(No Model.) 2 Sheets—Sheet 1.

J. REICHMANN.

HYDRAULIC ELEVATOR.

No. 522,030. Patented June 26, 1894.

Fig. 1.

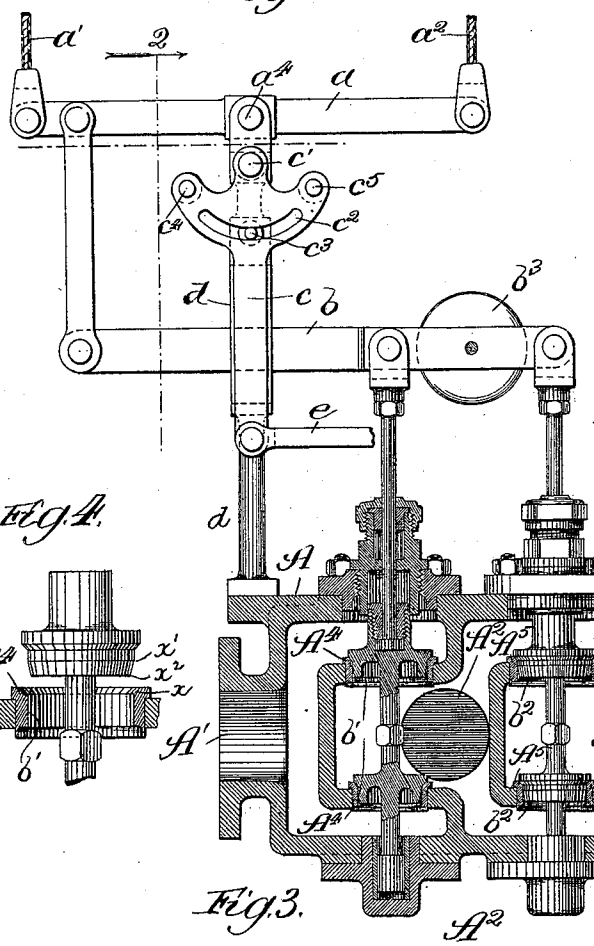


Fig. 2.

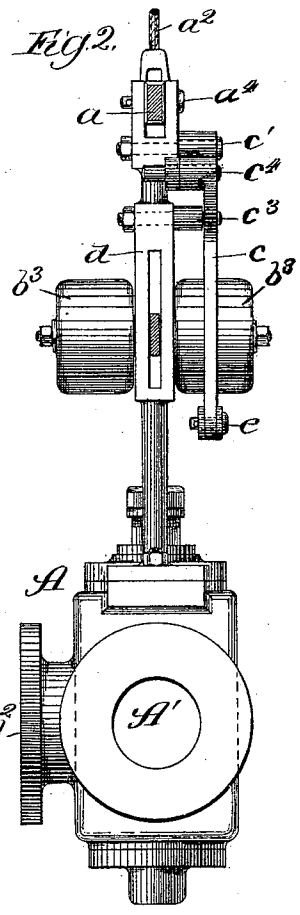
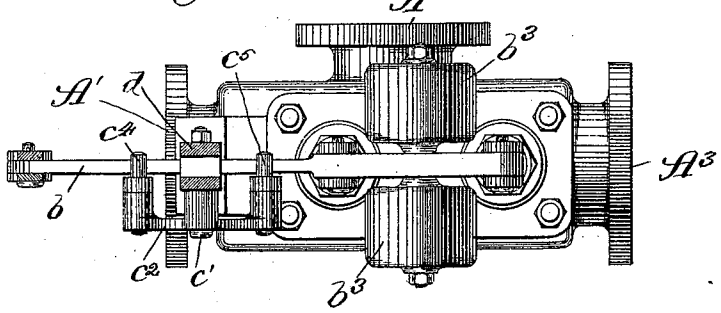


Fig. 4.

Fig. 3.



