E. A. GATHMANN.

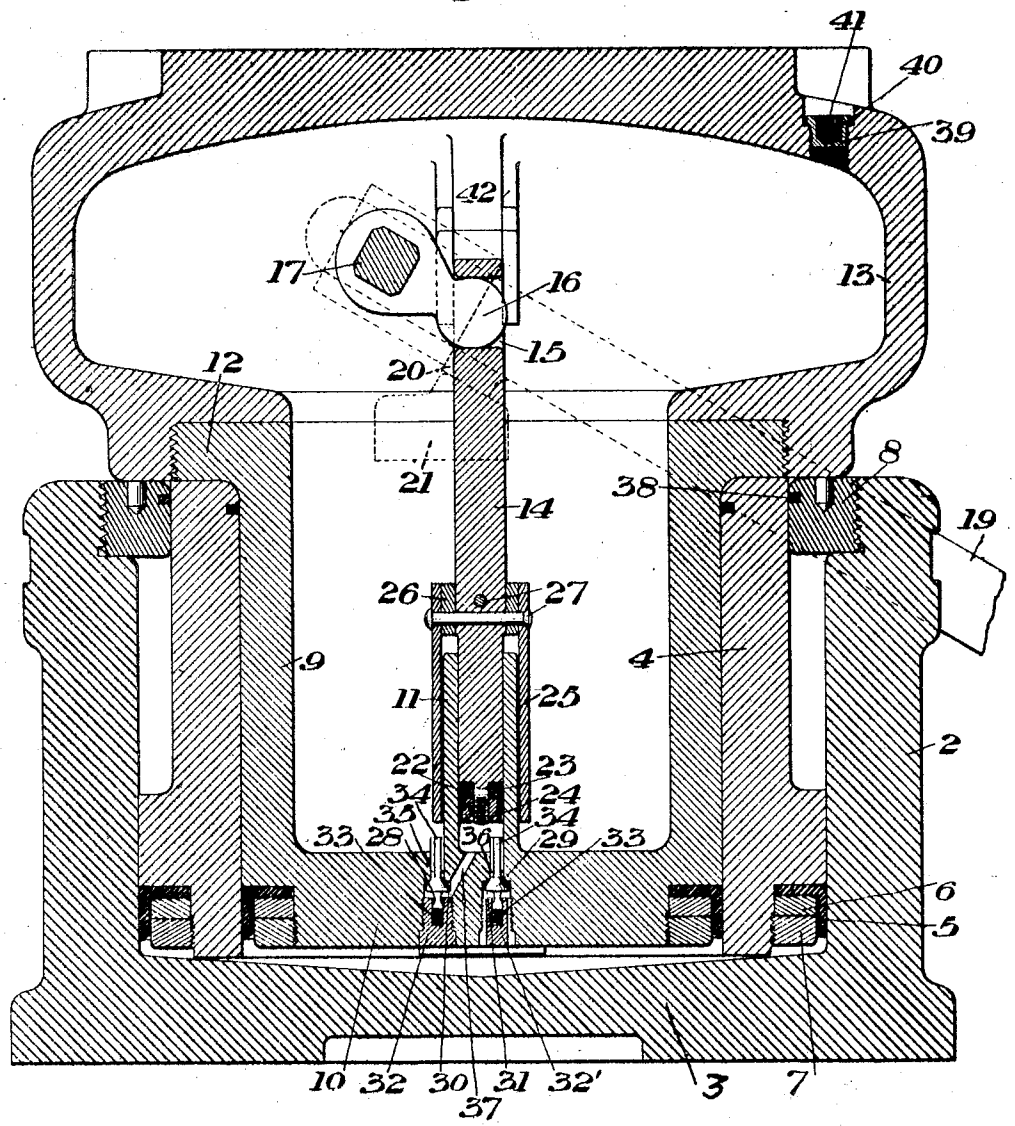
HYDRAULIC JACK.

APPLICATION FILED JULY 27, 1908.

941,870. Patented Nov. 30, 1909.

