J. W. NELSON & W. H. MATHERS.

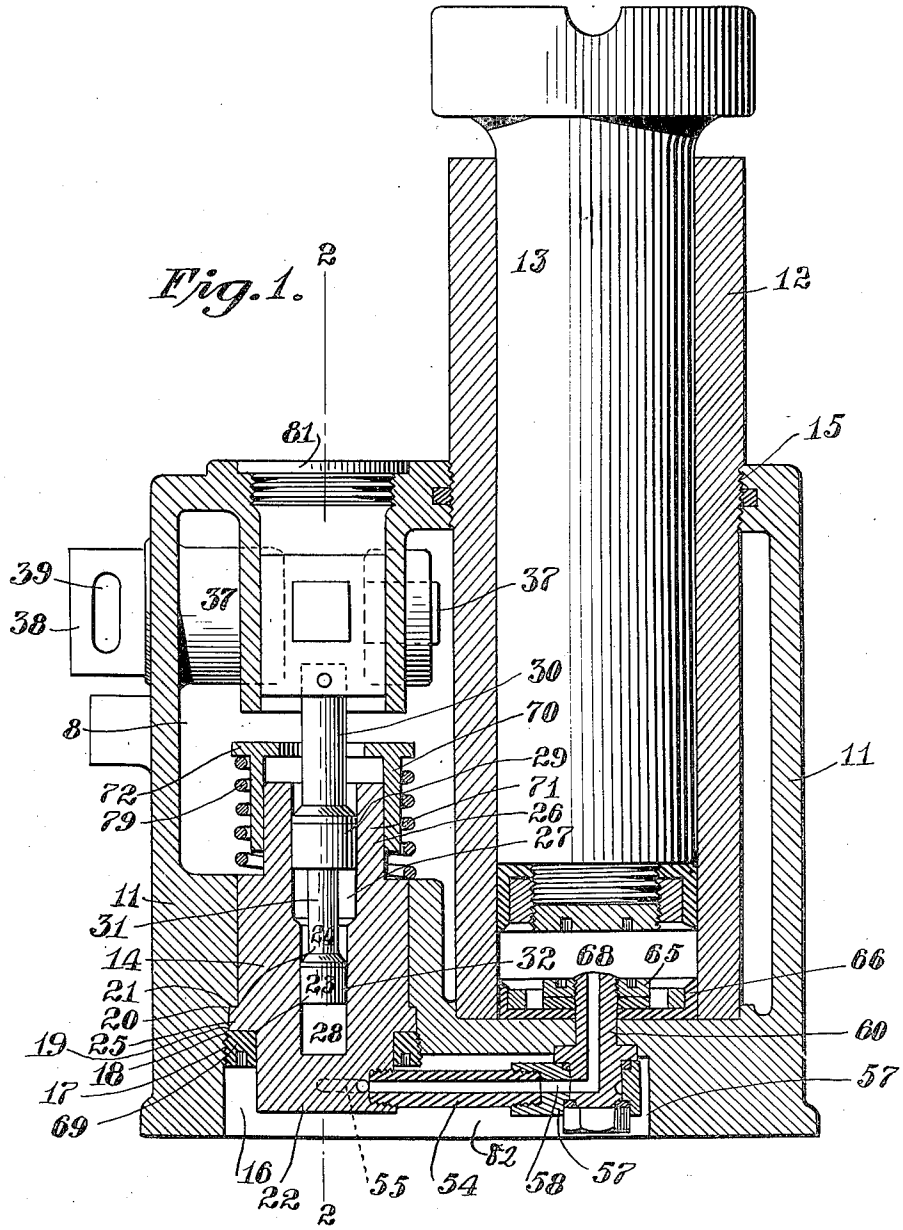
HYDRAULIC JACK.

APPLICATION FILED OCT. 27, 1909. RENEWED SEPT. 11, 1914.

1,136,830. Patented Apr. 20, 1915.

3 SHEETS—SHEET 1.

Fig. 1.



Attest:

P. C. Wenning.

Aaron Ginsburg

Inventors:

James W. Nelson

William H. Mathers

by Thos. H. Bowman Atty.

