(No Model.)

J. H. HUBBELL.

HYDRAULIC RELIEF VALVE MECHANISM.

No. 569,921. Patented Oct. 20, 1896.

Fig. 2

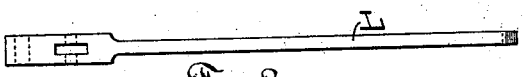

Fig. 3

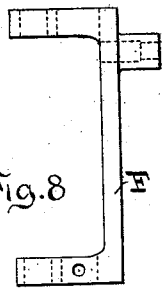

Fig. 8

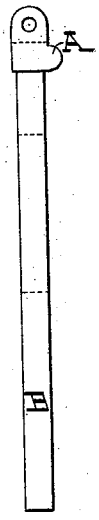

Fig. 6

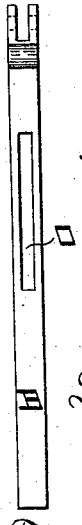

Fig. 7

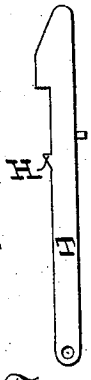

Fig. 4

Fig. 5

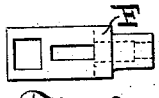

Fig. 9

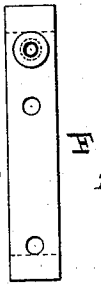

Fig. 10

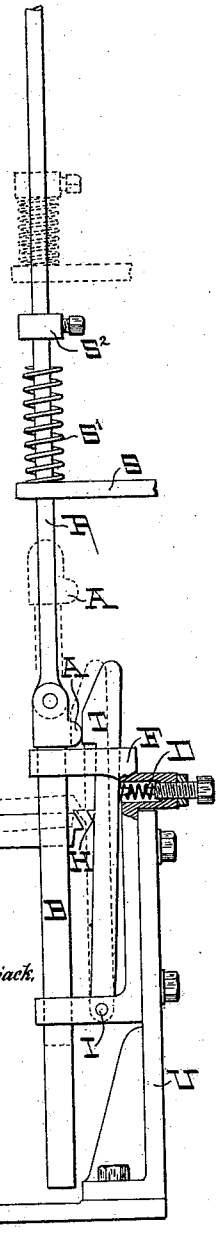

Fig. 1

Witnesses
Albert H. Norris.
Robt Everett.

Inventor
Joseph H. Hubbell.
By his Attorney
James L. Norris.

UNITED STATES PATENT OFFICE.

JOSEPH H. HUBBELL, OF DAYTON, OHIO, ASSIGNOR TO THE BUCKEYE IRON AND BRASS WORKS, OF SAME PLACE.

HYDRAULIC RELIEF-VALVE MECHANISM.

SPECIFICATION forming part of Letters Patent No. 569,921, dated October 20, 1896.

Application filed March 24, 1896. Serial No. 584,636. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH H. HUBBELL, 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 Relief-Valve Mechanism, of which the following is a specification.

This invention relates to that class of relief-valve mechanism designed for operative connection with the working cylinder of a hydraulic jack or other hydraulic machinery wherein the relief-valve is opened or unseated to permit the release of the surplus pressure fluid in transit to the working cylinder after the required pressure fluid has been supplied thereto or after the jack or other hydraulic machine is in operation.

In ordinary relief-valve mechanism of the character alluded to the pressure relief-valve is only raised from its seat a slight distance to permit the surplus pressure fluid to escape in a comparatively contracted or thin stream through the valve-casing to the escape or outlet thereof, which results in heating or cutting both the relief-valve and its seat, which is damaging and therefore objectionable. Further, in prior constructions the relief-valve is instantly reseated when a small quantity of the pressure fluid is withdrawn from the working cylinder during the operation of the jack or other hydraulic machine, thereby reapplying or restoring the full pressure of the fluid through the relief-valve casing to the working cylinder and replacing almost instantly a quantity of pressure fluid proportionate to the quantity which has been withdrawn. This operation causes the relief-valve to again swiftly open, and this action continues at comparatively brief intervals, so that the hydraulic pump or other fluid-actuator is subjected to a jerky action and strain, which is objectionable in that it is destructive to a nicely-constructed hydraulic pump or other fluid-actuator.

