No. 867,997. PATENTED OCT. 15, 1907.

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

HYDRAULIC JACK.

APPLICATION FILED OCT. 31, 1906.

Fig: 1.

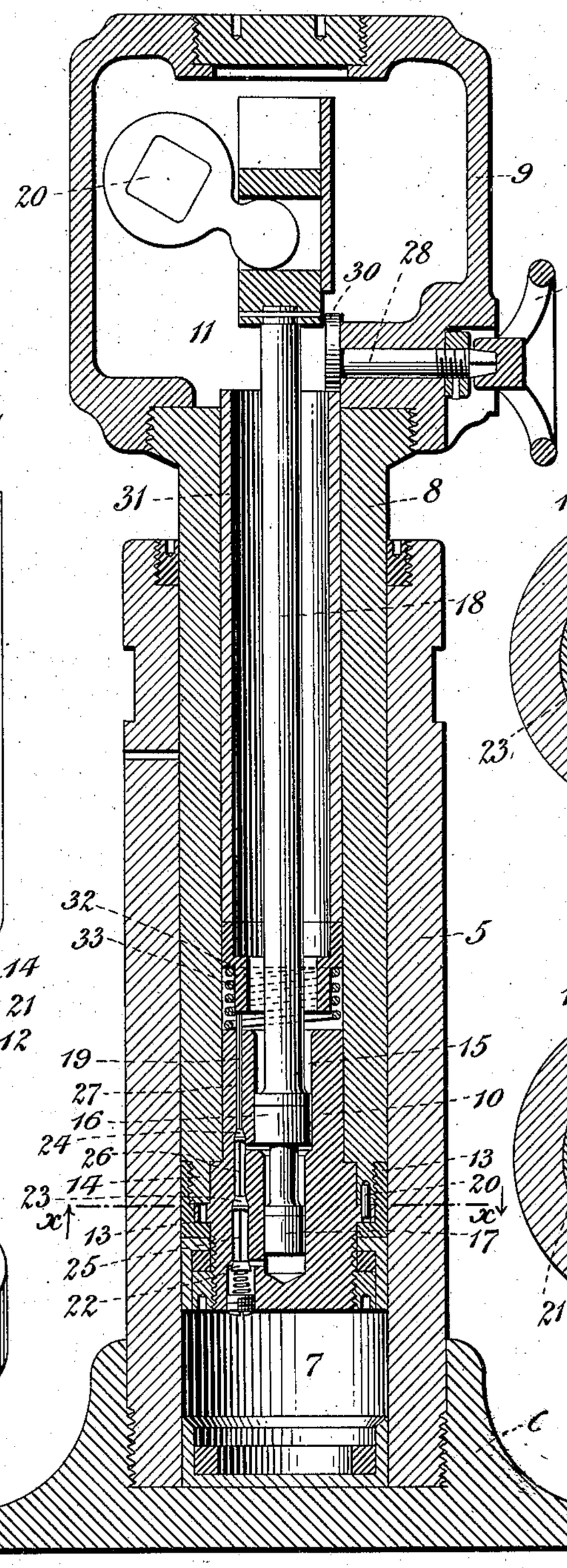


Fig: 4.