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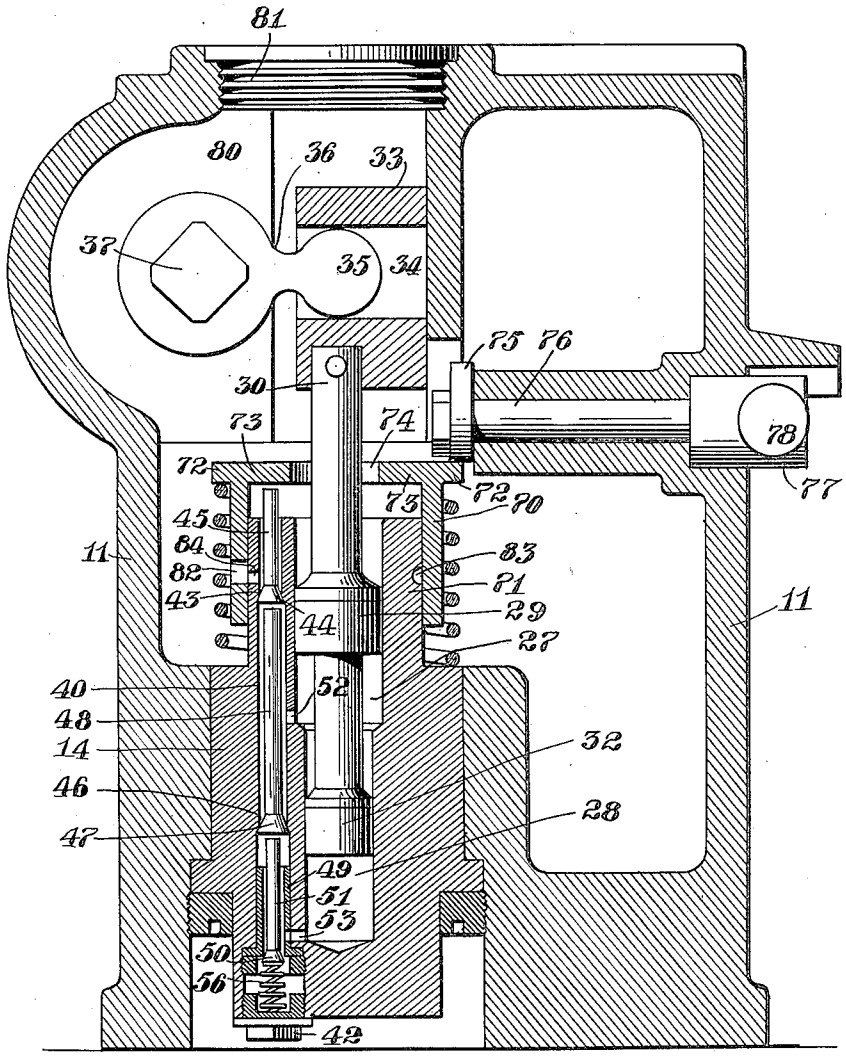
3 SHEETS—SHEET 2.

Fig. 2.



Attest:
P. O. Wening.
Aaron Lindberg

Inventors:
James W. Nelson
by William H. Mathers
Fred H. Bonnell
Atty.

J. W. NELSON & W. H. MATHERS.

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3 SHEETS—SHEET 3.

Fig. 3.

