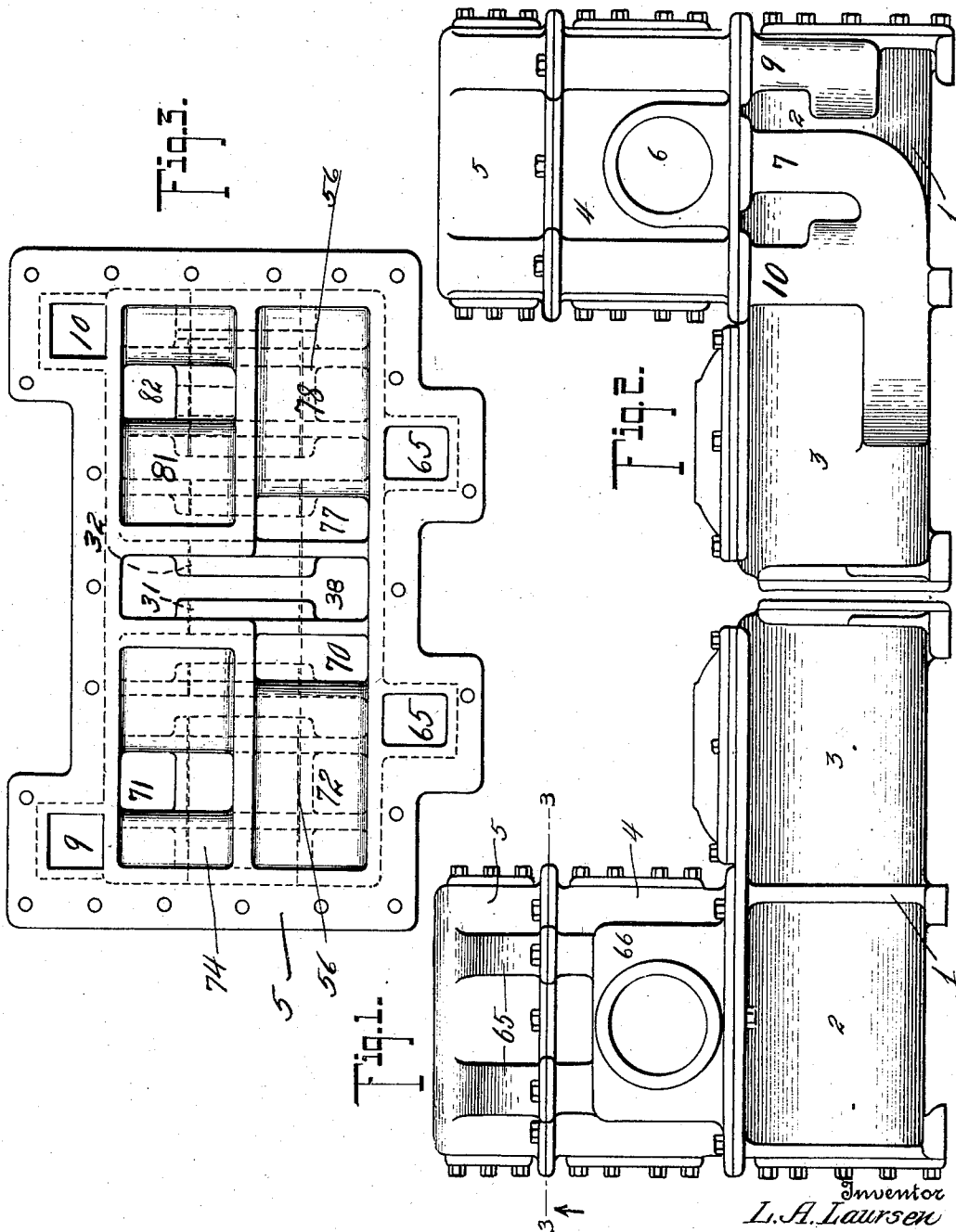


L. A. LAURSEN.
HYDRAULIC PUMP.
APPLICATION FILED JULY 10, 1912.

1,054,573.

Patented Feb. 25, 1913.

