(No Model.)

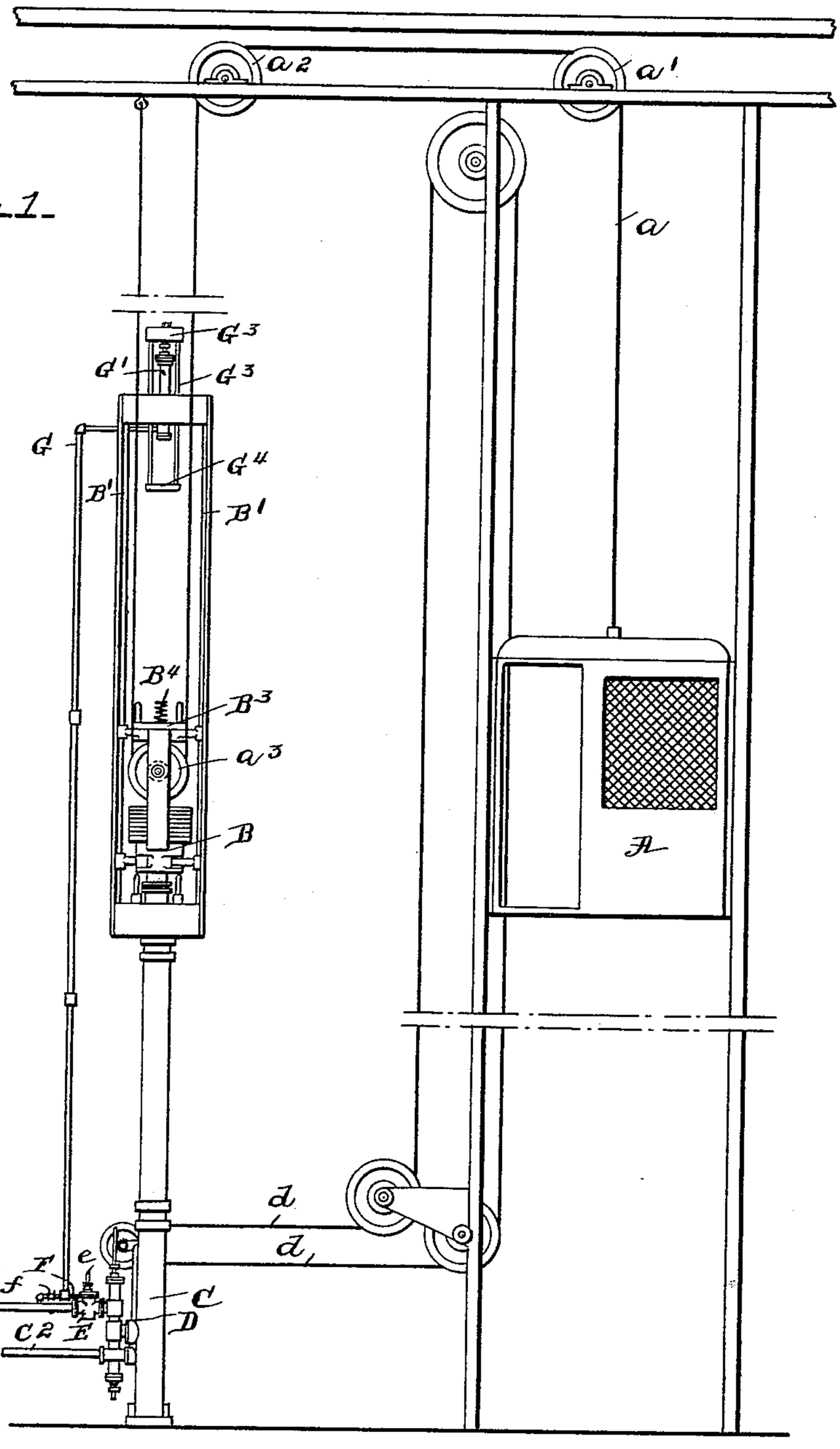
3 Sheets—Sheet 1.