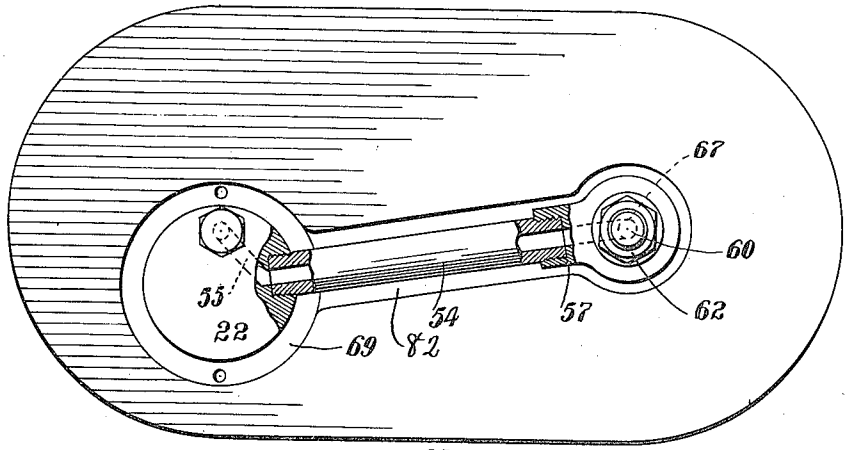
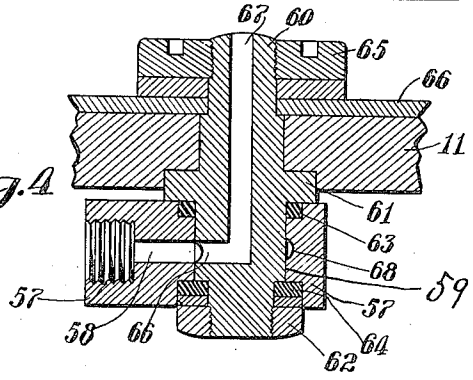


Fig. 4



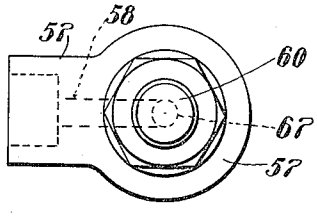


Fig. 5.

Attest:

P. O. Wening.

Aaron Ginsburg

Inventors:

James W. Nelson

William H. Mathers

by Thos. A. Bennett Atty.

UNITED STATES PATENT OFFICE.

JAMES W. NELSON AND WILLIAM H. MATHERS, OF NEW YORK, N. Y.

HYDRAULIC JACK.

1,136,830. Specification of Letters Patent. Patented Apr. 20, 1915.

Application filed October 27, 1909, Serial No. 524,956. Renewed September 11, 1914. Serial No. 861,325.

To all whom it may concern:

Be it known that we, JAMES W. NELSON and WILLIAM H. MATHERS, citizens of the United States, and residents of New York city, borough of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Hydraulic Jacks, of which the following is a specification.

This invention relates to hydraulic jacks, with more particular reference to jacks of the so-called horizontal type which are self-contained—that is, which include the reservoir or chamber from which is supplied the liquid employed to transmit and multiply the pressure.

The objects of the present invention are, first, to simplify and otherwise further improve upon the construction of this general type of hydraulic jack as shown and described by James W. Nelson alone in his Patent No. 874,700, dated December 24, 1907, particularly through the adaptation of a tandem arrangement of pistons to a jack of this type; second, by providing improved mechanism for the control of the valves, and, therefore, of the pumps, and through the character of such mechanism rendering available a larger proportion of the liquid in the reservoir irrespective of the position of the device; and, third, to so construct and assemble the various parts of the jack that the pump proper, with its various valves and passages, shall constitute a single rigid member which may easily and readily be removed in its entirety from the body and other portions of the jack without dismemberment of the latter.

When it is considered that the valves and the pump pistons, with their packings, are the parts of a hydraulic jack first likely to get out of order, and that even under the most favorable conditions one or another of these parts must frequently be removed for replacement or repair, the advantages of being able to quickly and easily remove the pump-block in its entirety, and thereby afford easy access to both valves and piston packings, will be apparent

Our 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 a hydraulic jack embodying our invention; Fig. 2 is an enlarged transverse section substantially on the line 2—2 of Fig. 1; Fig. 3 is a bottom plan view of Fig. 1; Fig. 4 is an enlarged central section and Fig. 5 a bottom plan view of details hereinafter described.

Referring now to the drawings in detail, numeral 11 refers to a heavy metal shell or casing, of preferably oval cross-sectional configuration, as shown in Fig. 3, having mounted in one side thereof the ram-cylinder 12, in which the ram 13 operates, and in the other side thereof the pump-block 14 and the pump-operating mechanism. We prefer that the ram-cylinder 12 be screwed into a suitable aperture 15 in the shell or casing 11, the bottom of said cylinder fitting into a suitable seat or socket in the base of the shell or casing. That portion of shell or casing 11 which contains the pumps and the pump operating mechanism, is of such configuration and dimensions that a chamber 80 is provided, sealed at its bottom by the pump-block 14, and which not only provides space for the interior pump operating mechanism, but also a storage reservoir for the liquid employed to receive, transmit and apply the pressure.