Witnesses:
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Inventor:
Joseph Reichmann,
By Dyrenforth & Dyrenforth,
Attys.

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

J. REICHMANN.

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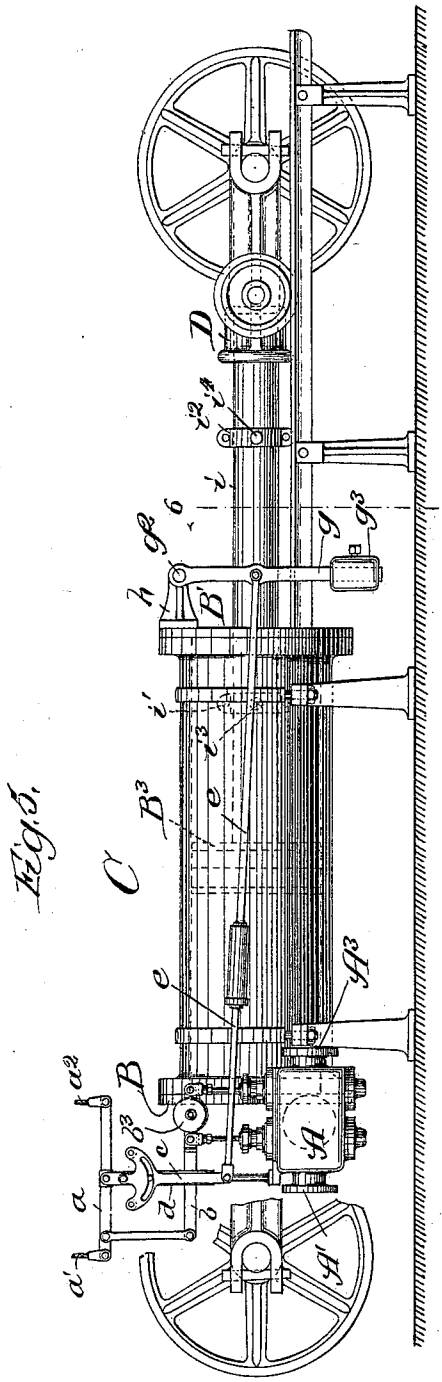

Fig. 5.

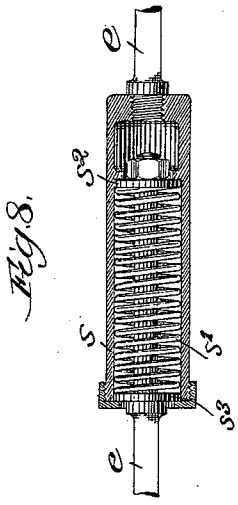

Fig. 8.

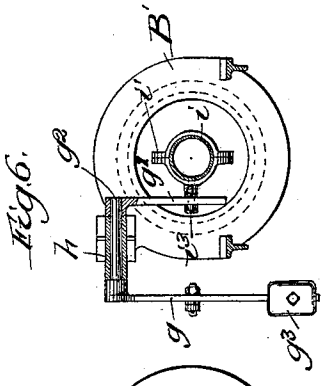

Fig. 6.

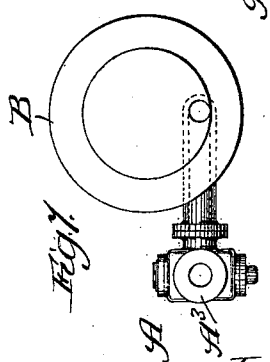

Fig. 7.

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UNITED STATES PATENT OFFICE.

JOSEPH REICHMANN, OF CHICAGO, ILLINOIS.

HYDRAULIC ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 522,030, dated June 26, 1894.

Application filed February 12, 1891. Serial No. 381,156. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH REICHMANN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Hydraulic Elevators, of which the following is a specification.

