J. W. NELSON.

HYDRAULIC PUMP.

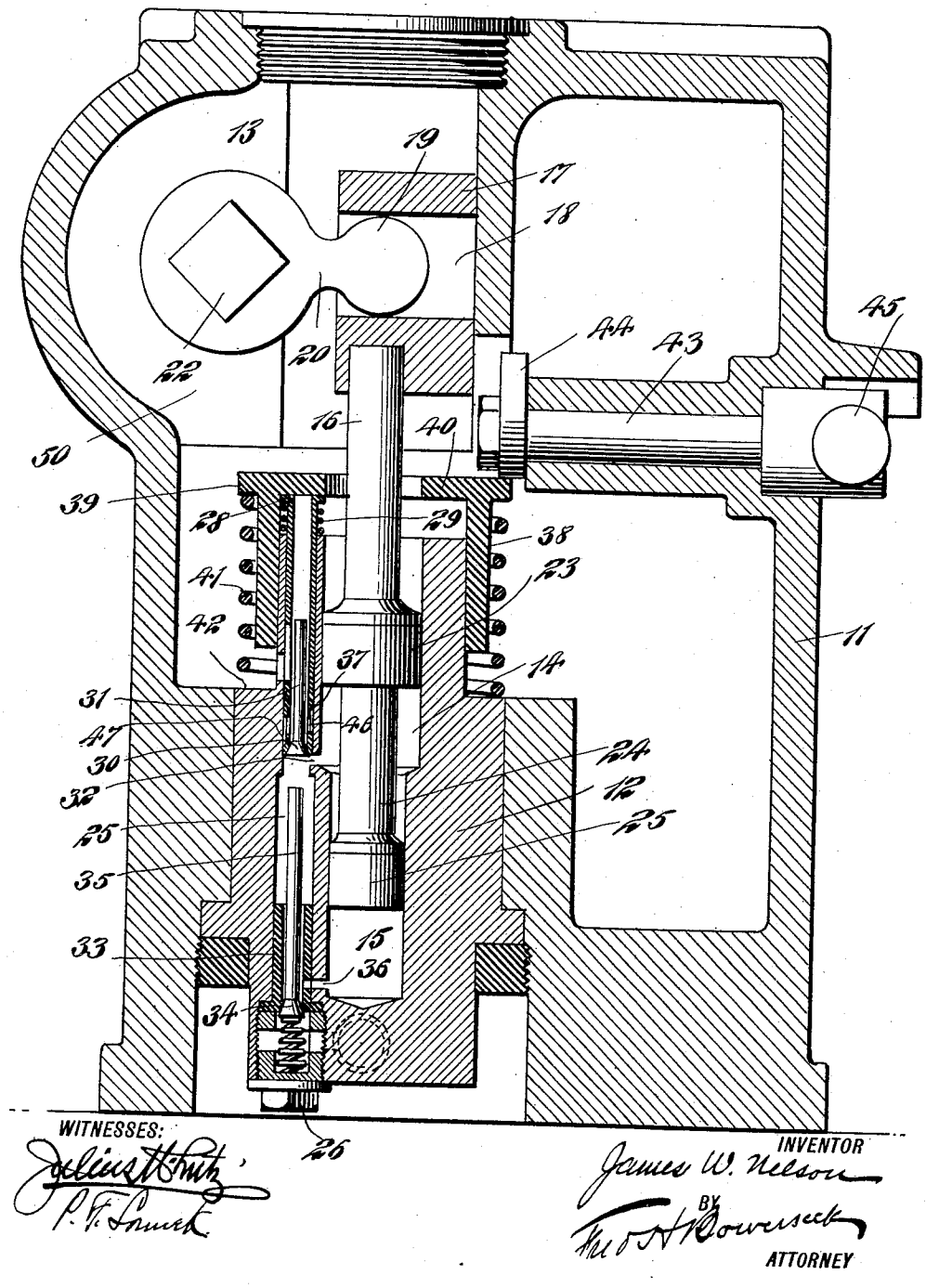
APPLICATION FILED JAN. 31, 1908.

909,647.

Patented Jan. 12, 1909.

3 SHEETS—SHEET 1.

Fig. 1.