3 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

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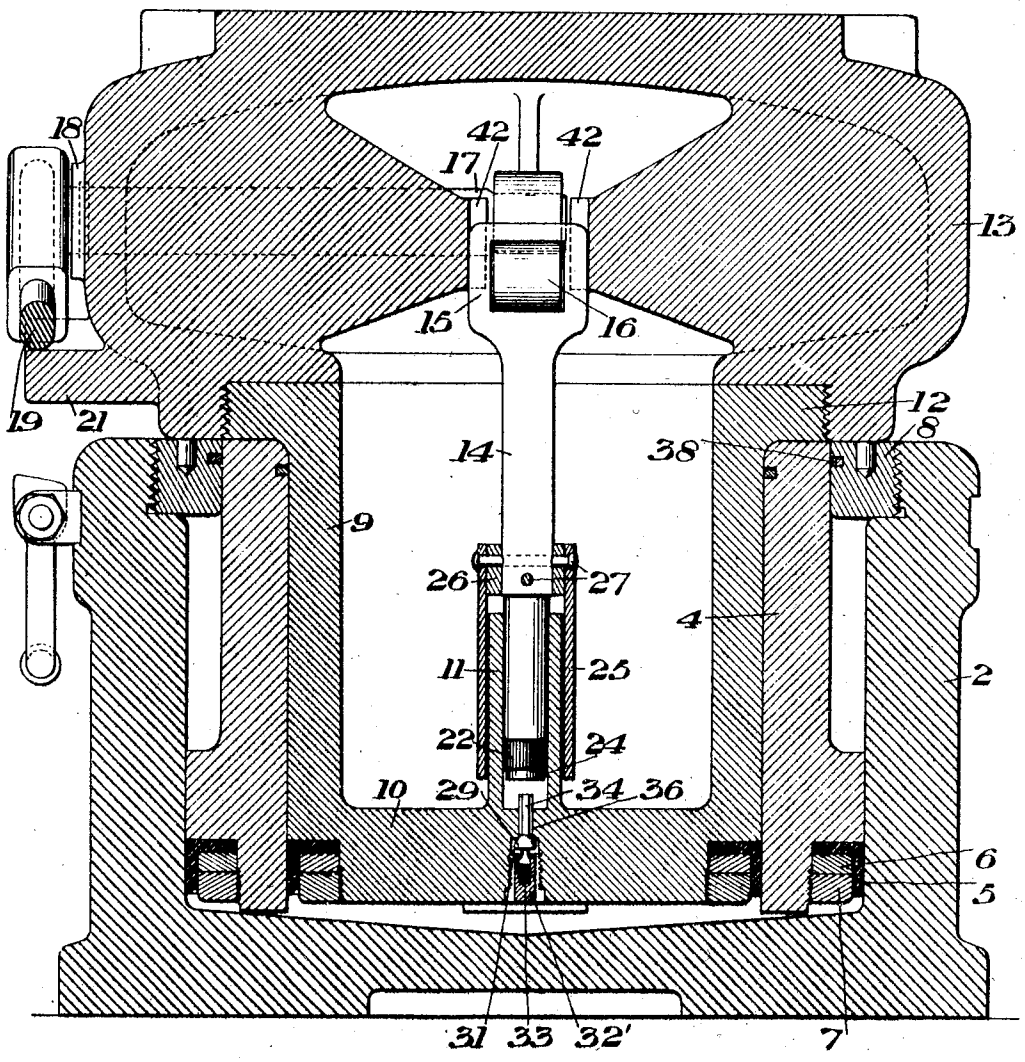
3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 3.

