(No Model.) 2 Sheets—Sheet 1.

# W. F. COLE.

## VALVE MECHANISM FOR HYDRAULIC ELEVATORS.

No. 526,146. Patented Sept. 18, 1894.

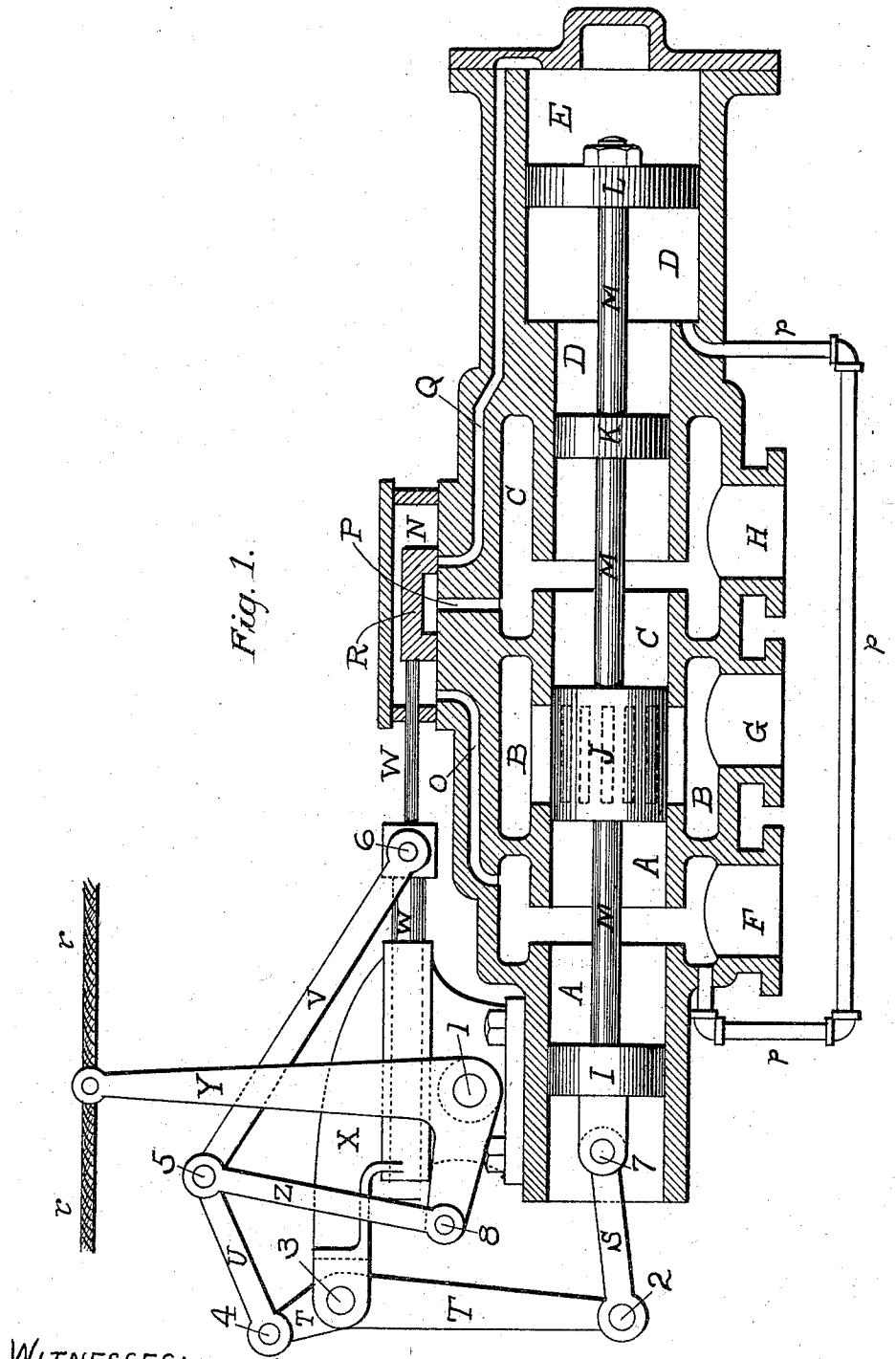


Fig. 1.

WITNESSES:
M. B. Walls
E. A. Dodge

INVENTOR:
Wm. F. Cole

(No Model.) 2 Sheets—Sheet 2.