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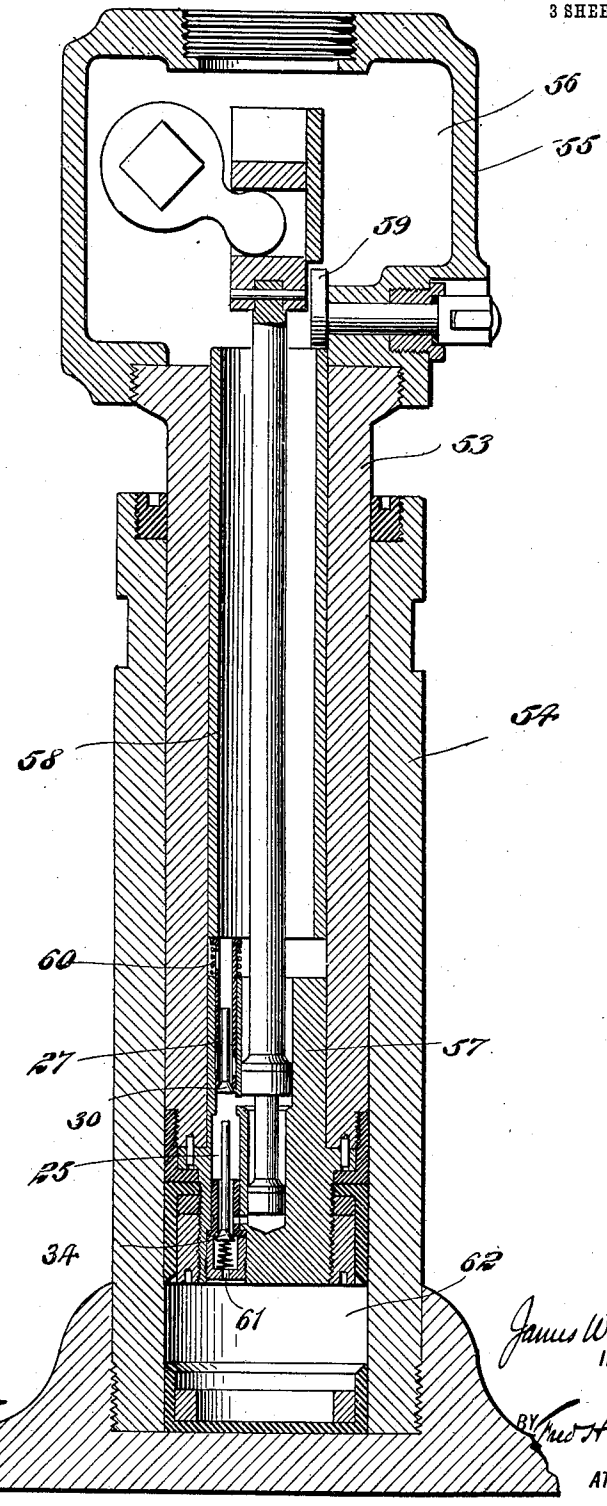
HYDRAULIC PUMP.

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3 SHEETS—SHEET 2.

Fig. 2.



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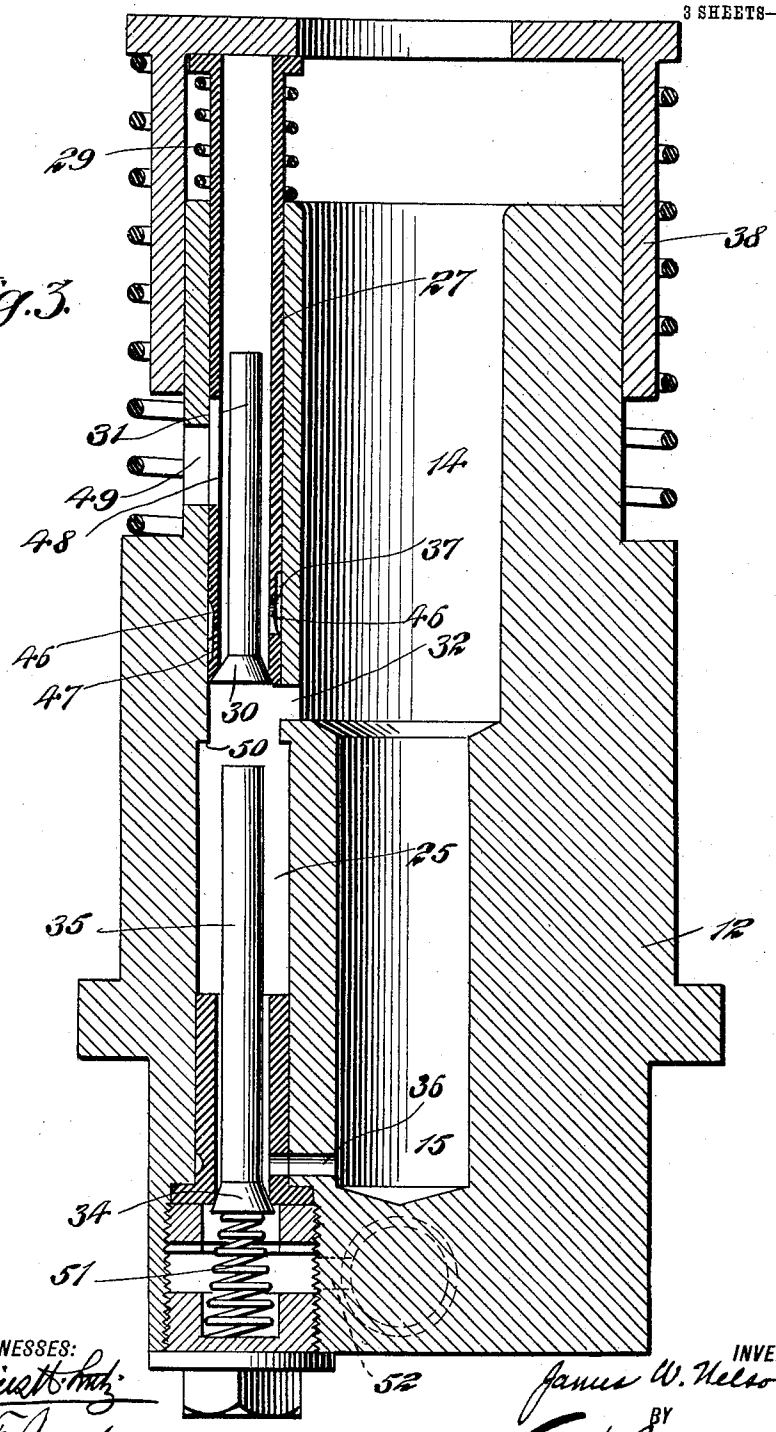
HYDRAULIC PUMP.