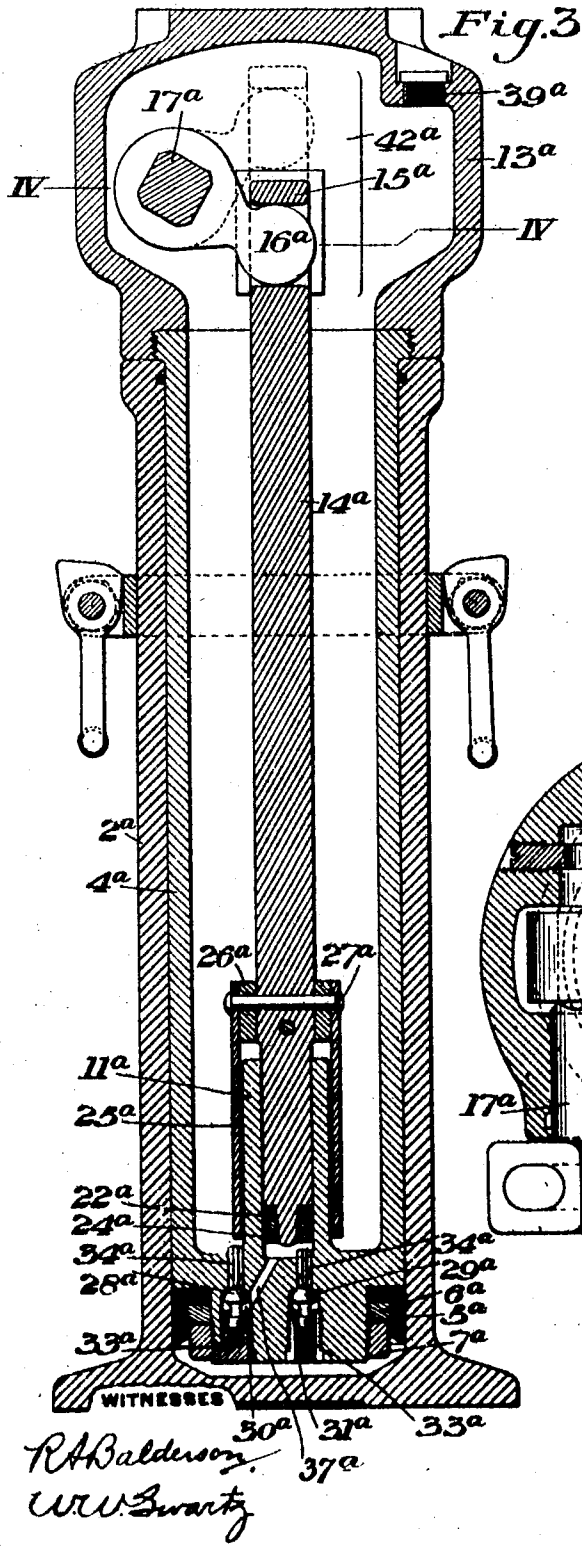
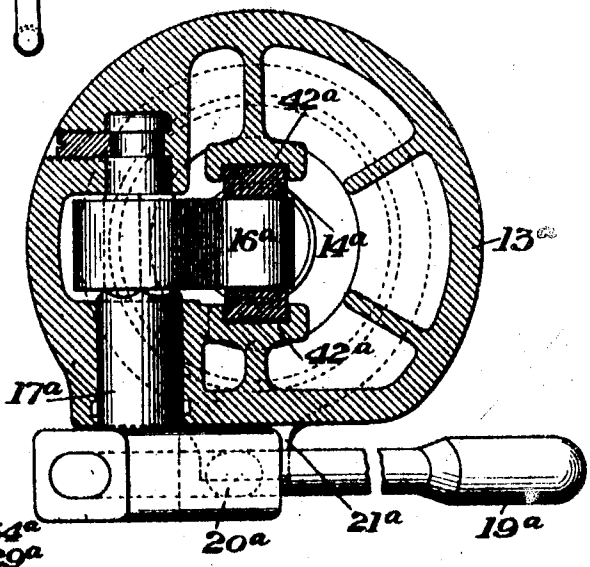


Fig. 4.



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UNITED STATES PATENT OFFICE.

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HYDRAULIC JACK.

941,870. Specification of Letters Patent. Patented Nov. 30, 1909.

Application filed July 27, 1908. Serial No. 445,467.

To all whom it may concern:

Be it known that I, EMIL A. GATHMANN, of Bethlehem, Northampton county, Pennsylvania, have invented a new and useful Improvement in Hydraulic Jacks, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which:

Figure 1 is a central vertical section of my improved jack in its duplex form; Fig. 2 is a side elevation, partly in vertical section, at right angles to the section of Fig. 1; Fig. 3 is a view similar to Fig. 1, showing a similar form; Fig. 4 is a cross section on the line 4—4 of Fig. 3.

