

June 4, 1929.

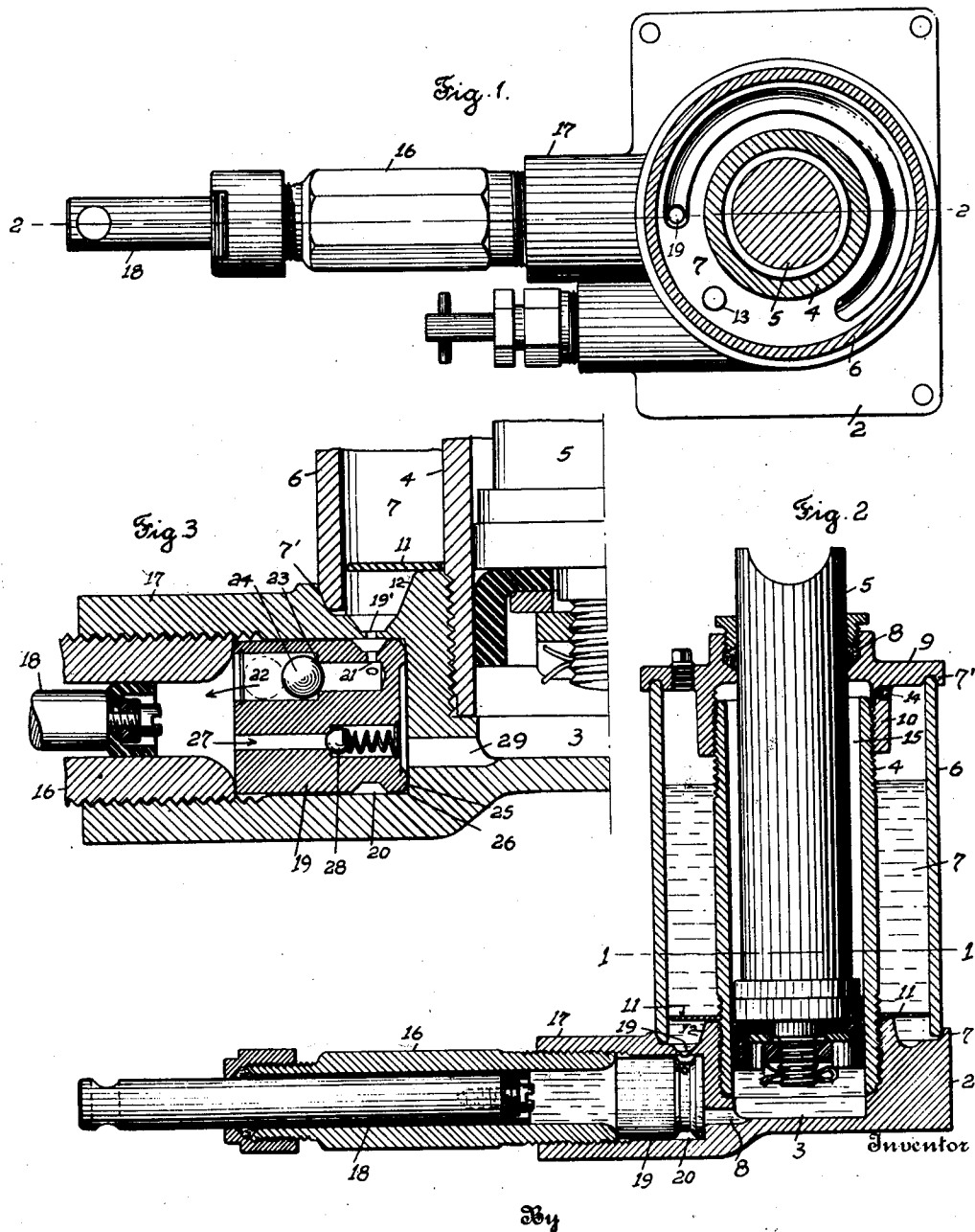
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HYDRAULIC JACK