The objects of my invention are to avoid the objections stated; to provide a novel mechanism having a new mode of operation which will effectually prevent heating and cutting of the relief-valve and its seat, and which will enable the hydraulic pump or other fluid-actuator to work continuously, easily, and without a jerky action, for a comparatively long period, and then remain inactive, or at rest, for another comparatively long period, in contradistinction to working at brief intervals with a jerky action, which strains the pump mechanism, renders it less durable, and in time destroys its usefulness as regards perfect and satisfactory work.

To accomplish all these objects, my invention consists, among other things, in the combination, with the relief-valve of a hydraulic machine, of a lever for opening the relief-valve, a lifting-bar for lifting the valve-opening lever, a traveling finger, a device for holding the valve-opening lever raised, a spring placed under tension by the up motion of the traveling finger until the spring-pressure overcomes the fluid-pressure on the valve, and means for releasing the valve-holding device when the lifting-bar descends.

The invention also consists in the features of construction and in the combination or arrangement of parts, involving the mode of operation, hereinafter described and claimed, reference being made to the accompanying drawings, in which—

Figure 1 is a sectional side elevation of my improved relief-valve mechanism, sufficient parts being shown for operative connection with a hydraulic jack or other hydraulic machinery to enable the invention to be clearly understood. Fig. 2 is a side elevation of the relief-valve-operating lever. Fig. 3 is a top plan view of the same. Fig. 4 is a side elevation of the latch-bar or trigger for engaging and disengaging the trip-head of the lever-lifting bar. Fig. 5 is an edge view of the same. Fig. 6 is a side view of the lever-lifting bar. Fig. 7 is an edge view of the same. Fig. 8 is a detail side elevation of the double-armed frame, in which the lever-lifting bar and the latch-bar or trigger are mounted. Fig. 9 is a top plan view of the same, and Fig. 10 is an edge view of the same.

In order to enable those skilled in the art

to make and use my invention, I will now describe the same in detail, referring to the drawings, wherein—

The letter Z indicates a suitable base-frame, to which is secured an upright frame or standard U, carrying a double-armed frame F, mounted vertically thereupon and constructed in any suitable manner to receive and support a vertically-movable lifting-bar B and an oscillating or rocking latch-bar or trigger T. The lifting-bar is susceptible of sliding perpendicularly in suitable openings in the upper and lower arms of the frame F, and the latch-bar or trigger is pivoted, as at I, to the lower arm of this frame, and extends through a slot in the upper arm, so that it can oscillate or rock toward and from a trip-head A on the upper end portion of the lifting-bar.

The upper end of the latch-bar or trigger is beveled, and, as here shown, it is approximately hook-shaped, and the face of the trip-head is convex or rounded, the construction being such that when the lifting-bar is moved upward and the trip-head rises above the latch-bar or trigger the latter can be rocked or swung forward to the position indicated by dotted lines, but when the lifting-bar descends the convex or rounded face of the trip-head A acts upon the beveled upper end of the latch-bar or trigger and forces it backward to the position represented in full lines, Fig. 1.

The inner edge of the latch-bar or trigger is provided, at a point considerably below the beveled or hook-shaped upper end, with a projecting lug or tooth H, having a flat upper side and a beveled lower side designed to cooperate with the correspondingly-shaped free end of the relief-valve-operating lever L. This lever is pivoted at one end to a standard or support rising from the base-frame, and in proximity to this pivoted end the lever is pivotally attached to the stem V′ of a relief-valve V, arranged in a valve-casing W, having pipe connections P and P^3, designed to connect, respectively, with an accumulator or hydraulic pump or other fluid-actuator and the working cylinder of a hydraulic jack or other hydraulic machine. The valve-casing contains a passage P′ and P^2, by which the pressure fluid may flow from the pipe connection P to the pipe connection P^3, and the valve-casing is constructed or otherwise provided with an escape or outlet E, arranged in the example shown directly under the relief-valve V. The communication between the part P^2 of the passage in the valve-casing and the pipe connection P^3, which leads to the working cylinder, is controlled by a check-valve C of any ordinary construction, which, at the proper time, lifts from its seat to permit the pressure fluid to flow to the working cylinder of the jack or other hydraulic machine.

The outer or free end portion of the relief-valve-operating lever L extends through a vertical slot O, (best seen in Fig. 7,) formed in the lifting-bar B, so that the beveled extremity of the lever may coöperate with the lug or tooth H on the latch-bar or trigger.