The pump-block 14 is of integral structure and of generally cylindrical configuration, but comprises portions of different diameters. The bore in the shell 11 in which this pump-block is mounted is of greatest diameter throughout the extent of its bottom portion 16, the upper end of this bottom portion 16 being provided with the interior screw-threads 17. At 18 the diameter of this bore is reduced to provide an interior shoulder 21. The pump-block 14 is provided with a lower portion 22 considerably less in diameter than the diameter of the portion 16 of the containing bore, while at 23 the diameter of said block is increased and at 24 again diminished to provide an annular rib or projection 25 which is firmly seated against the shoulder 21. From the point 24 to the end of the containing bore, the pump-block and said bore are of corresponding diameter, so that the former fits snugly within the latter. At this point, the pump-block is again reduced in diameter to form the comparatively smaller upper portion 26.

The pump-block 14 is provided with a central pump-bore comprising an upper portion 27 of comparatively larger diameter and the lower portion 28 of comparatively

smaller diameter. Adapted to reciprocate in the upper and larger portion 27 of said bore is the piston 29 on the piston-rod 30. From the end of the piston 29 projects an extension 31 of the piston rod, at the end of which is mounted the piston 32 fitting and adapted to reciprocate in the lower portion 28 of the pump-bore. Both of these pistons are preferably provided with suitable packing, but as this is a common and well-known expedient we have not illustrated this feature in the drawings.

The upper end of the piston-rod 30 is provided with a head 33 integral therewith or rigidly secured thereto, which head is provided with a socket 34 into which projects the knuckle 35 at the end of the short arm 36 fixed upon the rock-shaft 37. On the exterior of the shell or casing 11, in which the shaft 37 has bearings and through which it projects, said shaft is provided with a head 38, having a socket 39 for the reception of the well-known form of pump-lever, not shown in the drawings. It will now be apparent that through the employment of a suitable lever to rock said shaft 37, the knuckle 35 in the head 33 will operate to reciprocate the piston-rod and therewith the pistons in their respective bores.

In carrying the present invention into effect, we prefer to employ the same system and arrangement of valves as that shown and described in the patent aforesaid to Nelson alone, and in other patents to Nelson of even date therewith and numbered 874,698, and 874,699, respectively. For this purpose the pump-block 11 is provided with an individual valve-bore 40 extending longitudinally through said block but sealed at its bottom by means of the screw-cap 42. This bore 40 is of smallest diameter throughout the upper portion thereof (referring now to the vertical position of the jack indicated in the drawings) and at 43 the diameter of said bores increase to provide a seat for the valve 44 which has a stem 45 projecting upwardly into the chamber above the top of the pump-block. At 46 the bore 40 is again increased in diameter to provide a seat for the valve 47 which has a stem 48 projecting upwardly nearly but under normal conditions not quite to the valve 44. Below the valve 47, we prefer to again reduce the effective diameter of the bore 40 through the employment of a removable cylindrical valve-plug 49, the lower end of which provides a seat for the third and lowest valve 50 which has a stem 51 projecting upwardly nearly but under normal conditions not quite to the valve 47, the valve 50 being preferably spring-seated as shown. A duct 52 connects the chamber 27 at or near the bottom thereof with the bore 40 between the valves 44 and 47. Similarly, a duct 53 connects the lower portion of the chamber 28 below the small piston 32 with the bore 40 between the valves 47 and 50.

At one side of the lower portion 22 of the pump-block 14 is provided a threaded socket for the reception of the correspondingly threaded end of a pipe 54, and a duct 55 (shown by dotted lines in Fig. 1) leads from the chamber 56 in the bore 40 below the valve 50 to said socket and is open to the interior of said pipe 54. The other end of the pipe 54 is similarly threaded into the plug 57, which is provided with a longitudinal bore 58 leading from the interior of said pipe and a relatively larger transverse bore 59 for the reception of the plug 60, which is snugly fitted and held therein between the rib 61 and the nut 62 screwed on the end thereof and engaging shoulders on both the plugs 57 and 60. Packing rings 63 and 64 insure against leakage. The upper end of the plug 60 is threaded for the reception of the bolt-nut 65, acting against the packing 66 to form a hermetically tight joint between said plug and the bottom of the ram-chamber which is suitably apertured for the reception of said plug. The bottom wall of the casing 11 is suitably channeled to provide an open receptacle 82 for the pipe 54 intermediate the pump-block containing-bore on one side and the containing-bore for the plug 60 on the other. The plug 60 is provided with a lateral duct or bore 66 adapted to register, when the plug is firmly seated in place, with the duct 58 and the plug 57, the duct 66 being provided with a vertical extension 67 leading to the ram-chamber 68 in the ram-cylinder below the ram 13.

