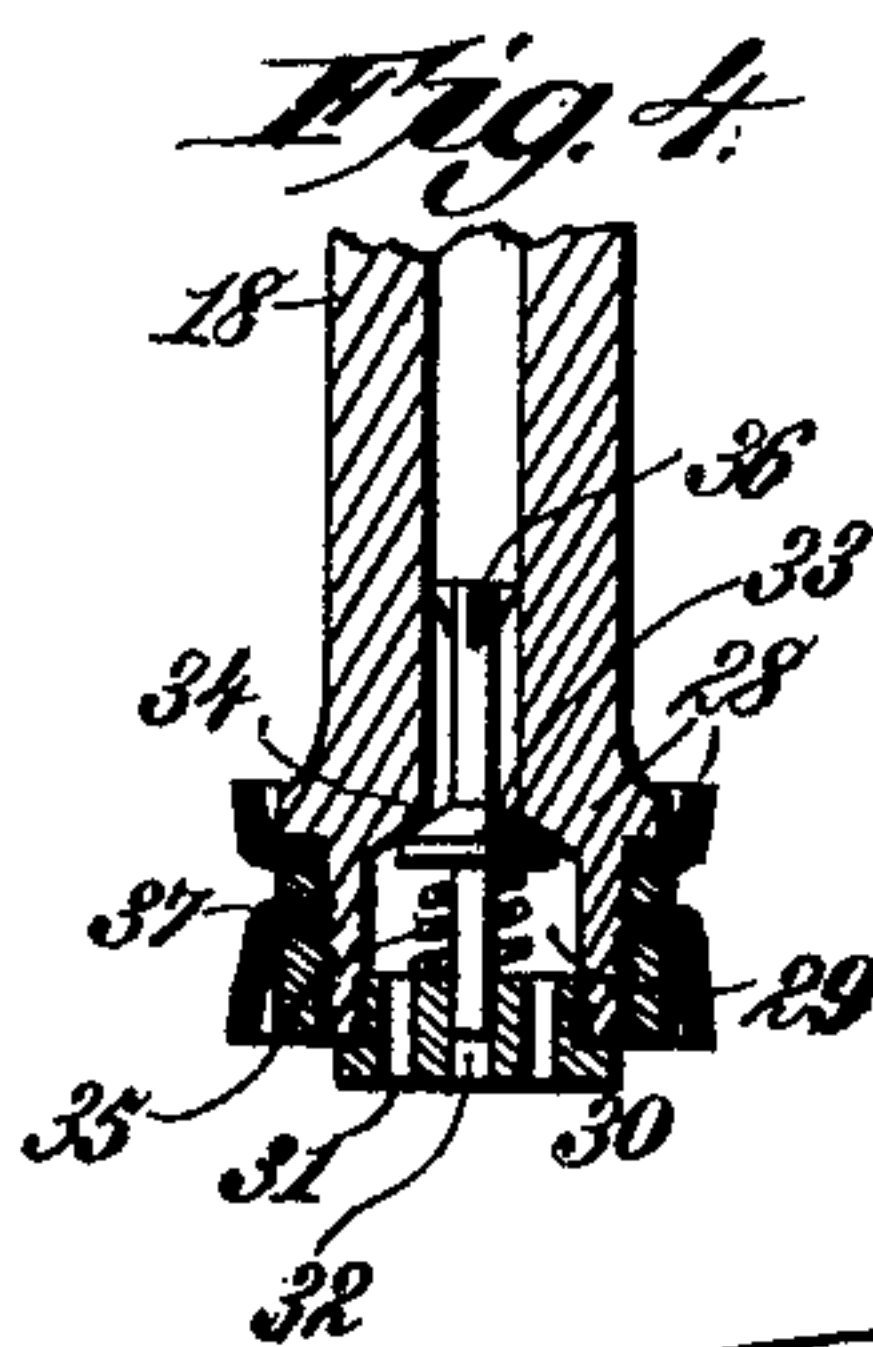