Filed March 14, 1927

2 Sheets-Sheet 1



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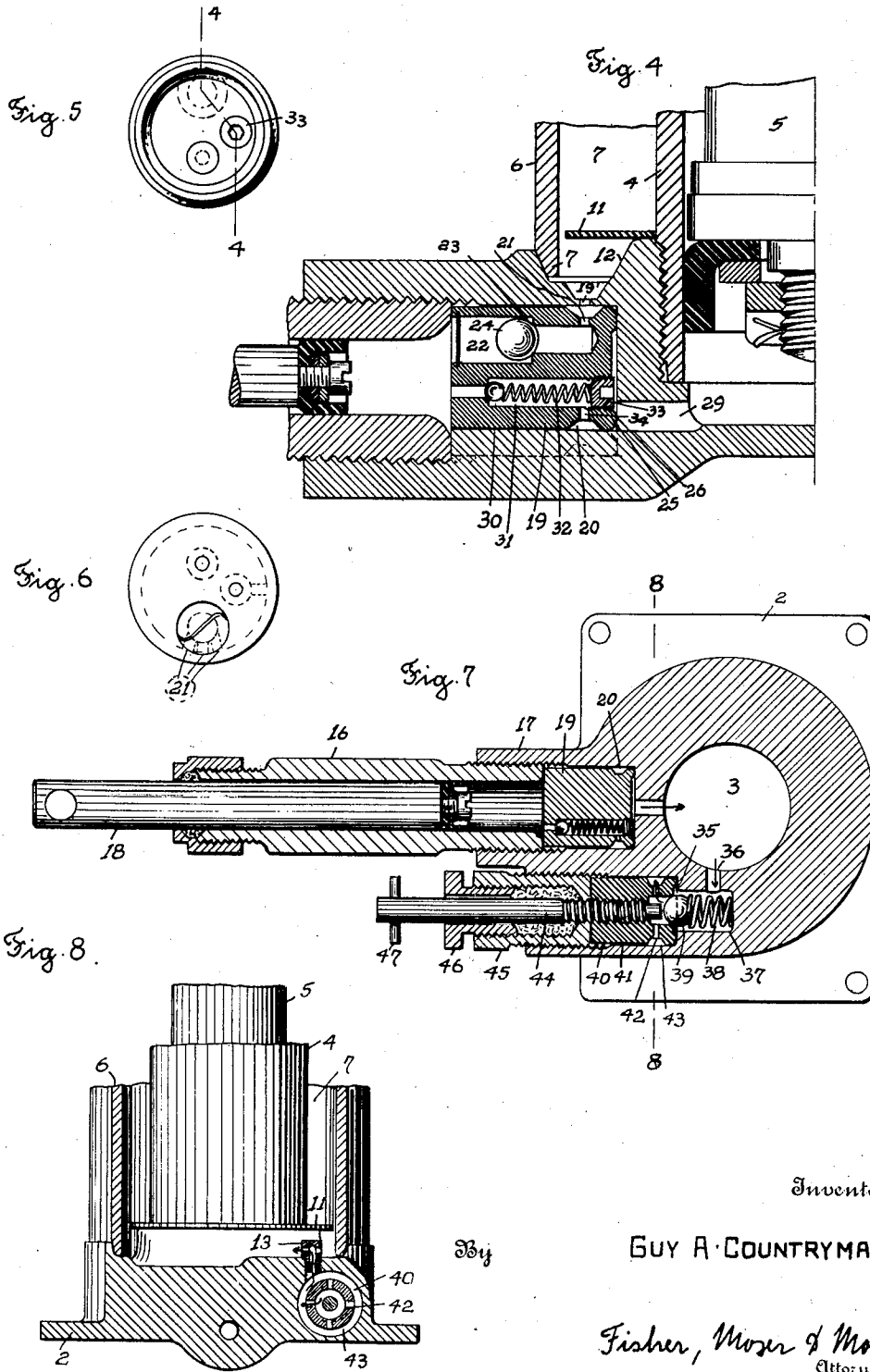
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UNITED STATES PATENT OFFICE.

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HYDRAULIC JACK.

Application filed March 14, 1927. Serial No. 175,175.

My invention relates to an improvement in hydraulic jacks, and in general my object is to provide a hydraulic jack containing means adapted to relieve the structure of excessive internal pressures during operation thereof, especially in lifting a load beyond the capacity of a given sized jack, and in raising a load to the working limits of the jack or to a point where the jack might collapse under the load. The jack is also particularly constructed to permit convenient assembly and disassembly of its parts, and to permit convenient access to and removal of the valve elements. Provision is also made to prevent the fluid from jetting and spattering upwardly into the reservoir and into the central piston chamber in lowering the load.

