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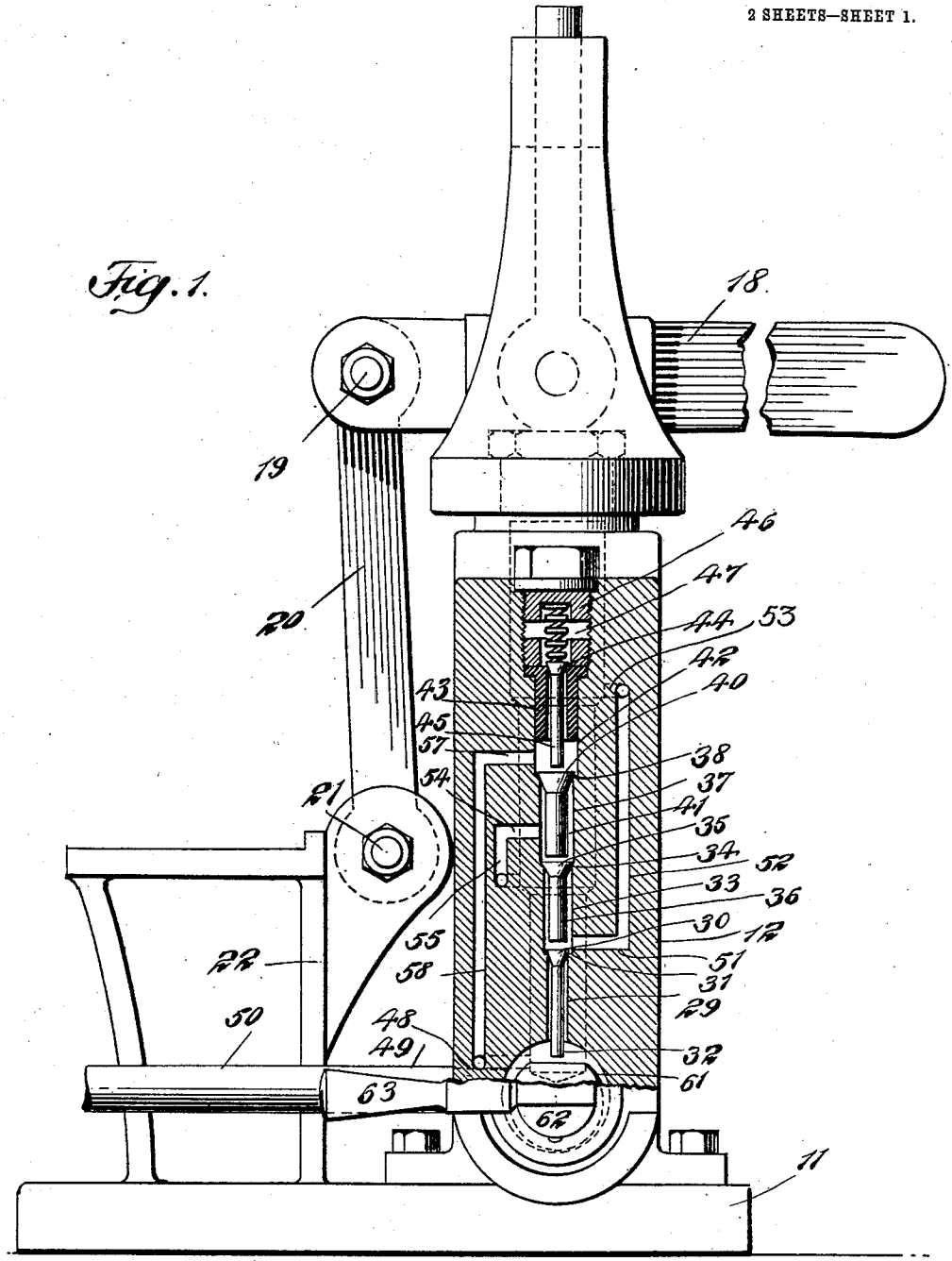
HYDRAULIC PUMP.

APPLICATION FILED FEB. 4, 1908.

904,557. **Patented Nov. 24, 1908.**

2 SHEETS—SHEET 1.

Fig. 1.