3 SHEETS—SHEET 1.



Witnesses
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H. M. Brucke

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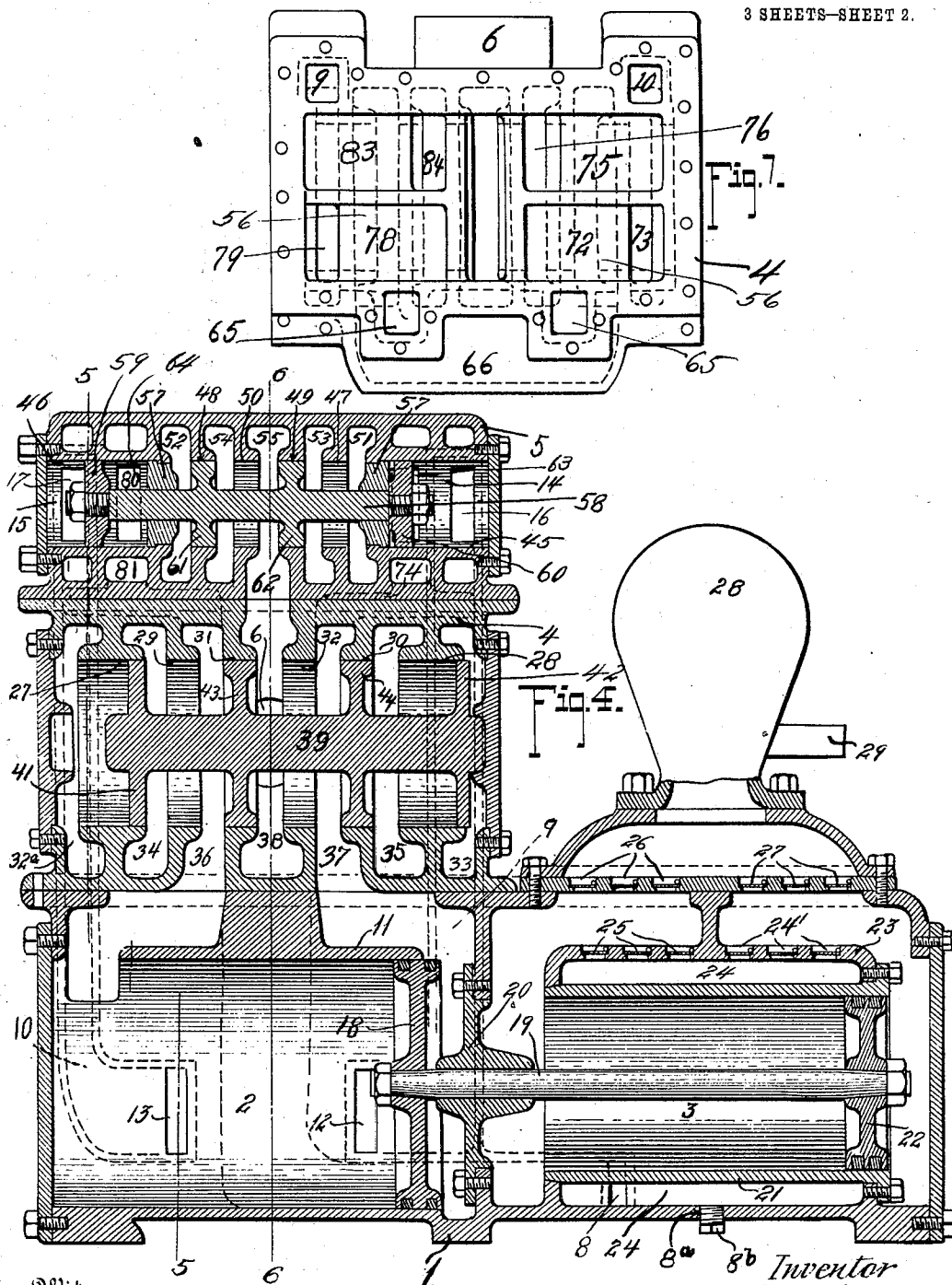
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3 SHEETS—SHEET 2.