In order to avoid the necessity for undue nicety in the mounting and adjustment of the plug 60, we provide an annular groove or channel 68 in the transverse bore of the plug 57, which, as will be noted (with particular reference now to Fig. 5), will at all times register with the lateral duct 66 in the plug 60, irrespective of the rotative position of said plug. In this manner, effort need not be made to properly register the contiguous openings to the ducts 58 and 66, inasmuch as the annular groove or channel 68 is always open to the duct 66 and will supply liquid thereto from the duct 58.

In the annular space between the lower portion 22 of the pump-block 14 and the containing-bore for the pump-block, and located above the pipe 54 we provide the threaded ring 69 provided with suitable sockets for a spanner-wrench, which ring 69 is screwed into the threaded portion 17 of the pump-block containing-bore and serves, when firmly seated to lock said pump-block rigidly in place between the shoulder 21 in said bore and said ring 69.

It will be apparent that, with the valves

44, 47 and 50 in their normally operated condition, upon the upstroke of the pump-lever the pistons 29 and 32 will be raised, creating a partial vacuum in the chamber underneath each piston. The inequality of pressure thus generated will result in the unseating of the valves 44 and 47 and a flow of liquid from the reservoir into the duct 40, past the valve 44 and into the chamber 27 below the larger piston, and past both valves 44 and 47 into the chamber 28 below the smaller piston. Upon the down-stroke of said pump lever, the excess of pressure generated within the pump chambers will seat the valve 44, checking back flow to the reservoir 80, and the water will be forced from the chamber 27 past the valves 47 and 50, and from the chamber 28 past the valve 50, through the passage as described to the pressure chamber 68. It will now be seen that upon unscrewing and removing the nut 62, the ring 69 may be unscrewed and during such operation the pump-block 14, carrying therewith the pipe 54, may be gradually withdrawn until said ring 69 has cleared the threaded portion 17 of the pump-block containing-bore, whereupon said pump-block including the valves therein, may be entirely withdrawn from the shell or casing 11, the plug 57, at the end of the pipe 54 slipping off the lower end of the plug 60. If desired, the push-collar 70 and spring 79 may similarly be removed, the flange 72 being slightly less in diameter than the smallest portion of the pump-block containing bore. The pistons 29 and 32, of course, will remain within the casings, but easy access may be had thereto for repair or replacement of packings, or, if necessary, they may be withdrawn through the fill-hole in the top of the casing which is normally closed and sealed by the threaded cap 81. This feature of quick and easy removal of the pump-block is considered by us to be one of the most valuable features of our invention, but apart from the facility which this construction of jack affords for the removal of such pump-block, it will be noted that the valves may be removed without removing said pump-block, it only being necessary for this purpose to unscrew the cap 42 which seals the lower end of the bore 40.

To provide for the manual control of the valves, and this by means which are readily and easily adjustable and operable irrespective of relative positions, we provide a sleeve or collar 70, fitting over the upper and smaller portion 71 of the pump-block. This collar 70 is provided at its upper end with the exterior flange 72 and the preferably wider interior flange 73 which has, however, an aperture 74 of considerably greater diameter than the diameter of the piston-rod 30 which operates therethrough. The interior flange 73 extends inwardly over the stem 45 of the valve 44, while the enterior flange 72 is in coöperative positional relation to a cam 75 at the end of the shaft 76 which has bearings in and projects through the casing 11 and terminates in a head 77 to which is secured an operating lever 78, by means of which the shaft 76 may be rotated. Surrounding the collar 70 is the spring 79 in compression between the underside of the outer flange 72 and the top of that section of the pump-block below the same.

