

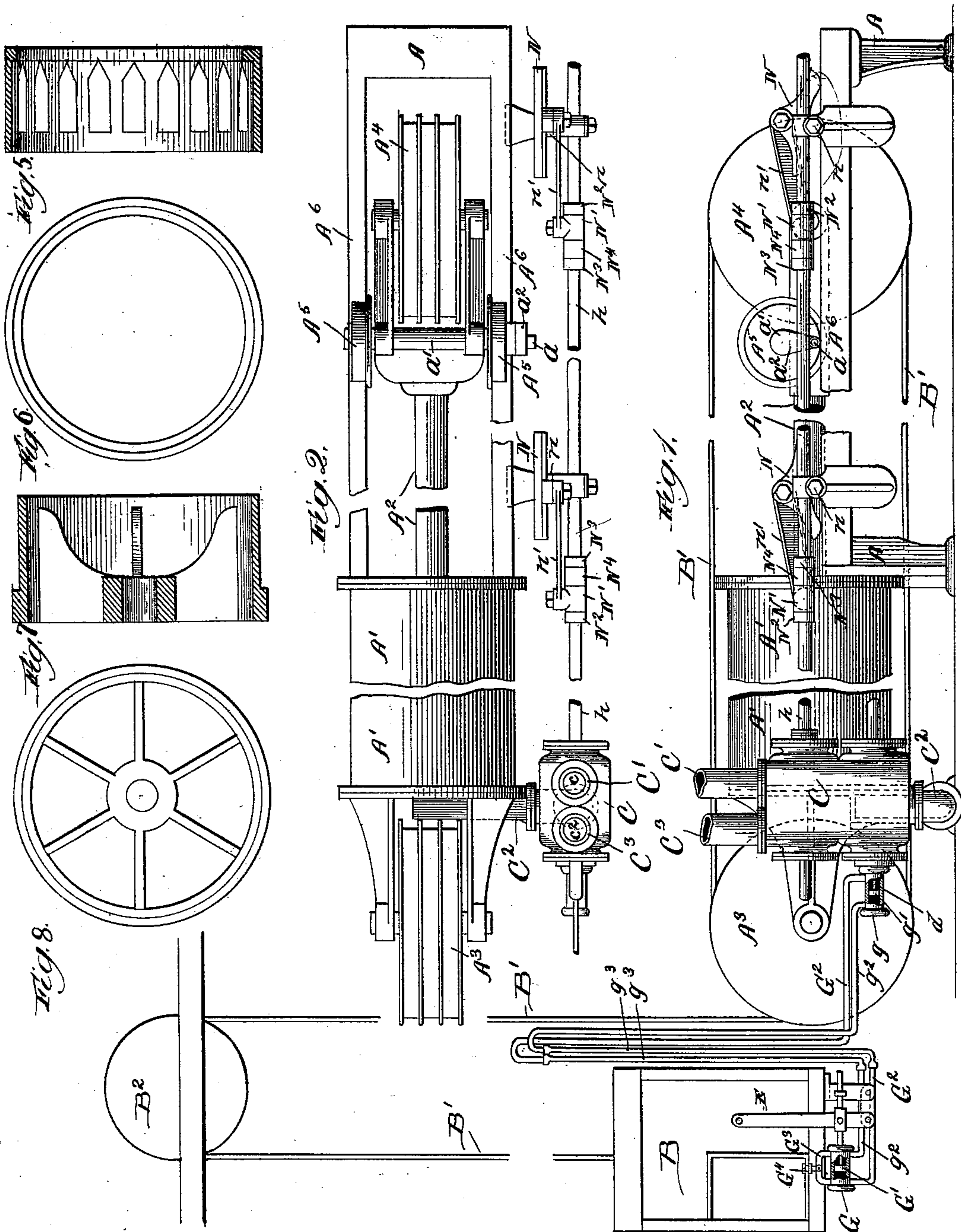
(No Model.)

2 Sheets—Sheet 1.

T. W. EATON.
HYDRAULIC ELEVATOR.

No. 561,047.

Patented May 26, 1896.



Witnesses:

Law. C. Curtis.