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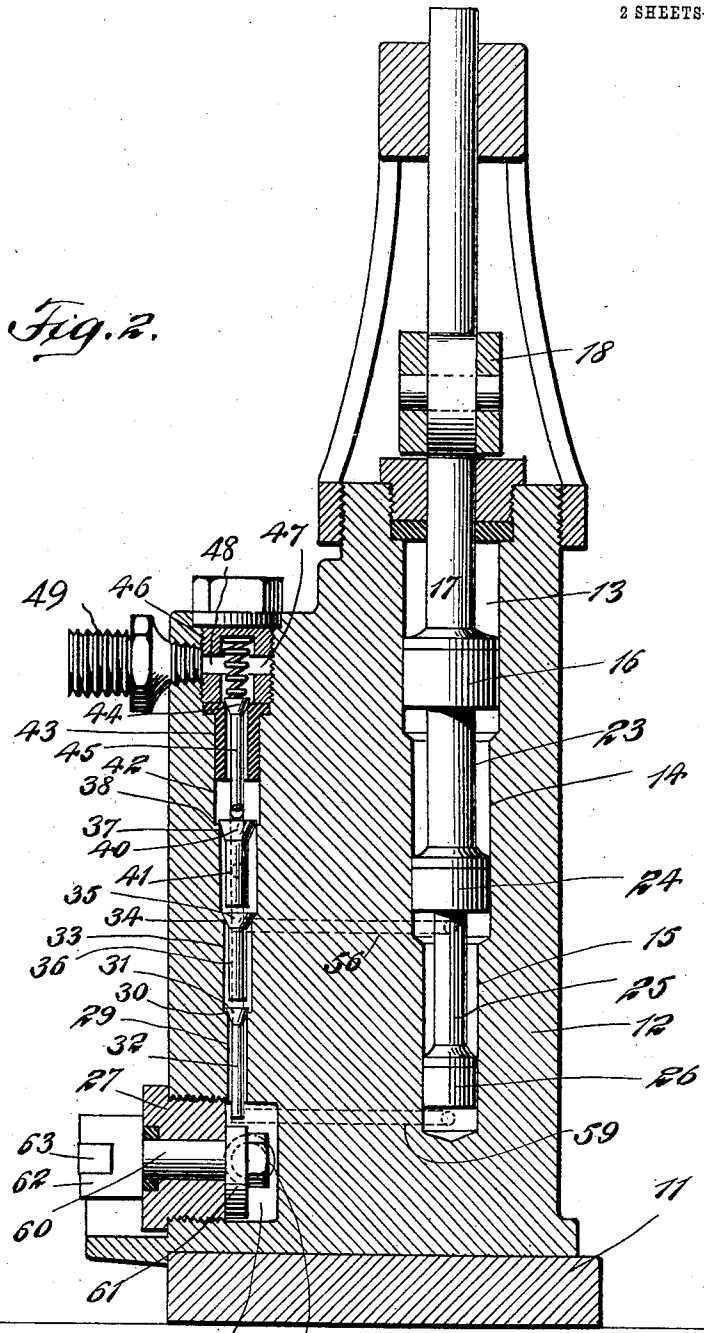
HYDRAULIC PUMP.

APPLICATION FILED FEB. 4, 1908.

904,557. Patented Nov. 24, 1908.

2 SHEETS—SHEET 2.

Fig. 2.



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HYDRAULIC PUMP.

No. 904,557. Specification of Letters Patent. Patented Nov. 24, 1908.

Application filed February 4, 1908. Serial No. 414,168.

To all whom it may concern:

Be it known that I, JAMES W. NELSON, a citizen of the United States, and a resident of the city of New York, borough of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Hydraulic Pumps, of which the following is a specification.

This invention relates to hydraulic pumps, with particular reference to pumps wherein a plurality of pistons are employed to force a large volume of liquid to the ultimate pressure chamber in order to rapidly raise the ram—or otherwise generate a certain degree of lesser preliminary pressure—after which the pistons may be one at a time rendered inoperative for the generation of pressure, in order to gradually increase the power at a correspondingly gradual sacrifice of speed under the well known principles of hydrostatics.