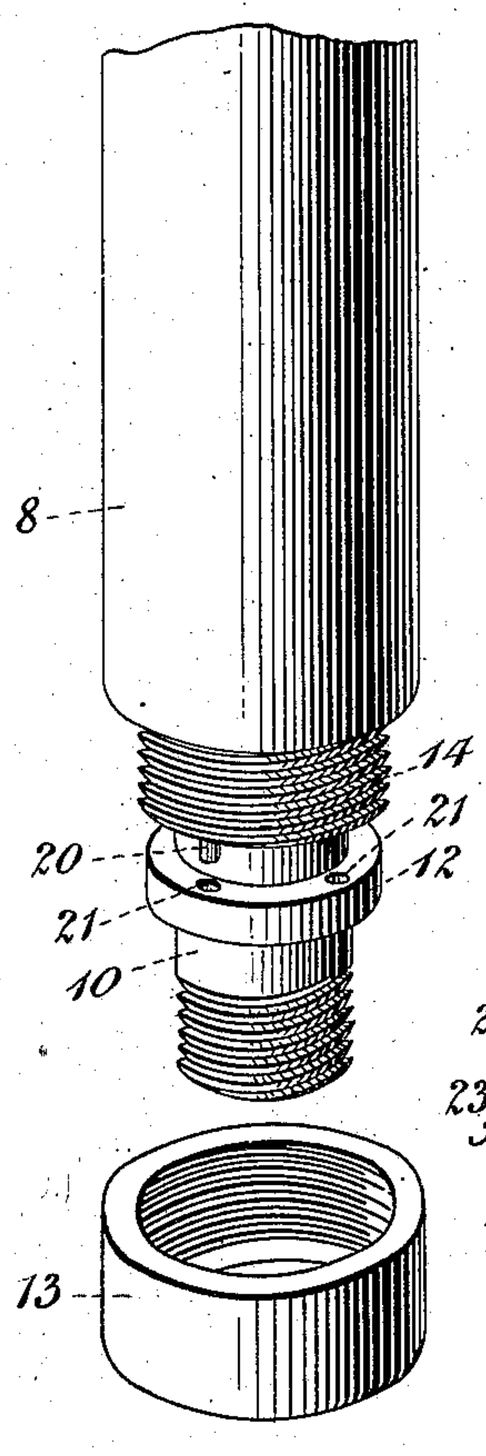


Fig: 5.

Fig: 3.

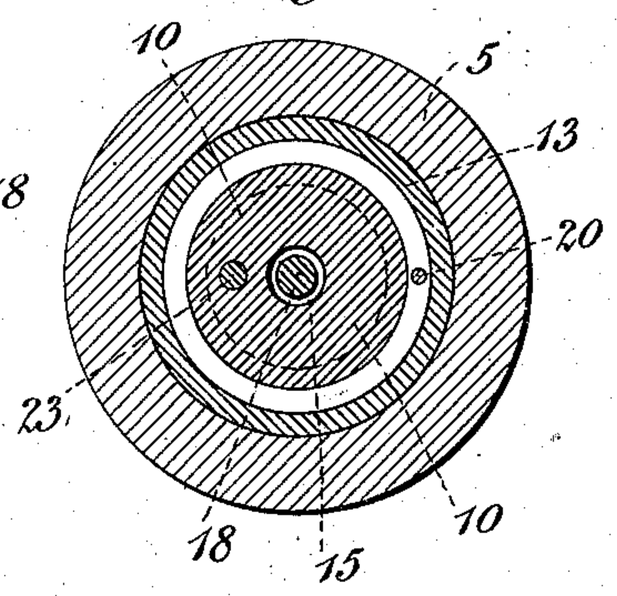
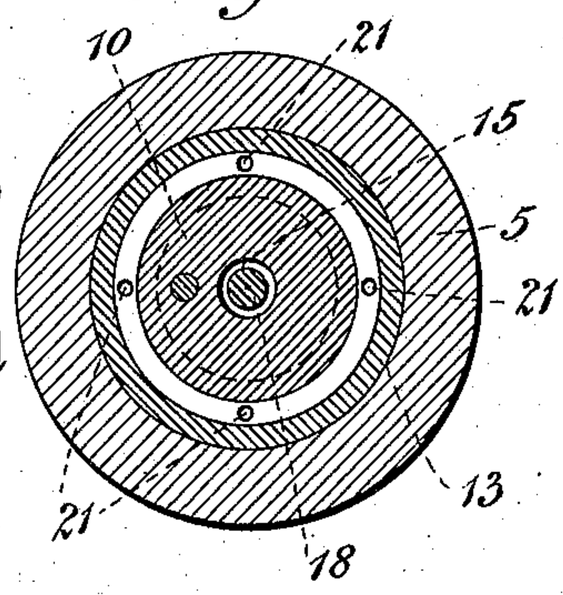


Fig: 2.



