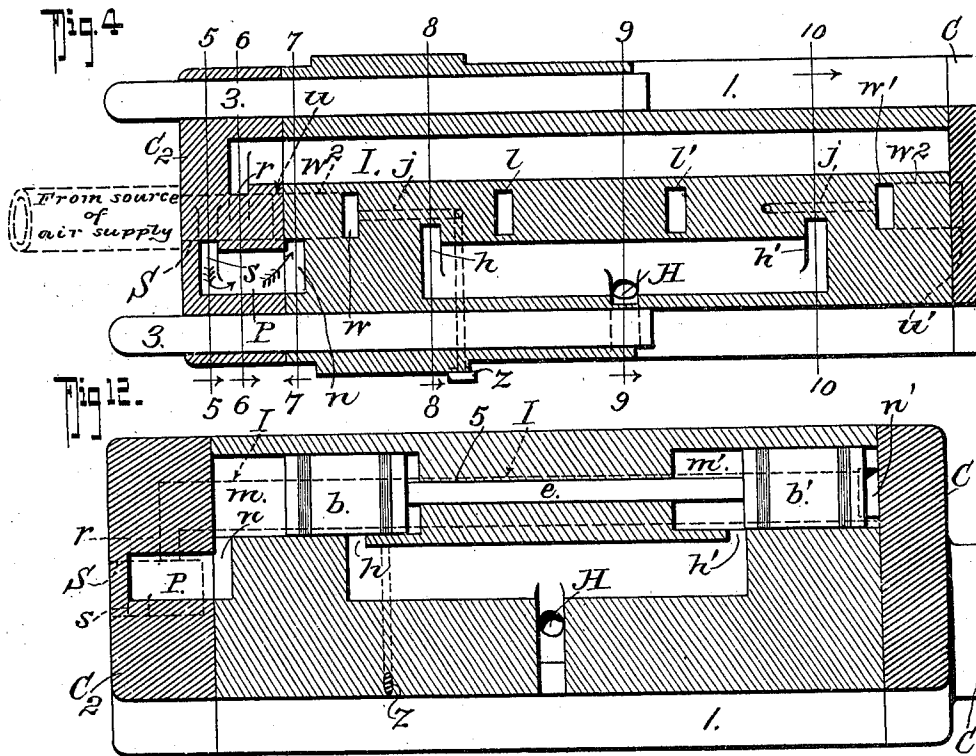
BY
Fred G. Bosterick & Co.
ATTORNEYS.

F. C. LOOMIS.
VALVE MECHANISM FOR ROCK DRILLS.
APPLICATION FILED APR. 17, 1909.

995,614.

Patented June 20, 1911.