Witnesses
C. H. Wagner.
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334

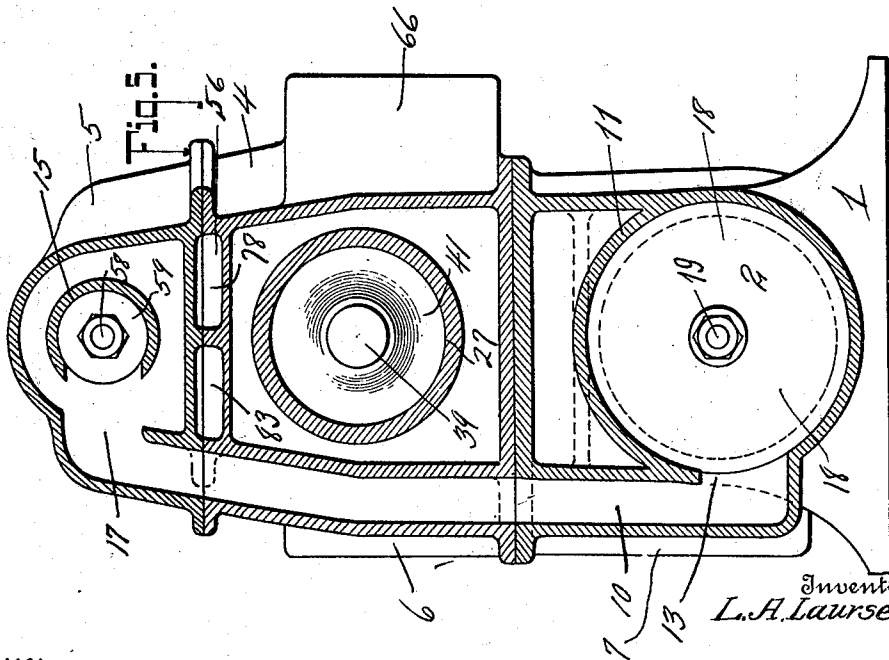
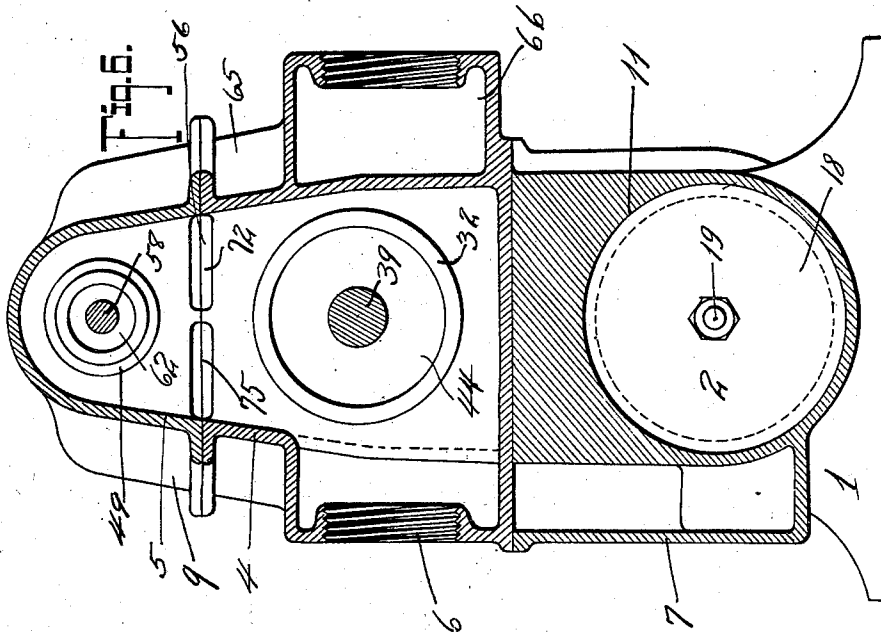
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

LAURITS A. LAURSEN, OF EAU CLAIRE, WISCONSIN.

HYDRAULIC PUMP.

1,054,573.

Specification of Letters Patent.

Patented Feb. 25, 1913.

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To all whom it may concern:

Be it known that I, LAURITS A. LAURSEN, a citizen of the United States, residing at Eau Claire, in the county of Eau Claire and State of Wisconsin, have invented certain new and useful Improvements in Hydraulic Pumps, of which the following is a specification.

