No. 642,150. Patented Jan. 30, 1900.

J. OLSEN.

PUMPING MECHANISM.

(Application filed Oct. 29, 1898.)

(No Model.) 2 Sheets—Sheet 1.

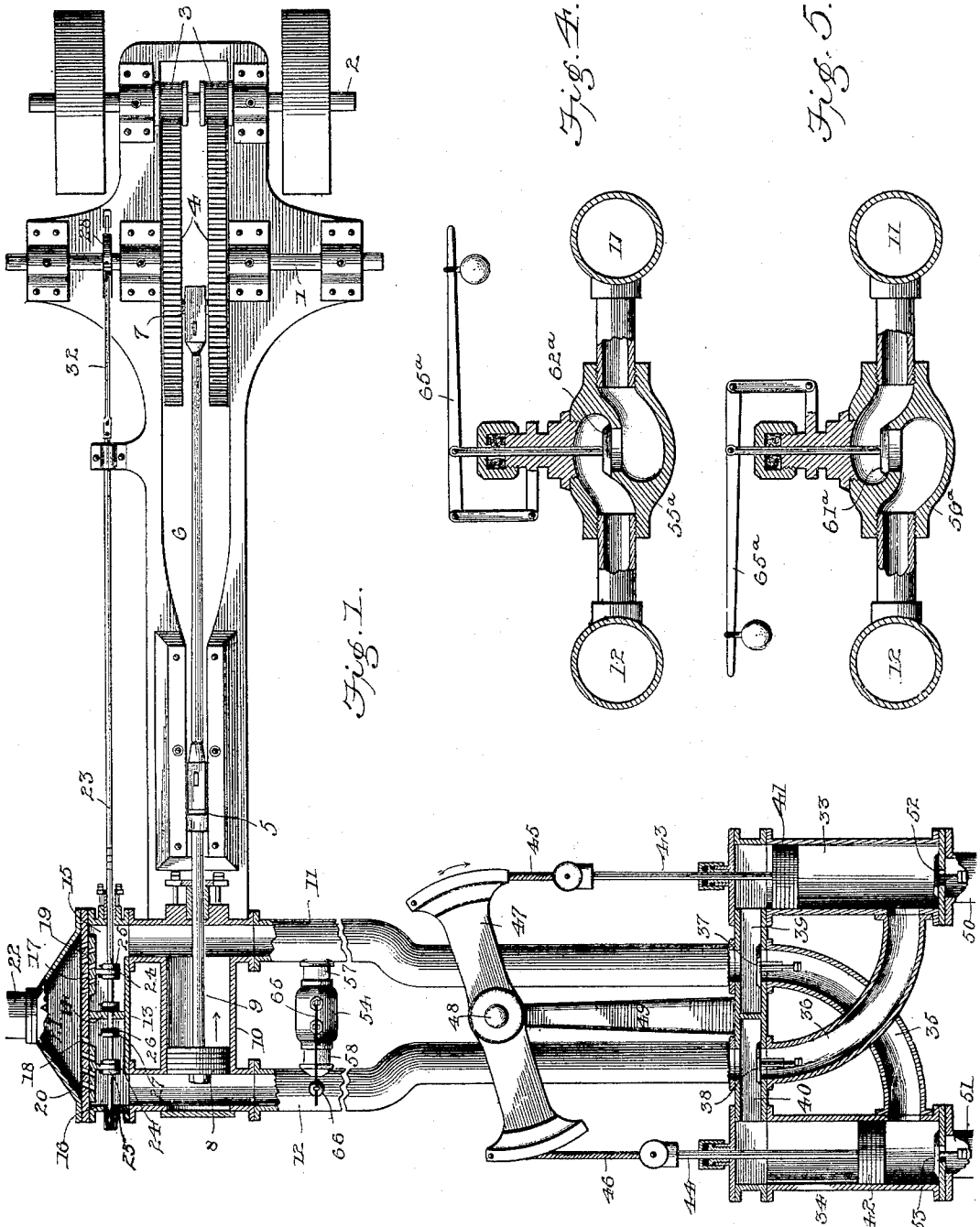


Fig. 1.

Fig. 4.

Fig. 5.