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3 SHEETS—SHEET 3.

Fig. 3.



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HYDRAULIC PUMP.

No. 909,647. Specification of Letters Patent. Patented Jan. 12, 1909.

Application filed January 31, 1908. Serial No. 413,544.

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 more particular reference to the valves of a device of this character and means for their control.

With what is known as a double-pump jack—that is, a jack having two pumps of different capacities, both being utilized for purposes of speed to bring the ram up to the point where it receives the full weight of the load, after which the larger of said pumps is rendered effectively inoperative, whereby speed is sacrificed for increased power under the well-known principles of hydrostatics—a total of five valves was for a long time considered essential. As is well known, the valves are doubtless the weakest parts of a device of this character, being almost invariably the first parts to get out of order or repair, frequently causing trouble and delay, and necessitating dismemberment of the jack for their removal for repair or replacement. With this idea in mind, the total number of valves necessary for the successful operation of a double-pump hydraulic jack, was ultimately reduced to four, and more recently (as shown and described by me in an earlier patent, No. 874,698, dated December 24, 1907) to three valves, which, when free to perform their automatic functions, rendered both of the pumps effectively operative, but which were subject to manual control to effect, first, rendering one of said pumps inoperative to sacrifice speed for power in the manner referred to, or, second, to render both of said pumps inoperative, as might be desirable, among other conditions, when the pumps were driven by power and it was desirable to temporarily cease the application of increased pressure without checking the pump-actuating means, or, third, to open all three of said valves and thus relieve the pressure in the ram or pressure chamber and open an unobstructed passage from said chamber back to the reservoir or other source of liquid supply.

The present invention primarily contemplates still further reducing the number of valves necessary for the proper operation of a double-pump hydraulic jack to two, these two valves, under normal conditions rendering effective the operations of both pumps, but being provided with controlling means operable, first, to render ineffective the stroke of one of the pistons, or, second, to render ineffective the strokes of both pistons, or, third, to relieve the pressure in the pressure chamber and permit of the lowering of the ram.

By reference to my earlier patent of December 24, 1907, aforesaid, it will be seen that when both pumps are effectively operative, the middle of the three valves performs no useful function. In fact, under these conditions, the double-pump jack is really nothing more than a single-pump jack the piston of which has an effective area equal to the combined effective areas of the two pistons shown and described. Therefore, when both of said pistons are effectively operative, the middle valve of the series of three shown and described may be eliminated. It will now be apparent that if the upper valve were bodily and operatively transferred to a point in the valve-bore between the ducts to the pump chambers and at the same time leave open a passage from the upper pump chamber to the cource of liquid supply, the lower and smaller piston alone will be effectively operative, the result being the same as that occurring when the upper of the series of three valves is held off its seat.

The principal object of this invention is the provision of means, under easy control, for changing the location of the upper of two valves in the valve bore to a point when it checks back flow from the lower or smaller pump alone, instead of from both pumps, and this without closing the passage between the upper or larger pump and the source of liquid supply. In this manner the middle valve of the series shown and described by me in the patent aforesaid may be eliminated, and I will have a double-pump jack with but two valves, yet which is capable of performing every useful function required of this type of device.

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 central sectional elevation of what is known as the horizontal type of hydraulic jack embodying my invention; Fig. 2 is a central sectional elevation of a so-called vertical type of jack embodying the same invention, and Fig. 3 is a sectional view of the pump-block, valves and valve-controlling means shown in Fig. 1, on an enlarged scale, with the upper valve in its changed location.

Referring now to the drawings in detail, and first to the construction shown in Figs. 1 and 3, numeral 11 refers to the shell or casing of a so-called horizontal type of jack, which preferably includes the cylinder for the ram, but as these members form no part of the present invention they are not illustrated in the drawings. Preferably removably mounted in the base of this shell or casing 11 is the pump-block 12, closing and sealing the opening through which it is inserted and being of such dimensions that the chamber 13 is provided above the same which constitutes a storage reservoir for the liquid employed and provides space for the interior pump-operating mechanism.

