(No Model.) 4 Sheets—Sheet 1.

T. F. ROWLAND.

HYDRAULIC ELEVATING MACHINERY.

No. 488,836. Patented Dec. 27, 1892.

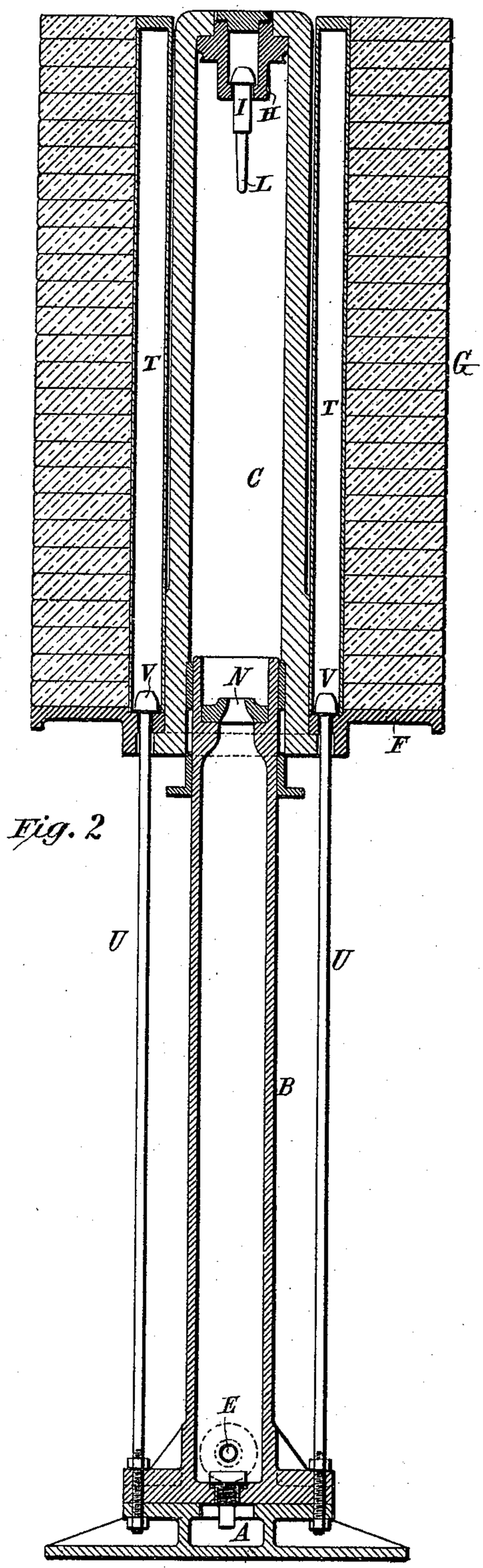


Fig. 2

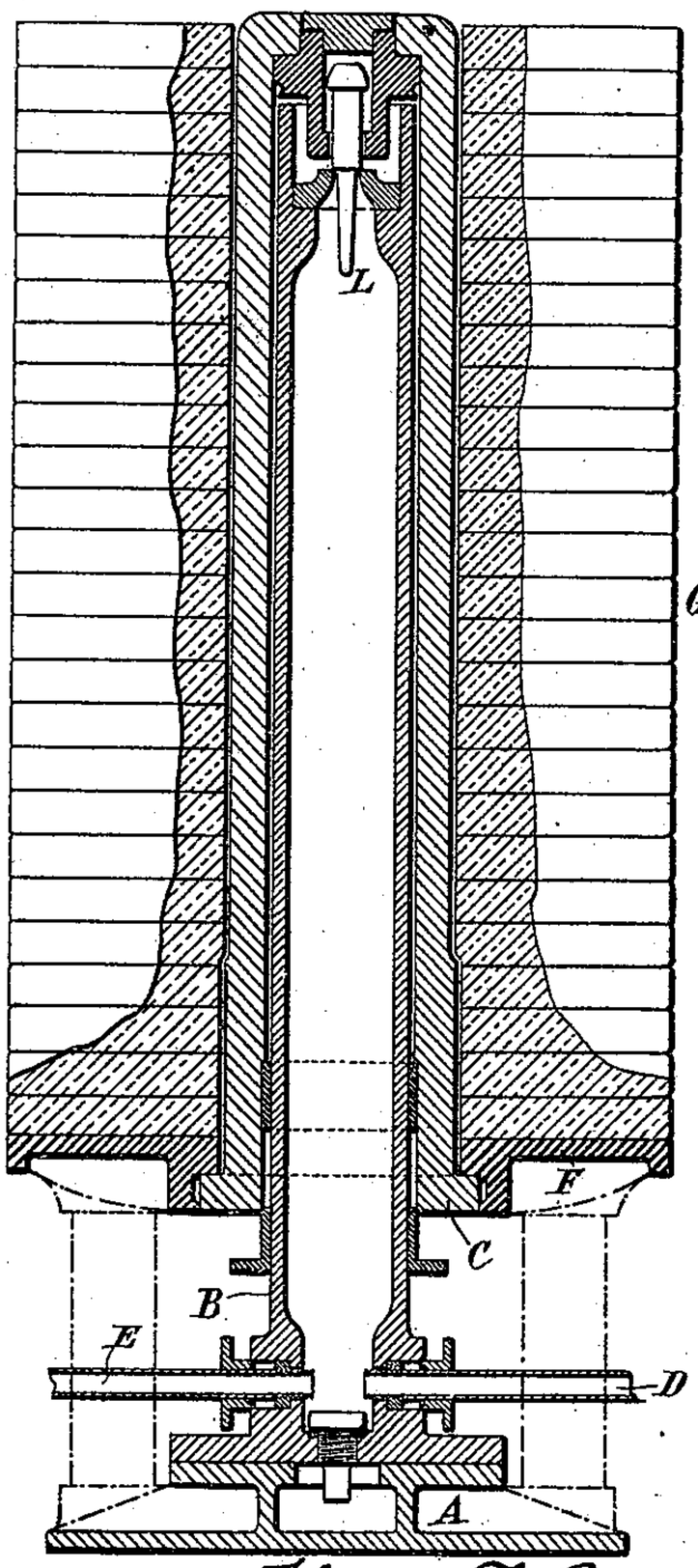


Fig. 1

Witnesses: Raphael Netter, Robt F. Gaylord

Inventor Thomas F. Rowland by Dueen & Page Attorneys.

(No Model.) 4 Sheets—Sheet 2.

