(No Model.)

R. T. CRANE.

DISCHARGE REGULATOR FOR HYDRAULIC ELEVATORS.

No. 445,748. Patented Feb. 3, 1891.

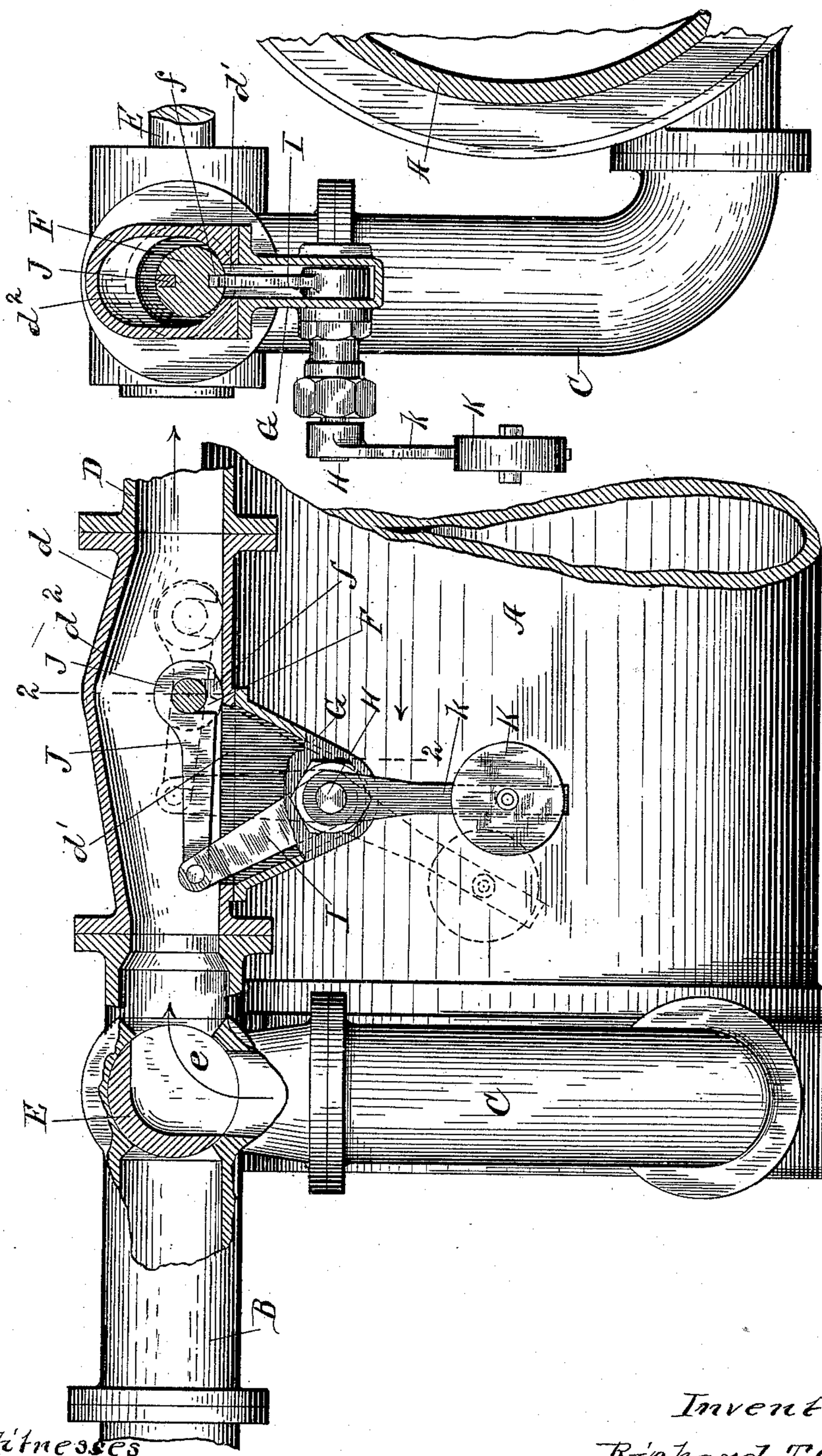

Fig 2

Fig 1

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DISCHARGE-REGULATOR FOR HYDRAULIC ELEVATORS.