In a co-pending application, filed October 29, 1907, Serial No. 399,739, I have shown and described a single-piston pump with the pump and pressure valves—for reasons set forth therein—downwardly seating in a separate valve bore. In another co-pending application, filed February 7, 1908, Ser. No. 414,668, I have shown and described a similar valvular arrangement as applied to a double-piston pump. In the last-mentioned application, it was explained that the inversion of the valve-action from that shown and described by me in a prior patent, No. 874,698, dated December 24, 1907, necessitated a novel arrangement of the ducts connecting the valve bore with the respective pump or piston chambers. For the same general reasons, the employment of three or more pumps, or three or more pistons in the same pump—in following out the same general system of valvular arrangement and control as set forth in the applications and patent aforesaid—necessitates a still different manner of providing the connecting ducts in the pump block.

The object of the present invention is, primarily, the adaptation of the superposed arrangement of inverted valves, as shown and described in my co-pending applications aforesaid, to three or more pumps, or to a pump having three or more pistons.

My invention will be more readily understood by reference to the accompanying drawings, forming a part of this specification, in which

Figure 1 is a sectional elevation of a triple-piston pump embodying my invention, and Fig. 2 is an enlarged transverse central section through the pump block.

Referring now to the drawings in detail, numeral 11 refers to a supporting base-plate, to which is suitably secured the preferably cylindrical pump-block 12. This pump-block is provided with a central bore extending from the top to a point near the bottom of said block, the upper portion 13 of said bore being of greatest diameter and the lowest portion 15 thereof being of smallest diameter, with a portion 14 intermediate thereof, of a diameter less than the upper and greater than the lower portions of said bore. Fitting within the upper portion 13 of said bore, is a piston 16 mounted upon a piston-rod 17 projecting above the top of the pump-block and suitably pivoted to a pump lever 18 fulcrumed at 19 to the link 20 which is, in turn, pivoted to the bracket 21 on the standard 22. An extension 23 of said piston-rod 17, projecting from the piston-head 16, carries the piston 24, snugly fitting in the portion 14 of the pump bore, and from the piston head 24 projects a further extension 25 of said rod, mounted on the end of which is the piston-head 26 snugly fitting within the lower and smallest portion 15 of said bore. These pistons are each preferably provided with suitable packing, although, as this is common and well-known expedient and forms no part of this invention, the same is not shown in the drawings.

The pump-block 12 is provided with a lateral bore the end of which is sealed by means of the screw-plug 27 to form the interior chamber 28. The pump-block is further provided, located laterally of the pump-bore, with a vertical bore extending from the top of said block to and terminating in said chamber 28. This last-mentioned bore is of varying diameters, the lower portion 29 thereof being of smallest diameter which is abruptly increased at 30 to provide a seat for the valve 31 which has a stem 32 extending downwardly and projecting into the chamber 28. A short distance above the valve 31, the widened portion 33 of said bore is again increased in diameter to provide a seat 34 for the valve 35 which has a stem 36 extending downwardly nearly but under normal conditions not quite to the valve 31. The portion 37 of said bore, above the valve 35, is at 38 again increased in di-

ameter to provide a seat for the valve 40 which has a stem 41 extending downwardly nearly but under normal conditions not quite to the valve 35. Above the valve-seat 38, the portion 42 of said bore is of still greater diameter, but in order to reduce the effective area of said bore, and for other reasons, I mount in this portion 42 the removable valve-plug 43, the top of which provides a seat for the valve 44 which has a stem 45 extending downwardly nearly but under normal conditions not quite to the valve 40. A screw-plug 46 closes and seals the top of this valve bore and provides a chamber 47 therein above the valve 44. A lateral duct 48 in said pump-block leads from the chamber 28 to the coupling or connection 49, to which may be suitably secured the end of a preferably flexible tube or conduit 50 from any suitable source of liquid supply. From the portion 33 of the valve-bore, between the valves 31 and 35, leads a lateral duct 51 which has a vertical extension 52 and a further lateral extension 53 which leads to the bottom of the chamber 13 below the upper and larger piston. From the portion 37 of the valve-bore, between the valves 35 and 40, leads the lateral duct 54 having the short vertical extension 55 and the further horizontal extension 56 which leads to the chamber 14 below the middle piston. Similarly, from the portion 42 of said bore, between the valves 40 and 44, leads the lateral duct 57 having the vertical extension 58 and the final horizontal extension 59 leading to the chamber 15 below the lowest and smallest piston.