Witnesses

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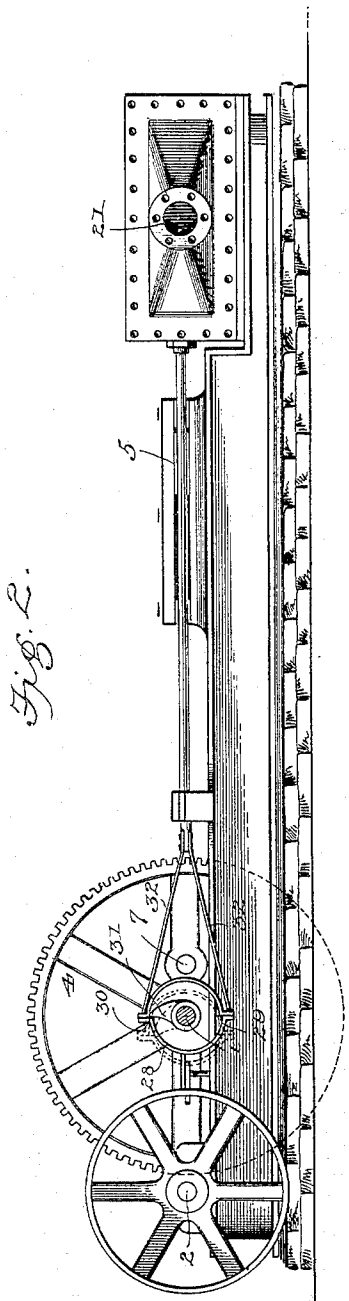


Fig. 2.

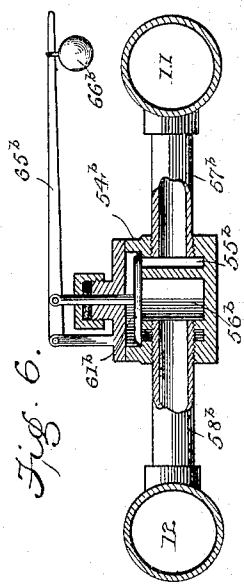


Fig. 6.

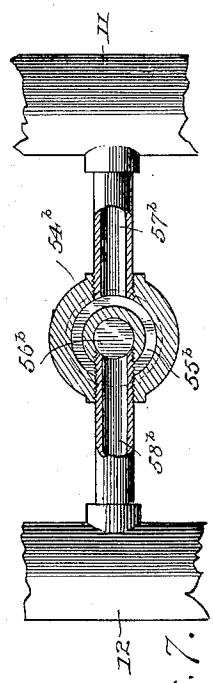


Fig. 7.

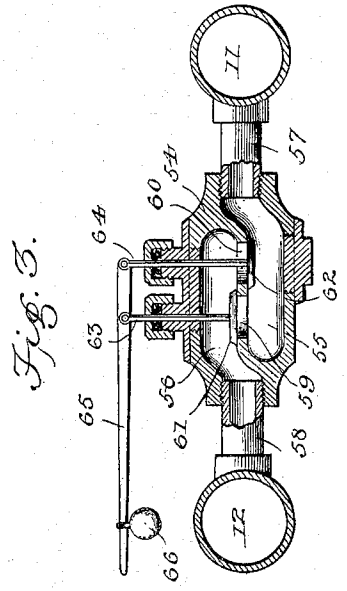


Fig. 5.

Witnesses

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PUMPING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 642,150, dated January 30, 1900.

Application filed October 29, 1898. Serial No. 694,954. (No model.)

To all whom it may concern:

Be it known that I, JOHN OLSEN, a citizen of the United States, residing at Salt Lake City, in the county of Salt Lake and State of Utah, have invented a new and useful Steam-Pumping Mechanism, of which the following is a specification.

My invention relates to steam-pumps, and has for its object to provide a simple and efficient construction and arrangement of parts whereby the application of power for operating the water-elevating devices may be at an elevation above the pumping-cylinder to avoid piping the steam or other motive agent to a depressed point, and in this connection to provide simple and improved compensating or pressure-equalizing devices, whereby a continuous and uniform operation of pumping without the application of strains to the parts thereof may be attained.

Further objects and advantages of this invention will appear in the following description, and the novel features thereof will be particularly pointed out in the appended claims.

In the drawings, Figure 1 is a view, partly in section, of a pumping system constructed in accordance with my invention. Fig. 2 is a side view of the driving mechanism, showing the valve-operating devices. Fig. 3 is a detail sectional view of a compensating or pressure-equalizing device, whereby the conveyers are connected. Figs. 4 and 5 are similar views of the members of a slightly-modified construction of compensating or pressure-equalizing device. Figs. 6 and 7 are respectively vertical and horizontal longitudinal sections of another modified construction of compensating or pressure-equalizing device.

Similar numerals of reference indicate corresponding parts in all the figures of the drawings.