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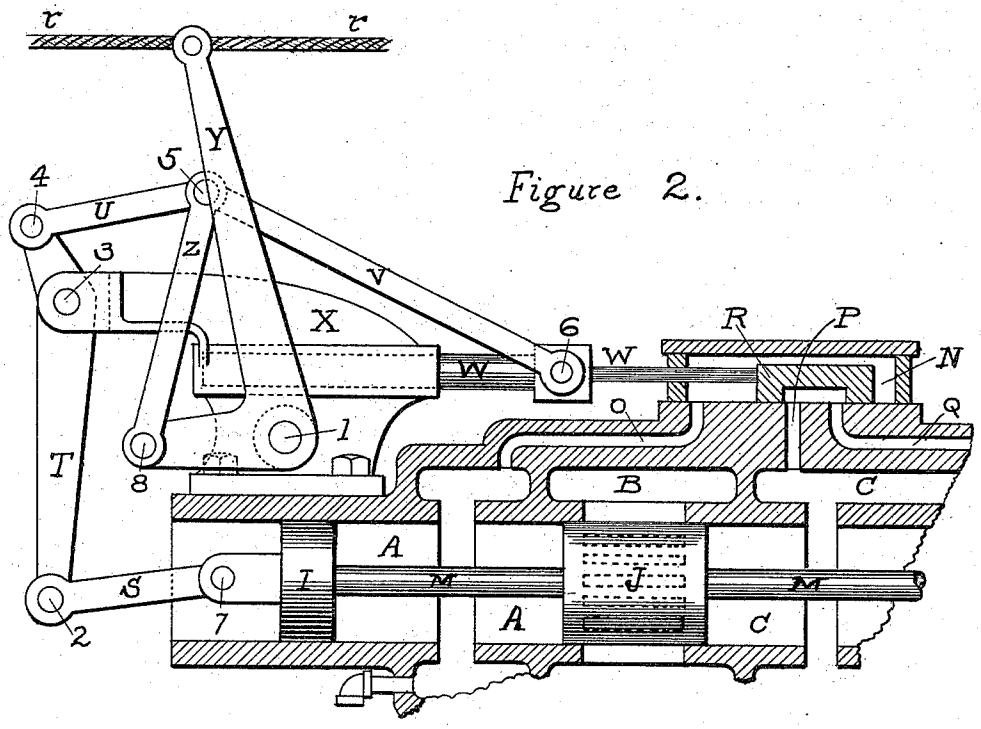


Figure 2.

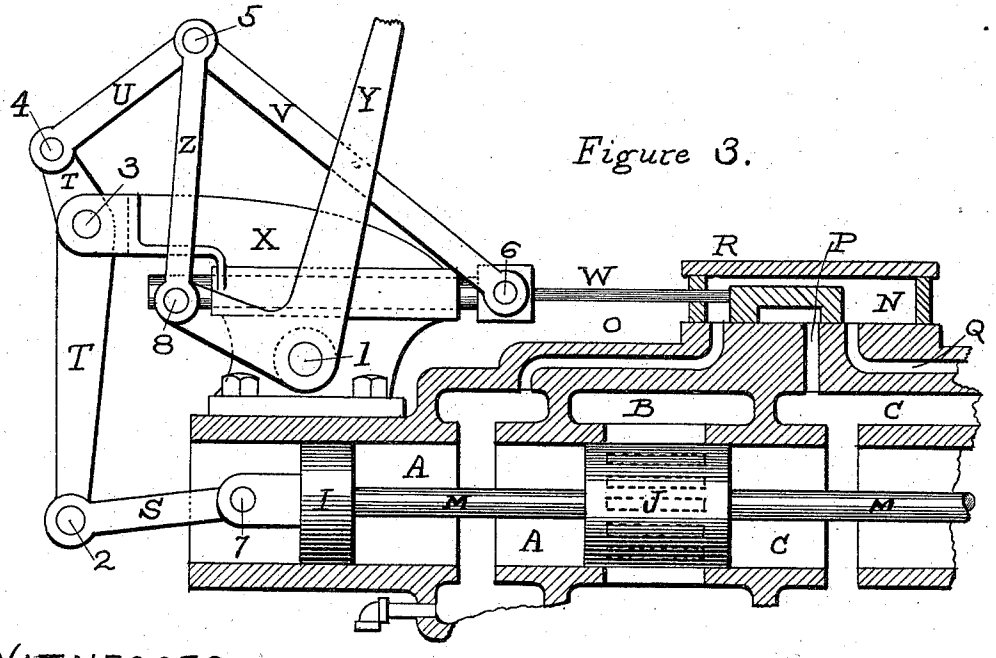


Figure 3.

WITNESSES:

M. B. Wells

E. L. Dodge

INVENTOR:

Wm. F. Cole

# UNITED STATES PATENT OFFICE.

WILLIAM F. COLE, OF WORCESTER, MASSACHUSETTS.