3 SHEETS—SHEET 2.



Witnesses
Charles H. Wagner
John T. Schrott

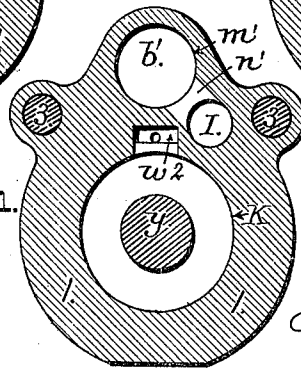
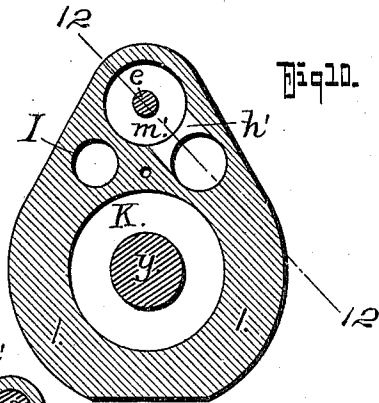
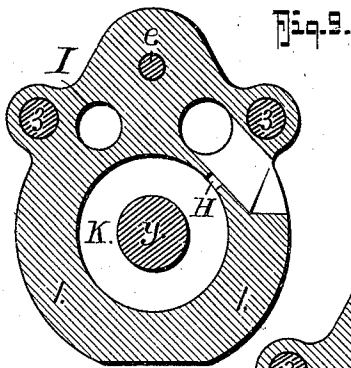
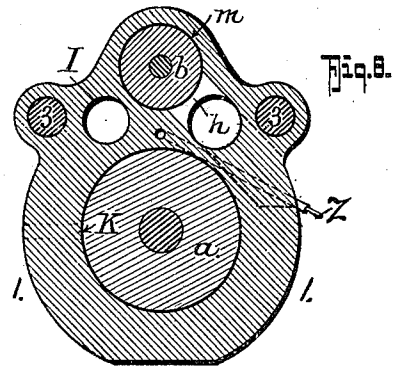
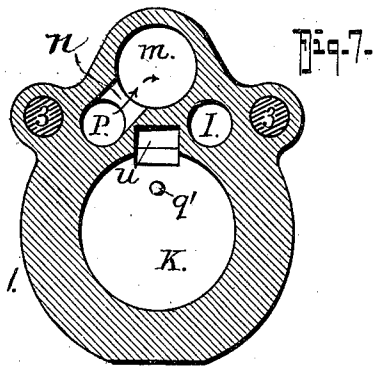
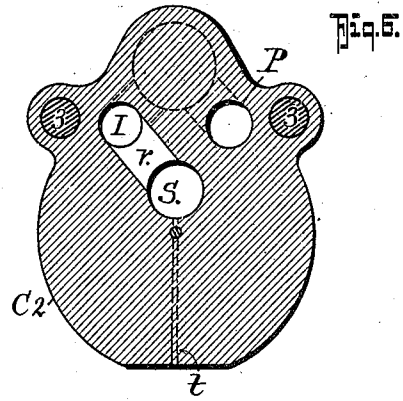
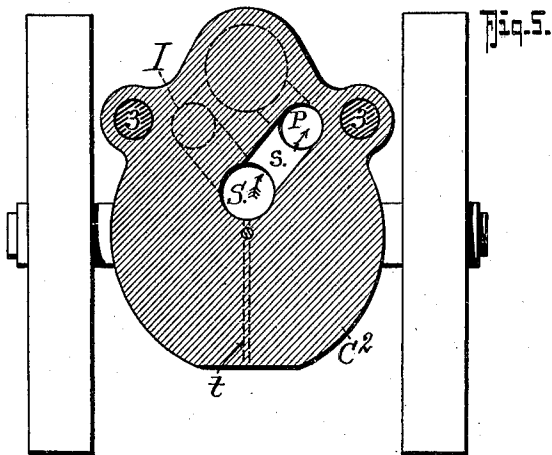
Inventor
F. C. Loomis.
BY
Fred S. Dutcher
Attorneys

F. C. LOOMIS.
VALVE MECHANISM FOR ROCK DRILLS.
APPLICATION FILED APR. 17, 1909.

995,614.

Patented June 20, 1911.

3 SHEETS—SHEET 3.



WITNESSES:

J. Theodore Schrott.
Mr. C. Immich.

INVENTOR

F. C. Loomis.

BY
Fred G. Peterson & Co.
ATTORNEYS.

UNITED STATES PATENT OFFICE.

FORDYCE C. LOOMIS, OF NEW PHILADELPHIA, OHIO.

VALVE MECHANISM FOR ROCK-DRILLS.

995,614.

Specification of Letters Patent. Patented June 20, 1911.

Application filed April 17, 1909. Serial No. 490,521.

To all whom it may concern:

Be it known that I, FORDYCE C. LOOMIS, residing at New Philadelphia, in the county of Tuscarawas and State of Ohio, have invented a new and Improved Valve Mechanism for Rock-Drills, of which the following is a specification.

This invention, which in its general nature, is an improved construction of drilling engine of that type known as coal cutters, rock channelers and the like, more particularly has for its object to provide a simple, economical and stable construction of portable drilling engine, in which all the operative parts are coöperatively so combined and arranged whereby to effectively serve for the intended purpose without danger of undue shocks or impacting of the piston and valve devices.

My invention comprehends among other salient features, a novel and improved pressure actuated valve mechanism, reversely shiftable under the direct fluid pressure supply and operating in independent piston chambers both in direct communication with the main or working piston cylinder and each having a supplemental connection with the said cylinder so arranged whereby the equilibrium of the said valve pistons is intermittently changed and the valves primarily shifted under the pressure of the exhaust air from the main cylinder.