The present invention relates to a hydraulic pump wherein novel automatic means are employed to alternately conduct water under pressure from a race pipe to opposite sides of a piston, which piston operates a plunger, which in turn suitably acts upon a portion of the water from the race pipe so that the same may be forced to an elevation above the source of water.

An important object of this invention is to provide means of the above mentioned character, which are automatic and continuous in operation and not liable to disarrangement of the parts.

Other objects and advantages of this invention will be apparent during the course of the following description.

For a full understanding of the present invention, reference is to be had to the following description and the accompanying drawings, in which—

Figure 1 is a side view of the waste side of the pump; Fig. 2 is a side view of the intake side of the same; Fig. 3 is a bottom plan view, looking from the line 3—3 of Fig. 1; Fig. 4 is a central vertical longitudinal section through the hydraulic pump; Fig. 5 is a vertical sectional view, taken on the line 5—5 of Fig. 4; Fig. 6 is a vertical sectional view, taken on the line 6—6 of Fig. 4; and Fig. 7 is a top plan view of the casing containing the main valve structure.

Throughout the following detail description and on the several figures of the drawings, similar parts are referred to by like reference characters.

Referring particularly to the drawings, the numeral 1 designates a horizontal body portion or casting, which is divided into working and pumping chambers 2 and 3, respectively. Rigidly mounted in the upper side of the working chamber 2, is a main valve casing 4, upon which is rigidly

mounted an auxiliary valve casing 5, as shown.

As shown in Fig. 2, the numeral 6 designates an intake opening, discharging into the central portion of the main valve casing 4.

A suitably inclined race pipe (not shown) discharges into the intake opening 6. An exterior conduit 7 is in free communication at its upper end with the main valve casing 4 and has a horizontal portion which discharges through an opening 8 into a water space of the pumping chamber 3, to be hereinafter described. Exterior vertical conduits 9 and 10 have communication at their lower ends with an internal cylinder 11 disposed within the working chamber 2, through the medium of openings 12 and 13, respectively. The conduits 9 and 10 discharge at their upper ends into end chambers 14 and 15 of the auxiliary valve casing 5, through openings 16 and 17, respectively.

Mounted to reciprocate within the cylinder 11 is a piston 18, which travels outwardly past both of the openings 12 and 13. Rigidly connected with piston 18 is a piston rod 19, operating through an apertured boss formed upon a partition 20, interposed between the chambers 2 and 3.

Rigidly mounted in the pumping chamber 3 and in spaced relation thereto, is an internal pumping cylinder 21, having both ends open, as shown. A plunger 22 operates within the cylinder 21 and is connected with the piston rod 19. Surrounding the cylinder 21 is an intermediate cylindrical shell 23, forming an annular water space 24 in free communication with the opening 8, before referred to. Upon its upper side the shell 23 is provided with openings 24', adapted to be closed by upwardly opening check valves 25. The water discharging through the openings 24' passes into chamber 3 exteriorly of shell 23, and then passes through openings 26 which are adapted to be covered by upwardly opening check valves 27. The water then passes into the pressure collecting tank 28 to be discharged through pipe 29. It is thus seen that when the plunger 22 is moved to the left a vacuum is created in the chamber 3 exteriorly of shell 23,

whereby water will be drawn through openings 24 into chamber 3, which water is placed under pressure upon the movement of the plunger in the opposite direction, and is forced through the openings 26.

Formed within the main valve casing 4 are spaced annular valve seats 27, 28, 29, 30, 31, and 32, formed with webs of material comprising said casing and providing the ports 32^a, 33, 34, 35, 36, 37, and 38, as shown each port being enlarged laterally of the respective seats and forming an annular space about the respective seat. Mounted to reciprocate within the casing 4 is a valve structure comprising a central stem 39, carrying valve heads 41, 42, 43, and 44. The valve heads 41 and 42 slide upon the seats 27 and 28, the valve head 43 alternately engages seats 29 and 31, and valve head 44 alternately engages seats 30 and 32. It is thus seen that when the main valve structure is shifted to the right, so that valve head 43 engages seat 31 and valve head 44 engages seat 30, the water supplied through opening 6 will pass by way of port 37 to the right side of piston 18, to force the same to the left. When the main valve structure is shifted to the left so that valve head 43 engages seat 29 and valve head 44 engages seat 32, the water will pass by port 36 to the left side of piston 18 to shift the same to the right.