The pump-block 12 is provided with a central pump-bore which comprises an upper portion 14 of relatively larger diameter and a lower portion 15 of relatively smaller diameter. A piston rod 16 is provided with a head 17 in which a socket 18 is adapted to receive a knuckle 19 at the end of a short arm 20 fixed upon the rock-shaft 22 which has suitable bearings in the shell or casing 11. This shaft 22 projects to the exterior of said casing, where it is connected with a suitable operating lever, or other actuating means, not shown in the drawings. Upon the piston-rod 16 is mounted a piston 23 snugly fitting within the portion 14 of the pump-bore, while an extension 24 of said piston-rod carries the smaller piston 25 snugly fitting within the lower portion 15 of said pump-bore. The pistons are preferably provided with suitable packing, which being a common and well known expedient, is not shown in the drawings. The pump-block 12 is provided with another longitudinal bore 25, which extends completely through said pump-block, the lower end thereof being closed and sealed by means of the screw-cap 26. Snugly fitting within the upper portion of this bore 25 and slidable therein, is the tube 27, the upper end of which is provided with the flange 28 between which and the top of the pump-block 12 a suitable spring 29 is under compression. The lower end of the tube 27 provides a seat for the valve 30, which preferably has a guiding stem 35 extending upwardly in said tube. When said tube 27 is in its normal or most elevated position, the lower end thereof is just above a duct 32 which connects the bore 25 with the bottom of the chamber 14 below the larger piston 23. Below the duct 32, the diameter of the bore 25 is abruptly increased, for a purpose which will hereinafter be made clear, and in the lower end of this enlarged portion of the bore 25, I prefer to insert a removable cylindrical valve-plug 33, the lower end of which provides a seat for the valve 34 which has a stem 35 projecting upwardly nearly but not quite to the point where the diameter of the bore 25 changes. Just above the valve 34, a duct 36 provides communication between said bore 25 and the bottom of the chamber 15 below the smaller piston 25. The valve 34, if desired, may be spring-seated, as shown.

Near the lower end of the tube 27 is provided the lateral and preferably longitudinally elongated aperture 37. In the position indicated in Fig 1, this aperture, obviously, serves no useful purpose, but when said tube 27 is depressed, in the manner hereinafter described, this aperture 37 is adapted to register with the duct 32 and open a passage from the pump-chamber 14 to the interior of said tube 27 above the valve 30.

Loosely fitting over the upper and preferably reduced portion of the pump-block 12, is the sleeve or collar 38 provided at its upper end with an exterior flange 39 and a preferably somewhat wider interior flange 40. This sleeve or collar 38 is normally retained in its elevated position by means of a suitable spring 41 in compression between the exterior flange 39 and the shoulder 42 on said pump-block. The interior flange 40 projects over and upon longitudinal movement of said collar is adapted to engage the flanged upper end of the tube 27.

Suitably journaled in the shell or casing 11 is the shaft 43 at the inner end of which is suitably mounted a cam 44 in coöperative positional relation to the exterior flange 39 on the sleeve or collar 38. This shaft 43 is rotated by means of a lever 45, on the outside of the casing, and by such rotation the cam 44 may be operated to depress the collar 38 against the action of the spring 41, the latter serving to return said collar to its normally elevated position when the same is relieved of the overcoming pressure of said cam.

It will be apparent that the cam 44 may be operated to depress the collar 38, carrying therewith the tube 27, until the aperture 37 in the side of said tube registers with the duct 32. In such position, the valve 30 has been depressed with said tube to a plane slightly below the top of the enlarged portion of the bore 25, but does not contact with the stem 35 of the valve 34, the latter being free to perform its functions in the usual manner, as shown in Fig. 3. Further rotation of the cam 44 will continue down-

ward movement of the tube 27 until the lower end of the longitudinal groove 47 in said tube clears the shoulder 50, where the diameter of the bore 25 is increased. At the upper end of this longitudinal groove or channel 47 is a communicating annular groove 46 which includes the aperture 37 in the tube 27. In this position, the valve 34 remains seated, under the excess of pressure below the same, but an open passage has been provided from the chamber 15 underneath the lower piston through the lower portion of the bore 25, the grooves 47 and 46, the aperture 37 and the upper portion of the bore 25 to the source of liquid supply. The aperture 37 being longitudinally elongated, as stated, the passage described from the chamber 14 to said source of supply remains open. Still further rotation of the cam 44 will effect engagement between the valve 30 and the top of the stem 35 of the valve 34 and force the latter off its seat, thus opening a passage from the pressure chamber to the source of supply—the passages from the pump chambers to the same point remaining open.

To provide for the entrance of liquid to the tube 27, and, therefore to the pump chambers, and at the same time to avail myself of the maximum capacity of the reservoir, I have shown an aperture 49 in the wall of the pump-block 12 with which a corresponding aperture 48 in the tube 27 is adapted to register. When the device is to be used in a horizontal position only, it will be seen that the tube 27 alone may be apertured at a point above the top of the pump-block, but when the device is used in a vertical position, the provision of the lower registering apertures, as shown, renders available a larger volume of liquid if from a contained source of supply.