T. F. ROWLAND.

HYDRAULIC ELEVATING MACHINERY.

No. 488,836. Patented Dec. 27, 1892.

Fig. 3

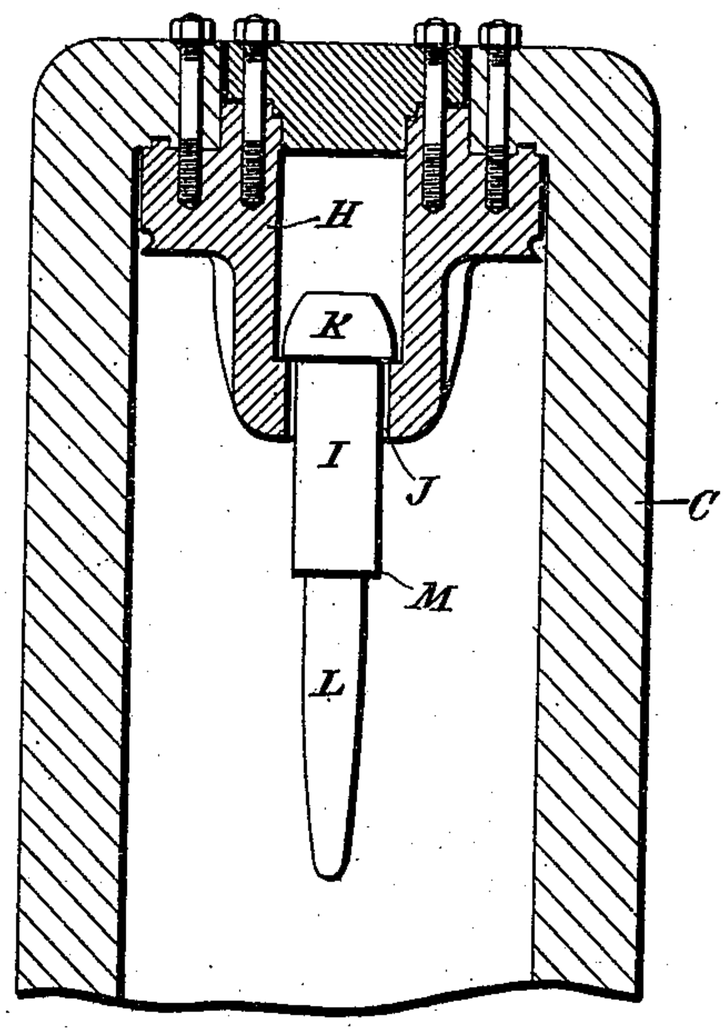


Fig. 4

Witnesses:
Raphael Netter
Robt. F. Gaylord

Inventor
Thomas F. Rowland
by Duncan & Page
Attorneys.

(No Model.)

4 Sheets—Sheet 3.

T. F. ROWLAND.

HYDRAULIC ELEVATING MACHINERY.

No. 488,836. Patented Dec. 27, 1892.