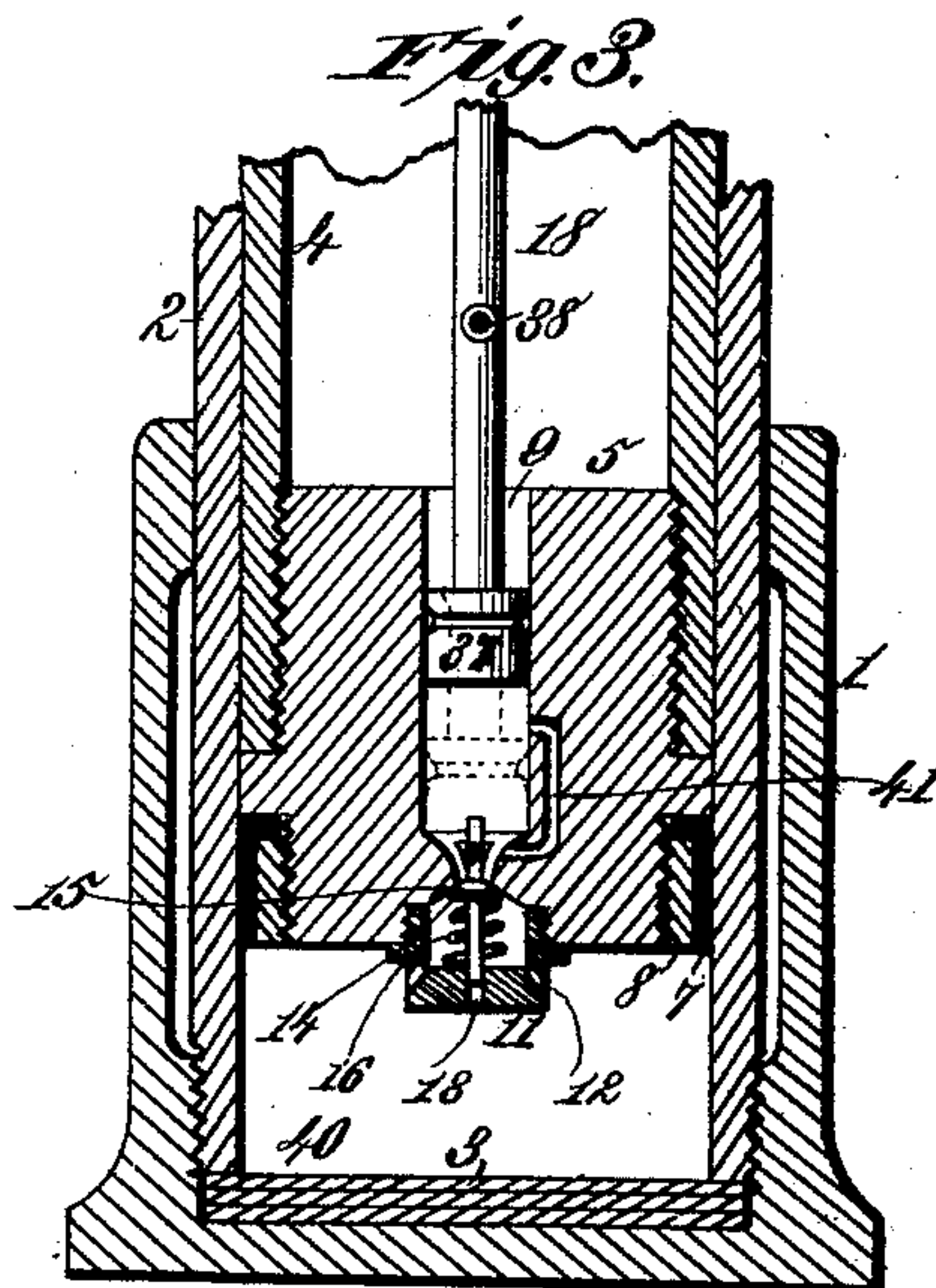
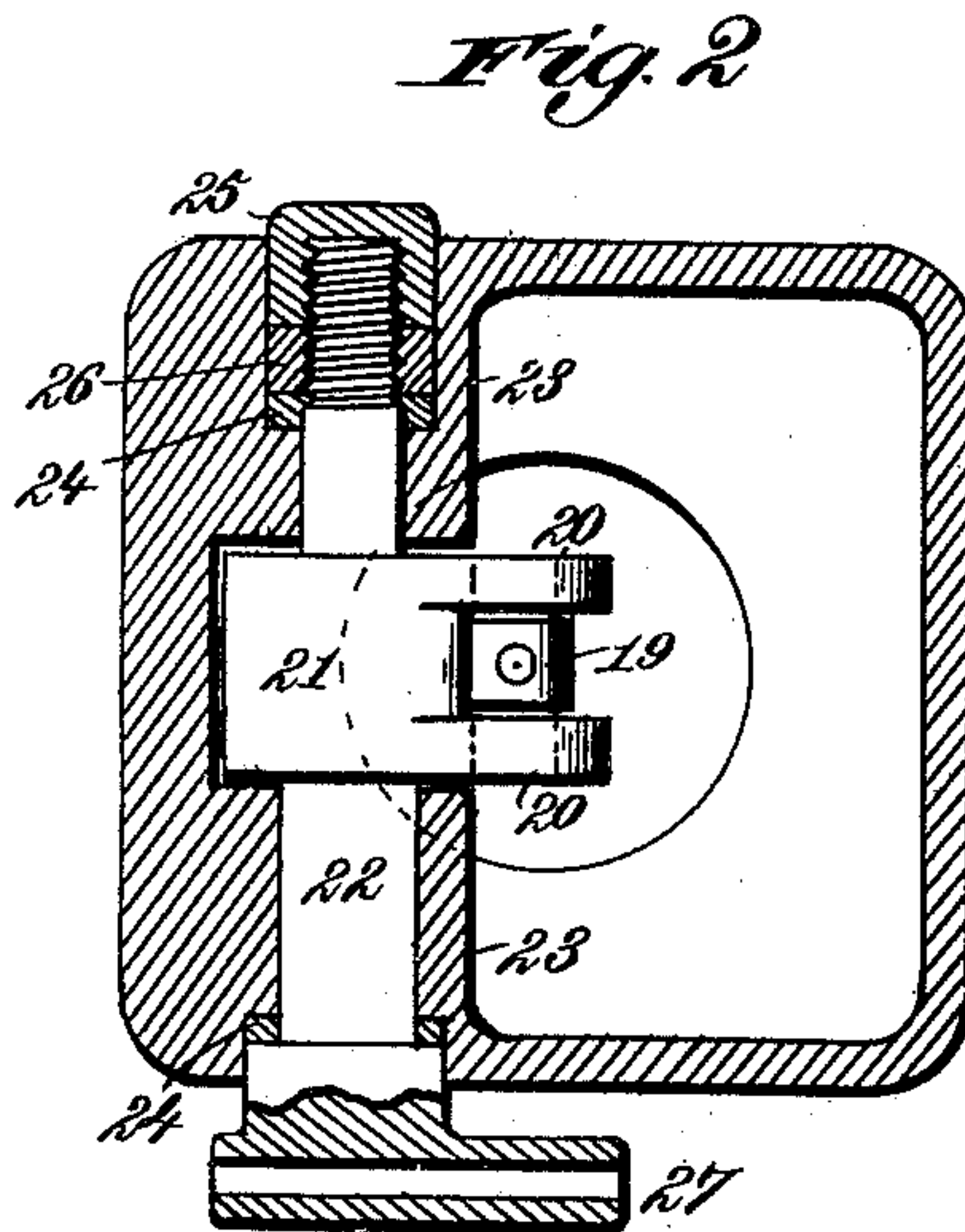