It will now be apparent that with the various parts in the positions of adjustment indicated in Fig. 1, upon the upstroke of the pistons, liquid will flow from the reservoir 13 above the pump-block, or from other suitable source of supply, through the aperture 49 in said block and the registering aperture 48 in the tube 27, into the bore 25 and thence past the valve 30, which it unseats, into the chambers 14 and 15 below the respective pistons. Upon the downstroke of said pistons, the excess of pressure will seat the valve 30 and unseat the valve 34, the liquid being forced into the chamber 51 in the bore 25 below the valve 34 and thence through the duct 52 and its connections to the ultimate pressure chamber. When the ram has been raised to the point where it receives the full weight of the load, or it is otherwise desired to utilize the pressure of the smaller pump only, the cam 44 is rotated in the manner described to depress the tube 27 until the aperture 37 registers with the duct 32, in which position, as explained, the valve 30 is non-interferent with automatic action of the valve 34. It will now be apparent that upon the up-stroke of the piston, the liquid which enters the chamber 14 through the aperture 37 above the valve 30 (see Fig. 3) will, upon down-stroke of said piston flow back through said aperture and to the source of supply. The liquid which enters the chamber 15 below the smaller piston, which in its flow has unseated the valve 30, will upon down-stroke of said pistons, seat said valve 30 and be forced past the valve 34 to the pressure-chamber. Under these conditions, it will be apparent, the lower pump only is effectively operative. To render both pumps inoperative without, however, relieving the pressure below the valve 34, rotation of the cam 44 is continued until the bottom of the groove 47 has cleared the shoulder 50, whereupon, in the manner explained, open passages have been provided from both pump chambers to the source of supply, through which the liquid will be idly forced, back and forth, under pressure insufficient to unseat the valve 34. To relieve the pressure in the ram-chamber, and lower the ram for removal or readjustment of the device, the cam 44 is still further rotated to further depress the tube 27 and cause the valve 30 to impinge against the top of the stem 35 and force the valve 34 off its seat, thus opening a passage, in the manner explained, from the pressure chamber to the reservoir or the source of supply, and leaving open the passages from pump chambers to said supply-source. As the cam 44 is returned to its normally inoperative position, the springs 29 and 41 serve to return the tube 27 and the collar 38, respectively, to their normally raised positions, restoring to the valves 30 and 34 their originally-described functions.

In Fig. 2, I have illustrated the application of my invention to a self-contained double-pump hydraulic jack of what is known as the vertical type. In this type of jack, the ram 53 slides vertically in the ram-chamber 54 and is provided with a head 55 providing the reservoir 56 for the liquid employed and a chamber for the pump-operating mechanism. In this type of jack the pump-block 57 is mounted within and forms a part of the ram. On account of the necessarily greater distance between the top of the pump-block and the actuating mechanism in the head of the jack, instead of employing a short push-tube a longer tube 58 is employed, the lower end of which rests upon the top of the tube 27, while the other end of the tube 58 is in coöperative positional relation to the cam 59, which may be operated in a precisely similar manner to the cam 44 in the construction shown in Figs. 1 and 3. In the construction shown in Fig. 2, the

spring 60 is sufficiently powerful to normally raise the tube 27 and the tube 58 resting thereupon. In this construction, furthermore, the chamber in the valve-bore 25 below the valve 34 has a lower aperture 61 open to the pressure-chamber 62 below the ram. Apart from the above, however, other features of the invention, in this construction, are identical in all respects to those shown and described in connection with Figs. 1 and 3.

It will be apparent that the principles involved in my invention may as well be employed in connection with other forms of pumps and jacks, and with other arrangements of pumps or pistons, and other modifications of minor details will doubtless readily suggest themselves to those skilled in this art. I therefore do not limit my invention to the specific construction, arrangement and applications herein shown and described.

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

1. A device for generating hydraulic pressure comprising a plurality of pumps, an equal number of valves, and valve-controlling means for rendering one of said pumps inoperative.

2. A device for generating hydraulic pressure comprising a plurality of pumps, an equal number of valves, and valve-controlling means for rendering one or more of said pumps inoperative.

3. A device for generating hydraulic pressure comprising a plurality of pumps, an equal number of valves, and valve-controlling means for rendering one or all of said pumps inoperative.

4. A device for generating hydraulic pressure comprising a plurality of pumps, an equal number of valves, and valve-controlling means for rendering said pumps successively inoperative.

5. A device for generating hydraulic pressure comprising a plurality of pumps, an equal number of valves, and means for rendering one of said pumps inoperative and for relieving the pressure at the point of application.

6. A device for generating hydraulic pressure comprising a plurality of pumps, an equal number of valves, and means for rendering one or more of said pumps inoperative and for relieving the pressure at the point of application.

7. A device for generating hydraulic pressure comprising a plurality of pumps, an equal number of valves, and means for rendering one or all of said pumps inoperative and for relieving the pressure at the point of application.

8. A device for generating hydraulic pressure comprising a plurality of pumps, an equal number of valves, and valve-controlling means for rendering one of said pumps inoperative and for relieving the pressure at the point of application.

9. A device for generating hydraulic pressure comprising a plurality of pumps, an equal number of valves, and valve-controlling means for rendering one or more of said pumps inoperative and for relieving the pressure at the point of application.

10. A device for generating hydraulic pressure comprising a plurality of pumps, an equal number of valves, and valve-controlling means for rendering one or all of said pumps inoperative and for relieving the pressure at the point of application.

11. A device for generating hydraulic pressure comprising a plurality of pumps, an equal number of valves, and valve-controlling means for rendering one of said pumps inoperative, said means being further operable to render inoperative more than one of said pumps.