Fig. 7

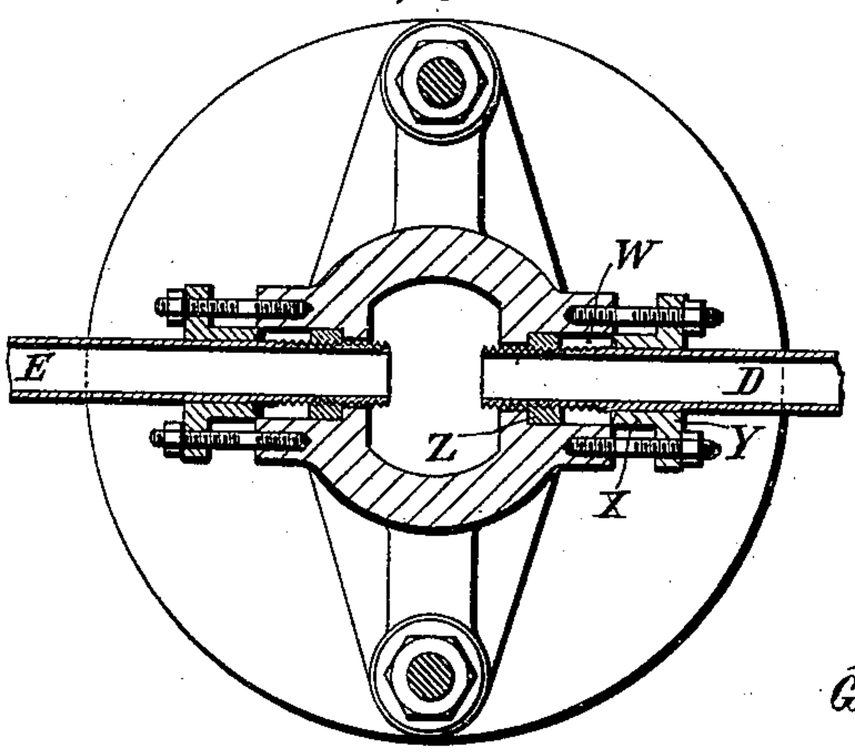


Fig. 8