F. E. HERDMAN.

AUTOMATIC STOP FOR HYDRAULIC ELEVATORS.

No. 602,448. Patented Apr. 19, 1898.

Fig. 1.



WITNESSES:

Jesse B. Keller.

Frank L. Busser

INVENTOR

Frank E. Herdman

BY

G. F. Harding

ATTORNEY

(No Model.) 3 Sheets—Sheet 2.

F. E. HERDMAN.

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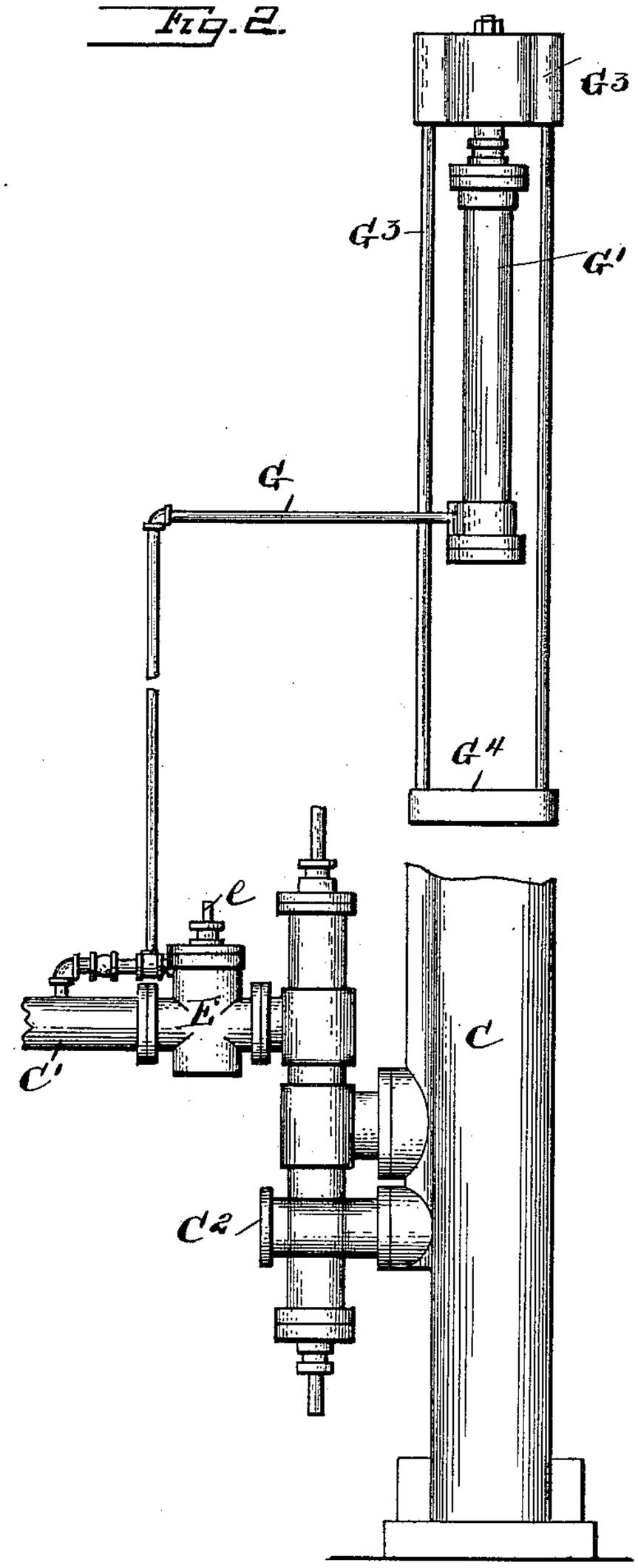
Fig. 2.



Witnesses.

Jesse B. Hellers

Carol. H. Dieterich

Inventor.

Frank E. Herdman

by G. H. Harding

Attorney.

(No Model.)