With the cam 75 in its normal or inoperative position, the collar 70 will be raised by the spring 79 to its uppermost position, in which position the flange 73 does not contact with the top of the stem 45 of the valve 44, and is therefore noninterferent with automatic action of said valve. Upon rotation of the shaft 76 by means of the lever 78, the cam may be operated to depress the collar 70 against the action of the spring 79, the first effect of which will be to engage the stem 45 of the valve 44, unseat said valve and hold the same positively off its seat, without, however, interfering in any way with automatic action of either of the valves 47 or 50. With the valve 44 thus held off its seat, it will be seen that reciprocations of the larger piston 29 will be effectively inoperative, inasmuch as the liquid which is drawn into the pump chamber underneath the piston 29, in the manner described, will, upon the down-stroke of said piston, instead of operating to unseat the valve 47 and pass with the liquid under pressure of the smaller piston 32 into the pressure-chamber 68, follow the path of least resistance and be returned past the open valve into the reservoir 80. Under these conditions, the lower and smaller piston 32 alone is effectively operated, reducing the volume of liquid forced to the pressure-chamber and increasing the power transmitted under the well known principles of hydrostatics. It will be apparent that by means of a lever 78, the cam 75 may now be returned to its original position, permitting of the raising of the sleeve or collar 70 under action of the spring 79 to again clear the end of the stem 45 of the valve 44 and restore the automatic functions of said valve. Obviously, both pumps are now again effectively operative. On the other hand, the cam 75 may be located through a slightly greater arc than that necessary to effect the unseating of the valve 44, in which case said valve 44 will impinge against the end of the stem 48 of the valve 47, unseating the latter and holding both of the valves 44 and 47 off their seats. It will be seen that under these conditions both pumps are effectively inoperative, the liquid merely flowing idly back and forth between the pump chambers and the reservoir, position of the unseated valve

47 being such, however, that the same is non-interferent with the seating of the lower valve 50 which prevents release of the generated pressure which has been transmitted to the ram-chamber. Effective operations of one or both pumps may now be restored, through partial or complete return of the cam 75, or said cam may be rotated through a still greater arc, causing the valve 47 to impinge against the stem 51 of the valve 50, thus seating said valve and holding all of said valves off their seats. An open passage has now been provided from the pressure chamber 68 to the reservoir, and in this manner the ram may be lowered for removal or readjustment of the device.

It will be seen that through the employment of the push collar or sleeve 70, as means interposed between the cam 75 or other actuating means and the upper end of the stem 45 of the valve 44, in order to manually control the operation of one or more of the valves, no nicety of adjustment is required in assembling the various parts or members of which our jack is composed. Irrespective of the relative rotative position of this push collar 70, the exterior flange 72 thereof will invariably be in position to be operated upon by said cam 75, and said interior flange 73 will invariably be in position to impinge against the valve stem 45 when said collar is moved by said cam. The insertion of this collar, in assembling the parts of the device, may therefore be readily accomplished without reference to the relative position of the valve bore 40 and the cam 75. We have referred to this construction of jack as being peculiarly adapted for use in a horizontal position. When used in such position, the level of the liquid in the reservoir 80 must obviously be above the mouth of the bore 40 through which the valve stem 45 projects, in order to render pumping operations effective. Under ordinary conditions, the same would be true when the jack is used in a vertical position, but in order to avail ourselves of the more nearly complete capacity of the reservoir 80, we prefer to provide the push collar 70 with an aperture 82 and the pump block 14 with an exterior annular groove or channel 83 which is open through a duct 84 to the valve bore 40. The annular groove or channel 83 is located to register with the duct or bore 82 in the collar or sleeve 70, and said duct 82 is elongated, longitudinally of said collar, whereby an open passage is maintained from said bore through said duct 84, said groove 83, and said duct 82 to the reservoir 80 irrespective of both rotative and longitudinal relative positions of the pump-block 14 and the collar or sleeve 70.

While we have herein shown and described a double-pump type of hydraulic jack, it will be apparent that our invention is similarly applicable to a single pump jack or to a jack provided with more than two pumps. Many other modifications of minor details of our improved hydraulic jack will doubtless readily suggest themselves to those skilled in the art to which it appertains, and we therefore do not desire to limit our invention to the specific construction herein shown and described.