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UNITED STATES PATENT OFFICE.

JAMES W. NELSON AND WILLIAM H. MATHERS, OF NEW YORK, N. Y.; SAID MATHERS ASSIGNOR TO SAID NELSON.

HYDRAULIC JACK.

No. 867,997. Specification of Letters Patent. Patented Oct. 15, 1907.

Application filed October 31, 1906. Serial No. 341,395.

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, and has for its objects, generally, the attainment of a greater degree of simplicity of construction, adapting a particular type of jack to a wider range of usefulness, improving the manner of assembling the various parts to facilitate manufacture and subsequent repair or replacement of parts, and, in fact, to decrease cost of construction without sacrifice of efficiency, dependability or durability.

We have more particularly in mind a type of jack in which the pump-block is located at the base of the ram and is provided with an intake duct or bore located laterally of the main pump bore. When the ordinary vertical type of jack is operated in its normal, vertical position, it can obviously make no difference, so far as the location of the mouth of the intake duct is concerned, at what point on the upper face of the pump-block the mouth of this duct is located—the level of the liquid, if the supply is sufficient, always being above said mouth, which is, therefore, at all times submerged. But when it is desired to use this same jack in a horizontal position, the pumping lever being necessarily fixed in location in one side of the tool, which side must be upwardly disposed in order to operate the pump, it is obviously desirable—if not frequently necessary—that the mouth of the intake duct be located on the lower side of the pump-block, so that it may be at all times below the level of the liquid, which may not—and most often does not—submerge the whole of the exposed face of the pump-block.

The ram of the ordinary vertical type of jack, such as we have in mind, consists in three principal parts; *i. e.*, the head, constituting the reservoir or supply chamber for the liquid and within which is located the mechanism for applying power to the piston or pump-rod; the ram cylinder, which must obviously be secured to said head to form therewith a part or extension of said chamber, the joint being hermetically sealed; and the pump-block, sealing the base of the ram-cylinder and forming a part of the ram. Of course, there are many ways in which these three members may be secured together, but having in view simplicity and economy in construction, perfectly tight joints, and great strength and rigidity, it has been found that best results are obtained from screw-threading and directly screwing together head and ram-cylinder, and similarly securing ram-cylinder and pump-block—either directly these members themselves being screw-threaded for this purpose, or, preferably, indirectly, the pump-block being first loosely inserted in the cylinder, and provided with a flange or shoulder which is firmly held between the end of said cylinder and a cap which is screwed on the end of said cylinder. These parts being separately made, prior to assembling, it will be apparent that when head and ram-cylinder are firmly screwed together, the pump-lever socket, or other pump-lever retaining means, will be definitely located in a fixed position with reference to these two now-rigid parts. It is well known that where two bodies are provided with exterior and interior screw-threads, for the purpose of securing them to each other, it is impossible to so regulate or adjust the ends of the spiral or helical threads to determine in advance the relative positions of the two bodies when they have been tightly screwed together. Now, if it is impossible to determine in advance of assembling the relative position of the pump-block with reference to the ram-cylinder, it is equally impossible to determine, in jacks as heretofore constructed, the relative location of the mouth of the intake duct in the pump-block with reference to said ram-cylinder, and, therefore, with reference to the pump-lever—whether said pump-block is directly secured to or screwed into said ram-cylinder or is held in place by a screw-cap, as explained, it being obviously desirable that pump-lever and intake duct be located on opposite sides of the longitudinal axis of the jack. Furthermore, as there must invariably be a back-pressure valve in said intake duct, which valve should, in most cases, be under manual control and which is so controlled as a rule from a point fixed with reference to the cylinder or the head, it will be similarly obviously desirable to provide controlling means for said valve which will be operable irrespective of the relative position of said pump-block in said cylinder, and, therefore, the relative location of said duct and valve therein with reference to said fixed controlling means.