Formed within the auxiliary valve casing 5 are end annular valve seats 45 and 46, forming the chambers 14 and 15, previously referred to. Spaced annular valve seats 47, 48, 49, and 50 are also formed within the casing 5 each being formed of a web of material comprising the casing, which valve seats provide ports 51, 52, 53, 54, and 55, as shown each port being enlarged laterally of the respective seat to form an annular space about the respective seat. The port 55 is in free communication with the port 38. The ports 53 and 54 are in free communication with the ports 33 and 32^a, respectively, by means of the port 56.

Rigidly mounted in the inner ends of the valve seats 45 and 46 are fixed heads 57 through which is mounted a reciprocatory stem 58 of the auxiliary valve structure. This stem carries spaced valve heads 59, 60, 61, and 62, rigidly connected therewith. When the valve head 62 engages the valve seat 49, as shown in Fig. 4, it is obvious that water will pass upwardly through port 38, into port 55, port 54, port 56, to port 32^a, to move the main valve structure to the right, as shown in Fig. 4. When the auxiliary valve structure is shifted to the right to bring valve head 62 in engagement with valve seat 47, water will pass from port 55, into port 53, port 56, and to port 33 to shift the main valve structure to the left.

The annular valve seats 45 and 46 are pro-

vided with waste openings 63 and 64 at their inner ends, which discharge into waste conduits 65, leading into a shell 66, to be connected with a waste pipe (not shown). It is to be noted that valve heads 59 and 60 only partially cover the waste openings 63 and 64. When the piston 18 is moved to the right sufficiently to pass opening 12, some of the water passes through opening 12, conduit 9, and into the end chamber 14, whereby the auxiliary valve structure, including valve head 60, will be shifted to the left to occupy the position shown in Fig. 4. When the piston 18 is moved to the left to occupy a position outwardly of the opening 13, water passes through opening 13, conduit 10, and into chamber 15. Water is also being fed through conduit 9 into chamber 16, but since the waste opening is partly open, it is obvious that the pressure in chamber 15 will be the greater, whereby the auxiliary valve structure including the valve head 59 will be shifted to the right. Valve head 62 will then engage valve seat 47 whereby the main valve structure will be shifted to the left, as above stated. When this takes place water passes through port 36 to the left side of piston 18 to move the same to the right to occupy its position shown in Fig. 4. The ports 32^a and 33 have communication with exhaust ports 67, leading into the chambers 14 and 15, which ports are entirely covered by the valve heads 59 and 60 when they are in their outermost positions.

In the operation of the device, water is supplied at suitable pressure to casing 4 through opening 6. The water causes the piston to move to the left. When the piston reaches the end of this movement, the auxiliary valve structure will be shifted to the right, whereupon the main valve structure will be shifted to the left. The water will now move the piston to the right. When the piston reaches the end of its travel to the right the operation is again repeated. The piston 18 operates the pump in the manner hereinbefore described.

As will be seen in Fig. 3, the lower side of the casing which contains the auxiliary valve structure is provided with port openings 70 and 71, the former opening into the chamber 72, which is disposed between the said casing and the casing which contains the main valve structure, the latter being particularly shown in Fig. 7. The port 70 communicates with port 53, and the chamber 72 communicates with the port 73 formed in the upper portion of the casing containing the main valve structure. By this means the intake water may be conducted to the right side of the main valve structure, in the manner before referred to. The port 71 communicates with chamber 74, the said port opening into the second chamber 75, 130

which is disposed between the said two casings. The chamber 75 communicates with the intake side of the main valve chamber, by which means the water exhausts through port 63, after said water has acted upon the piston 60, may pass through the ports 71 and 76 so as to join the intake water, said last named port being formed in the upper portion of the casing which contains the main valve structure. In like manner the port 77 formed in the lower side of the casing which contains the auxiliary valve structure, communicates with port 54, and with the chamber 78, the latter being connected with port 32 by means of a port 79, the latter being shown in Fig. 7, by this means when the upper valve structure is forced to the right, water in port 54 will be forced through the ports just described and said water will act upon the left-hand end of the main valve structure to move it toward the right. The water which has passed into chamber 15 will, after acting on the piston in said chamber, leave the said chamber by means of port 80, passing into chamber 81, whence it passes through port 82 (Fig. 3) into chamber 83. The latter chamber communicates by means of a port 84 with the intake side of the main valve structure so that the water which was in chamber 15 may join the intake water. The water that is wasted from the central portions of the auxiliary valve chamber passes down through the pipes 65, shown in Fig. 1, into the waste water chamber 66.