It will now be apparent that upon the upstroke of the pump lever 18, and therewith the pistons 16, 24 and 26, partial vacuums will be created in the pump-chambers underneath said piston, and the inequality of pressures thus created will cause the liquid to flow from the source of supply through the tube or conduit 50 into the chamber 28, through the portion 29 of the valve-bore and past the valve 31, which it unseats, and into the portion 33 of the said bore. Here the liquid is divided, a portion being drawn into the duct 51 and thence to the chamber 13 below the uppermost and largest piston, and a portion flowing upwardly through the portion 33 of the valve 35, which it unseats, and into the portion 37 of said bore. Here it is again divided, a portion entering the duct 54 and flowing thence to the chamber 14 below the middle piston, and the other portion flowing upwardly through the portion 37 of the valve-bore, past the valve 40, which it unseats, into the duct 57 and thence to the chamber 15 below the lowest and smallest piston.

Upon the down-stroke of the pump lever 18, and therewith the three pistons, the pressure within the lowest pump chamber, in connection with the force of gravity, will seat the valve 31, and the liquid will be forced upwardly, from all of the pump chambers, through the valve-bore, past the valve 44, which will be unseated, into the chamber 47 and thence through the duct 48, the coupling or connection 49 to which a suitable pipe or conduit (not shown in the drawings) may be secured in the usual manner and which leads to the ultimate pressure chamber or to the desired means for rendering the pressure available for practical purposes.

Centrally journaled in the screw plug 27, is the short shaft 60, the inner end of which projects into the chamber 28 and is therein provided with a cam 61 in coöperative positional relation to the end of the stem 32 of the valve 31. The exterior end of said shaft 60 is provided with a head 62 or other means for suitably securing thereto the lever 63 by means of which said shaft 60 may be conveniently rotated. Under normal conditions, the cam 61 is non-interferent with automatic action of the valve 31 and, therefore, with automatic action of any of the valves in the series.

When it becomes necessary or desirable to increase the power at a sacrifice of the volume of liquid which is being transmitted to the pressure chamber, the lever 63 is turned through an arc sufficient to cause the cam 61 to impinge against the stem 32 and raise the same to positively unseat the valve 31. It will be seen that under these conditions the lowest and middle pistons alone are operative. The valve 35 now checks back flow from said lower and middle pump chambers in a manner precisely similar to that in which, under normal conditions, the valve 31 checked back flow from all of said pump chambers. The valve 31 being now held off its seat, an open passage is provided from the uppermost and larger pump chamber to the source of supply, and under operation of this uppermost piston the liquid will merely flow idly back and forth, to and from the source of supply. If it is desired to still further increase the power at a still further sacrifice of speed the lever 63 is turned through a slightly greater arc, causing the cam 61 to raise the valve 31 to a point where it impinges against the stem 36 and unseats the valve 35. Open passages are now provided from both the uppermost and middle pump-chambers to the source of supply, the valve 40 retaining its automatic function and checking back flow from the lowest and smallest pump-chamber the piston in the latter alone thus remaining effectively operative. By turning the lever 63 through a still greater arc, the cam 58 will operate through the successive valve-stems to finally unseat the valve 44 and, therefore, hold off their seats all of the four valves in the series.

An open passage is now provided through the valve-bore from the pressure chamber back to the source of supply, by means of which the pressure in said chamber is relieved. It will be noted, therefore, that the same actuating means—namely, the lever 63, the shaft 60 and the cam 61—are operable, first, to render the largest pump alone inoperative; second, to render the largest and the next largest pumps inoperative; third, to render all three pumps inoperative; and fourth, to unseat all valves and relieve the pressure in the ultimate pressure chamber.

In a double piston type of pump, with the valves seating downwardly in a separate and vertical valve bore, as was shown by me in my co-pending application, Serial No. 414,668, aforesaid, the lowest valve must control backflow from the upper pump chamber, while a higher valve in said series checks back-flow from the lower pump chamber, necessitating what may be termed a transposition of the connecting ducts between pump and valve bores. In applying this arrangement of superposed, downwardly-seating valves to a triple-piston pump, it will be apparent that a somewhat more elaborate transpositional arrangement of the connecting ducts, as herein shown and described, is necessary, in view of the fact that the lowest valve of the series must check back flow from the uppermost pump-chamber, the next higher valve check back-flow from the middle or intermediate pump-chamber, and the next higher check back-flow from the lowermost pump chamber—the final pressure valve being the highest in the series.