H. W. Munday.

Inventor:

Thomas W. Eaton

By Munday Evans & Adcock
Attys

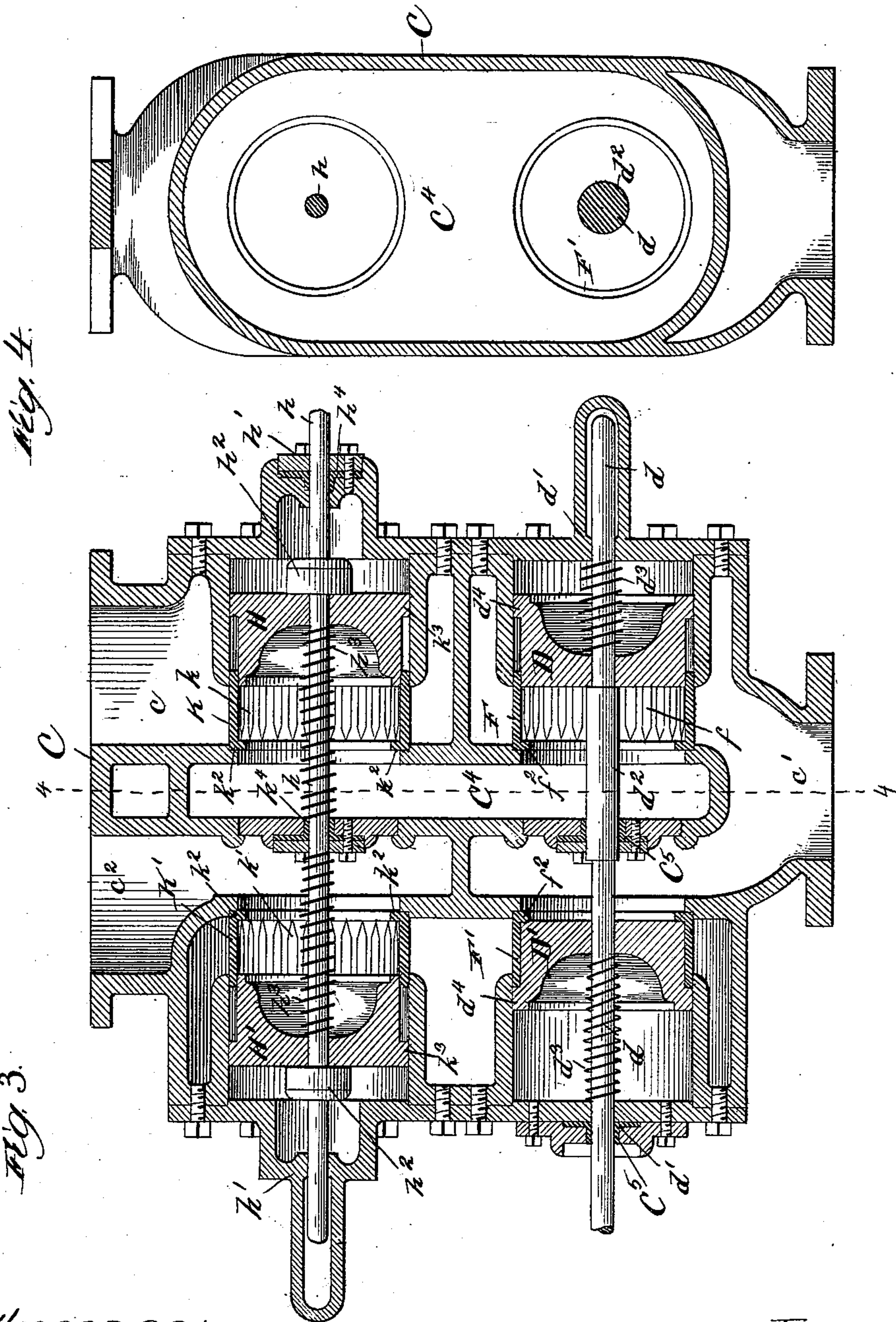
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UNITED STATES PATENT OFFICE.

THOMAS W. EATON, OF CHICAGO, ILLINOIS.

HYDRAULIC ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 561,047, dated May 26, 1896.

Application filed April 19, 1890. Serial No. 348,705. (No model.)