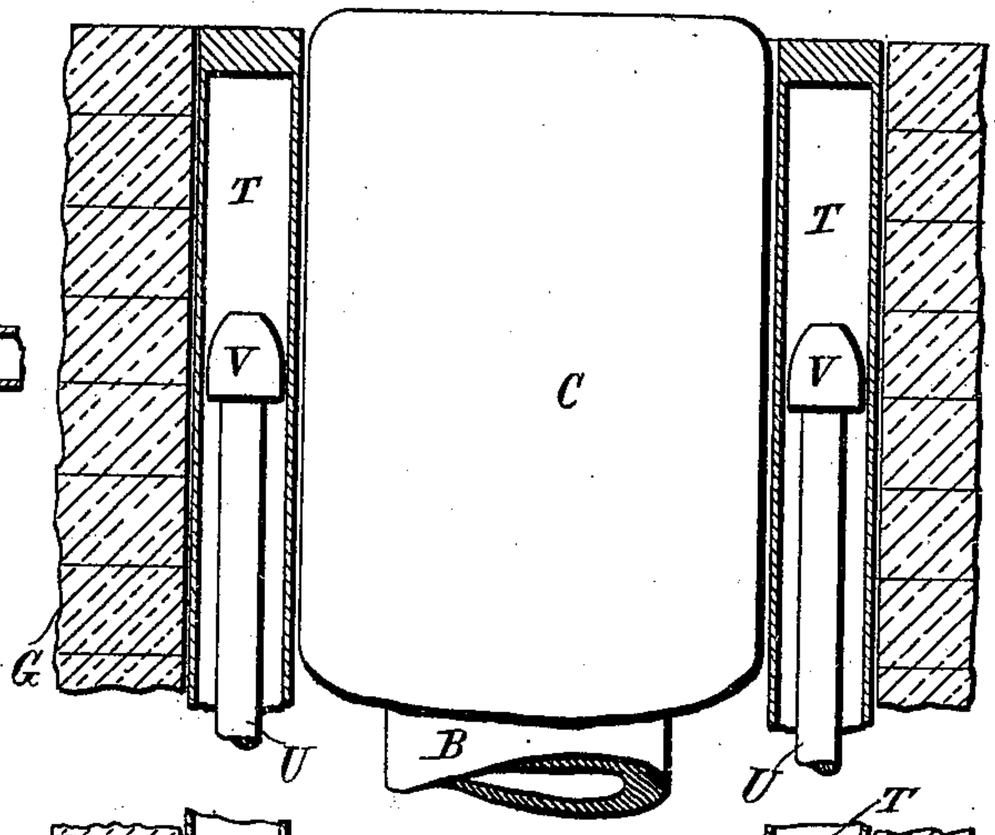


Fig. 5