My object is to provide improved means in a hydraulic elevator, for use when the flow of the liquid furnishing the power is controlled from a moving car or platform, whereby the controlling operation shall be rendered the more positive, and also automatic when required; and my object is, further, to provide mechanism which, when the main piston of the elevator-engine has been moved to a certain position, will operate the valve-device employed, to effect closure of the valve and thereby produce stoppage of the motion of the piston in desired position.

My improved means for accomplishing the aforesaid objects may be advantageously applied to elevator-controlling valve-devices of various constructions; though the valve-device illustrated in the drawings and hereinafter described has been especially devised by me for application with my present improvement, but no claim is herein made for it, since it forms the subject of my separate application, divided from the present one, and filed on the 20th day of March, 1893, with the Serial No. 466,834.

In the accompanying drawings, Figure 1 is a partly broken vertical sectional view of a valve device for use with my improved device. Fig. 2 is a section taken on the line 2 of Fig. 1 and viewed in the direction of the arrow, presenting an end view, and Fig. 3 a top plan view, of the same. Fig. 4 is an enlarged broken sectional view showing a detail-construction of a valve. Fig. 5 shows a horizontal hydraulic elevator-engine in side elevation with the valve-device attached and as provided with details of my improvement for automatically controlling the valves from the piston. Fig. 6 is a section taken on the line 6 of Fig. 5 and viewed in the direction of the arrow. Fig. 7 is an inside view of the rear cylinder-head of the elevator-engine with the valve-device attached thereto in operative position. Fig. 8 is an enlarged view showing a longitudinal section of a compensating device forming an interposed part of a rod for connecting parts of the mechanism.

Figs. 1, 2, 3 and 4 show the construction of a valve-device for use with my improved mechanism.

A is the casing or shell of the valve-chamber, having the induction and eduction openings A′ and A^3 for the ingress and discharge of the motive agent, and an opening A^2 at which to connect the chamber with the apparatus to be driven. The chamber is subdivided by partitions in which suitable openings are formed for the admission of the motive agent to, and to permit its expulsion through, the opening A^2; and these openings are controlled by double-headed valves b' and b^2, the openings, which are provided in the horizontal portions of the partitions, affording seats for the said valves. The stems of the valves b' and b^2 pass through suitable stuffing-boxes and have on their lower ends flanges which enter the upper heads of the valves and are secured thereto by screw-caps. The valve-stems are pivotally connected at their upper ends with a lever b, toward one end thereof, the lever passing toward its opposite end through a forked or guiding standard d.

The seats for the double heads of the valves b' and b^2 are provided with adjustable and detachable bushings A^4 and A^5, respectively; and besides the guides and usual seats referred to, each valve-head, or valve-proper, is formed with an extension to enter its respective bushing when closed, which extension is made, by preference, cylindrical throughout a part of its length to fit the bushing closely all around, the remainder of the extension being conical, tapering slightly toward its extremity. Thus when a valve-head is raised from its seat the passage for the liquid remains closed until the straight or cylindrical portion of the valve is entirely withdrawn, when there will be sufficient space between the valve-head and seat, or bushing, to permit free passage of the liquid around the head or valve; but as the straight portion of the valve is withdrawn the flow of the liquid will wear only the inner surface of the bushing and the outer surface of the valve-head, which will also be the effect when the valve is fully open, as shown in Fig. 4.

The foregoing construction of the valve is particularly useful for operating a hydraulic elevator, since by means of the form of the heads, stopping and starting of the same may be rendered very gradual, which is essential to enable smooth and easy starts and landings to be made.

A lever a is pivotally supported at its center on the upper end of the standard d, being linked near one end, as shown in Fig. 1, to the adjacent end of the lever b; and from opposite ends of the lever a extend in a well-known manner cable-ends a' and a^2 to the elevator-car (not shown) in which the operator may control the valves b', b^2, by a pulling force on one end of the cable, thereby permitting the other end thereof to yield, and thus producing movement of the lever a from its normal horizontal position and with it that of the lever b. In this manner, depending on the direction of tipping the lever a, one or the other of the double-headed valves b' or b^2 may be opened or closed at will, the connection of the lever b with the valve-stems rendering one of the latter the fulcrum for the lever in raising the other in the manner stated.