This invention also comprises in a drilling engine of the character stated, an improved means for releasing the compression in front of the piston until the requisite cushion for the piston is obtained, other improved features of construction being also embodied in my invention, all of which will be hereinafter fully described, specifically pointed out in the appended claims and illustrated in the accompanying drawings, in which:—

Figure 1, is a vertical longitudinal section thereof, the parts being in position to receive the fluid pressure through the inlets, and lead the said pressure back of the working piston to move it forwardly in the direction of the arrow 10. Fig. 2, is a view similar to Fig. 1, the piston still moving in the direction of arrow 10, the valve pistons just about to be shifted. Fig. 3, is a view similar to Fig. 2, the valve pistons having been shifted and the piston on its return stroke. Fig. 4, is a horizontal section taken on the line 4—4 of Fig. 1 in the direction of

the arrow. Fig. 5, is a cross section on the line 5—5 of Fig. 4 in the direction of the arrow. Fig. 6, is a cross section on the line 6—6 of Fig. 4 in the direction of the arrow. Fig. 7, is a cross section on the line 7—7 of Fig. 4 in the direction of the arrow. Fig. 8, is a cross section on the line 8—8 of Fig. 4 in the direction of the arrow. Fig. 9, is a cross section on the line 9—9 of Fig. 4 in the direction of the arrow. Fig. 10, is a cross section on the line 10—10 of Fig. 4 in the direction of the arrow. Fig. 11 is a cross section on the line 11—11 of Fig. 1 in the direction of the arrow. Fig. 12, is a section on the line 12—12 on Fig. 10.

In the practical embodiment of my invention, as shown in the drawing, the body or main casting, designated 1 has trunnions to receive the carriage wheels 2—2 and the rear end of the casting 1 has handle members 3—3 whereby the operator can conveniently move and position the machine up to the wall to be cut in the manner clearly understood from Fig. 1.

The main or body portion 1 is preferably formed of the front head C cast integral with a tubular extension C' in which is slidably mounted the piston rod or drill stock *y*, and the outer end of the said extension is split and formed with a tapering socket *c* to receive the shank *f* of the cutter F held in the stock *y* by the tapering screw nut G. The rear end of the body is also in the nature of a head C², in practice, bolted or otherwise made fast to the central or main portion of the said body 1 which has a cylindrical chamber K that extends its full length and is closed by the end heads, and the said chamber at the extreme opposite ends has ports *u—u'* through which the fluid pressure for actuating the working piston *a* passes, as will be clearly understood from Fig. 2, from which it will also be seen the cylinder, about midway its length has a pair of exhaust ports *l—l'* and an air releasing port H midway the ports *l—l'*, presently again referred to.

Coöperating with the main cylinder K is a pair of independently positioned piston chambers *m—m'*, one of which *m*, is in communication with the feed port *u* and the other *m'* is in communication with the feed port *u'*, and each of said chambers has its innermost end in communication with the exhaust ports *l—l'* from the main cylinder from which the air exhausts from the op-

posite ends of the cylinder K, through the exhaust ports $h-h'$ in the chambers $m-m'$, in the manner presently more fully explained.

Operable in each of the chambers $m-m'$ is a valve head or piston $b-b'$ provided with suitable packing rings, and these are linked to move together by a rod e slidable in a long bearing 5 in the body 1, and each chamber has an inlet $n-n'$, one of which n , connects with the short supply port P and the other n' with the long supply port I and the two ports P and I extend to a common inlet S to which the fluid pressure supply pipe is connected in any well-known manner and in practice is suitably equipped with a controlling valve so that the operator can turn on or cut off the fluid pressure supply at will. The ports P and I connect with inlet S through the throat passages s and r , one of which at times is closed by a shiftable valve q that has a stem q' that extends into the working cylinder to be engaged by the working piston a when it reaches the limit of its back stroke in the manner and for the purpose presently more fully explained. This valve q is so arranged that at no time does it close over the inlet s to port P and always automatically moves to uncover the throat or inlet r to port I when the piston is driven forward, and to avoid knocking or a too quick shifting of the said valve q under the fluid pressure against it, and to prevent a vacuum in front of it, a bleeding off port t having a regulating valve x , is provided, as shown.