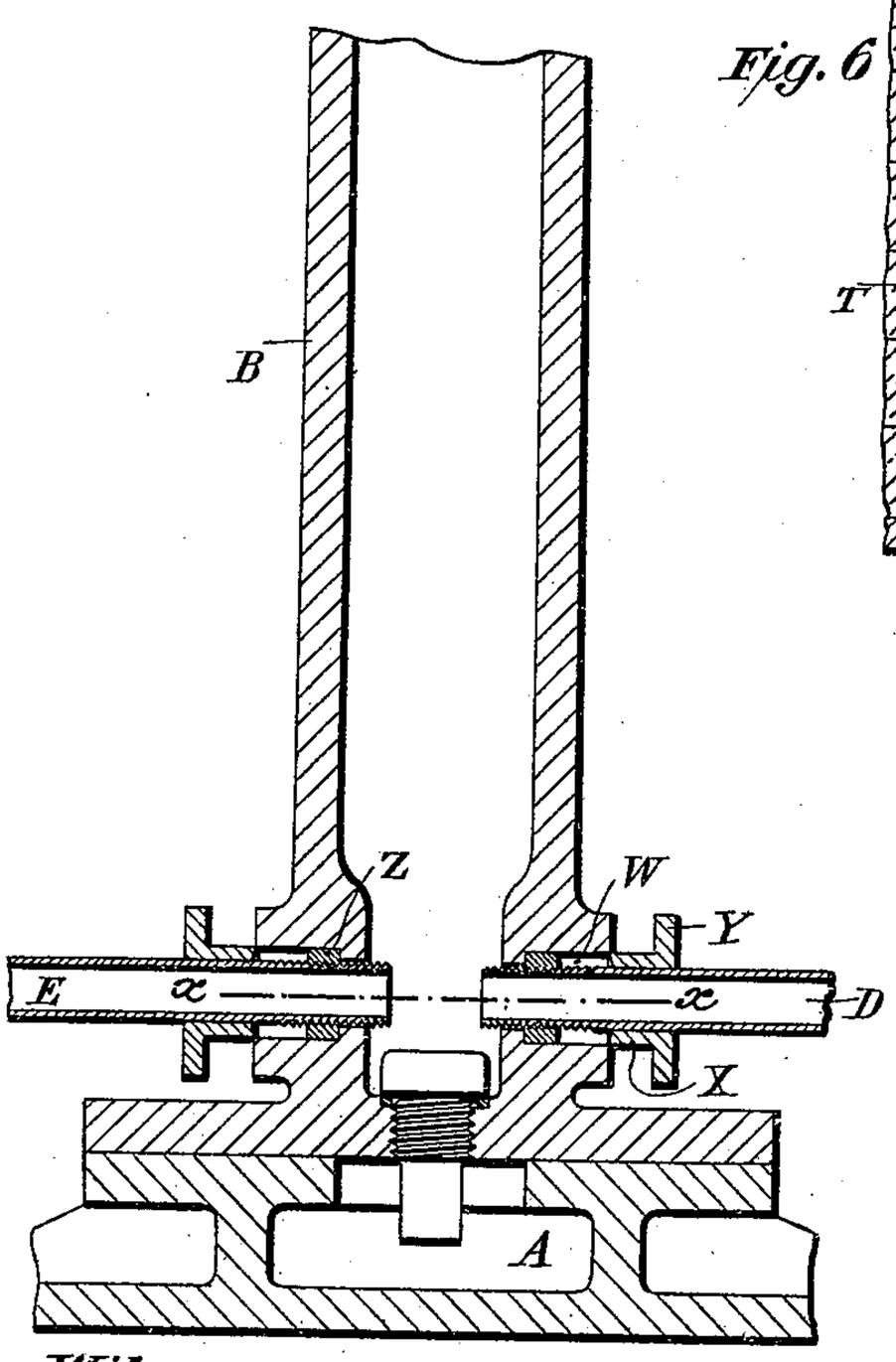
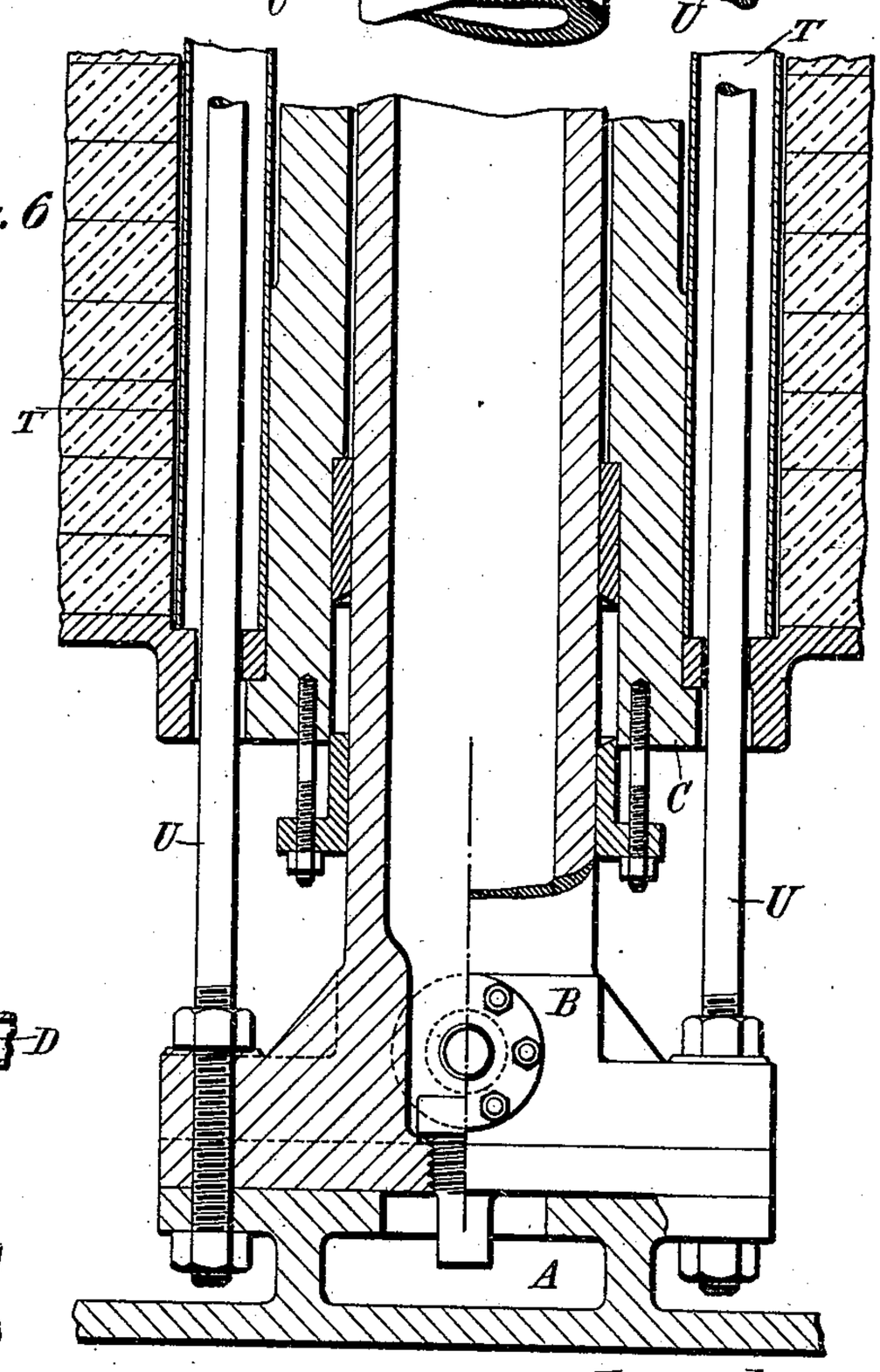