While I have herein shown and described a triple pump having the pistons arranged in tandem order, it will be apparent that my invention is equally applicable to a triple pump having any other arrangement of pistons, and also to the combination with three separate pumps providing said pumps act jointly or severally to force liquid in an upward direction through a common said valve-bore. Furthermore, it will be apparent that my invention may be made applicable to any desired number of pumps.

Many other modifications of minor details of my improved hydraulic pump will doubtless readily suggest themselves to those skilled in the art to which it appertains, and I therefore do not mean to limit my invention to the specific construction and application herein shown and described.

I claim as new and desire to secure by Letters-Patent:

1. A device for generating hydraulic pressure comprising at least three pumps, a series of downwardly-seating valves, and means acting upon one of said valves to unseat said valve only or two or more of said valves.

2. A device for generating hydraulic pressure comprising at least three pumps having common actuating means, a series of downwardly-seating valves, and means acting upon one of said valves to unseat said valve only or two or more of said valves.

3. A device for generating hydraulic pressure comprising at least three pumps, a series of downwardly-seating valves, and means for unseating one of said valves and thereby render one of said pumps inoperative, said means being further operable to unseat two or more of said valves and render a corresponding number of said pumps inoperative.

4. A device for generating hydraulic pressure comprising at least three pumps having common actuating means, a series of downwardly-seating valves and means for unseating one of said valves and thereby render one of said pumps, inoperative, said means being further operable to unseat two or more of said valves and render a corresponding number of said pumps inoperative.

5. A device for generating hydraulic pressure comprising at least three pumps and having all valves arranged in a vertical series, and means acting upon the lowest valve to positively unseat said valve only or two or more of said valves.

6. A device for generating hydraulic pressure comprising at least three pumps having common actuating means and having all valves arranged in a vertical series, and means acting upon the lowest valve to positively unseat said valve only or two or more of said valves.

7. A device for generating hydraulic pressure comprising at least three pumps, a series of downwardly-seating valves and means acting against one of said valves to unseat said valves successively and thereby render said pumps successively inoperative, the last valve unseated effecting the relief of the pressure at the point of application.

8. A device for generating hydraulic pressure comprising at least three pumps having common actuating means, a series of downwardly seating valves and means acting against one of said valves to unseat said valves successively and thereby render said pumps successively inoperative, the last valve unseated effecting the relief of the pressure at the point of application.

9. A device for generating hydraulic pressure comprising at least three pumps, a passage for the flow of liquid communicating with but not including the pump-chambers, valves in said passage to normally effect the flow of liquid in an upward direction therethrough, and means for unseating one or more of said valves to render inoperative one or more of said pumps.

10. A device for generating hydraulic pressure comprising, at least three pumps of

different capacities, a passage for the flow of liquid communicating with but not including the pump-chambers, valves in said passage to normally effect the flow of liquid in an upward direction therethrough, and means for unseating one of said valves to render the larger inoperative.

11. A device for generating hydraulic pressure comprising at least three pumps of different capacities, a passage for the flow of liquid communicating with but not including the pump-chambers, valves in said passage to normally effect the flow of liquid in an upward direction therethrough, and means for unseating one or more of said valves to render inoperative said pumps from the largest to the smallest successively.

12. A triple piston hydraulic pump having a passage for the flow of liquid communicating with but not including the pump chambers, valves in said passage to normally effect the flow of liquid in an upward direction therethrough, and means for successively unseating said valves in order from the lowest to the highest and thereby successively rendering inoperative said pumps in inverse order.

13. A triple-piston hydraulic pump having a fluid-passage not including the pump chambers and having all valves located in said passage and downwardly seating therein, and means for unseating one or more of said valves to render ineffective operations of one or more of said pistons.