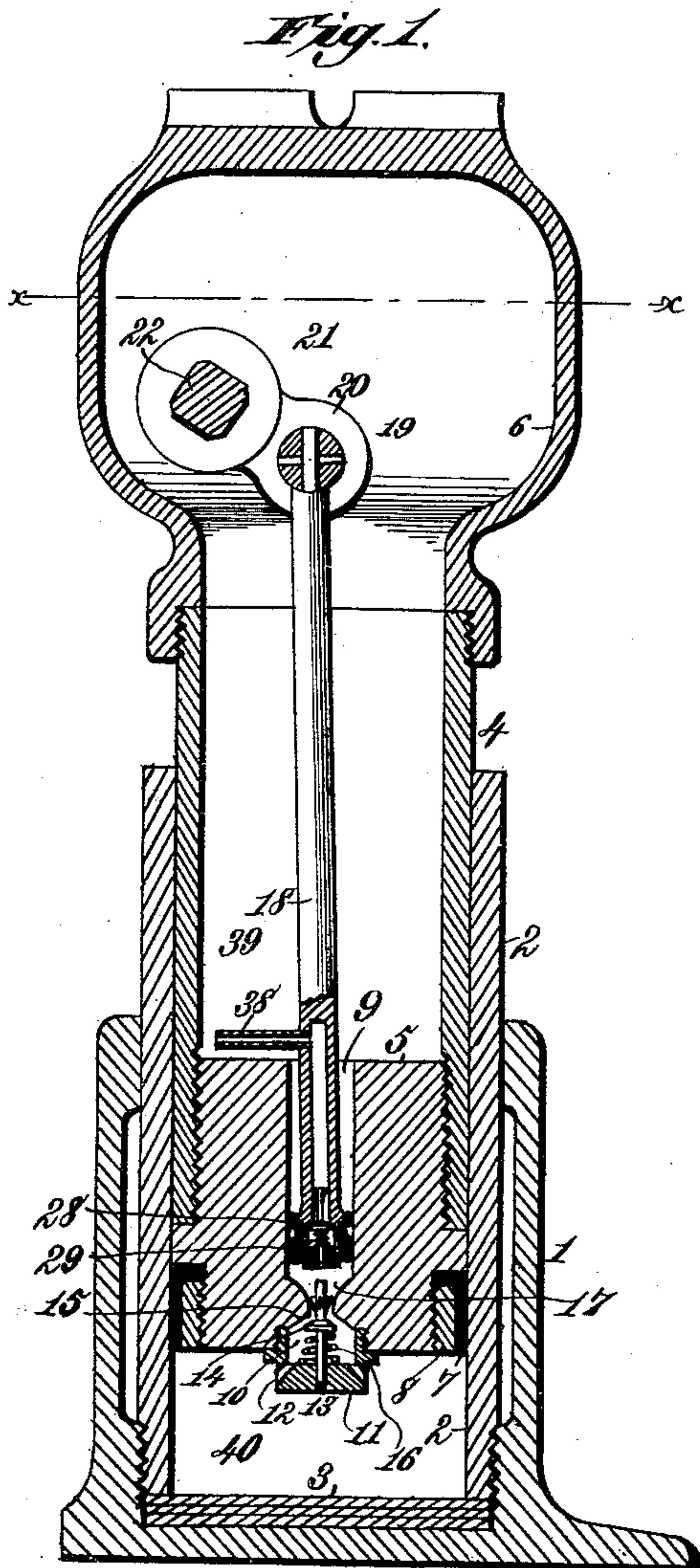