To the lever b is attached, between the stems of the valves b' and b^2, a weight, b^3, which, should the cable a', a^2, break while the elevator is in operation, will serve to force the levers a and b to their normal horizontal positions and thereby produce closure of the valves to stop the motion of the elevator.

To the standard d, at one side thereof, is fulcrumed a lever c having, near its upper pivoted end a transverse curved slot c^2 extending between two horns or projections c^4 and c^5 projecting at opposite sides of the standard below the lever a; and the oscillatory motion of the pendent lever c is limited by a fixed stud, c^3, passing through the curved slot from the standard. The extent of pendular motion of the lever c is sufficient to allow the valves b' and b^2 to be fully opened and closed by the operator on the car without thereby tipping the lever a far enough in either direction to bring it into contact with the horn-projections or tappets on the lever c.

C (Fig. 5) denotes a known form (as to its general construction) of horizontal elevator engines, comprising a cylinder on a suitable supporting-frame and provided at its opposite ends, one of which is open, with heads B and B' and containing a piston B^3, the rod i of which extends through the open head B' and is operatively connected with the sheave-mechanism about which the cable is wound, to drive the sheaves by its reciprocating movements, all in a manner well-known and therefore not requiring detailed explanation. I connect the shell A with the engine C preferably by direct attachment thereof to the head B, though an additional valve may be applied and operated by the piston to limit its stroke. On the head B' is supported, in suitable bearings h, a horizontal rock-shaft g^2, from opposite ends of which are suspended, respectively, a lever g, carrying a weight, g^3, and a lever g'; and a rod, e, connects the lever c and g together, as shown, the rod being rendered extensible and contractible, to a limited degree, by an interposed yielding section comprising a cylindrical shell s inclosing a spiral spring s' through which one section of the rod e passes, terminating in a movable washer s^2, between which and an end of the wheel s^3 the spring is confined, the opposite end of the shell having the other severed section of the rod e rigidly fastened to it. Thus a pulling strain on the rod e will cause compression in one direction of the confined spring s' and thereby permit extension of the rod e, and force contrarily applied to the rod will compress the spring in the opposite direction and produce shortening of the rod, the tension of the spring s' being such that it will maintain its normal condition when the rod, while in motion, as hereinafter described, meets with no obstruction. The weight g^3 on the lever g' serves to return the latter by gravity to its normal perpendicular position when released after being moved therefrom, and cause it to carry its connections with it to their normal positions.

To the piston-rod i are secured collars, i' and i^2, in a manner to render them adjustable to desired points longitudinally of the piston-rod. On the said collars are provided lateral projections i^3 and i^4 (see Figs. 5 and 6) which extend across the plane of the lever g' and will, respectively, strike the latter in the backward and forward movements of the piston and carry the lever from its normal perpendicular position, thereby producing, in the manner hereinafter described, closure of the valves b' and b^2 and stopping the motion of the piston B^3. If, however, the piston should continue to move after the valve-closure has been produced, the lever c will be stopped by the stud c^3 from advancing any farther than the slot c^2 will permit; but because of the yielding connection e between the piston and valve-mechanism, further advancement of the piston will only compress the spring s' without producing undue strain on the device or the operating cable.

If desired, the construction could be such as to transmit the effect of movement of the lever c directly to the cable a' a^2, or to the lever b, to obtain the same result, as the lever a is not essential in some cases to the operation of the device.