The driving mechanism of the pump illustrated in the drawings embodies a driving-shaft 1, which may receive its motion from a belt-pulley shaft 2 or the equivalent thereof through intermeshing gears 3 and 4 and a cross-head 5, connected by a pitman 6 with a wrist-pin 7, carried by said gears 4, which perform the functions of crank-disks. The reciprocation of this cross-rod by the rotation of the driving-shaft is utilized to actuate the main piston 8, of which the rod 9 is attached to said cross-head. In communication with the cylinder 10 of the main piston 8 are independent conveyers 11 and 12 at opposite ends of the valve-casing 13, divided transversely at an intermediate point by a partition 14 to form independent chambers 15 and 16, respectively, in communication with opposite ends of the cylinder 10. In valve-seats formed by one wall of the valve-casing are arranged exhaust-ports 17 and 18, controlled by slide-valves 19 and 20 and opening into the exhaust-chamber 21, from which extends a discharge conveyer or pipe 22. Said exhaust-controlling valves 19 and 20 are so disposed with relation to each other that one is closed when the other is open, and they are connected for simultaneous operation by a valve-stem 23, to which extensions or ears 24 of the valves are secured by means of collars 25. Said valve-stem also extends through the partition 14 between the valve-chambers, and secured upon the valve-stem at opposite sides of the plane of said partition are yielding cushions or buffers 26, adapted for contact with opposite sides of said partition at the ends of the strokes of the valve-stem to prevent leakage through the stem of the guide in the partition, said cushions being held in place by adjustable collars 27. The valve-stem is actuated by a tappet-ring 28, provided with spaced shoulders 29 and 30, and a cross-head 31, fixed to the driving-shaft 1, said tappet-ring being connected by a yoke 32 with the stem 23. As the shaft 1 rotates, the extremity of the cross-head is brought into contact alternately with the shoulders 29 and 30 to advance the ring alternately in opposite directions, and thus correspondingly shift the valves to alternately open the ports 17 and 18 to establish communication between the valve-chambers and the exhaust-chamber 21.

The conveyers 11 and 12 communicate directly with the contiguous ends of pumping-cylinders 33 and 34 and indirectly, by means of valved conductors 35 and 36, with the remote ends, respectively, of said cylinders 34 and 33, said conductors 35 and 36 being provided, respectively, at their outlet ends or at their points of communication with the conveyers 11 and 12 with inwardly or upwardly

opening check-valves 37 and 38. Thus the conveyer 11 communicates with a passage 39, which is in direct communication with the adjacent end of the pumping-cylinder 33, and the conveyer 12 with a passage 40, which correspondingly is in direct communication with the contiguous end of the pumping-cylinder 34, pistons 41 and 42 being mounted for reciprocation, respectively, in the cylinders 33 and 34 and having their stems 43 and 44 flexibly connected, as shown at 45 and 46, with opposite ends of a working beam or lever 47, fulcrumed, as at 48, upon a suitable standard 49, preferably rising from the casting forming the passages 39 and 40. Also the conveyer 11 communicates, through the valved conductor 35, with the remote end of the pumping-cylinder 34, and the conveyer 12 communicates, through the valved conductor 36, with the remote end of the pumping-cylinder 33, the communication of fluid from said conveyers through the conductors to the cylinders, however, being prevented by the check-valves 37 and 38, which are mounted to open and allow the communication of liquid, respectively, from the lower ends of the cylinders to the conveyers. Also in communication with the pumping-cylinders 33 and 34 are suction-pipes 50 and 51, having upwardly or inwardly opening check-valves 52 and 53, which allow liquid to pass from the suction-pipes into the lower ends of the pumping-cylinder, while preventing backward pressure into the cylinders by the suction-pipes.