Fig. 6



Witnesses:
Raphael Netter
Robt. F. Gaylord

Inventor
Thomas F. Rowland
by Duncan & Page
Attorneys.

(No Model.) 4 Sheets—Sheet 4.

T. F. ROWLAND.

HYDRAULIC ELEVATING MACHINERY.

No. 488,836. Patented Dec. 27, 1892.

Fig. 9

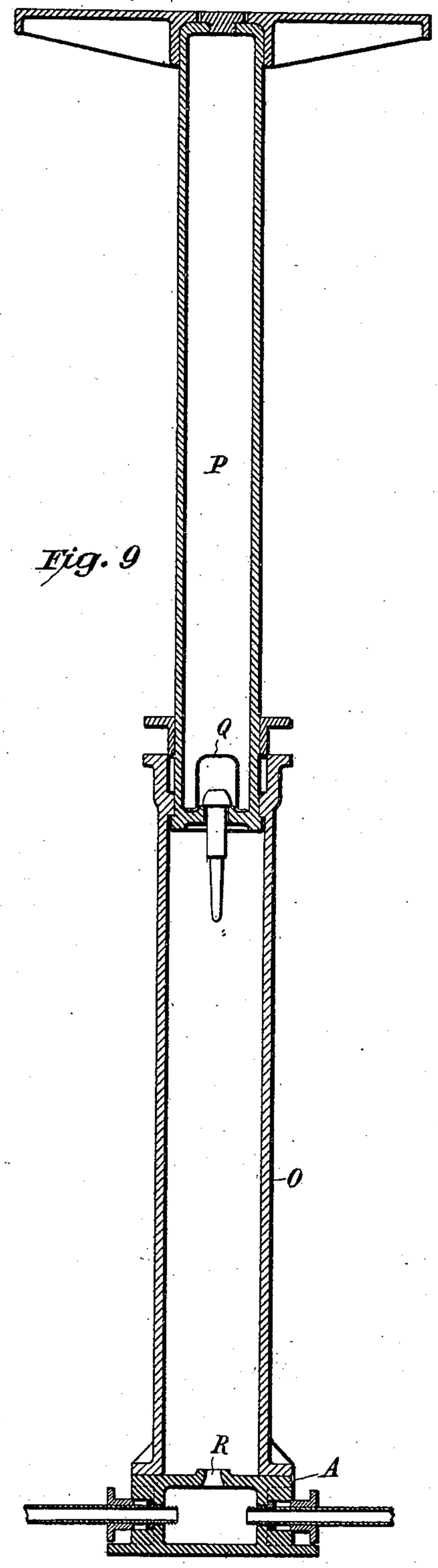
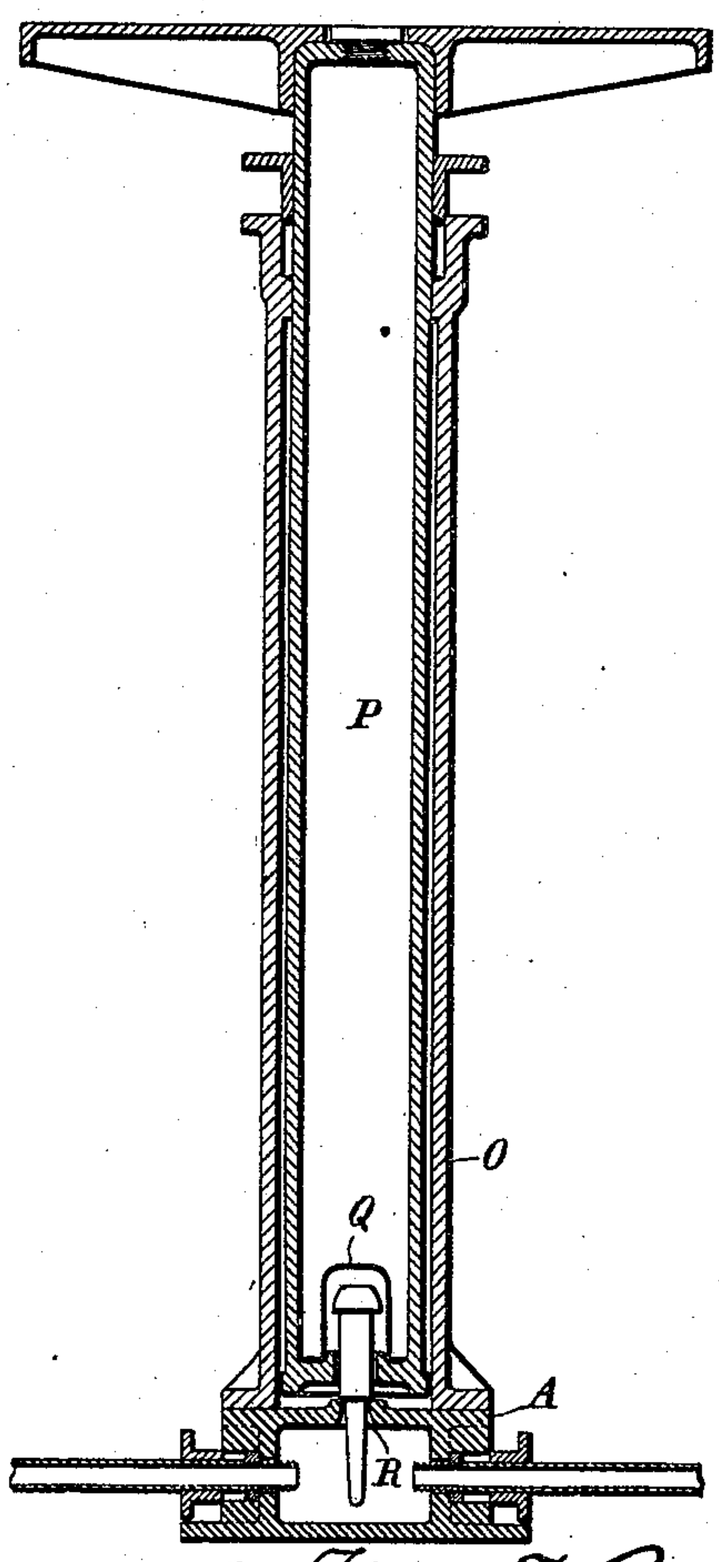


Fig. 10



Witnesses { Raphael Netter
Robt. F. Gaylord

Inventor: Thomas F. Rowland
by Duncan & Page
Attorneys.

UNITED STATES PATENT OFFICE.

THOMAS F. ROWLAND, OF NEW YORK, N. Y.

HYDRAULIC ELEVATING MACHINERY.

SPECIFICATION forming part of Letters Patent No. 488,836, dated December 27, 1892.

Application filed July 8, 1891. Serial No. 398,756. (No model.)

To all whom it may concern:

Be it known that I, THOMAS F. ROWLAND, of the city, county, and State of New York, have invented certain new and useful Improvements in Hydraulic Elevating Machinery, of which the following is a description, reference being had to the accompanying drawings.

The present features of invention relate to that class of hydraulic machinery which is employed to lift loads of various kinds, the form of mechanism selected to illustrate the application of the improvements being a hydraulic accumulator, but it is to be understood that the improvements are applicable to many other forms of elevators, lifts or rams.