## VALVE MECHANISM FOR HYDRAULIC ELEVATORS.

SPECIFICATION forming part of Letters Patent No. 526,146, dated September 18, 1894.

Original application filed January 25, 1893, Serial No. 459,644. Divided and this application filed April 2, 1894. Serial No. 506,055. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM F. COLE, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented a new and useful Valve Mechanism for Hydraulic Elevators, of which the following is a specification.

The following specification of my invention has been in substance set forth in a prior application filed by me January 25, 1893, Serial No. 459,644, and this application is filed as a division of that prior one.

My invention has to do with that class of valves operated by fluid pressure, which are commonly known as "pilot valves." My valve, like others of the "pilot" class, consists essentially, first, of a main valve, preferably of the piston type; secondly, of a motor cylinder attached to the main valve and fitted with one or more pistons, so connected with the stem of the main valve that the motion of the latter may be governed by supply of water (or other motive fluid) to this motor cylinder; thirdly, of a secondary valve for controlling the flow of water to or from the motor cylinder; fourthly, of an operating handle; and fifthly, of such connections from the secondary valve to the main valve stem and operating handle as will secure a definite correspondence between the positions of the last two. It is to novel methods of making these connections that my invention particularly relates. In order to effect their purpose, the construction of these "connections" must be such that the secondary valve may be shifted by movement, either of the operating handle, or of the main valve stem, and by the one entirely independent of any motion of the other. This will be seen from the following analysis of the action of a "pilot valve." An initial movement of the operating handle opens the secondary valve, admitting water to the motor cylinder thereby setting the main valve stem in motion. This motion is transmitted by the connections to the secondary valve so as to close the same without further movement of the operating handle. As soon as the secondary valve has been fully closed, shutting off the water from the motor cylinder, the main valve stem is brought to rest in a new position. This new position is determined by the distance it had to travel to close the secondary valve, which obviously depends upon the initial opening given the same by a greater or less movement of the operating handle. Accordingly for every position of this operating handle there exists a corresponding position to which the main valve stem will be driven and there brought to rest.

In my valve I make the "connections" in the following manner:—To simply change the amount or direction of motion to be transmitted from the main valve stem to the secondary valve, I employ any convenient arrangement of links and levers. I then complete the connection by two links, (which I denominate adjusting links) somewhat inclined to each other and joined together after the manner of a toggle joint. The knuckle of this joint is connected by a third link (denominated the carrying link) with an adjustable pivot moved by the operating handle. When this pivot is lowered and raised, the knuckle joint is opened and shut, and the non-adjoining ends of the adjusting links are alternately forced apart and drawn together again; but as the main valve stem is held fast by its connection with the motor pistons, the adjusting link next adjacent to it will be prevented from all motion, except rotation on the connecting pin, so that all translation must take place in the other one of the adjusting links, *i. e.*, the one next adjacent to the secondary valve. The adjoining connections and the secondary valve itself follow the motion of this latter link. In this way, I am able to move the secondary valve independent of any motion of the main valve stem.

After the secondary valve stem has been thus opened, and the main valve stem set in motion, these adjusting links transmit the motion, properly reduced, to the secondary valve, the carrying link simply rocking upon the adjustable pivot in whatever position this pivot may chance to be, and thus the secondary valve may be also moved by the main valve stem independent of any motion of the operating handle, and the two requirements above set forth are fully met.

To explain my invention more completely and in detail, reference is made now to the accompanying drawings, in which—

Figure 1 is a longitudinal section of a pilot valve equipped with my mechanism. Figs. 2 and 3 show part of the same with the mechanism in different adjustment.

Referring to Fig. 1, the cylindrical shell shown in section is seen to embody in a single casting both the main valve and the motor cylinder. The supply pipe is connected at F, admitting water to the supply chamber A. From this supply chamber, a small pipe, *p*, leads to the inner end of the motor cylinder D.