With this construction of parts the operation of the mechanism is as follows: The position of the main piston 8 being at the limit of its stroke toward the left of the cylinder 10, as indicated in Fig. 1, and the valves 19 and 20 being so located as to respectively close and open the ports 17 and 18, the movement of said piston in the direction indicated by the arrow in Fig. 1 will communicate downward pressure to liquid in the conveyer 11, owing to the fact that there is no other outlet from the cylinder 10 than through said conveyer. This downward pressure communicated to the liquid in the conveyer 11 will be communicated to the outer side of the pumping-piston 41 in the cylinder 33 to advance said pumping-piston downwardly, and thus discharge the liquid contents of the cylinder 33 through the conductor 36 (the check-valve 38 being lifted by said pressure) and into the conveyer 12. Also the downward movement of the piston 41, drawing upon the connection 45, rocks the working beam 47 in the direction indicated by the arrow in Fig. 1, and thereby raising the pumping-piston 42 and discharging the liquid above the same through the passage 40 and also into the conveyer 12. Thus the column of water in the conveyer 12 is raised into the valve-chamber 16, from whence it passes into the discharge-chamber 21 and thence through the discharge-pipe 22. When the main piston 8 approaches the limit of its stroke in the direction indicated by the arrow in Fig. 1, the cross-head 31 comes in contact with the upper shoulder 30 of the tappet-ring and moves said ring from the position indicated in full lines in Fig. 2 to that indicated in dotted lines, and thereby reverses the valves 19 and 20 to open the ports 17 and close the ports 18, and hence when the main piston starts upon its movement in the direction opposite to that indicated by the arrow in Fig. 1 pressure is exerted upon the liquid contents of the cylinder 10 and conveyer 12, and is communicated to the upper side of the pumping-piston 42, which is then located at the upper end of the cylinder 34. This downward pressure upon the piston 42 is communicated to the contents of the cylinder 34, thereby closing the valve 53 and expelling the water or other liquid through the conductor 35 and into the conveyer 11; but this downward motion of the piston 42 by actuating the working beam 47 in the opposite direction to that indicated by the arrow raises the piston 41, and thus closes the valve 38 and opens the valve 52 to allow an inflow of water from the suction-pipe 50 into the cylinder 33; also, the upward movement of the piston 41 discharges the liquid in the cylinder 33 above said piston and causes it to rise in the conveyer 11, while the water in the conveyer 11 escapes through the valve-ports 17 into the discharge-chamber 21 and thence through the discharge-pipe 22.

It is obvious that the main piston and operating mechanism may be located at the surface of the ground or at any point where it may be convenient to arrange it as remote from the well from which water is to be pumped, and the conveyers 11 and 12 may be made of any desired length to extend to the well and to the desired depth therein. The depressed portion of the pumping mechanism, which is located at or near the point from which the water is to be drawn, consists of the pumping-cylinders 33 and 34 with their coöperating pistons and the oscillating connection between said pistons consisting of the working beam 47. It will be seen that the auxiliary pumping mechanism, consisting, as above indicated, of the cylinders 33 and 34 and the coöperating parts, is of simple construction, involving only those check-valves which are necessary to cause the desired direction of the water in entering and leaving the pumping-cylinders, while the main pumping mechanism, which may be located contiguous to the driving-shaft, is accessible to enable the necessary adjustments and repairs to be made without inconvenience. The length of the conveyers 11 and 12, which communicate operating pressure to the pumping-pistons 41 and 42, does not materially affect the operation of the auxiliary pumping mechanism for the reason that water being practically an incompressible fluid is adapted for communicating the same to any desired distance. In other words, with the apparatus properly charged with liquid, the movement

of the main piston from a position of rest will communicate an equal pressure to one of the pumping-pistons, and thus will exert upon the contents of the pumping-cylinder a pressure practically equal to that which is exerted upon the contents of the main cylinder 10 to expel the contents of said pumping-cylinder into the conductor which is in communication therewith.

In order to insure the direct coöperation of the main and pumping pistons, and thus insure the efficient operation of the mechanism, I have found it desirable, in connection with the conveyers 11 and 12, to employ compensating or pressure-equalizing devices, whereby an excess of pressure in one conveyer may be communicated to the other, or, in other words, whereby an equal pressure may be maintained in both conveyers. The form of compensator which I have illustrated in Fig. 1 consists of a valve-casing 54, having chambers 55 and 56 in communication, respectively, by passages 57 and 58 with the conveyers 11 and 12. Connecting said chambers 55 and 56 are relief-ports 59 and 60, in operative relation with which are seated valves 61 and 62, of which the stems 63 and 64 pass through suitable stuffing-boxes and are pivotally connected at an interval with a compensating lever 65, provided with an adjustable counterbalancing-weight 66. The tendency of this weighted lever is to maintain both relief-valves seated, but an excess of pressure in the conveyer 11 over that in the conveyer 12 will cause the unseating of the valve 61 and the communicating of the excess of pressure to said conveyer 12, while an excess of pressure in the conveyer 12 will cause the unseating of the valve 62 and a corresponding communication of pressure to the conveyer 11. The adjustment of the weight 66 enables the movement of pressure necessary to unseat one of said relief-valves to be regulated.