This invention is designed, primarily, to overcome the difficulties above set forth, and will be more readily understood by reference to the accompanying drawings, forming a part of this specification, wherein we have shown a type of jack which forms the subject-matter of a copending application by James W. Nelson alone, filed May 21, 1906, Serial Number 317,865, and in which

Figure 1 is a central, vertical section of an hydraulic jack embodying our invention; Fig. 2 is a transverse section, substantially on the line *x*—*x* of Fig. 1, the view being in the direction of the right-hand arrow; Fig. 3 is a section on the same line, the view being in the direction of the left-hand arrow; and Fig. 4 is an

enlarged perspective view of the ram-cylinder and pump-block, partly separated. Fig. 5 is a diagrammatical sectional view showing possible variations in adjustment of parts, as hereinafter more fully described.

Referring now to the drawings in detail, we have shown a type of so-called "vertical" jacks, comprising a tubular or otherwise suitably bored body 5, secured to a base 6 and providing a pressure chamber 7 underneath the ram, which is slidable therein. The ram comprises three principal parts, the ram-cylinder 8, the head 9 and the pump-block 10. We have shown the ram-cylinder 8 provided at its top with exterior screw-threads, meshing with interior threads in the lower part of the head 9, whereby these members may not only be firmly and rigidly screwed together, but the union therebetween may be liquid or water tight, the ram-cylinder 8 providing a continuation of the storage reservoir or chamber 11 for the liquid employed. It will be apparent, however, that the cylinder 8 may be interiorly and the head 9 exteriorly threaded, if desired, or other form of securing means be employed without departing from the spirit of our invention.

The pump-block 10 may obviously be directly screwed into the ram-cylinder 8, but we prefer that it be provided with a flange or annular shoulder 12, providing a stop which limits extent of insertion of the upper portion of said block in said cylinder, and which flange or shoulder may be firmly held between the interiorly-threaded apertured cap 13 and the exteriorly-threaded end 14 of said cylinder. This pump-block 10 is provided with a centrally located pump-bore 15 which, for the purposes of this description, is shown of different diameters, corresponding to the diameters of the two piston or pump heads 16 and 17 at the end of the piston rod 18. It will be apparent, however, that our invention is equally applicable to a construction employing a single piston in a bore of uniform diameter. In either case, the base of the pump-bore is closed, and the liquid supplied from the reservoir 11 to the pump chamber or chambers by means of a separate bore 19, communicating with the pump chambers and with the pressure chamber 7, and provided with requisite valves to control the flow therethrough—these valves being independent in automatic action and interdependent for manual control, as hereinafter described. It will be apparent that the valved supply-bore 19 must of necessity be located laterally of the pump-bore 15, and, therefore, near one side of the pump-block 10.