Each valve chamber has an outlet port $w-w'$ that connects through the channels w^2-w^2 with its respective feed port $u-u'$ and each of the said channels w^2 connects with a passage $j-j$ of very small area that discharge into the chambers $m-m'$, and with each of the passages $j-j$ coöperates a regulator z , in practice, set to release the compression at each end of the working piston a until the required cushion pressure is obtained, it being understood that the amount of the said cushion compression can be governed by properly choking the passages $j-j$ as desired, through the adjustment of the regulators z referred to.

Suitable packing L held by plate M is fixed around the drill stock or piston rod to hold the fluid from leaking out into the tubular extension.

Having thus described the structural features of my invention, the manner of its operation is best explained as follows: The several movable parts being in the position shown in Fig. 1, the piston a now being at limit of its return or back stroke and the pressure fluid now passing through the feed ports s and P through port n into chamber m and from thence through the port w to the back of piston a , it being understood

that the shiftable piston valve has been moved to the position shown in the said Fig. 1, by the fluid pressure entering through port n , see Fig. 7 into the chamber m against the valve piston b , the piston b' in the other chamber m' being now at a position where it uncovers the exhaust h' which is now in direct communication with the working cylinder in front of the piston a through the port l' and the small passage j , inlet r to the long port I that leads to the inlet n' in the chamber m' being now closed by the valve q that was shifted by the back stroke of piston a . The instant the actuating fluid, under pressure, passes through port w and against the back end of the piston a , the said piston moves in the direction of arrow 10 to drive the cutter or drill into the wall, see Fig. 3. As the piston a moves in the direction stated, it closes off the exhaust port l' to chamber m' and then passes beyond and opens the port l to the chamber m and thereby brings the said chamber m in communication with the working cylinder, and thus provides for the escape of a part of the compressed or working charge to the chamber m and to flow against the under end of the valve piston b in the said chamber, it being understood from the drawings, that the distance between the ports $l-l'$ and the length of the working piston a are relatively such that the port l' closes before the piston a has completed approximately one-half of its stroke. At this point, it should be stated that the valve q over inlet r moves relatively slow, it being held back by the cushion formed in the chamber, back of it and in line with the passage t . As the piston is thus thrust forwardly, the impact thereof is controlled by the cushioning of the air in the cylinder K in front of the piston a , the compression of which is released and controlled through the escape port j having the regulator z , which provides for the escape of the air until the requisite cushion is secured, it being understood that before the piston has finished its forward stroke the valve q has been completely shifted to uncover inlet r , to bring the feed channel I that leads to the inlet n' for the chamber m' into communication with the source of working agent or live fluid supply. As before stated, piston a as it passes forwardly under impact of the fluid pressure through chamber m , uncovers the port l and establishes communication between the said chamber m and the now live charge of fluid pressure back of piston a , which in exhausting from the cylinder passes against the valve piston member b and instantly shifts the said valve member and the like member b' in the other chamber m' to the position shown in Fig. 4.

By reason of the peculiar arrangement and combination of the chambers $m-m'$, the fluid passages that communicate therewith

and with the main piston cylinder, and the valve pistons that move in the chambers $m-m'$, a positively operating and advantageous means for controlling the valve pistons is provided, and since the shifting of the valve piston is partially effected by the fluid pressure from that end of the piston cylinder receiving the working charge from the supply port, renders the said valve devices, as it were, a typical intermittently operating valve mechanism. Furthermore, the parts described and shown also operate to disturb any tendency of a sustained equilibrium of pressure at each end of the working piston when the ports r and s are open to the supply port s .

It is understood that after the valve heads $b-b'$ are shifted to the reverse position as shown in Fig. 3 by the live pressure that entered the cylinder to force the piston a in the direction indicated in Fig. 1, the live pressure then entering through port n' holds the valve heads $b-b'$ shifted until the piston a is forced in the direction of the arrow on Fig. 3, and the port l' is exposed, when the now live pressure through the port l' , will again shift the valve heads $b-b'$ back to the position shown in Fig. 1. Since the valve head b when reversed by the exhaust air as stated, uncovers the exhaust h after piston a uncovers the exhaust port l , it relieves that end of the cylinder k which received the prior charge, such end being now closed to chamber m by reason of the valve piston b now closing off the port w , it being understood that when this occurs port u' from chamber m' opens up the passage of the actuating agent (the fluid pressure) into the working cylinder through port u' and against the piston a to effect its back stroke, which is also cushioned in the same manner it was on the forward stroke.