3 Sheets—Sheet 3.

F. E. HERDMAN.

AUTOMATIC STOP FOR HYDRAULIC ELEVATORS.

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Fig. 3.

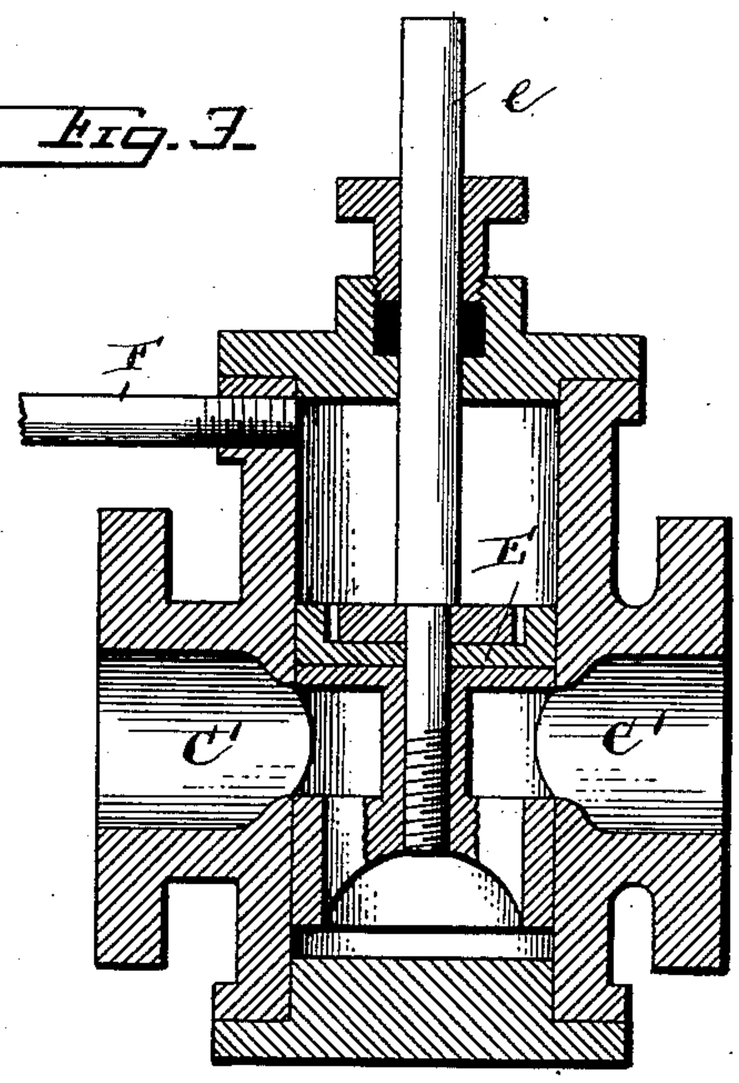
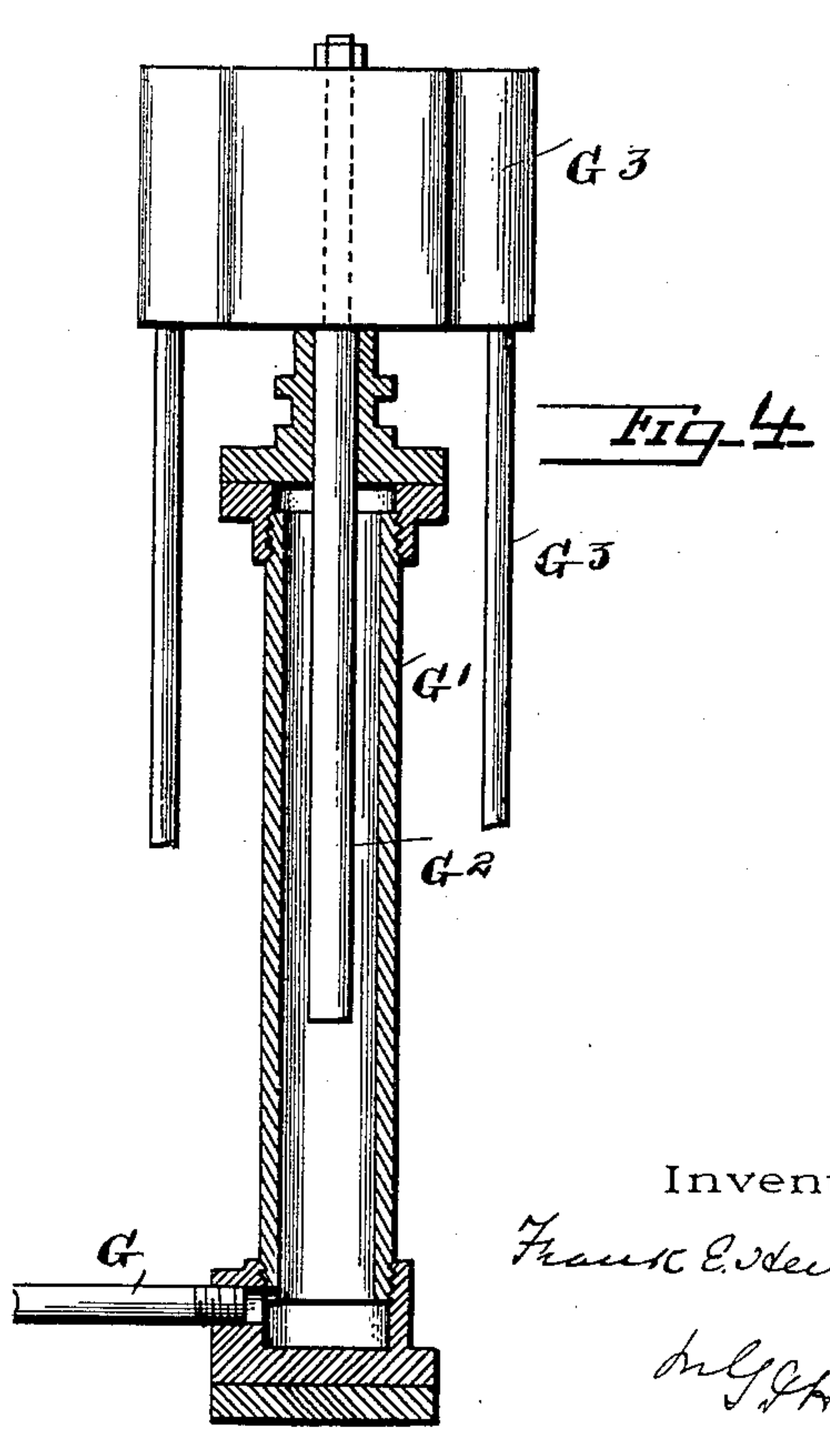