The head 9, in addition to providing a reservoir or chamber for the liquid, contains the means for reciprocating the piston-rod 18 and the means for the manual control of the valves on the bore 19. Both must be operated from without the head, and the operating means consists, in the first case, in a suitable socket or other retaining means for a pump-lever, (not shown) operation of which rocks the shaft 20, and, in the second case, in a hand-wheel or similar device projecting from the head 9. It will be apparent that when the jack is used in a vertical position, the location of either pump-lever or hand-wheel is of small, if any, importance, but that when the jack is used in a horizontal position, both pumping lever and hand-wheel should be located on the upper side of the jack. It will be similarly apparent that when the jack is used vertically, the location of the mouth of the bore 19, on the interior face of the pump-block, is of no consequence, this mouth always being submerged in the liquid which is to be drawn therethrough—so long as the supply is adequate for the operation of the device. If, however, the jack is placed in a horizontal position, the liquid in the chamber 11, and the ram-cylinder extension thereof, may not, and after a certain amount of use undoubtedly would not, completely fill said extension. It is therefore most important that in such horizontal use of the jack, the mouth of the bore or duct 19 be at all times below the level of the liquid in the ram-cylinder extension of the chamber 11. It is essential, therefore, in use of the jack in a horizontal position, that the bore 19 in the pump-block 10 and the exterior operating means on the head 9 be located on opposite sides of the axis or the axial line of the ram. Now, each of these three principal parts or members of the ram is the subject of separate and independent manufacture. The ram-cylinder 8, when completed, comprises nothing more than a tube provided with screw-threads at each end thereof. The head 9 is threaded, and the location of the valve and pump operating means permanently fixed prior to assembling of the parts of the ram. The pump-block 10 is similarly suitably formed and bored prior to assembly, and in the manufacture, independently, of the pump-block 10 there is nothing to suggest or determine the proper location therein of the supply-bore 19. The same is true of the location of the exterior operating means on the head 9. Both pump-block and head are independently mounted on the ram-cylinder 8, and, as it is impossible to determine in advance of assembly the relative positions of two bodies screwed together, particularly after some use and more or less wear, the difficulty of positionally adjusting the head with reference to the pump-block, both being independently secured, directly or indirectly, to the ram-cylinder, will be apparent. In seeking to overcome these difficulties, we permit the positional relation between the head 9 and the ram-cylinder 8 to remain abitrary, so that the two may be treated as an integral body, with the pump and valve operating means permanently fixed in location thereon. Downwardly projecting from the lower end of the ram-cylinder 8, we provide a pin 20, arbitrarily positioned with respect to the circumference of the cylinder. In the upper face of the flange or shoulder 12 of the pump-block 10, we provide four holes or sockets 21 21, equidistantly disposed, or, in other words, separated from each other by arcs of 90°.

It will be noted that in advance of assembly there is nothing to determine or suggest the proper location of the pin 20 in the end of the cylinder 8. If there were, then—as will subsequently appear—but one hole or socket would be required in the flange or shoulder 12, and that one located on the side of said pump-block opposite to that in which the bore 19 is located. Positional relation between head and cylinder, however, being non-predeterminable, the pin 20 is arbitrarily positioned in the end of the cylinder 8 and the four holes or sockets 21 21 are bored in the said collar 12, at equidistant points, without reference to the location of

the bore 19. When head and cylinder have been firmly screwed—or otherwise suitably secured—together, the pump-block 10 may be inserted, it being noted prior to this operation that the bore 19 is properly located with respect to the fixed position of the operating means on the head. It is possible, of course, that one of the sockets 21 may not have happened to be properly positioned to receive the pin 20 when said bore 19 is exactly in proper location, but there is sure to be one of said sockets within an arc of 45°, on one side or the other, and by rotating said pump-block, in one direction or the other, through an arc of 45° or less, one of said sockets 21 may be brought underneath the pin 20 which is inserted therein, whereupon, when the cap 13 is tightly screwed in place, the parts of the ram will have been assembled with the mouth of the bore 19 in the pump-block and the operating means on the head relatively positioned to a degree of accuracy sufficient for all practical purposes,

It will be obvious that it is immaterial, so far as our invention is concerned, whether the pin 20 is in the end of the cylinder 8 with the holes or sockets 21 in the flange 12 of the pump-block 10, as shown and described, or whether said pin projects upwardly from said flange 12 with the holes or sockets in the end of the ram-cylinder.