From the foregoing, taken in connection with the drawings, the complete construction, the manner in which my machine operates and its advantages, it is believed, will be readily apparent to those skilled in the art to which it appertains.

The valve q in case it should be adjusted so both inlets r and s are open, can be readily adjusted for starting the machine by pushing the cutter against the face of the wall to push piston a back until it engages the stem q' and shifts the valve q to the position shown in Fig. 1 to allow first charge through inlet s only, it being understood that this valve after the engine has started forms no special function, since the constant fluid charges through ports P and I are controlled by the shifting of valve pistons $b-b'$.

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

1. In a direct acting engine, a casing inclosing a working chamber and a piston op-

erating therein, a valve chamber and a valve in said valve chamber, a source of working agent supply, means for admitting the working agent from said source of supply into said valve chamber against said valve to tend to move it in one direction, and means for counterbalancing the force of said working agent admitted; valve controlled port connections between said valve chamber and said working chamber through which said working agent is passed into said working chamber to act on said working piston to move it in one direction, said casing having an exhaust port controlled by said working piston, and piston controlled means for admitting working agent from said working chamber back into said valve chamber to shift said valve and close off the flow of working agent from said valve chamber into said working chamber, as said piston approaches the limit of its movement in one direction, and means for establishing auxiliary communication between said working chamber and said valve chamber to cushion said valve when it moves from one position to another.

2. In a direct acting engine, a working cylinder, a working piston in said cylinder, a balanced fluid pressure controlled distributing valve, means controlled by said working piston for directing live fluid under pressure against said distributing valve to shift it before the piston completes its stroke in a given direction and other means for establishing a pressure against said valve to cushion its movement.

3. In a direct acting engine, a working cylinder, a double acting working piston operating therein, a double acting balanced fluid pressure controlled distributing valve, means controlled by said working piston for directing live fluid under pressure against said distributing valve to shift it before the piston completes its stroke in a given direction, and means for establishing a cushioning pressure against said valve when moving to its different positions.

4. In a direct acting engine, a working cylinder and piston, a single fluid pressure infeed, a pair of independent passages from the infeed, one for each end of the working cylinder, a fluid pressure balanced valve mechanism for controlling the said passages to open and close them alternately, piston controlled means for increasing the fluid pressure in one direction on the valve to shift it, and other means for closing the feed passage to one end of the cylinder at times.

5. In a direct acting engine, a working piston and cylinder, a single fluid pressure infeed, a pair of independent passages from the infeed, one for each end of the working cylinder, a balanced fluid pressure valve mechanism for controlling the said passages to open and close them alternately, a piston

controlled means for increasing the fluid pressure in one direction on the valve mechanism to shift it, and piston controlled means for controlling the passage of working agent into one of said independent fluid passages from the infeed.

6. In a direct acting engine, a working cylinder and a piston, a separate valve chamber for each end of the cylinder, a feed port from each valve chamber to the respective ends of the cylinder, a piston valve in each valve chamber that controls the feed ports of the cylinder, said valves being coupled to shift in unison, an inlet for the fluid pressure, a separate passage for each valve chamber that opens into the said feed port, means for exhausting a part of the driving fluid pressure charges into the valve chambers against the inner ends of the valve pistons and means for finally exhausting the cylinder ends after the valve pistons have been shifted.

7. In a direct acting engine, a working cylinder and piston, a separate valve chamber for each end of the cylinder, fluid passage that connects the outer ends of the said valve chambers and the outer ends of the cylinder, a single fluid inlet to the engine, a separate passage for each valve chamber, that opens into the said feed inlet, a valve piston in each valve chamber, an exhaust passage from each end of the cylinder to each valve chamber, and another passage for each valve chamber that connect said chambers with the feed inlets to the cylinder.

8. In a direct acting engine, a working cylinder and piston, a separate valve chamber for each end of the cylinder, fluid passages that connect the outer ends of the said chambers and the outer ends of the cylinder, a single fluid feed inlet to the engine, a separate passage for each valve chamber that opens into the said feed inlet, a valve piston in each valve chamber, each of the said chambers having an exhaust from each end of the cylinder to the valve chamber and a bleeding-off passage that leads from each of the fluid passages and a regulating valve in each of the bleeding off passages.