Fig. 4.



Witnesses.

Jesse B. Keller.

Carol. A. Deshong.

Inventor.

Frank E. Herdman

by G. J. Harding

Attorney.

UNITED STATES PATENT OFFICE.

FRANK E. HERDMAN, OF WINNETKA, ILLINOIS.

AUTOMATIC STOP FOR HYDRAULIC ELEVATORS.

SPECIFICATION forming part of Letters Patent No. 602,448, dated April 19, 1898.

Application filed October 22, 1896. Serial No. 609,642. (No model.)

To all whom it may concern:

Be it known that I, FRANK E. HERDMAN, a citizen of the United States, residing at Winnetka, county of Cook, and State of Illinois, have invented a new and useful Improvement in Automatic Stops for Hydraulic Elevators, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates, broadly, to mechanism by means of which any moving portion of the elevator when near either end of its travel will, through the medium of a liquid, operate a cut-off valve, so as to close the passage from the source of supply to the cylinder or from the cylinder to the exhaust.

It consists, more particularly, of a valve-cylinder connected with the operating-cylinder and containing a valve that regulates the flow of water to or from the operating-cylinder combined with a pressure-cylinder containing liquid under pressure, which pressure is transmitted by a suitable connection to the valve-cylinder and acts to hold the valve open against a constant pressure tending to close the valve. A moving part of the elevator mechanism is adapted by any suitable means and at a predetermined time, preferably when the car is near the end of its travel in either direction, to relieve the pressure in the pressure-cylinder, whereby the pressure is released in the valve-cylinder to permit the constant pressure against the valve to become effective to close the valve.

I will now describe the embodiment of my invention illustrated in the drawings, and then specifically point out the invention in the claims.

Figure 1 is a side elevation showing car, operating-cylinder, traveling sheaves and their connections, automatic valve, and the mechanism for controlling the same. Fig. 2 is a detail view of a portion of operating-cylinder, supply connections, automatic valve, and mechanism for controlling the same. Fig. 3 is a sectional view of the automatic valve and its hydraulic connections. Fig. 4 is a sectional view of a portion of the mechanism for controlling the automatic valve.

A is the elevator-car; *a*, the lifting-cable, which, as in the ordinary manner, passes around the sheaves a' and a^2 and the lifting-sheave a^3, which is in connection with the traveling framework B, which traveling framework B is controlled by mechanism in the hydraulic cylinder C in the ordinary manner. The framework B, with the traveling sheave a^3, is guided upon the fixed frame B'.

C' is the inlet-pipe from the source of supply to the operating-cylinder C, and C^2 is the exhaust-pipe.

D is the ordinary controlling-valve, which regulates the admission and exhaust of liquid to and from the operating-cylinder C. This valve is operated by means of the cables *d*, which pass through car A in position to be moved by the operator.

E is a valve on the supply-pipe between the source of supply and the controlling-valve D.

e is the valve-stem.

The effective area of the upper face of the valve is less than the effective area of the lower face of the valve, due to the presence of the valve-rod on its upper surface. The under surface of the valve is in direct communication with the water from the source of pressure-supply in the inlet-pipe C'. The upper surface of this valve is also in communication with the water from the source of pressure-supply by means of the pipe F, having upon it the check-valve *f* to prevent the return of water from the valve-chamber of the valve E backward. So long as a free exit is provided for the water in the upper part of the valve-chamber the valve will be lifted and cut off the passage to the operating-cylinder. Normally, however, the water above the valve is confined, as hereinafter described, so that it is impossible for the pressure below the valve to be effective to lift it, leaving the passage to and from the operating-cylinder free.

From the pipe F there extends a pipe G, terminating in the cylinder G'. In this cylinder is a plunger G^2, which is provided with a weighted frame G^3, which causes said plunger to normally press upon the water, exerting a pressure through the pipe G upon the upper surface of the valve. This weighted framework G^3 at its lower surface G^4 is in alinement with the stop B^3 (carried by frame B) and spring-buffer B^4, (on stop B^3,) so that

in the upward movement of the frame B the stops B^3 and B^4 act upon the frame G^3 and elevate the piston.

When the valve D is operated, so as to cause water to enter the operating-cylinder C′, the framework B, carrying the sheave, will be elevated, allowing the car to descend. When the car has descended a distance sufficient to cause the spring to strike the weighted frame G^3, the spring will be compressed and the weighted frame will receive a gradually-increasing force against it, causing it to move upward until finally it is pushed upward with the full force of the stop B^3. By reason of thus withdrawing the plunger G^2 the water in the valve-chamber above the valve is free to flow therefrom through pipe G to cylinder G′, and the pressure upon the under surface of the valve becomes effective to lift the valve to the extent which the frame B lifts the piston. When the plunger has been withdrawn to such an extent that the valve E is lifted to cut off the supply to the operating-cylinder, the frame B no longer ascends and the car comes to rest. When the car is reversed, by as much as the frame B moves away it allows the weighted frame G^3 to follow it until it returns to its normal position, gradually displacing the water in the cylinder G′. The only outlet for the water being through pipe G into the valve-chamber above the valve, the valve is again moved downward to open the pipe C′. The check-valve *f* in both cases keeps the pipe G full of water, so as to compensate for any leakage, as water is free to flow from the supply to the pipe G backward.