12. A device for generating hydraulic pressure comprising a plurality of pumps, an equal number of valves, and valve-controlling means for rendering one of said pumps inoperative, said means being further operable to relieve the pressure at the point of application.

13. A device for generating hydraulic pressure comprising a plurality of pumps, an equal number of valves, and valve-controlling means for rendering inoperative one of said pumps, said means being further operable to render inoperative all of said pumps and, finally, to relieve the pressure at the point of application.

14. A device for generating hydraulic pressure comprising a plurality of pumps having common actuating means, an equal number of valves, and valve-controlling means for rendering one of said pumps inoperative.

15. A device for generating hydraulic pressure comprising a plurality of pumps having common actuating means, an equal number of valves, and valve-controlling means for rendering one or more of said pumps inoperative.

16. A device for generating hydraulic pressure comprising a plurality of pumps having common actuating means, an equal number of valves, and valve-controlling means for rendering one or all of said pumps inoperative.

17. A device for generating hydraulic pressure comprising a plurality of pumps having common actuating means, an equal number of valves, and valve-controlling means for rendering said pumps successively inoperative.

18. A device for generating hydraulic pressure comprising a plurality of pumps having common actuating means, an equal number of valves, and valve-controlling means for rendering one or more of said

pumps inoperative and for relieving the pressure at the point of application.

19. A device for generating hydraulic pressure comprising a plurality of pumps having common actuating means, an equal number of valves, and valve-controlling means for rendering one or more of said pumps inoperative and for relieving the pressure at the point of application.

20. A device for generating hydraulic pressure comprising a plurality of pumps having common actuating means, an equal number of valves, and valve-controlling means for rendering one of said pumps inoperative, said means being further operable to relieve the pressure at the point of application.

21. A device for generating hydraulic pressure comprising a plurality of pumps having common actuating means, an equal number of valves, and valve-controlling means for rendering one of said pumps inoperative, said means being further operable to render inoperative all of said pumps and, finally, to relieve the pressure at the point of application.

22. A device for generating hydraulic pressure comprising two pumps, two valves only, and valve-controlling means for rendering one of said pumps inoperative.

23. A device for generating hydraulic pressure comprising two pumps, two valves only, and valve-controlling means for rendering one of said pumps inoperative and for relieving the pressure at the point of application.

24. A device for generating hydraulic pressure comprising two pumps, two valves only, and valve-controlling means for rendering one or both of said pumps inoperative and for relieving the pressure at the point of application.

25. A device for generating hydraulic pressure comprising two pumps, two valves only, and means for rendering one of said pumps inoperative, said means being further operable to relieve the pressure at the point of application.

26. A device for generating hydraulic pressure comprising two pumps, two valves only, and means for rendering one of said pumps inoperative, said means being further operable to render both of said pumps inoperative.

27. A device for generating hydraulic pressure comprising two pumps, two valves only, and means for rendering one of said pumps inoperative, said means being further operable to render both of said pumps inoperative and still further operable to relieve the pressure at the point of application.

28. A device for generating hydraulic pressure comprising two pumps, two valves only, and valve-controlling means for rendering one of said pumps inoperative, said means being further operable to render both of said pumps inoperative and still further operable to relieve the pressure at the point of application.

29. In an hydraulic pump, the combination of a plurality of pistons having common actuating means, an equal number of valves, and controlling means for said valves for rendering ineffective the operations of one of said pistons.

30. In an hydraulic pump, the combination of a plurality of pistons having common actuating means, an equal number of valves, and controlling means for said valves for rendering ineffective the operations of one of said pistons and for relieving the generated pressure.

31. In an hydraulic pump, the combination of a plurality of pistons having common actuating means, an equal number of valves, and controlling means for said valves for rendering ineffective the operation of one or more of said pistons.

32. In an hydraulic pump, the combination of a plurality of pistons having common actuating means, an equal number of valves, and controlling means for said valves for rendering ineffective the operations of one or more of said pistons and for relieving the generated pressure.

33. In an hydraulic pump, the combination of a plurality of pistons having common actuating means, an equal number of valves, and controlling means for said valves for successively rendering ineffective the operations of said pistons.

34. In an hydraulic pump, the combination of a plurality of pistons having common actuating means, an equal number of valves, and controlling means for said valves for successively rendering ineffective the operations of said pistons and for relieving the generated pressure.

35. A device for generating hydraulic pressure comprising two pumps, a single valve normally checking back-flow from both of the pump-chambers, a valve checking back-flow from the ultimate pressure chamber, and means for making said first-mentioned valve operable to check back flow from one of said pump-chambers only.

36. A device for generating hydraulic pressure comprising two pumps, a single valve normally checking back-flow from both of the pump-chambers, a valve checking back-flow from the ultimate pressure-chamber, and means for changing the location of said first-mentioned valve to check back-flow from one of said pump-chambers only.

37. A device for generating hydraulic pressure comprising two pumps, a single valve normally checking back-flow from both of the pump-chambers, a valve checking back-flow from the ultimate pressure

chamber, and means for making said first-mentioned valve operable to check back-flow from one of said pump-chambers only, said means being further operable to render said first mentioned valve wholly inoperative.