The object of the invention is to provide improved means whereby the load on the ram, or traveling piston or cylinder of the machine, can be easily landed or brought to rest and without injury to the machine, particularly in event of the rupture of the connecting pipes, or the occurrence of such other break or derangement of the parts as would permit the fluid in the ram cylinder to escape.

It is also the object of the invention to provide improved connections for attaching the pipes to the ram or its cylinder. And, further, the invention relates to improved guide and controlling devices, whereby the load on the ram is confined to a predetermined path of motion.

The mechanism of the drawings will be described in detail, and in the claims to follow the description, I will point out the features of invention that I claim as new.

Figure 1 is an elevation view of a hydraulic accumulator embodying my improvements, the plunger and cylinder being shown in central vertical section, this type of machine being one in which a cylinder moves over a fixed plunger; and in this view the cylinder and plunger are shown in their closed position, or in the position where the load is at the lower limit of its path of movement. Fig. 2 is a central vertical section on a plane taken at right angles to the section plane of Fig. 1; this view, however, shows the load as raised or at the upper limit of its movement. Figs. 3 and 4 are enlarged detail central sectional views of the valve and valve seat of the cylinder of Figs. 1 and 2. Figs. 5 and 6 are enlarged sectional views of the base of the apparatus, as seen also in Figs. 1 and 2. Fig. 7 is a cross section on plane *x*—*x* of Fig. 5. Fig. 8 is a detail sectional view of the upper ends of the guides that control and limit the movement of the load. Figs. 9 and 10 are central vertical sections of a form of hydraulic apparatus in which the cylinder is fixed and the plunger moves, the former showing the extended and the latter the closed position of the parts.

Referring to the views Figs. 1 to 8, A represents the base of the apparatus; B is the hollow plunger fixedly attached to the base; C is the cylinder moving on the plunger; D is an inlet and E an outlet pipe to the plunger B; and F is a platform carried on the cylinder and upon which is carried the load G, in this case shown as a series of heavy disk-like blocks of metal. The upper end of the cylinder is closed, and is provided with any suitable packing devices whereby tight joints are made between it and the plunger; and, in other respects, the general construction of the apparatus is in accordance with the well-known methods. It is to be understood that this form of apparatus is intended to serve to produce an artificial head to the water, that is, to put it under high pressure, and to maintain a constant and steady pressure—of a thousand pounds or more to the square inch in some cases. Thus the pipe D may be considered as connecting with the pumps designed to force the water into the accumulator, and the pipe E as leading to the machinery to be operated by the water under pressure. But the same character of plunger and cylinder can be employed to lift ordnance or heavy projectiles, passenger cars, and any form of loads where the conditions are adapted to the employment of hydraulic apparatus.

At the upper end of the cylinder C is the valve cage H in which is disconnectedly held the plug valve I. This cage is of a hollow cylindrical form, and is secured in or at the upper end of the cylinder by bolts or other proper connections. The lower end of the cage has

a flanged opening J in which hangs the valve I, the body part of which is somewhat smaller than the opening J, while the head K which is smaller than the interior bore of the cage is larger than said opening, so that the valve is suspended in the opening by its head engaging the flange edge of the same. This valve is free to move vertically in the cage, and when its head is off the supporting flange water can pass freely around the valve into or out from the cage. The body I of this plug valve is cylindrical in form, and this cylindrical portion is of a length corresponding substantially to the vertical extent of the bore or hollow of the cage. From the lower end of the body of the valve projects the coned plug point L, which point is smaller in its largest diameter than the body of the valve, thus producing the shoulder M.

N is the valve seat, which seat is properly secured to and in the upper end of the piston B. The size of the seat opening is slightly larger than the greatest diameter of the plug L of the valve. The valve and valve seat are arranged centrally to and on the axial line of the piston B and cylinder C. It will now be plain, that as the load descends (especially in any case when control of the flow of the water from the cylinder is lost) and as the upper ends of the cylinder and piston approach, the conical point of the valve will enter the valve seat, and, by its downward movement, gradually close the same, thus trapping a body of water between the cylinder and piston, and stopping or retarding the descent of the cylinder. It is to be understood that, under the pressure usually maintained in such apparatus, the parts are rarely if ever absolutely water-tight one within the other, and therefore there will always be some leak of the water from between the piston and cylinder. Accordingly, after the load has been retarded in its descent, or brought as nearly to rest as the tightness of the parts will permit, the further slow escape of the water from between the cylinder and piston will permit the cylinder to slowly descend yet farther and gradually come to absolute rest upon the piston. In this way, the cylinder is prevented coming in violent contact with the piston, and the danger of thereby breaking the parts is obviated. In this latter connection, it is to be noticed that the valve has no positive attachment to the cylinder, and, therefore, when the valve strikes the valve seat and the full flow of water is cut off, the further motion of the cylinder cannot be transmitted through the valve to the plunger since the valve cage is free to move vertically along the valve. In event of accident to the pipes, or if the pressure on the water is for any other reason suddenly released, so that the load can escape control and run down, this valve will cause it to be easily and gradually landed without injury to the apparatus.