B is the port chamber with which the pipe leading to the elevator cylinder is connected at G. The exhaust pipe is connected at H with the exhaust chamber C. The pistons I, J, and K, of uniform diameter, and the piston L of larger diameter (preferably of twice the area) are all connected by the main valve stem M. From the supply chamber A, a passage O leads to the secondary valve chest N. Another passage Q connects this chest N with the outer end of the motor cylinder E. Flow of water through the passage Q is controlled by the secondary valve R of the common D slide valve form. The cavity under the secondary valve is connected with the exhaust chamber C by the passage P. It is now obvious that when the passage Q is closed by the secondary valve R, confining the water in the chamber E, the valve stem M will be held fast; while the admission of water to or its exhaust from this chamber E will effect a movement of the main valve stem M to the left or to the right. Thus much of the valve is of common construction and its action well understood. To the body of the main valve is bolted a bracket X, which serves the threefold purpose of a guide for the secondary valve stem W, a bearing for the stud 1 upon which the operating handle Y is pivoted, and a support for the fulcrum 3 about which the lever T rocks. The lever T with arms of unequal length is employed as a convenient method of reducing and changing the direction of the motion to be transmitted from the main valve stem to the secondary valve. This lever T is connected with the main valve stem M by the link S, and with the secondary valve stem W by the adjusting links U and V. These two adjusting links U and V stand inclined to each other and are united by the pin 5 to form a toggle joint. The angularity of this joint is maintained by the carrying link Z, one end of which is connected with the pin 5, while the other end is pivoted upon the stud 8. This stud 8 is carried by one arm of the bell crank shaped operating handle Y. To the other end of this handle is fastened the shipper rope *r*. In the position shown in Fig. 1, all parts of the valve are in mid or neutral position. The passage Q is closed by the secondary valve R, confining the water (or other motive fluid) within the chamber E so that the main valve stem M is held fast.

When it is desired to shift the main valve stem to the right, the operating handle Y is carried to the left as shown in Fig. 2. This lowers the stud 8 and with it the pin 5, thus further opening the toggle joint and forcing the pin 6 away from the pin 4, which latter pin is held fast by the lever T connecting it with the yet immovable main valve stem. This pushes the secondary valve R to the right, opening communication between the passages Q and P, thus allowing the water to escape from the chamber E. The unbalanced pressure on the differential pistons K and L now shifts the main valve stem to the right. The stem carries with it the link S, setting the lever T in motion, the pin 4 traveling to the left. This carries with it the connected adjusting links U and V, the carrying link Z simply rocking upon the stud 8. So soon as the movement of the stem M has thus carried the secondary valve R far enough to the left to again cover the passage Q, further escape of water from the chamber E is prevented and the main stem is brought to rest. If it is desired to shift the main valve stem to the left, the operating handle Y is carried to the right as shown in Fig. 3. This raises the stud 8, somewhat closing the toggle joint, thus drawing the pin 6 toward the pin 4. This moves the secondary valve R to the left so as to admit water from the chest N through the passage Q to the chamber E. This shifts the main valve stem to the left and the intermediate connections S, T, U, and V, transmit motion in the opposite direction to the secondary valve R. So soon as the motion has sufficed to close the passage Q, the main valve stem M is once more brought to rest.

It is not necessary that the carrying link be jointed to the links U and V in precisely the manner shown, nor will the action be different if separate pins be employed for joining each of the adjusting links to the carrying pin. So long as a toggle joint action between the two adjusting links is secured and the carrying link, by which adjustment of the toggle joint is effected and maintained, rocks upon an adjustable stud, my purpose is effected and I do not limit myself to any precise methods of connecting the carrying link and two adjusting links; but the method shown in Figs. 1, 2 and 3 and described at length is simple and hence preferred.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination with a hydraulic valve, a motor cylinder attached thereto, and a secondary valve for controlling the flow of motive fluid to the motor cylinder, of two adjusting links jointed at their adjacent ends each to a common carrying link, and jointed at their opposite ends, one to connections with the main valve stem, the other to connections with the secondary valve stem, said carrying

link oscillative about an adjustable pivot, said adjustable pivot and means for effecting and maintaining adjustment of the same.

2. The combination with a hydraulic valve, a motor cylinder attached thereto, and a secondary valve for controlling the supply of motive fluid to the motor cylinder, of a pin uniting two inclined adjusting links said two adjusting links suitably connected, one with the main and the other with the secondary valve stem, and a carrying link jointed with the afore mentioned pin for effecting and maintaining adjustment of the same, all for the purpose above set forth and specified.

WILLIAM F. COLE.

Witnesses:
M. B. WALLS,
E. W. DODGE.

Correction in Letters Patent No. 526,146.

It is hereby certified that in Letters Patent No. 526,146, granted September 18, 1894, upon the application of William F. Cole, of Worcester, Massachusetts, for an improvement in "Valve Mechanism for Hydraulic Elevators," an error appears in the printed specification requiring the following correction, viz: In line 112, page 2, the word "pin" should read *link;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 2d day of October, A. D. 1894.

[SEAL.]

JNO. M. REYNOLDS,
*Assistant Secretary of the Interior.*

Countersigned:

S. T. FISHER,
*Acting Commissioner of Patents.*