By reference to Fig. 5, it may be noted that rotation of the pump-block in the cylinder 9 through an arc not exceeding 45°, will not greatly vary the elevation of the mouth of the bore 19 with respect to the base or bottom of the chamber. Therefore, if the supply of liquid is sufficient for the operation of the jack, horizontally, under any conditions whatsoever, the mouth of the bore 19 may thus be made determinable in location at a point at all times below the level of the liquid. With the same idea of proper positional adjustment in view, the control of valves in a bore the location of which is non-predeterminable from means the relative position of which is similarly indeterminate, is important. The back-pressure valves 22, 23, 24, in the bore 19, are independently automatic in action, operated for the main purpose by the direction of flow or pressure in said bore 19. In order to release the liquid in the ram or pressure chamber 7, when it is desired to lower the ram or contract the expanded members of the jack, and permit the liquid to flow back into the reservoir 11, we have shown each of these valves provided with a controlling stem, 25, 26, 27, respectively, the last projecting above the interior face of the pump-block 10. When it is desired to lower, or contract, depression of the stem 27 will trip the valve 24, which, upon continued application of force, will, through the stem 26 of the valve 23 trip the latter, which, in turn, will, through the stem 25, trip the valve 22, thus holding all of said valves off their respective seats and opening a passage from pressure chamber to reservoir. The means for manual operation of said valves should be located in the head 9, and preferably comprises a rotating shaft or stem 28 suitably journaled in the wall of said head, and provided on the outside of said head with means to facilitate the rotation thereof, such as the hand-wheel 29, and on the inside with means, such as the cam 30, for varying the elevation of a member interposed between said means and the valve stem 27. It will be apparent that were the positional relation between head and pump-block predeterminable, a rod might serve as this interposed connecting member; but in assembling the parts of the ram, great difficulty would be experienced in properly adjusting the rod so that while in a vertical position—or in a line parallel to the axis of the ram—the ends thereof would register, respectively, with the stem 27 and the cam 30, or other power-transmitting part. We therefore provide a tubular member 31, which, irrespective of rotative position, at all times contacts with the cam 30 and with the stem 27. This tubular member 31 is preferably inwardly offset at its lower end to provide a shoulder 32, between which and the face of the pump-block a compression spring 33 acts to retain said member in its most elevated or inoperative position. Therefore, whatever may be the positional relation of head and pump-block, rotation of the hand-wheel 29 will always serve to force said tube 31 against the action of the spring 33 to unseat said valves in regular succession. While we have shown this interposed member 31 in the form of a tube, it will be apparent that parts thereof may be cut away to reduce weight, or it may consist of two rings properly braced against each other—the essential construction being an annular bearing part or member to receive the power and a similar part or member to apply the same, the particular manner in which these parts or members are rigidly connected being unimportant.

Many modifications of details other than those mentioned of an hydraulic jack embodying our invention 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.

Having thus described our invention, we claim as new and desire to secure by Letters Patent:

1. The combination, with a device of the class described having a ram comprising two members each independently secured to a third and at least one thereof by means which does not in itself determine relative positions, of means independent of the securing means for insuring a predetermined positional relation between said two members irrespective of the position of said third member.

2. The combination, with a device of the class described having a ram comprising three members, two thereof being each independently secured to the other in a manner which does not in itself determine relative positions, of means independent of the securing means for insuring a definite positional relation between said two members irrespective of the position of the member to which they are secured.

3. The combination, with a device of the class described having a ram with a head and a pump each independently secured thereto and at least one thereof in a manner which does not in itself determine relative positions, of means independent of the securing means for establishing a predetermined positional relation between head and pump irrespective of the position of the ram.

4. The combination, with a device of the class described having a ram comprising a head rigidly secured thereto in non-predeterminable positional relation, a pump-block and means for securing said block in said ram by means which does not in itself determine relative positions, of means for establishing a predetermined positional relation between said head and said pump-block when rigidly secured to said ram.

5. The combination, with a device of the class described having a ram comprising a head rigidly secured thereto and a pump-block secured therein, the latter in a manner which does not in itself determine relative positions, of means independent of the securing means for establishing a predetermined positional relation between said head and said block.

6. The combination, with a device of the class described having a ram cylinder, a head screwed thereto containing the pump-operating means, and a pump independently mounted in said cylinder and secured thereto in a manner which in itself does not determine relative positions, said pump having an in-take duct located laterally of the main pump-bore, of means independent of the securing means for insuring location of said duct and said pump-operating means on opposite sides of the axial line of the ram when the parts are assembled.