(No Model.)

F. I. JOYCE.  
HYDRAULIC JACK.

No. 407,217.

Patented July 16, 1889.



Witnesses:  
Robert Emmett,  
Geo. H. Rea.

Inventor:  
Frank I. Joyce.  
By James L. Norris,  
Att'y.



# UNITED STATES PATENT OFFICE.

FRANK I. JOYCE, OF DAYTON, OHIO.

## HYDRAULIC JACK.

SPECIFICATION forming part of Letters Patent No. 407,217, dated July 16, 1889.

Application filed August 27, 1888. Serial No. 283,898. (No model.)

*To all whom it may concern:*

Be it known that I, FRANK I. JOYCE, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented new and useful Improvements in Hydraulic Jacks, of which the following is a specification.

This invention relates to a hydraulic lifting-jack adapted to be operated in either a horizontal, vertical, or inclined position; and it consists in the construction and combination of parts hereinafter described and claimed.

In the annexed drawings illustrating the invention, Figure 1 is a central vertical section of a hydraulic jack embodying my improvements. Fig. 2 is a horizontal section of the same on the line *xx* of Fig. 1. Fig. 3 is a central vertical section at right angles to Fig. 1, and showing the plunger in side elevation and the outlet-valve of the ram closed. Fig. 4 is an enlarged sectional elevation of the lower end of the plunger and its packing, showing the inlet-valve closed.

The numeral 1 designates the frame of the jack, and 2 a hollow cylinder secured therein above and in contact with packing 3, which is placed in the bottom of the frame to provide a tight joint. Within the cylinder 2 is fitted a tube 4, having a head 5 secured in its lower end and forming therewith the ram of the jack. To the upper end of the ram-tube 4 is secured the hollow head 6, which is to support the load to be lifted or bear against the object to be moved, as the case may be.

The ram-head 5 is provided at its lower end with packing 7, which is held in place by a nut 8, as shown. In the center of the ram-head is a plunger-chamber 9, and below this plunger-chamber and communicating therewith is an outlet-valve chamber 10, in the lower end of which is secured a nut 11, having openings 12 for the passage of fluid. The nut 11 has a central guideway 13 for the stem of a valve 14, which is normally pressed upward to its seat 15 by means of a spiral spring 16, supported on the nut 11 below said valve. The upper end of the valve-stem above the valve 14 is provided with wings 17, which serve as guides for the valve-stem in the contracted passage between the valve-chamber and plunger-chamber.