9. In a direct acting engine, a fluid pressure actuating piston, a balanced fluid pressure controlled distributing valve, means for increasing the fluid pressure on the valve in one direction whereby to disturb its equilibrium, and other means at each end of the cylinder for reducing the compression in advance of the cylinder whereby to cushion the working piston.

10. In a direct acting engine, a fluid pressure actuating piston, a balanced fluid pressure controlled distributing valve, means for increasing the fluid pressure on the valve in one direction whereby to disturb its equilibrium, and other means at each end of the cylinder for reducing the compression

in advance of the piston whereby to cushion the working piston, said means consisting of a passage of small area that communicates with the feed and exhaust inlets for the piston cylinder and a regulating valve for the said passage.

11. In a direct acting engine, a working chamber, a working piston operating therein, a working agent inlet port, a valve casing having two valve chambers, a double headed valve having its respective heads operating in the respective valve chambers and operative connections between said valve heads, means for establishing live fluid pressure against the outer ends of said valve heads to balance said valve, valve controlled port connections between said valve chambers and the respective ends of said working chamber whereby the live working agent may be passed into said working chamber, an exhaust port for said working chamber, and piston controlled means for leading live working agent from said piston chamber into said valve chambers at times against the inner ends of said valve heads to disturb the equilibrium of said valve and shift the same.

12. In a direct acting engine, a working chamber, a working piston operating therein, a working agent inlet port, a valve casing having two valve chambers, a double headed valve having its respective heads operating in the respective valve chambers and operative connections between said valve heads, means for establishing live fluid pressure against the outer ends of said valve heads to balance said valve, valve controlled port connections between said valve chambers and the respective ends of said working chamber whereby the live working agent may be passed into said working chamber, an exhaust port for said working chamber, piston controlled means for leading live working agent from said piston chamber into said valve chambers at times against the inner ends of said valve heads to disturb the equilibrium of said valve and shift the same, and a means for cushioning said valve.

13. In a direct acting engine, a working chamber, a working piston operating therein, a working agent inlet port, a valve casing having two valve chambers, a double headed valve having its respective heads operating in the respective valve chambers and operative connections between said valve heads, means for establishing live fluid pressure against the outer ends of said valve heads to balance said valve, valve controlled port connections between said valve chambers and the respective ends of said working chamber whereby the live working agent may be passed into said working chamber, an exhaust port for said working chamber and piston controlled means for leading live

working agent from said piston chamber into said valve chambers at times against the inner ends of said valve heads to disturb the equilibrium of said valve and shift the same, and a piston controlled valve device controlling the passage of working agent from the inlet or feed port into one of said independent passages.

14. In a direct acting engine, a working chamber, a working piston operating therein, a working agent inlet port, a valve casing having two valve chambers, a double headed valve having its respective heads operating in the respective valve chamber operative connections between said valve heads, means for establishing a live fluid pressure against the outer ends of said valve heads to balance said valve, valve controlled port connections between said valve chambers and the respective ends of said working chamber whereby the live working agent may be passed into said working chamber, an exhaust port for said working chamber, piston controlled means for leading live working agent from said piston chamber into said valve chambers at times against the inner ends of said valve heads to disturb the equilibrium of said valve and shift the same, means for cushioning said valve, and a piston controlled

valve device controlling the passage of working agent from the inlet or feed port into one of said independent passages.

15. In a direct acting engine, a cylinder inclosing a working chamber, a piston operating therein, a piston controlled exhaust port for said working chamber, a valve casing inclosing a valve chamber, a piston valve working in said valve chamber, a working agent inlet port, means for establishing a fluid pressure from said working agent inlet port against opposite ends of said valve to maintain it in equilibrium, a port connecting said valve chamber with one end of said working piston chamber to pass the working agent from the valve chamber into the working chamber, a piston controlled means for passing the live working agent from the working chamber against said valve to disturb its equilibrium and cause it to shift to close an inlet between the valve chamber and the working chamber as the piston approaches the limit of its working stroke, and means for cushioning said valve during its movement.

FORDYCE C. LOOMIS.

Witnesses:

JOSEPH H. EBRIGHT,
ISRAEL A. CORRELL.