My invention relates to the class of hydraulic jacks, particularly portable jacks, and is designed to reduce the number of joints and packings and make the operation of the jack more certain and safe.

A further object is to provide a jack which can be operated in either a horizontal, vertical or inclined position and to reduce the number of operating parts and make them simple and easily accessible for adjustment or repair.

A further object is to produce a jack of minimum weight with a maximum factor of safety for a given thrust; and another object of my preferred duplex form is to obtain a minimum height of jack with a maximum rise of lift of the ram.

In the drawings, referring to the preferred duplex form of Figs. 1 and 2, 2 represents the hollow jack cylinder having an integral closed bottom or base 3. This cylinder with its bottom is made in one integral piece, preferably of forged steel. Within the cylindrical bore of this cylinder fits an intermediate bushing or sleeve 4 having at its lower, larger diametered portion a cup packing 5 held in the lower integral recess by an integral washer 6 and nut 7 which screws on the bushing. The upper reduced diameter portion of this bushing moves within a stop collar 8, which is screwed within the upper end of the cylinder and projects inwardly to act as a stop against the lower, larger portion of the bushing. Within the bushing 4 fits the hollow ram piston 9 having an integral bottom 10 with an integral central, upwardly projecting pump cylinder 11. This ram piston with its bottom and pump cylinder is also preferably forged in one integral piece of steel. The upper portion of the ram piston is enlarged or flanged outwardly at 12 over the bushing or collar 4, and to it is screwed the enlarged hollow ram head 13. This head has an inclosed cavity opening into the smaller diametered bore of the ram piston, and when the parts are in the lowered position the ram piston rests upon the bushing and the head rests upon the stop collar. Located centrally within the hollow ram piston is the pump rod 14 having a horizontally extending eye 15 in its upper end, engaged by a rocker arm 16 projecting from a rocker shaft 17. This rocker shaft extends through a sleeve bearing 18 projecting within the head, and has its external portion provided with the usual operating handle 19, which in the form shown has a stop portion 20 coacting with a stationary stop 21 on the outside of the head which limits its down movement. The lower end of the pump rod within the pump cylinder 11 is provided with cup packing 22 secured by washer 23 and nut 24. Around the pump cylinder is located a valve sleeve 25 which is secured to the valve rod above the cylinder by a washer or ring 26, having right angled rivets 27 extending through the pump rod, the spacing ring and the sleeve. This sleeve may, of course, be secured to the pump rod in any desired manner.

The suction and discharge valves are shown at 28 and 29, each valve seating upwardly in the valve chambers 30 and 31. These valve chambers are bored into the bottom of the hollow ram piston, their lower ends being closed by screw plugs 32, 32′ which are provided with guide holes for the lower portions of the valves, which are normally forced upwardly to their seats by springs 33. The upwardly projecting stems 34 of these valves are guided by projections within the channels 35 and 36 which lead respectively into the pump cylinder and into the hollow ram piston. The valve chamber 30 has a channel or passage 37 leading into the pump cylinder, and the plug 32 of the valve chamber 31 is provided with through grooves or channels leading downwardly into the space between the hollow ram piston and the base of the cylinder.

In order to prevent dirt or foreign matter from entering between the coacting surfaces of the ram cylinder and bushing, I prefer-

ably employ annular cleaning washers 38 seated in recesses in the stop ring 8 and the inner surface of the bushing. At 39 I show a filling plug which is screwed into the ram head and is hollow to receive absorbent material 40 in the form of waste or a sponge, held by a perforated cap 41.

In order to reduce the wear on the pump packing I preferably guide the pump rod in the axis of the pump chamber. This is obtained by enlarged inward projections 42 in the ram head, whose inner faces are provided with guideways coacting with the sides of the eye 15.