To all whom it may concern:

Be it known that I, THOMAS W. EATON, a citizen of the United States, residing in 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 invention relates to hydraulic elevators, and more particularly to improvements in the valves and valve operating or controlling mechanism by or through which the supply and discharge of the water to and from the hydraulic cylinder is regulated, as fully set forth hereinafter, and as illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation, partly in section, of my improved elevator. Fig. 2 is a plan of the cylinder and valve-chest and the safety-valve mechanism. Fig. 3 is a central vertical section through the valve. Fig. 4 is a cross-section on the line 4 4 of Fig. 3. Fig. 5 is a detail sectional view of the valve-seat sleeve or cylinder. Fig. 6 is an end view of the same. Fig. 7 is a detail sectional view of the valve. Fig. 8 is an end view of the same.

In the drawings, A represents the frame of the hydraulic cylinder; A', the hydraulic cylinder; A², its piston-stem; A³, the stationary sheave around which the cable passes, and A⁴ the movable sheave which is moved to and fro by the piston of the hydraulic cylinder. The outer end of the piston A² and the sheave A⁴ are furnished with friction wheels or rollers A⁵, that travel on the track A⁶.

B is the elevator-car, which is actuated by the hydraulic engine through the cable B', which passes over the stationary pulley B² and around the sheaves A³ A⁴.

C is the valve case or shell, having a water-supply passage or port c, connecting with the supply-pipe C', a passage or port c', connecting with the pipe C², leading to the hydraulic cylinder A', and a discharge passage or port c², connecting with the discharge-pipe C³.

D and D' are respectively the supply and discharge valves, which are connected with and operated from the operating-lever E on the car, as hereinafter stated, or in some other suitable way, and forming the main or reversing valve of the elevator, and F and F' are the valve-seat sleeves or cylinders in which the valves D D' fit, and the ports f, with which

both are provided, are closed by the said valves.

The valves D D' are hollow cylinders with arms and hub, as shown at Figs. 7 and 8, and fit loosely upon the valve-stem *d*, which reciprocates in suitable bearings *d'* *d'* in the case or shell C. The valve-stem *d* is furnished with an enlargement *d*², rigid therewith, which abuts against the valve D or D' and causes the same to move with the valve-stem in opposite directions. The spiral springs *d*³, surrounding the valve-stem *d*, move the valves D D' in the direction opposite to that in which they are moved by the stem *d*. The valve-port cylinders F F' have internal shoulders *f*², against which the ends of the valves D D' abut, and said valves have external shoulders *d*⁴, which set up against the opposite ends of the sleeves F F'. The abutting ends and shoulders of the two telescoping parts F D or F' D' are fitted to each other, so as to make a tight closure at these abutting points or joints. By this means I secure a tight closure between the two telescoping parts when the abutting points are brought together, and I am also permitted to make the fit between their cylindrical surfaces so loose as to permit the water to circulate between them at other times. By this loose fit the movement of the valve is made very easy and almost entirely free from friction. It should also be observed that the valve-stem *d*, which slides in its bearings *d'* in the valve case or shell C, supports or sustains the valves D D', and thus also serves to prevent friction between the valves and the sleeves or chambers within which they reciprocate. At the bearings or points where the valve-stem *d* extends through the case C and its dividing-wall C⁴, I provide cup-shaped packings or stuffing-boxes C⁵ C⁵.

The valve-stem *d* is operated from the lever E on the car by means of a cylinder G and its piston G', mounted on the car, and a corresponding cylinder *g* and its piston *g*', the stem of which is connected to or made integral with the valve-stem *d*. The cylinders G and *g* are connected together by pipes G² *g*², connecting the opposite ends of the two cylinders. A portion *g*³ of each of these pipes G² *g*² is made of hose or other flexible material to permit the movement of the car up and down. The two cylinders G *g* and the

pipes connecting the same constitute a closed circuit or system, the same being filled with some liquid, preferably one of an antifreezing character. The lever E is pivoted to the piston G', the lever being normally in its upright or middle position, as indicated in the drawings, and the piston G' at the middle of its stroke. When the piston G' is moved in either direction by the lever E, a corresponding movement is communicated to the piston g' and the valve-stem d through the liquid in the closed circuit or system of pipes connecting the two cylinders. The cylinder G is furnished also with a pipe connection G³ between its two ends, the same being furnished with a cock G⁴ for keeping the same normally closed. The purpose of this pipe G³ and cock G⁴ is for adjusting or equalizing the amount of the liquid on each side of the piston of the cylinder G when the apparatus is in its normal position. This is done by opening the cock G⁴ and then moving the lever E sufficiently to bring about a balance upon the two sides of the piston. When thus equalized, the cock G⁴ may be closed. During this adjustment the operating-valves will remain stationary by reason of the pressure of the springs and of the greater pressure upon one side thereof, as described farther on.