The plunger-rod 18 is provided at its upper end with a crank-pin 19, which is journaled in the forks 20 of a crank-arm 21, that is secured to a many-sided rock-shaft 22, which is journaled in the head 6 by means of the bosses 23, packing 24, and cylindrical jam-nuts 25 and 26, in the manner described in my application, Serial No. 270,469, filed April 12, 1888, the object being to provide for the easy removal and replacement of the rock-shaft and plunger and at the same time prevent leakage. On one end of the rock-shaft 22 is secured a crank-head 27, which is perforated or recessed for the insertion of a lever to operate the plunger. The lower end of the plunger-rod is hollow or tubular and somewhat expanded to form a plunger 28, which operates in the plunger-chamber 9 of the ram-head. In the plunger 28, as shown in Fig. 4, is formed an inlet-valve chamber 29, into the lower end of which is screwed a nut 30, having openings 31 for the passage of fluid. This nut 30 has a central guideway 32 for the stem of the inlet-valve 33, which is normally held up to its seat 34 by a spiral spring 35, that is supported by the nut. On the upper end of the valve-stem are wings 36, which act as guides in the hollow plunger-rod. The plunger 28 is provided with an inverted-cup packing 37, in the manner described in my hereinbefore-mentioned prior application.

In order to enable the jack to be operated equally well in either a vertical, horizontal, or inclined position, the hollow plunger-rod 18 is provided above and near the ram-head 5 with a lateral tube 38, which extends very nearly to the extreme side of the upper chamber 39, which contains the fluid to be employed for raising the ram.

When the plunger 28 is lifted, it tends to cause a vacuum in the lower part of the plunger-chamber 9 and in the inlet-valve chamber 29, so that the valve 33 will move from its seat and permit a flow of fluid from the chamber 39 through the tube 38 and hollow plunger-rod 18 into said valve-chamber 29, and thence through the openings 31 into the lower part of the plunger-chamber. When the plunger arrives at the upward limit of its stroke, it will occupy the position shown in Fig. 3, and both valves 33 and 14 will be closed by the action of the springs. As the plunger de-



scends, the pressure is increased in the lower part of the plunger-chamber 9, thereby causing the upper or inlet valve 33 to press more firmly on its seat and prevent the escape of the fluid back into the chamber 39; but at the same time this pressure causes the lower or outlet valve 14 to move away from its seat, and the fluid thus passes through the outlet-valve chamber 10 and openings 12 into the fluid-chamber 40 beneath the ram-head 5, thereby raising the ram.

As the tube 38, which communicates with the hollow plunger-rod, is located very near the ram-head and is of such length as to extend very nearly to the extreme side of the chamber 39, it is obvious that its outer end will be submerged until nearly all the fluid in said chamber has been pumped out, even when the jack is placed in a horizontal or inclined position; and in order that the fluid may be compelled to flow through the tube 38 and plunger-rod 18, even after the surface of the fluid has sunk below the central horizontal line of the plunger-chamber, the plunger is provided with the inverted-cup packing 37, which will spread and produce a perfect vacuum in the plunger-chamber.

In order to provide for lowering the ram from a raised position, a small by-passage 41 is formed in the ram-head 5, communicating with the plunger-chamber at both ends above and below the plunger 28 when it is in the lowest position. By forcing the plunger down to its lowest point in the plunger-chamber, as

shown by dotted lines in Fig. 3, the valve 14 will be pressed down away from its seat and a passage will be afforded for the flow of fluid from the lower chamber 40, through the openings 12, valve-chamber 10, by-passage 41, and upper part of the plunger-chamber 9, to the upper chamber 39, thereby permitting the ram to descend by gravity.

What I claim as my invention is—

The combination, in a hydraulic jack, of a base-frame provided with a hollow cylinder, a fluid-containing ram-tube sliding lengthwise in the cylinder, a ram-head fixed to the lower end of the ram-tube working along the cylinder and having a longitudinal chamber in communication with the fluid in the ram-tube, a valve in the lower portion of the ram-head, a hollow plunger-rod having a hollow packed plunger working in the ram-head, a valve carried by and located in the packed plunger, and a lateral tube communicating with the hollow plunger and extending from the latter at a point above both the plunger-valve and ram-head to a point nearly or adjacent to the extreme side of the fluid-containing ram-tube for enabling the jack to be used in a horizontal or inclined or perpendicular position, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

FRANK I. JOYCE.

Witnesses:

JAMES L. NORRIS,  
JOS. L. COOMBS.