In some instances, it is found desirable to operate the pump by one source of water and to take from a separate source the water to be pumped. In order to accommodate these conditions, I have provided an opening 8^a, shown in Fig. 4, which when a single source of water is used, is to be plugged by a member 8^b, and when a separate source of water is used, connection from the pumping chamber 3 to said source is obtained by connecting the inflow pipe in the opening 8^b and closing the opening 8 by means of a metal seat or otherwise.

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

1. In an engine of the class described, the combination with a cylinder and a piston therein adapted to travel substantially for the full length of the cylinder, of a main valve for controlling supply and exhaust of pressure vehicle to and from the cylinder, an auxiliary valve for controlling movements of the main valve, and a housing for said valves, said housing having an intake port communicating with both valves substantially midway of their length, cylinder ports leading laterally from each side of the intake port at the main valve and communicating with the respective ends of the cylinder, a cylinder exhaust port disposed later-

ally with respect to each of said cylinder ports, a main valve chamber at each end of the main valve, auxiliary valve ports disposed laterally of the intake at the auxiliary valve and leading therefrom to the respective main valve chambers, an auxiliary valve exhaust port disposed laterally of each auxiliary valve port adapted to communicate therewith alternately, a chamber at each end of the auxiliary valve, a port leading from each end portion of the cylinder adjacent the respective end to the respective auxiliary valve chamber, and an exhaust port for each of said auxiliary valve chambers disposed to drain pressure vehicle therefrom relative to the positions of the auxiliary valve, said main valve being formed with valve heads adapted to alternately close the cylinder exhaust ports and positioned on the valve for closing one cylinder exhaust port and at the same time affording communication between the intake and the adjacent cylinder port, and at the same time establishing communication between the other cylinder exhaust port and the other cylinder port, said main valve being also formed with heads disposed to be influenced by pressure vehicle in said main valve chambers, the auxiliary valve being formed with heads adapted to alternately close communication between each auxiliary valve port and the respective adjacent auxiliary valve exhaust port and at the same time to alternately establish communication between the intake and the other auxiliary valve port, and a head at each end of the auxiliary valve disposed in the respective auxiliary valve chamber and adapted to be influenced by the pressure vehicle therein.

2. In an engine of the class described, the combination, with a cylinder and a reciprocating piston therein adapted to travel substantially throughout the length of the cylinder, of a main valve for controlling supply and exhaust of pressure vehicle to and from the cylinder, an auxiliary valve for controlling movements of the main valve, and a housing for said valves, said housing having an intake port communicating with both valves substantially midway of their length, cylinder ports leading from the intake at the main valve and communicating with the respective ends of the cylinder, communication between the intake port and the cylinder ports being adapted to be alternately established and cut off by said main valve, a cylinder exhaust port for each of said cylinder ports disposed to be alternately opened and closed with respect to the cylinder ports, main valve chambers for the end portions of the main valve adapted to receive pressure vehicle for actuating the main valve, intake and exhaust ports for said main valve chambers disposed to be alternately opened and closed by the auxiliary valve, auxiliary valve chambers adapted to receive pressure vehicle

for actuating the auxiliary valve, exhaust ports for said auxiliary valve chambers, and ports leading directly from the cylinder adjacent the ends thereof to the auxiliary valve chambers independently of the main valve, the last mentioned ports communicating with the cylinder at points adjacent the ends of the cylinder but spaced therefrom a distance sufficient for accommodating the piston between the terminal of the respective port and the adjacent end of the cylinder.