38. A device for generating hydraulic pressure comprising two pumps, a single valve normally checking back-flow from both of the pump-chambers, a valve checking back-flow from the ultimate pressure chamber, and means for changing the location of said first-mentioned valve to check back-flow from one of said pump-chambers only, said means being further operable to render said first-mentioned valve wholly inoperative.

39. A device for generating hydraulic pressure comprising two pumps, a single valve normally checking back-flow from both of the pump-chambers, a valve checking back-flow from the ultimate pressure-chamber, and means for making said first-mentioned valve operable to check back-flow from one of said pump-chambers only, said means being further operable to unseat said second-mentioned valve and open a passage from said pressure-chamber to the source of liquid supply.

40. A device for generating hydraulic pressure comprising two pumps, a single valve normally checking back-flow from both of the pump-chambers, a valve checking back-flow from the ultimate pressure-chamber, and means for changing the location of said first-mentioned valve to check back-flow from one of said pump-chambers only, said means being further operable to unseat said second-mentioned valve and open a passage from the said pressure-chamber to the source of liquid supply.

41. A device for generating hydraulic pressure comprising two pumps, a single valve normally checking back-flow from both of the pump-chambers, a valve checking back-flow from the ultimate pressure-chamber, and means for making said first-mentioned valve operable to check back-flow from one of said pump-chambers only, said means being further operable to render said first-mentioned valve wholly inoperative, and still further operable to unseat second-mentioned valve and open a passage from said pressure-chamber to the source of liquid supply.

42. A device for generating hydraulic pressure comprising two pumps, a single valve normally checking back-flow from both of the pump-chambers, a valve checking back-flow from the ultimate pressure-chamber, and means for changing the location of said first-mentioned valve to check back-flow from one of said pump-chambers only, said means being further operable to render said first-mentioned valve wholly inoperative, and still further operable to unseat said second-mentioned valve and open a passage from said pressure-chamber to the source of liquid supply.

43. A double-piston hydraulic pump having a single valve normally checking back-flow from both pump-chambers, and means for controlling said valve to permit of back flow from one or both of said chambers.

44. A double-piston hydraulic pump having a single valve normally checking back-flow from both pump-chambers, and means for varying the operative position of said valve to permit of back flow from one or both of said chambers.

45. A double-piston hydraulic pump having two valves only in the passage from the source of liquid supply to the ultimate pressure chamber, and means for controlling one of said valves to render ineffective operations of one or both of said pistons.

46. A double-piston hydraulic pump having two valves only in the passage from the source of liquid supply to the ultimate pressure chamber, and means for controlling one of said valves to render ineffective operations of one or both of said pistons, said means being further operable to open said passage.

47. A double-piston hydraulic pump having a fluid-passage not including the pump-chambers and providing the only means of communication between the source of liquid supply and the ultimate pressure-chamber, two valves only in said passage, and means for controlling one of said valves to render operations of one or both of said pistons ineffective.

48. A double-piston hydraulic pump having a fluid-passage not including the pump-chambers and providing the only means of communication between the source of liquid supply and the ultimate pressure-chamber, two valves only in said passage, and means for controlling one of said valves to render operations of one or both of said pistons ineffective, said means being further operable to open said passage.

49. A double-piston hydraulic pump having a single fluid-passage from the source of liquid supply to the pressure-chamber, said passage not including the pump-chambers but communicating therewith, two valves in said passage, and means for controlling one of said valves to render operations of one or both of said pistons ineffective.

50. In an hydraulic jack having a double pump, the combination of two valves controlling flow from the source of liquid supply to the ultimate pressure-chamber, the first of which normally checks back-flow from both of said pumps, and means for changing the relative position of said first valve to check back-flow from one of said pumps only and thereby open a passage

from the other pump to said source of supply.

51. In an hydraulic jack having a double pump, the combination of two valves controlling flow from the source of liquid supply to the ultimate pressure-chamber, the first of which normally checks back-flow from both of said pumps, and means for changing the relative position of said first mentioned valve to check back-flow from one of said pumps only and thereby open a passage from the other pump to said source of supply, said means being further operable to open passage from both pumps to said source of supply.

52. In an hydraulic jack having a double-pump, the combination of two valves controlling flow from the source of liquid supply to the ultimate pressure-chamber, the first of which normally checks back-flow from both of said pumps, and means for changing the location of said first valve to check back-flow from one of said pumps only and thereby open a passage from the other pump to said source of supply, said means being further operable to first render said valve wholly inoperative and then positively unseat the second valve.

53. In a double-pump hydraulic jack having a separate fluid-passage from the source of supply to the ultimate pressure chamber and a duct from each pump-chamber to said passage, the combination, with two valves in said passage between which in their normal positions said ducts are located, and means for moving one of said valves to an operative position intermediate said ducts.

54. In a double-pump hydraulic jack having a fluid-passage from the source of supply to the ultimate pressure chamber and a duct from each pump-chamber to said passage, the combination, with two valves in said passage between which in their normal positions said ducts are located, and means for moving one of said valves to an operative position intermediate said ducts and thereby opening a passage from one of the pump-chambers to said source of supply.