In Figs. 9 and 10 I show a reversed arrangement of plunger and cylinder. Here the cylinder O is fixed to the base A, and the plunger P has movement vertically in the cylinder; the plug valve is, of course, arranged in the lower end of the plunger and properly confined by the cage Q, while the valve seat R is at the lower end of the cylinder or in the base A. The action of this construction will be the same as already described for the other figures of the drawings.

In the views Figs. 9 and 10, the valve cage Q is shown as composed of a bar or strap of metal bent to proper form to pass up over and loosely inclose the valve. The purpose of a valve cage is to insure the valve being held at all times in operable position, that is, to prevent it rising so high as to get out of the opening in which it is hung, as well as to guide its upper end and thereby hold its lower end in line with the valve seat. Such a cage, however, is not necessary to the working of the valve when the latter is properly constructed and positioned; it is essentially but a guard that it is preferred to have to prevent the valve being displaced under possible conditions tending thereto.

T represents tubes seated in the platform F, and extending vertically through holes in the inner periphery of the weight disks G. These tubes serve to hold the weights from shifting circularly upon each other.

U represents guide rods for the load of disks, and they are firmly anchored to the base A, pass through the platform F, and have at their upper ends heads V of a diameter about the same as that of the bore of the tubes T, and larger than that of the rods or the holes for the rods through the platform. These rods serve as guides to the load, and also to prevent the cylinder C being accidentally carried so high as to run off the plunger, and therefore to permit the load to topple and wreck the apparatus by falling. Thus, if the cylinder rise too high, the heads on the guide rods will engage the platform and arrest the load; it being understood that the power of the pumps serving the accumulator is not so much in excess of that necessary to lift the load but that the lifting action is easily resisted by the guide rods. This guide mechanism, however, is not the only mechanism provided for controlling the load; it is employed as an emergency protection to answer to possible but not usual conditions.

It is found in the use of this kind of apparatus, and especially when the pressure is very high, that the water cuts away the pipes and other passages, and so makes leaks or ruptures of the parts a constant source of danger. This tendency naturally occurs at points in the water passages where the deflection is the greatest, and where variation of current is most pronounced. One such point, and the one to be most guarded, is where the inlet and outlet pipes are attached to the apparatus. To overcome this difficulty I pierce the plunger B (Figs. 5 and 7) with plain holes, for the pipes D and E, which holes are out-

wardly enlarged or socketed at W to receive the pack flange X of a common form of packing ring Y, and I provide each of the pipes with a collar Z threaded on the end of the pipe and fitting the outer packing socket. The pipes D and E are inserted so as to project into the plunger B beyond the face of the inner walls of the same. By these means, as the inner ends of the pipes are cut away, the collars Z can be set farther back so as to insure the ends of the pipes always projecting well into the plunger, and so far beyond the walls of the same as to prevent the water cutting into the walls and weakening them.

I am aware that various forms of valves have been proposed for hydraulic apparatus that are adapted to gradually shut off or close an inlet or outlet port, and I do not claim such.

My invention relates to a plug or similar valve carried without positive attachment or operable connection on the moving piston or plunger or on the moving cylinder of an hydraulic apparatus, such valve being arranged to close the water passage or port between the plunger and cylinder as they come together and confine between them a cushioning body of water.

What is claimed as new is:—

1. In combination, a hydraulic cylinder and the plunger or piston thereof, a valve disconnectedly carried on the cylinder or moving member, and an open valve seat on the plunger arranged in line with the valve, whereby as the cylinder descends upon the plunger a body of fluid is confined between them and the cylinder is thereby retarded and gradually brought to rest upon the plunger without shock.

2. In combination with a hydraulic cylinder and the plunger thereof, a movable coned valve disconnectedly carried on the cylinder or moving member, an open valve seat on the plunger or stationary member arranged in line with said valve, whereby as the cylinder descends upon the piston the escape of the fluid from between the two members is retarded and the movable member caused to come to rest upon the stationary member without shock.

3. In combination, the hydraulic plunger B and the cylinder C, a plug valve disconnectedly hung in a valve-inclosing cage on the cylinder, a valve seat on the plunger arranged to receive the said valve as the plunger and cylinder close together, substantially as and for the purpose set forth.

4. In combination in a hydraulic accumulator, the plunger B and the cylinder C, the platform F carried by the cylinder or moving member, the tubes T holding the weights G in position upon the platform, and the headed guide rods U arranged to limit the upward movement of the platform, substantially as and for the purpose set forth.

5. In combination with the plunger or cylinder of a hydraulic apparatus, the socket pipe hole W, the pipe D having its end threaded and extending through the walls B of the cylinder, the threaded collar Z adjustable on the pipe D, and the packing ring Y, combined and operating substantially as and for the purpose set forth.

THOS. F. ROWLAND.

Witnesses:
MARY E. ROWLAND,
ROBT. F. GAYLORD.