3. In an engine of the class described, the combination with a cylinder and a piston therein adapted to reciprocate substantially throughout the length of the cylinder, of a main valve controlling supply and exhaust of pressure vehicle to and from the cylinder, an auxiliary valve for controlling movements of the main valve, and a housing for said valves, said housing having an intake port communicating with both valves, cylinder ports leading laterally from each side of the intake port at the main valve and communicating with the respective ends of the cylinder, a cylinder exhaust port disposed laterally with respect to each cylinder port, valve seats between the cylinder exhaust ports and the respective cylinder ports and between the intake and the respective cylinder ports, each of said seats being formed of a web of the material of the housing and each cylinder port and cylinder exhaust port being enlarged to form an annular space about and extending laterally of its respective valve seat, a main valve chamber at each end of the main valve, auxiliary valve ports disposed laterally of the intake at the auxiliary valve and leading therefrom to the respective main valve chambers, an auxiliary valve exhaust port disposed laterally of each auxiliary valve port adapted to communicate therewith alternately, valve seats between the auxiliary valve exhaust ports and the respective auxiliary valve ports and between the intake and the respective auxiliary valve ports, each of said seats being formed of a web of the material of the housing and each auxiliary valve port and auxiliary valve exhaust port being enlarged to form an annular space about and extending laterally of its respective valve seat, a chamber at each end of the auxiliary valve, a port leading from each end portion of the cylinder to the respective auxiliary valve chamber, and an exhaust port for each of said auxiliary valve chambers disposed to drain pressure vehicle therefrom relative to the positions of the auxiliary valve, said main valve being formed with valve heads adapted to alternately close the cylinder exhaust ports and positioned on the valve for closing one cylinder exhaust port and at the same time affording communication between the intake and the adjacent cylinder port,

and at the same time to establish communication between the other cylinder exhaust port and the other cylinder port, said main valve being also formed with heads disposed to be influenced by pressure vehicle in said main valve chambers, the auxiliary valve being formed with heads adapted to alternately close communication between each auxiliary valve port and the respective adjacent auxiliary valve exhaust port and at the same time to alternately establish communication between the intake and the other auxiliary valve port, and a head at each end of the auxiliary valve disposed in the respective auxiliary valve chamber and adapted to be influenced by the pressure vehicle therein.

4. In an engine of the class described, the combination, with a cylinder and a piston therein adapted to travel substantially throughout the length of the cylinder, of a main valve for controlling supply and exhaust of pressure vehicle to and from the cylinder, an auxiliary valve for controlling movements of the main valve, and a housing for said valves, said housing having an intake port communicating with both valves substantially midway of their length, cylinder ports leading laterally from each side of the intake port at the main valve and communicating with the respective ends of the cylinder, a cylinder exhaust port disposed laterally with respect to each of said cylinder ports, a main valve chamber at each end of the main valve, auxiliary valve ports disposed laterally of the intake at the auxiliary valve and leading therefrom to the respective main valve chamber, an auxiliary valve exhaust port disposed laterally of each auxiliary valve port adapted to communicate therewith alternately, a chamber at each end of the auxiliary valve, a port leading from each end portion of the cylinder, adjacent the respective end, to the respective auxiliary valve chamber independently of the main valve, and an exhaust port for each of said auxiliary valve chambers disposed to drain pressure vehicle therefrom relative to the positions of the auxiliary valve, each of said auxiliary valve chamber exhaust ports being located relative to the respective end of the auxiliary valve for bleeding pressure vehicle from within the auxiliary valve chamber for effecting starting of the return thrust of the auxiliary valve, said main valve being formed with valve heads adapted to alternately close the cylinder exhaust port and at the same time affording communication between the intake and the adjacent cylinder port, and at the same time establishing communication between the other cylinder exhaust port and the other cylinder port, said main valve being also formed with heads disposed to be influenced by pressure vehicle in said main valve chambers, the auxiliary valve being

formed with heads adapted to alternately close communication between each auxiliary valve port and the respective adjacent auxiliary valve exhaust port and at the same time to alternately establish communication between the intake and the other auxiliary valve port, and a head at each end of the auxiliary valve disposed in the respective auxiliary valve chamber and adapted to be influenced by the pressure vehicle therein. 10

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

LAURITS A. LAURSEN.

Witnesses:

ANNA E. SINDELL,
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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."