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To all whom it may concern:

Be it known that I, RICHARD T. CRANE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Discharge-Regulators for Hydraulic Elevators, which are fully set forth in the following specification, reference being had to the accompanying drawings, in which—

Figure 1 represents a side elevation of one end of the main cylinder of a hydraulic elevator with the parts adjacent thereto, the discharge-pipe being shown in section and the remainder of the cylinder and discharge-pipe being broken away; and Fig. 2, a cross-section of the same, taken on the broken line 2 2 of Fig. 1, looking in the direction of the arrow thereon.

The ordinary construction and operation of hydraulic elevators are well known and require no particular explanation here. In the operation of elevators of this class the water which is forced into the main cylinder for the purpose of hoisting the car is discharged therefrom when the car is to be lowered, the weight of the latter in its descent operating to drive the water from the cylinder. Now the pressure of the car will increase somewhat as its velocity increases in the descent, and if there is a free discharge from the cylinder the downward movement of the car will become too rapid and must be checked. This has been accomplished by applying a brake or by moving the valve controlling the outlet, so as to partly close the latter; but neither way is entirely satisfactory.

My invention relates to automatic means for regulating the discharge of water from the main cylinder, whereby the outward flow is impeded as the pressure is increased by devices operating automatically under the increase of pressure, and so the downward movement of the elevator-car is properly regulated without any attention whatever from the attendant.

I will proceed to describe in detail the construction and operation of mechanism whereby I have practically carried out my invention in one form, and will then point out definitely in claims the particular improvements which I believe to be new and wish to secure by Letters Patent.

I have shown in the drawings only so much of the elevator mechanism as is necessary to an understanding of my invention, the general construction and operation of all the main parts of elevators of this class being perfectly well known and understood.

In the drawings, A represents the main cylinder of a hydraulic elevator, only a portion of the cylinder at one end being shown, the rest being broken away. The pipe B is the ordinary supply-pipe which delivers water under pressure, as required, to the cylinder for the purpose of operating the piston therein. This pipe is connected with the cylinder at one end of the latter by means of a branch pipe C, as seen in Fig. 2 of the drawings. The supply-pipe B is extended somewhat past the junction between it and the branch pipe and has joined to it the discharge-pipe D, which, as here shown, runs alongside the cylinder, as seen in Fig. 1. This discharge-pipe delivers the water forced out from the cylinder in any ordinary way, usually to a cistern, from which it is pumped to a reservoir to reuse. The branch C serves as both the inlet and outlet pipe for the cylinder, and, of course, to provide for this operation the supply and discharge passages must be controlled, so that when one is opened the other is closed. This is effected in any well-known way, as this feature of construction is an ordinary one in hydraulic elevators.

In the drawings I have shown a valve E, set in the pipes at the junction between the supply and branch pipes, which is an ordinary two-way valve with a right-angled port *e*, whereby it will be seen that the branch pipe may be connected with the discharge-pipe and shut off from the supply or connected with the supply and shut off from the discharge, this valve being, as usual, under the control of the elevator-attendant.

Within the discharge-pipe D, I arrange a small ball F, of metal or any other suitable material, which is left free to roll back and forth on the bottom of the pipe, but is connected to a counterbalancing-weight that regulates this movement. This ball is intended