In the accompanying drawings, Fig. 1 is a horizontal section on line 1—1 of Fig. 2 of the jack, and Fig. 2 is a vertical section centrally thereof on line 2—2 of Fig. 1. Fig. 3 is an enlarged sectional detail on the same line 2—2, showing the main intake and outlet valves for the pump. Fig. 4 is a sectional view corresponding to Fig. 3 but showing the valve cylinder in section on line 4—4 of Fig. 5. Figs. 5 and 6 are end views of the valve cylinder. Fig. 7 is a sectional view horizontally through the base of the jack. Fig. 8 is a sectional view vertically on line 8—8 of Fig. 7.

The invention comprises a base 2 having a round well 3 therein from which a screw-threaded pipe or tube 4 extends upwardly to provide a working chamber for a hydraulic ram or lift plunger 5. A hollow cylinder 6 surrounds pipe 4 to provide a reservoir 7 for the liquid used to raise ram 5. The upper end of the ram is reduced in diameter and extends through a suitable packing gland 8 in a cover 9 having screw-threaded connection 10 with the upper end of pipe 4. Cylinder 6 is beveled at its opposite ends to engage correspondingly beveled seats 7'—7'' in the top of base 2 and the bottom of cover 9, so that when said cover is screwed upon pipe 4 the cylinder will be tightly clamped in place with fluid tight effect at the joints. A flat ring 11 is sleeved loosely over pipe 4 and forms a false bottom in reservoir 7 adapted to rest on the top of the central boss 12 with which pipe 4 has screw-threaded connection. Ring 11

covers an intake jet 13 at the bottom of reservoir 7, see Fig. 8, and it baffles or checks sudden rush of liquid into the reservoir when the load on the ram is lowered rapidly or suddenly. Baffling is also accomplished in part by providing jet member 13 with lateral orifices, see Fig. 8. In that connection it will be noted that cover 9 contains a vent opening 14 between the upper end of the reservoir 7 and the space 15 within pipe 4 above the head of ram 5, and that jetting of the liquid into reservoir 7 is apt to transfer and trap part of the liquid within pipe 4. Ring 11 prevents such transfer upon sudden drop of the ram, but if liquid should pass into the pipe from above, say in case the jack is accidentally upset, the trapped liquid would be discharged slowly into the reservoir again upon uplift of the ram.

Now, reverting to the base parts of the jack, in operation the liquid is drawn from reservoir 7 by a horizontal pump comprising a barrel 16 which is screwed into a lateral boss 17 and contains a reciprocable piston 18 which may be operated by any suitable means, not shown. A single valve cylinder, plug or insert member 19 is seated removably within the inner end of the bore in boss 17, and the liquid from reservoir 7 must pass through this member by way of a series of passages before it is drawn into barrel 16. Thus an outlet 19' in the bottom of reservoir 7 permits the liquid to flow into an annular channel 20 formed in the circumference of valve cylinder 19, and orifices 21 in the bottom of channel 20 permit the liquid to pass into a longitudinal passage 22 having a valve seat 23 therein. A ball valve 24 in passage 22 permits the liquid to pass into the pump chamber upon the outstroke of piston 18 but this ball seats itself and closes the passage upon the return or pressure stroke of the piston. Valve cylinder 19 has a recessed end, the annular border portion 25 of which is adapted to be pressed tightly against the flat bottom 26 of the bore in boss 17 when the inner end of barrel 16 is screwed tightly against the outer end of said cylinder 19, see Fig. 3, thus preventing escape of the liquid from channel 20 except at orifices 21. However, the liquid drawn into the pump may be discharged through valve cylinder 19 by way of a separate longitudinal