In the modified construction of compensator illustrated in Figs. 4 and 5 separate valve-casings 55^a and 56^a are employed, each being in communication with both conveyers 11 and 12 and each having a valve 61^a and 62^a, of which the stems are connected with compensating levers 65^a. Also in the modified construction of compensator illustrated in Figs. 6 and 7 the valve-casing 54^b is provided with a central valve-chamber 56^b, is in communication by a passage 58^b with the conveyer 12, and an annular valve-chamber 55^b is in communication by a passage 57^b with the conveyer 11, a single valve 61^b being employed to close both of said chambers, being exposed to opening-pressure in a common direction from both chambers, and being yieldingly held seated by a compensating lever 65^b, provided with an adjustable weight 66^b.

From the above description it will be seen that the shifting of the conveyer-controlling valves 19 and 20 is accomplished while the valves are not subjected to liquid pressure due to the movement of the piston 8 in the main cylinder 10, for the reason that the cross-head 31 does not come in contact with one of the shoulders 29 and 30 until the piston 8, having reached the limit of its throw in one direction or the other, is at rest during the movement of the crank-pin across the dead-center line of the wheel. In other words, the movement of the crank over the dead-center line is utilized to actuate the valves, with the result that the valves may be shifted without being opposed by friction due to the pressure of the water.

Various changes in the form, proportion, and the minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of this invention.

Having described my invention, what I claim is—

1. In a pumping mechanism, the combination with separate pumping-cylinders, connected pumping-pistons, conveyers, and connections between the conveyers and the pumping-cylinders, a main cylinder in communication at opposite ends with said conveyers, a main piston operating in said main cylinder, valves for controlling the outlets of said conveyers, a cross connection between the conveyers, comprising a valve-casing, oppositely-opening valves in said casing, a common valve-seating device for said valves adapted to yieldingly resist pressure in the cross connection, of a rotary crank-wheel having connection with said main piston, a reciprocatory tappet-ring connected with said valves and provided with spaced shoulders 29 and 30, and a cross-head 31 carried by the crank-shaft for engagement successively with said shoulders when the main piston is at the limit of its throw, whereby the shifting of the valves is accomplished during the time that they are not exposed to liquid pressure, substantially as specified.

2. In a pumping mechanism, the combination with pumping-cylinders having valved suction-pipes, conveyers, each having direct communication with one of said pumping-cylinders at one end and valved connection with the other cylinder at the other outer end, connected pumping-pistons operating respectively in said pumping-cylinders, a main piston for applying pressure alternately to the contents of said conveyers, and operating connections between said valves and the main piston, of a compensator or pressure-equalizer having valve-chambers and passages connecting said conveyers with the chambers, valve-controlled ports communicating with the valve-chambers, a separate valve for each port and a common valve-seating device for yieldingly resisting pressure in the passages, substantially as specified.

3. In a pumping mechanism, the combination with separate fluid-conveyers, and means for applying pressure alternately to the contents of said conveyers, of a compensator or

pressure-equalizing device connecting said conveyers, and having valve-chambers respectively in communication with said conveyers, and connected by relief-ports, oppositely-opening relief-valves normally closing said ports, and a common compensating lever connected with the stems of said valves, substantially as specified.

4. In a pumping mechanism, the combination with pumping-cylinders having valved suction-pipes, conveyers having direct communication with said pumping-cylinders at one end and valved connection therewith at the other end, connected pumping-pistons operating in said pumping-cylinders, a main piston for applying pressure alternately to the contents of said conveyers, valves for controlling the outlets from the conveyers, and operating connections between said valves and the main piston, of a compensator or pressure-equalizing device connecting said conveyers and having valve-chambers respectively in communication with said conveyers and connected by relief-ports, oppositely-opening relief-valves for normally closing said ports, and a compensating lever connected with the stems of said relief-valves, substantially as specified.

5. In a pumping mechanism, the combination with pumping-cylinders having valved suction-pipes, conveyers having direct communication with said pumping-cylinders at one end and valved connection therewith at the other end, connected pumping-pistons operating in said pumping-cylinders, a main piston for applying pressure alternately to the contents of said conveyers, valves for controlling the outlets from the conveyers, and operating connections between said valves and the main piston, of a compensator or pressure-equalizing device connecting said conveyers and having valve-chambers respectively in communication with said conveyers and connected by relief-ports, oppositely-opening relief-valves for normally closing said ports, and a compensating lever connected with the stems of said relief-valves, and provided with an adjustable counterbalancing-weight, substantially as specified.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

JOHN OLSEN.

Witnesses:
DON H. PORTER,
PAUL HAMMER, Jr.