14. A triple-piston hydraulic pump having a passage for the flow of liquid communicating with but not including the pump chambers, valves in said passage to normally effect the flow of liquid in an upward direction therethrough, and means for successively unseating said valves in order from the lowest to the highest and thereby successively rendering inoperative said pumps in inverse order and finally relieve the pressure at the point of application.

15. A triple-piston hydraulic pump having a fluid-passage not including the pump chambers and having all valves located in said passage and downwardly seating therein, and means for unseating one or more of said valves to render ineffective operation of one or more of said pistons and finally relieve the pressure at the point of application.

16. A triple-pump hydraulic pressure generator having a fluid-passage not including the pump chambers, a series of downwardly-seating valves in said passage and means for unseating one, two or more of said valves to render inoperative one, two or more of said pumps.

17. A triple-pump hydraulic pressure generator having a fluid-passage not including the pump chambers, a series of downwardly-seating valves in said passage and means for unseating one, two or more of said valves to render inoperative one, two or more of said pumps and finally relieve the pressure at the point of application.

18. A triple-piston hydraulic pump having a valve-bore separate from but communicating with the pump-chambers, a series of downwardly-seating valves in said bore, and means for unseating said valves to establish communication between the source of liquid supply and one or more than one of said pump chambers.

19. A triple-piston hydraulic pump having a valve-bore separate from but communicating with the pump-chambers, a series of downwardly-seating valves in said bore, and means for unseating said valves to establish communication between the source of liquid supply and one or more than one of said pump chambers and finally between said source of supply and the ultimate pressure chamber.

20. A triple-piston hydraulic pump having a common passage valved to normally effect the flow from all pumps in an upward direction therethrough, and means for controlling said valves to render one or more of said pumps inoperative.

21. A triple-pump hydraulic pressure generator having a common passage valved to normally effect the flow from all pumps in an upward direction therethrough, and means for controlling said valves to render one or two or all of said pumps inoperative.

22. A triple-pump hydraulic pressure generator having a common passage valved to normally effect the flow from all pumps in an upward direction therethrough and means for unseating said valves to render one, two or all of said pumps inoperative and finally relieve the pressure at the point of application.

23. A triple-pump hydraulic pressure generator having a common passage valved to normally effect the flow from all pumps in an upward direction therethrough, means for successively unseating said valves to successively render one, two or all of said pumps inoperative.

24. A triple-pump hydraulic pressure generator having a common passage valved to normally effect the flow from all pumps in an upward direction therethrough, means for successively unseating said valves to successively render one, two or all of said pumps inoperative and finally relieve the pressure at the point of application.

25. A triple-pump hydraulic pressure generator having a separate valve-bore and a series of pump valves in said bore, the inlet port to said valves being located below the outlet port therefrom when the device is in a vertical position, and means acting against the lowest valve to unseat said valve only or all of said valves successively.

26. A hydraulic pressure generator com-

prising three vertically alined pumps of different capacities, a separate valve-bore and valves in vertical arrangement therein, said valves checking back flow from said pumps in inverse order respectively, and means for controlling said valves.

27. A hydraulic pressure generator comprising three vertically alined pumps of different capacities, a separate valve-bore and a series of four valves in vertical arrangement therein, three of said valves checking back flow from said pumps in inverse order respectively and one checking back-flow from the pressure chamber, and means for controlling said valves.

28. A hydraulic pressure generator comprising three vertically alined pumps of different capacities, a separate valve-bore and valves in vertical arrangement therein, said valves checking back flow from said pumps in inverse order respectively, and means for successively unseating said valves to successively render said pumps inoperative.

29. A hydraulic pressure generator comprising three vertically alined pumps of different capacities, a separate valve-bore and a series of four valves in vertical arrangement therein, three of said valves checking back flow from said pumps in inverse order respectively and one checking back-flow from the pressure chamber, and means for successively unseating said valves to successively render inoperative said pumps from the largest to the smallest in order.

30. A hydraulic pressure generator comprising three vertically alined pumps of different capacities, a separate valve-bore and a series of four valves in vertical arrangement therein, three of said valves checking back flow from said pumps in inverse order respectively and one checking back flow from the pressure chamber, and means for successively unseating said valves to successively render inoperative said pumps from the largest to the smallest in order and finally relieve the pressure at the point of application.

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Witnesses:
H. CROCKER,
JAS. MOORE.