The operation is as follows: The hollow head and hollow ram piston are filled with liquid, preferably a mixture of grain alcohol and water. In lifting the head, the pump rod is moved up and down by the handle in the usual manner, and on the up stroke of the pump rod the valve 28 is drawn from its seat and fluid passes through its chamber and through the passage 37 into the pump chamber. On the return or downward stroke of the pump rod the valve 28 closes under the excess pressure in addition to the force of the spring, and the valve 29 is forced down from its seat, the fluid passing by the valve and down through the plug underneath the ram bottom and the lower end of the bushing 4. The ram piston and bushing will thus be raised simultaneously in direct proportion to the relative displacement of the pump chamber and the ram piston and bushing. During this lifting and for about one-half the lifting movement of the ram I obtain a lifting capacity equal to the combined area of the bottom of the sleeve 4 and the ram piston 9, since the sleeve seats against the lower part of the ram head. After the sleeve is stopped by the stop ring 8 the hollow ram piston continues upwardly for the rest of its stroke. This is an important feature, as occasions frequently arise where powerful thrusts or lifts are required, especially for a portion of the ram movement. In this way I obtain a maximum rise or lift of the ram, together with a minimum height of this duplex action.

In lowering the ram the operating lever is reversed and the lower end of the pump rod, together with the valve sleeve 25 are brought into contact with the upwardly projecting valve stems 34, thus unseating the valves and allowing the fluid to flow back into the ram. In order that these valves may not be injured by compression between the pump rod, the trip sleeve and the valve stops, or plugs, 33 and 33′, the downward movement of the pump rod and valve sleeve is positively limited by contacting of the washer 26 with the upper end of the pump cylinder before the heads of the valves strike the stops in their downward movement.

The bushing or sleeve surrounding the ram piston may be dispensed with, as for example in the forms shown in Figs. 3 and 4. In this case I show a longer cylinder and hollow ram piston, since the duplex feature is not used. In this form parts similar to those of Figs. 1 and 2 are marked with similar numerals, with the letter *a* applied, the action being the same as in the first form except that the duplex action is not present, the sleeve or bushing being done away with. This form possesses the other advantages of my invention in the small number of packings and joints, the use in any position and the certain and safe operation. The cylinder has an integral bottom and the hollow ram piston has an integral bottom with an integral pump cylinder. Fig. 4 illustrates the guiding of the pump rod I and the arrangement of the rock shaft and actuating lever.

The advantages of my invention will be apparent to those skilled in the art. Owing to the integral construction the number of joints and packings is greatly reduced. The operation of the jack is rendered more certain, positive and safe, while the operating parts are few, simple in construction and easily accessible. The jack may be used in any position, whether horizontal, inclined or vertical; and may be built of minimum weight and have a high factor of safety for a given thrust, both as to run-out and capacity. In the preferred duplex form a jack of minimum height is obtained, together with a high lift or rise of the ram. A lifting capacity is obtained equal to the combined areas of the sleeve and ram piston, thus giving a powerful thrust for a portion of the stroke.

Many variations may be made in the form and arrangement of the jack and its parts without departing from my invention.

I claim:

1. In a hydraulic jack, a cylinder, a hollow ram piston working therein and provided with an integral bottom, a pump cylinder integral with and rising from said bottom, and a ram head secured to the piston, the joint between the head and piston being the only joint in the piston, substantially as described.

2. In a hydraulic jack, a cylinder having an integral bottom, a forged hollow ram piston working therein and having a bottom integral with the body of the piston and a pump cylinder integral with and rising from the bottom providing an annular space between the pump cylinder and the ram piston, and a ram head secured to the upper part of the piston, substantially as described.

3. In a hydraulic jack, a cylinder having an integral bottom, a hollow ram piston working therein and having a bottom integral with the body of the piston and a pump cylinder integral with and rising from the

bottom, there being an annular space between the pump cylinder and the ram piston, a ram head secured to the piston, a pump cylinder valve, a plunger rod for the pump cylinder, and an annular valve trip carried by the plunger rod, substantially as described.

4. A hollow ram for hydraulic jacks, consisting of a single forging having an integral bottom and a pump cylinder integral with and rising from the bottom, said pump cylinder being of smaller diameter than the inner wall of the ram, providing an annular space between them, substantially as described.

In testimony whereof, I have hereunto set my hand.

EMIL A. GATHMANN.

Witnesses:
A. N. ROBERTS,
JAS. C. FREDERICK.