passage 27, see Fig. 3. This discharge passage contains a valve seat and a spring-pressed ball valve 28 adapted to operate counter to ball valve 24 so that it will close on the outward stroke and open upon the pressure stroke of piston 18. The liquid discharges through the recessed end of cylindrical member 19 into an inlet port 29 for the working chamber for ram 5. The liquid so transferred from reservoir 7 to the ram lifts the ram accordingly, but repeated operations are required to raise the ram to its limits. These limits are established by the ram head striking cover 9, and obviously if the reciprocable movements of piston 18 are continued severe internal stresses will take place which are apt to disrupt the screw-threads, open the joints, or break the cover. To prevent such troubles from happening a small ball valve 30 is employed within a third longitudinal passage 31 of small diameter in cylindrical member 19, see Fig. 4. A strong compression spring 32 bears against ball valve 30 and holds it to its seat during normal operating conditions, and an adjustable screw plug 33 is adapted to increase or decrease the compression of spring 32 to meet varying conditions. Passage 31 has an outlet orifice 34 in open communication with channel 20 in cylindrical member 19; so that excessive pressure under ram 5 is prevented as in such case relief is afforded at passage 31 by overcoming the counter pressure of spring 32 and by unseating relief valve 30. The liquid in the pump barrel is then forced back into reservoir 7 by way of passage 31, channel 20, and orifices 19. The maximum load to be safely lifted by a given sized jack may be fixed by adjusting screw plug 33, but such adjustment can only be made by first removing cylindrical member 19 from its seat within boss 17. However the removal of this member or unit 19 is easily accomplished, and in so doing all three valves therein may be reached easily and conveniently inspected. The use of such a separate valve cage or unit also facilitates and reduces the cost of manufacture of a hydraulic jack. Lowering of the ram and load is controlled by a separate relief valve 35, also located within base 2 of the jack, see Fig. 7. Thus, well or channel 3 is provided with an outlet port 36 which communicates with a bore 37 containing a spring 38 and ball valve 39. A cylindrical plug 40 is seated removably in a counterbore 41, and ball 39 closes the entrance of a central discharge passage in the inner end of plug 40. Radial openings 42 extend through the walls of the plug to an annular channel 43 in its periphery, and this channel is open to the outlet or jet member 13 at the bottom of reservoir 7, see Fig. 8. When ball 39 is forced from its seat the liquid returns from beneath ram 5 to reser-

voir 7, thus permitting the ram to descend more or less slowly dependent upon the degree of opening afforded for the passage of the liquid at the valve seat. The means for unseating valve 39 comprises a screw-threaded stem 44 extending axially through plug 40 and a clamping nut 45 containing a packing gland member 46. The outer end of stem 44 is provided with a coupling member or a handle 47 of any suitable kind adapted to rotate the stem.

What I claim is:

1. A hydraulic jack, comprising a base, a working chamber containing a ram, a liquid reservoir, a pump, a cylindrical member seated removably in said base and adjacent said chamber and reservoir having valved inlet and outlet passages communicating therewith and with said pump, said member also containing a self-acting, spring pressed by-pass valve adapted to by-pass pumped liquid back to said reservoir, while under excessive back-pressure from the liquid in said working chamber, and a separate relief valve for lowering said ram.

2. A hydraulic jack, comprising a valve unit removably mounted within a part of said jack, said unit containing a pair of valved passages to control the pumping of a liquid therethrough, and a supplemental passage and an adjustable spring-pressed pressure actuated by-pass valve therein.

3. A hydraulic jack, comprising an inner working chamber and a reservoir, a ram within said chamber, means for pumping a liquid from said reservoir to said chamber to raise said ram, means for returning the liquid in said chamber to said reservoir to lower the ram including a valved fluid passage between said reservoir and said working chamber, and baffle means opposite said fluid passage for baffling sudden inrush of the liquid upwardly within said reservoir when the ram is lowered.

4. A hydraulic jack, comprising an inner chamber containing a ram, a hollow cylinder surrounding said chamber containing a baffle member, a pump and valved passages at the bottom of said chamber and cylinder, and a valved return passage leading from said chamber to the lower end of said hollow cylinder beneath said baffle member.

5. A hydraulic jack, comprising a liquid reservoir and a working chamber, a ram within said chamber, a base member having a bore provided with inlet and outlet ports communicating with said reservoir and chamber, a removable unit in said bore, a pump connected to said base member and extending into said bore in contact with said unit, a set of valves in said unit for controlling the flow of liquid from said reservoir to said chamber, said unit also containing a spring pressed by-pass valve adapted to by-pass liquid from said pump directly to said

reservoir, and separate valved means for returning the liquid from the chamber to said reservoir to permit said ram to be lowered.

- 5 6. A hydraulic jack, comprising a pressure cylinder, a ram within said cylinder, a liquid reservoir, a pump and a separate removable unit including valved inlet and out-let passages for connecting said cylinder with said reservoir and said pump and an adjustable by-pass valve for recharging liquid suctioned by said pump from said reservoir directly back into said reservoir at predetermined pressure within said cylinder.

In testimony whereof I affix my signature.

GUY A. COUNTRYMAN.