The operation is as follows: Liquid under pressure is admitted into the chamber A at A', and a pulling strain is exerted on the cable-end a', which will raise the levers a and b and with them the double-headed valve b' from its seats A^4. As the straight portions of the two valve-heads are withdrawn, gradual opening of the valve will be produced by the withdrawal of the tapering portions, thereby inducing a slow motion of the piston B^3, which may be increased to full speed by raising

the valve clear of its seats, or to the relative position represented in Fig. 4. The piston B^3 (which is shown only by dotted lines, in Fig. 5) is thus moved toward the head B', but before it reaches the end of its stroke the projection i^3 on the collar i' will strike the arm g' in its path, which will thus be moved along with it as also the lever g with the rod e and lever c. This will bring the horn-projection c^5 up against the lever a, and carry the latter to its normal position and with it the lever b, thereby closing the valve b' and stopping the motion of the piston. When the reverse motion is desired, pulling-strain is exerted on the cable-end a^2 to open the valve b^2 and cause the liquid in the cylinder of the engine C to exhaust by way of the inlet A^2 through the outlet A^3. The weight of the platform or car will move the piston back and thereby release the lever-arm g', which will, under the weight on the lever g, swing back to its normal position carrying with it its connections, whereby the device controlled by the cable will be independent, for operation, of the device controlled by the piston. This will enable the operator again freely to exercise control over the valves to raise or lower the car or platform, as desired, to any point within the limit of the piston-stroke. When the piston has nearly reached the end of its return-stroke, the projection i^4 on the collar i^3 will strike the lever g', causing the latter to carry with it its companion-lever g and its connections. This will bring the projection c^4 up against the lever a and return the latter to its normal horizontal position and with it the lever b, thereby closing the valve b^2 and stopping the motion of the piston.

By limiting the movement of the lever c through the medium of the stud c^3 in its curved slot c^2, it can not, at either of its extreme positions, move the lever a beyond the normal or horizontal position of the latter. Hence if the piston, from any cause, should continue to move after the supply or discharge-passage in the valve-device is closed, it would merely produce compression of the spring s' in the connecting-rod e. The tension of the spring is not affected by the movement within the limits of the slot c^2, but will yield readily to the aforesaid continued motion of the piston thus without causing undue strain on the mechanism or on the cable.

The operation described presupposes the entire combined mechanism to be in working order; but if the controlling-cable a' a^2 were to break, the operator in the car would loose control over the valve, and, were no means provided to prevent, the piston would be moved to the end of its stroke. The weight b^3 on the lever b will prevent this, however, since it will, obviously, by being thus released, force the parts to their relative normal positions illustrated, closing the valves and stopping the piston.

Owing to the great length of cable required in high buildings to operate the valve-device, and to the friction thereof on the sheaves over which it passes, the pressure tending to force a double-headed valve to its seat, which is due to the difference in area represented between the upper and lower valves, may not be sufficient to render the valve-operation positive under all conditions, but as the weight b^3 may be increased at will, the operation, may, accordingly, be rendered positive.

I do not limit the application of the weight to the lever b, since the valves b' and b^2 may be more directly weighted; and, obviously, a spring or analogous means may be substituted for the weight b^3 to perform its function.

My improved mechanism is shown in conjunction with a horizontal hydraulic elevator-engine having one end of its cylinder open; but I do not limit it to such particular combination. And even with such an engine the cylinder may be closed at both ends, since the described operation may be effected from the cross-head D, or from any part directly connected with the piston. The engine may, moreover, be of the vertical variety.

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

In combination with the described controlling valve of a hydraulic elevator, a weighted lever b connecting the valve-stems, a lever a linked to one end of the lever b and controlled from the elevator-car, a lever c limited as to its extent of motion and having tappets c^4 and c^5 and fulcrumed with relation to the lever a to adapt it to engage the same alternately at opposite sides of its fulcrum by the said tappets, a hydraulic engine containing a piston provided with projections on its rod, a rod e connected at one end with the lever c, and provided toward its opposite end with a weighted lever g, and a lever g' connected therewith and extending into the path of the said projections, the whole being constructed and arranged to operate substantially as described.

JOSEPH REICHMANN.

In presence of—
J. W. DYRENFORTH,
M. J. FROST.