The latch-bar or trigger is acted upon by a suitable spring D, arranged in or on a part of the frame F, and preferably a set-screw is arranged in connection with the spring, so that the tension thereof may be increased or diminished by turning the screw in one or the other direction, as will be obvious.

The upper end of the lifting-bar B is provided with a perpendicular rod R, preferably pivoted at its lower end and carrying at its upper portion a collar S^2, which is adjustable on the rod in any suitable manner, preferably through the medium of a set-screw, so that the collar can be adjusted to the required position and then rigidly secured to the rod. A spiral or other suitable spring S′ is arranged upon the rod beneath the adjustable collar, and this spring is adapted to be acted upon by a vertically-movable part of a hydraulic jack or other hydraulic machine. The part referred to may be in the form of a horizontal arm or finger S, arranged below the spiral spring and through which the rod R extends, in such manner that when the arm or finger is raised during the operation of the hydraulic jack the spring S′ will be raised until it reaches the collar S^2, when it will be compressed to a certain extent, as will more fully hereinafter appear.

In the operation of my invention, when the parts are in the position represented by full lines, Fig. 1, the pressure fluid flows over the relief-valve V, through the passages P′ and P^2 and pipe P^3 to the working cylinder of the jack, (not necessary to show,) until sufficient pressure fluid is supplied to the jack and the latter operates. The arm or finger S will then rise and move the spring S′ into contact with the collar S^2 on the rod R. This rod will then rise with the arm or finger and spring and raise the lifting-bar B until the lower end of the slot O in this bar comes in contact with the outer or free end of the lever L. The pressure of the fluid upon the relief-valve holds the latter to its seat and prevents the lever from rising, thereby stopping the ascent of the lifting-bar and the rod, but the arm or finger, raised by a vertically-moving part of the jack, continues to ascend and compresses the spring against the collar until the spring-pressure overcomes the fluid-pressure on the relief-valve, at which time the spring will suddenly force the collar S^2, rod R, and lifting-bar B upward, which raises the lever L and causes it to instantly open or unseat the relief-valve to its full extent for the free and unobstructed flow of the pressure fluid to the escape or outlet E, whereby heating and cutting of the relief-valve and its seat are avoided. This result is not attained where the relief-valve is only raised from its seat,

as heretofore, a limited extent to permit the surplus fluid to pass through in a comparatively contracted or thin stream.

When the lifting-bar commences its ascent, as above explained, the trip-head A moves against the beveled upper end of the latch-bar or trigger and rises above the same. The spring D will then cause the latch-bar or trigger to spring toward the lifting-bar, and consequently when the lever L is raised the required distance to fully open or unseat the relief-valve the free end of the lever will lie over and be supported by the lug or tooth H on the latch-bar or trigger. Therefore when the hydraulic jack or other hydraulic machine is in operation and has raised the arm or finger S, as above stated, until it has opened the relief-valve by raising the lifting-bar, the arm or finger can descend a certain distance before it is possible for the relief-valve to close or be reseated. The descent of the arm or finger relieves the spring S′, and the lifting-bar, descending by gravity, causes the trip-head A to trip the latch-bar from engagement with the lever L, whereupon the lever falls, the relief-valve closes, and the pressure fluid again flows to the working cylinder of the jack or other hydraulic machine for a repetition of the operation described.

During the time the relief-valve is held raised from its seat and the pressure fluid from the pipe connection P escapes through the outlet E of the valve-casing the full heavy pressure of the fluid is not present in the pipe P and passage P′ and P^2, and therefore the pressure fluid in use in the working cylinder of the jack or other hydraulic machine might relieve itself by flowing back through the pipe connection P^3 and passage P′ and P^2 to the escape or outlet E, but this is prevented by the presence of the check-valve C, which seats itself and prevents the backflow of the fluid-pressure. The pressure of the fluid in the jack itself or other hydraulic machine is relieved at any point and by any means at the proper time, as is well known, and therefore it is not deemed necessary to illustrate any particular mechanism for relieving the pressure in the working cylinder or jack itself.