It will be understood that the weight of frame G^3 must be great enough to overcome the slight excess of hydraulic pressure on the under surface of the valve.

It is self-evident that the only purpose of the spring D^4 is to prevent the stop B^3 from striking the plunger suddenly, and therefore the spring could be as well placed upon the lower surface G^4 of the frame G^3 as upon the stop B^3.

In the preceding description I have described the valve E as on the supply-pipe, this for controlling the elevator in its downward movement. If it were desired to control it on its upward movement, a similar valve would be placed in the exhaust-pipe.

If a break or leak should occur between cylinder G′ and the valve-chamber, the automatic valve would close, stopping the car. There is no likelihood of break by water-hammer, and if a break or leak should occur the automatic valve will, as before stated, close, thereby avoiding the possibility of accident.

Having now fully described my invention, what I claim, and desire to protect by Letters Patent, is—

1. In a hydraulic elevator, the combination with the elevator apparatus and the operating-cylinder, of a valve in connection with the operating-cylinder and a cylinder for the valve, a second cylinder connected with the valve-cylinder and containing liquid under pressure adapted to hold said valve open against a constant-pressure supply, and means operated by the moving part of the elevator mechanism adapted to relieve the pressure in the second cylinder and its connections, whereby the constant pressure becomes effective to shift said valve.

2. In a hydraulic elevator, the combination with the elevator apparatus and the operating-cylinder, of a valve in connection with the operating-cylinder and a cylinder therefor, a piston connected with said valve, there being a constant pressure on one side of said piston tending to close the valve, a second cylinder and pipe connection between it and the part of the valve-cylinder opposite the other side of said piston, means for maintaining a pressure on the last-mentioned side of said piston normally in excess of the constant pressure tending to close said valve, and means operated by the moving part of the elevator mechanism adapted to relieve the pressure in the second cylinder and its connections, whereby the constant pressure becomes effective to shift said valve.

3. In a hydraulic elevator, the combination with the elevator apparatus, the operating-cylinder, and the main controlling-valve, of a second valve and a cylinder therefor, a piston connected with said valve, there being a constant pressure on one side of said piston tending to close the valve, a second cylinder, a pipe connection between the second cylinder and that part of the valve-cylinder opposite the other side of said piston, a plunger in the second cylinder, means to cause the plunger to exert a pressure upon the liquid in the cylinder to normally overbalance the constant pressure tending to close said valve, and means operated by the moving part of the elevator mechanism to withdraw said plunger and relieve said pressure, whereby the constant pressure becomes effective to move said piston and close said valve.

4. In a hydraulic elevator, the combination with the elevator apparatus and the operating-cylinder, of a valve in connection with the operating-cylinder controlling the supply or discharge of the operating-cylinder, a cylinder for the valve, means tending to close the valve, a second cylinder connected with the valve-cylinder and containing liquid under pressure adapted to hold said valve open against the means acting to close it, and devices operated by the moving part of the elevator mechanism adapted to relieve the pressure in the second cylinder and its connections, to permit the said means to act to close said valve.

5. In a hydraulic elevator, the combination with the elevator apparatus, the operating-cylinder, and the main controlling-valve, of a second valve controlling the supply or discharge of the operating-cylinder, a piston

connected with said valve, means tending to close the valve, a cylinder, a pipe connection between the cylinder and one side of said piston, a plunger in the second cylinder, means to cause the plunger to exert a pressure upon the liquid in the cylinder and its connections to hold said valve open against the means acting to close it, and devices operated by the moving part of the elevator-operating mechanism to withdraw said plunger and relieve said pressure, to permit the said means to act to close said valve.

In testimony of which invention I have hereunto set my hand.

FRANK E. HERDMAN.

Witnesses:

M. T. BARBOUR,

A. E. SMITH.