to operate as a kind of check-valve for the purpose of retarding the outward escape of the water, and may be arranged at any convenient point along the discharge-pipe. Preferably, however, I locate it near the junction with the supply-pipe, and for convenience in construction and adjustment of the parts a short section *d* of this pipe is constructed especially for the reception of this ball, this being shown in the drawings as the first section of the pipe beyond the supply-pipe. This section is provided with a narrow slot *d'*, cut lengthwise in the under side thereof, and below this slot depends a hollow bracket G, shown in the drawings as tapering downward and fastened securely to the bottom of the pipe. This bracket forms a support for a rock-shaft H, which is mounted in its lower part and has fixed upon it a crank-arm I within the bracket which forms a casing for this arm. The arm extends up through the slot in the pipe, and is there connected in any suitable way to the ball F. As shown in the drawings, this is accomplished by providing the ball with a circumferential groove *f*, and a connecting-rod J is provided at one end with a hook *j*, which is adapted to hook onto the ball within the said groove, as seen in Fig. 1, while the other end of the rod is pivoted to the upper end of the crank-arm within the discharge-pipe, as seen in the same Fig. 1. The rock-shaft H projects out beyond its bracket-support on one side thereof, and on its outer end is hung a counterpoise-weight K by means of a depending arm *k*, which is fixed on this end of the shaft. Now, the rock-shaft being free to oscillate, the counterpoise will of course normally take a vertical position, depending from the rock-shaft, and in this position will of course hold the ball F at a certain point in the pipe-section *d*, as shown in Fig. 1. It is evident that the placing of this ball within the pipe will diminish the discharge-passage at the point where the ball normally rests; but it is desirable that this discharge-passage shall be normally the same throughout its length, and it is usually made to correspond in size with the inlet or supply passage to the cylinder. In order to preserve this uniformity of size, the pipe-section *d* is raised or considerably enlarged above the normal resting-point of the ball, so as to provide a dome projection or enlargement d^2, the apex of which is just over the ball in its normal position of rest, as seen in Fig. 1, and the pipe sloping downward each way from this apex. This enlargement is carefully calculated to provide additional space in the pipe corresponding to that occupied by the ball and its connecting devices within the latter, so that when these devices are in the normal state of rest the space around and above them will be of the same area as the regular discharge-opening. Hence it is obvious that in this position the escape of water through this pipe from the cylinder will be perfectly free and just the same as though the pipe were of ordinary construction and without any checking device. But now suppose the discharge has been opened and the car begins to descend and the pressure upon the water is increased, as described above. This increased pressure will at once be felt upon the ball and, overcoming the resistance of the counterpoise-weight, will of course drive the ball forward, which movement forces the latter beyond the center of the enlargement of the pipe, and thus diminishes the size of the discharge-passage, which movement is indicated by dotted lines in Fig. 1. Now this partial choking of the passage must of course impede the escape of the water, thereby counteracting the increasing pressure of the car and so regulating the descent of the latter and preventing all "racing." The counterpoise of course operates to bring the ball backward as the pressure diminishes, and so a complete automatic device is provided for checking and regulating the escape of water from the cylinder, so that the descent of the car is made substantially uniform regardless of the attendant, the operation of the checking device being entirely automatic and beyond his control. The counterpoise-weight should be regulated so as to afford sufficient resistance to hold the ball steadily against the pressure of the water flowing out at a normal rate, so that it will yield quickly when this pressure is increased.

The special devices for controlling the ball may be varied, and I do not wish to be understood as limiting myself to the particular means for this purpose herein described and shown, for the characteristic feature of my invention consists in placing within the discharge-pipe a movable check held in normal position of rest by any suitable devices which permit the check to be moved forward when the pressure of the escaping water is increased. The counterbalancing devices herein shown and described I have found suitable and well adapted to this purpose; but they may be modified in construction and arrangement or others substituted in their place.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a hydraulic elevator, the discharge-pipe provided with a dome-shaped enlargement, in combination with a ball-check arranged in said enlarged space and free to roll back and forth on the bottom of the pipe, and a counterpoise adapted to hold the ball in position against the normal pressure of the discharge, substantially as and for the purposes specified.

2. In a hydraulic elevator, the discharge-pipe D, provided with a dome-shaped enlargement d^2 and a slot *d'* in the under side thereof, in combination with the ball-check F, arranged to roll on the bottom of said pipe, the hollow bracket G, fastened to the pipe under-

neath said slot, and the crank-arm I, arranged within said bracket, projecting into the pipe through said slot, and connected to the ball-check, substantially as and for the purposes specified.

3. In a hydraulic elevator, the discharge-pipe D, provided with a dome-shaped enlargement d^2, in combination with the ball-check F, provided with the groove *f*, the rock-shaft H, provided with crank-arm I, the hooked connecting-rod J, and the counterpoise K on the arm *k*, fixed on said rock-shaft, substantially as and for the purposes specified.

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Witnesses:
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