55. In a double-pump hydraulic jack having a fluid-passage from the source of supply to the ultimate pressure-chamber and a duct connecting each pump-chamber with said passage, the combination, with two valves in said passage between which in their normal positions said ducts are located, of means for moving the first of said valves to an operative position intermediate said ducts and thereby opening a passage from the first-pump-chamber to said source of supply, said means being further operable to render said first valve wholly inoperative.

56. In an hydraulic jack having a fluid-passage from the source of liquid supply to the pressure-chamber and a duct connecting each pump-chamber with said passage, the combination, with two valves in said passage between which in their normal positions said ducts are located, of means for moving one of said valves to an operative position intermediate said ducts and thereby opening a passage from one of said pump-chambers to said source of supply, said means being further operable to open passages from both of said pumps to said source of supply.

57. In an hydraulic jack having a fluid-passage from the source of liquid supply to the pressure-chamber and a duct connecting each pump-chamber with said passage, the combination, with two valves in said passage between which in their normal positions said ducts are located, of means for moving one of said valves to an operative position intermediate said ducts and thereby opening a passage from one of said pump-chambers to said source of supply, said means being further operable to open passages from both of said pumps to said source of supply and still further operable to unseat the other valve.

58. In an hydraulic jack having a double pump and corresponding pump-chambers, an individual fluid-passage from the source of liquid supply to the pressure-chamber and ducts connecting said passage with each of said pump-chambers, the combination of an initial inlet-valve, a final outlet-valve, and means for moving said inlet-valve to an operative position intermediate said ducts.

59. In an hydraulic jack having a double pump and corresponding pump-chambers, an individual fluid-passage from the source of liquid supply to the pressure-chamber and ducts connecting said passage with each of said pump-chambers, and combination of an initial inlet-valve, a final outlet-valve, and means for moving said inlet-valve to an operative position intermediate said ducts and thereby opening a passage from one pump-chamber to said source of supply.

60. In an hydraulic jack having a double pump and corresponding pump-chambers, an individual fluid-passage from the source of liquid supply to the pressure-chamber and ducts connecting said passage with each of said pump-chambers, the combination of an initial inlet-valve, a final outlet-valve and means for moving said inlet-valve first to an operative and then to an inoperative position intermediate said ducts.

61. In an hydraulic jack having a double pump and corresponding pump-chambers, an individual fluid-passage from the source of liquid supply to the pressure-chamber and ducts connecting said passage with each of said pump-chambers, the combination of an initial inlet-valve, a final outlet-valve and means for moving said inlet-valve first

to an operative position intermediate said ducts, said means being also operable to render both valves inoperative.

62. In a hydraulic jack having a double pump and corresponding pump-chambers, an individual fluid-passage from the source of liquid supply to the pressure-chamber and ducts connecting said passage with each of said pump-chambers, the combination of an initial inlet-valve, a final outlet-valve, and means for moving said inlet-valve first to an operative and then to an inoperative position intermediate said ducts, said means being also operable to render both valves inoperative.

63. In a double-piston hydraulic pump, a valve mounted in a movable carriage and being movable by said carriage to each of two effectively different locations, one in which said valve controls back-flow from both of the pumps and one in which said valve controls back-flow from one of said pumps only.

64. A double-piston hydraulic pump having a single valve normally checking back-flow from both pump-chambers, said valve being mounted in a movable carriage and being movable by said carriage to each of two operative and effectively different locations.

65. A double-piston hydraulic pump having a single valve normally checking back-flow from both pump-chambers, said valve being mounted in a movable carriage and being movable by said carriage to each of two operative and effectively different locations, in one of which said valve checks back-flow from both of the pumps and one in which said valve checks back-flow from one of said pumps.

66. In a double-piston hydraulic pump, a valve mounted in a movable carriage and being movable by said carriage to each of three effectively different locations, one in which said valve controls back flow from both of the pumps, one in which said valve controls back flow from one of the pumps only, and one in which said valve is wholly ineffective.

67. A double-piston hydraulic pump having a single valve normally checking back flow from both pump chambers, said valve being mounted in a movable carriage and being movable by said carriage to each of two operative and effectively different locations and to one in which said valve is wholly inoperative.

68. A double-piston hydraulic pump having a single valve normally checking back flow from both pump chambers, said valve being mounted in a movable carriage and being movable by said carriage to each of three effectively different locations, in one of which said valve checks back flow from both of the pumps, in another of which said valve checks back flow from one of the pumps only, and in another of which said valve is wholly ineffective.

69. A pump having a valve-bore, a plurality of valves mounted therein, and a movable carriage for one of said valves said carriage being provided with means for establishing communication between the pump-chamber and said bore above said valve.

70. A double-piston pump having a valve-bore, a plurality of valves mounted therein, and a movable carriage for one of said valves provided with means for establishing communication between one of the pump-chambers and said bore above said valve and for rendering said valve inoperative.

71. A double piston-pump having a valve-bore, a plurality of valves mounted therein, and a movable carriage for one of said valves provided with means for establishing communication between one of the pump-chambers and said bore above said valve and for rendering said valve inoperative and for unseating the remaining valves in said bore.

In testimony of the foregoing, I have hereunto set my hand in the presence of two witnesses.

JAMES W. NELSON.

Witnesses:
A. E. FARLEY,
JAS. MOORE.