We claim as new and desire to secure by Letters Patent:

1. A hydraulic jack comprising, with a suitable casing, a pump and a ram-cylinder having separate axes and a connecting conduit therebetween, said conduit being included within said casing and said pump being located within a removable pump-block, said conduit being detachably mounted to permit of such removal, the securing means for said pump-block and said conduit being exterior of said casing.

2. A hydraulic jack comprising, with a suitable casing, a pump and a ram-cylinder, having separate axes and a separate conduit therebetween and included within said casing, said pump being included within a removable pump-block, said conduit being screw threaded at both ends to permit of its removal and the removal of the said pump-block, the securing means for said pump-block and said conduit being exterior of said casing.

3. A hydraulic jack comprising a pump and a ram-cylinder having separate axes and a connecting conduit therebetween, suitable valves for said pump, and exterior means for removably securing the pump-block in said jack, said valves being located in said block and removable therewith, and said conduit having exterior detachable connection with the ram-cylinder to permit of removal with said pump-block.

4. A hydraulic jack having the ram-cylinder located at one side of the pump and a lateral conduit provided with screw-threaded connections to both said pump and to said ram-cylinder, said pump being removable with a pump-block, to which one end of said conduit is secured, and the other end of said conduit having exterior detachable connection with the ram-cylinder, whereby said conduit may be removed with said pump-block, all of said parts being included within a suitable casing.

5. A hydraulic jack comprising a body portion which provides receptacles for the ram-cylinder, for the pump-block and for the connecting conduit between pump and ram, and exterior means for removably securing said pump-block and said conduit in said receptacle, said conduit having a detachable connection with the ram-cylinder to permit of such removal.

6. A hydraulic jack comprising a removable pump-block containing the pump-

valves which are removable therewith, a ram-cylinder and ram, a member removably secured to the base of said ram-cylinder, and a conduit seated in said member and in said pump-block and providing a passage from the pump-chamber to the pressure-chamber.

7. In a hydraulic jack, the combination, with a pump and a ram, the ram-cylinder being provided with a removable nipple, of a connecting conduit leading from the pump-chamber and having removable lateral connection with said nipple, and means for insuring an open passage from pump to ram-chamber through said nipple irrespective of the rotative position of said nipple.

8. In a hydraulic jack, the combination, with a ram and a pump which includes a removable pump-block, the base of the ram-cylinder being provided with a removable nipple, of a connecting conduit secured to said pump-block and having removable lateral connection with said nipple, and means for insuring an open passage from pump to ram-chamber through said nipple irrespective of the rotative position of said nipple.

9. A hydraulic jack comprising a pump and a ram in side-by-side arrangement with a connecting conduit therebetween, the ram-cylinder being provided with a removable nipple and exterior means for removably securing the pump-block in said jack, the pump valves being located in said block and removable therewith, and said conduit having detachable lateral connection with said nipple which is provided with means for insuring an open passage from pump to ram-chamber through said nipple irrespective of the rotative position of said nipple.

10. In a hydraulic jack, the combination, with a pump-block containing the pump and a separate valve-bore, suitable pump-valves in said bore, means for unseating one of said valves or more than one thereof successively, said means including a sleeve slidable on said pump-block, an aperture in said sleeve, a corresponding duct in said pump-block which communicates with said bore, and means for insuring an open passage between said aperture and said duct irrespective of the positional relation of said sleeve to said pump-block.

11. In a hydraulic jack, the combination, with a pump-block containing the pump and a separate valve-bore, suitable pump-valves in said bore, means for unseating one of said valves or more than one thereof successively, said means comprising a sleeve slidable on said pump-block and means for actuating said sleeve, said sleeve being provided with an aperture and said pump-block with a corresponding duct, and an annular groove in said pump-block providing an open passage between said aperture and said duct irrespective of the positional relation of said sleeve to said pump-block.

In testimony of the foregoing, we have hereunto set our hands in the presence of two witnesses.

JAMES W. NELSON.
WILLIAM H. MATHERS.

Witnesses:
H. A. CROCKER,
JAS. MOORE.