By my invention the relief-valve is opened its full extent and a free and unobstructed passage is provided for the escape of the surplus pressure fluid without danger of heating and cutting the relief-valve and its seat; and, further, the objectionable intermittent jerky actions of the pump or other fluid-actuator are avoided, because the relief-valve is held unseated for a predetermined time before it is tripped, so that it can reseat itself, after which it remains seated a predetermined time before it is again opened or unseated. This renders the jack or other hydraulic machine susceptible of performing considerable work between the intervals of the application of the pressure fluid to the working cylinder and its divergence and escape from the casing of the relief-valve.

The invention is designed for hydraulic apparatus in general, but is particularly useful in hydraulic systems employed to operate presses for extracting oil from cotton-seed and other articles or substances.

Having thus described my invention, what I claim is—

1. The combination with the relief-valve of a hydraulic machine, of a lever for opening the relief-valve, a lifting-bar for lifting the valve-opening lever, a traveling finger, a device for holding the valve-opening lever raised, a spring placed under tension by the up motion of the traveling finger until the spring-pressure overcomes the fluid-pressure on the relief-valve, and means for releasing the valve-holding device when the lifting-bar descends, substantially as described.

2. The combination in a relief-valve mechanism for a hydraulic machine, of a relief-valve casing having an escape-outlet and pipe connections to connect with an accumulator or pump and the cylinder of the hydraulic machine, a relief-valve V controlling the escape-outlet, a lever L acting on the relief-valve, a vertically-movable lifting-bar B, a latch-bar T, a traveling finger S, a spring S′, means for causing the latch-bar to move into engagement with the lever when the latter is raised by the lifting-bar, and means for disengaging the latch-bar from said lever as the traveling finger and the lifting-bar descend, substantially as described.

3. The combination with a pressure-fluid relief-valve, and a valve-operating lever, of a lifting-bar for moving the lever to unseat the valve, a latch-bar or trigger for engaging the lever to hold the relief-valve unseated, means for moving the lifting-bar, and a trip device actuated by the lifting-bar to disengage the latch-bar or trigger from the valve-operating lever, substantially as and for the purposes described.

4. The combination with a pressure-fluid relief-valve, of a valve-operating lever, a lifting-bar for moving the lever to unseat the valve, means for moving the lifting-bar in one direction to unseat the valve, means for moving the lifting-bar in the opposite direction, a latch-bar or trigger for engaging the lever to hold the valve unseated, and a trip device operated by the lifting-bar to disengage the latch-bar or trigger from the valve-operating lever, substantially as and for the purposes described.

5. The combination with a pressure-fluid relief-valve, of a valve-operating lever for unseating the relief-valve, a lifting-bar for moving the lever, a latch-bar or trigger for engaging the lever to hold the valve unseated, a traveling arm or finger, a yielding device acted on by the traveling arm or finger to move the lifting-bar in one direction, and a

trip-head actuated by the lifting-bar to disengage the latch-bar or trigger from the valve-operating lever, substantially as and for the purposes described.

6. The combination with a pressure-fluid relief-valve, of a valve-operating lever for unseating the relief-valve, a lifting-bar for raising the valve-operating lever, a rod connected with the lifting-bar and provided with a collar, a traveling arm or finger, a spring interposed between the arm or finger and the collar, a latch-bar or trigger for engaging the valve-operating lever to hold the valve unseated, and a trip device operated by the lifting-bar to disengage the latch-bar or trigger from said lever, substantially as and for the purposes described.

7. The combination with a pressure-fluid relief-valve, of a valve-operating lever for unseating the relief-valve, a lifting-bar for raising the lever to unseat the valve, a rod having a collar, a traveling arm or finger, a spring interposed between the traveling arm or finger and the collar, a rocking latch-bar or trigger for supporting the lever to hold the valve unseated, and a trip-head connected with the lifting-bar for operating the latch-bar or trigger to release the valve-operating lever, substantially as and for the purposes described.

8. The combination with a pressure-fluid relief-valve, of a lever for unseating said valve, a lifting-bar having a trip-head, a rod connected with the lifting-bar and provided with a collar, an arm or finger, a spring interposed between the arm or finger and the collar, and a pivoted spring-pressed latch-bar or trigger having means to engage and support the valve-operating lever to hold the valve unseated, substantially as and for the purposes described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

JOSEPH H. HUBBELL.

Witnesses:
GEO. W. FRANK.
JOHN L. H. FRANK.