7. The combination, with a device of the class described having a ram-cylinder, a head secured thereto containing pump-operating means operable from one side of the axial line of said head, and a pump-block mounted within said cylinder and secured thereto in a manner which in itself does not determine positional relation, said pump-block having an in-take duct located laterally of the main pump-bore, and means independent of the securing means for insuring location of said duct and said pump-operating means on opposite sides of said axial line when the parts are assembled.

8. The combination, with a device of the class described having a ram-cylinder, a head rigidly secured thereto in non-predeterminable positional relation, said head containing pump-operating means operable from one side thereof, and a pump-block independently mounted in said cylinder and secured thereto in a manner which in itself does not determine positional relation, said pump-block having an in-take duct located laterally of the main pump-bore, of means independent of the securing means for insuring location of said duct on the side of the axial line of the ram opposite to that from which the pump is operated.

9. The combination, with a device of the class described having a ram-cylinder, a head containing the pump-operating means operable from one side thereof, means for securing said head to said cylinder, a pump having its in-take duct located laterally of the main pump-bore, and means for securing said pump in said cylinder, each of said securing means comprising a connection which in itself does not determine positional relation, of means for insuring location of said duct on a side of the axial line of the ram opposite to that from which the pump is operated.

10. In a device of the class described, the combination of a ram-cylinder, a head screwed thereon, a pump-block fitting into said cylinder, a retaining-member screwed to said cylinder and holding said pump-block rigidly in place, and means for insuring a predetermined positional relation between said pump-block and said head.

11. In a device of the class described, the combination of a cylinder, a head screwed thereon, said head being provided with means controlled from one side thereof to operate the pump, a pump-block fitting into said cylinder, a cap screwed to said cylinder between which and said cylinder said pump-block is rigidly held, and means for establishing a predetermined positional relation between said pump-block and said head.

12. In a device of the class described, the combination of a cylinder, a head screwed thereon, said head being provided with means controlled from one side thereof to operate the pump, a pump-block fitting into said cylinder and provided with an in-take duct located laterally of the main pump-bore, a cap screwed to said cylinder between which and said cylinder said pump-block is rigidly held, and means for insuring location of said in-take duct on a side of the axial line of said cylinder opposite to that from which the pump is operated.

13. In a device of the class described, the combination of a ram-cylinder having a head secured at one end thereof, a pump-block fitting into the other end of said cylinder, a cap, means for connecting cap and cylinder to hold said pump-block firmly and rigidly therebetween, and means for retaining said pump-block and said cylinder in definite positional relation during the operation of securing said cap.

14. In a device of the class described, the combination of a ram-cylinder, a head secured thereto in non-predeterminable positional relation, a pump-block fitting into the other end of said cylinder, a cap, means for connecting cap and cylinder to hold said pump-block firmly and rigidly therebetween, and means for retaining said pump-block and said cylinder in definite positional relation during the operation of assembling the parts.

15. In a device of the class described, the combination of a ram-cylinder, a head secured thereto, a pump-block fitting into said cylinder, a screw-cap securing said pump-block in said cylinder, and means for insuring a predetermined positional relation between pump-block and cylinder.

16. In a device of the class described, the combination, with a ram comprising a cylinder, a head mounted thereon and a pump secured therein, said pump being provided with a supply duct located laterally of the main pump bore and provided with suitable valves and said head being provided with valve-operating means, of connecting means between said valves and said operating means effective irrespective of the positional relation of head and pump.

17. In a device of the class described, the combination, with a ram comprising a cylinder, a head secured thereto in non-predeterminable positional relation, and a pump mounted therein, said pump being provided with a valved supply duct located laterally of the main pump bore and said head being provided with permanently positioned valve-operating means, of connecting means between the valves and said operating means effective irrespective of the positional relation of said head and said pump.

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

JAMES W. NELSON.
WILLIAM H. MATHERS.

Witnesses:
M. B. GLEN,
JAS. MOORE.