H and H' are the automatic safety-valves mounted upon the valve-stem h, and K and K' are the valve-seat sleeves or cylinders in which the valves H H' fit. These valves and sleeves are of the same construction and operation as the valves and sleeves D F and D' F' before described, and have bearings h', springs h³, stuffing-boxes h⁴, ports k and k', internal shoulders k², and external shoulders k³, all corresponding to the similar features of the main or reversing valves. Upon the valve-stem h are placed two collars h², one at the outer side of each of the valves H and H'. These collars, being rigid upon the stem, carry the valves into position to close the ports of their sleeves, one in one direction and the other in the opposite direction, and the springs h³ open them by moving them in directions opposite to the movement imparted by the collars, the operation of the collars and springs being the reverse of the enlargement and springs of the main valves.

The valve-stem h is operated automatically by the movement of the hydraulic piston A² by double-end cam-levers N, sustained by supports pivoted at n to the frame of the machine and which are engaged by a projection or roller a, borne on the lower end of a crank a², attached to the non-rotating axle a' of the wheels A⁵, the levers N being connected to the valve-stem h by links n'. There are two of these levers N, one arranged at each limit of the movement of the piston A², one operating to close the supply-valve H when the car is at the top and the other operating to close the discharge-valve H' when the car reaches the bottom. The links n' are jointed to sleeves N' upon the extension of valve-

stem h, and said sleeves are confined between collars N² and N³, springs N⁴ being interposed between the sleeves and the collars N³. These springs are intended to allow for any excess of movement imparted to the sleeves above what is necessary to close the valves.

The valve seat or port sleeves F F' and K K' are rigidly secured to the valve case or shell C, but are preferably made separate from the case or shell for convenience of construction. The automatic valves H H', both the supply and discharge, are normally held open by the springs h³ and are only closed when the car reaches the extreme of its travel at top or bottom, the supply-valve H being automatically closed when the car reaches the top and the discharge-valve H' being automatically closed when the car reaches the bottom. By this means all danger of accidents from carelessness or inattention on the part of the operator on the car is avoided. The hand-operated valves D D', both the supply-valve and the discharge-valve, are held normally closed by their springs d³ and are only opened by the movement of the operating-lever E on the car. The movement of the lever E in one direction opens the supply-valve D and in the other direction opens the discharge-valve D'.

The valve-shell is divided by the wall C⁴, so as to separate the supply and the discharge, and the passages are so arranged as to compel the water to pass both valves H and D when entering and to pass valves D' and H' when discharging. As shown at Fig. 3, the discharge is closed by valve D', while the supply is open.

The cylinder g is placed immediately adjacent to the case C, and so the stem d may enter the same and be joined to the piston g'. This permits the pressure of the water within the main-valve case to supply any leakage which may occur within the closed valve-circuit G² g², the packing at the box C⁵ being so contrived as to allow the escape of water toward cylinder g, while it prevents any passage in the reverse direction.

It will be noticed that the valves D and D' are not exactly balanced, there being at one side of each of them a slight excess of area, against which the water may bear over the area or bearing-surface at the opposite side. This assists the springs in retaining said valves at their seats and is often a serviceable feature, while it does not interfere with their operation under the power of the valve-operating mechanism.

I claim—

1. In a hydraulic elevator having separate supply and discharge passages, the combination with the main or reversing valves located in and controlling said passages, of independently-operating safety-valves also located in said passages between the said main valve and the supply and discharge, and means for operating said valves automatically, substantially as specified.

2. In a hydraulic elevator, the combination of a pair of operating-valves for opening and closing the supply and discharge water-passages and connecting mechanism for operating the same from the car, with a separate and distinct pair of independently-operating automatic valves located in and operating to open and close the same supply and discharge water-passages, and connecting mechanism for operating the same automatically from the engine, substantially as specified.

3. In a hydraulic elevator, the combination of a pair of operating-valves for opening and closing the supply and discharge of water, and connecting mechanism for operating the same from the car, with a separate and distinct pair of automatic valves for opening and closing the supply and discharge of water, and connecting mechanism for operating the same automatically from the engine, said operating-valves being furnished with springs by which they are held normally closed, and said automatic valves being furnished with springs by which they are held normally open, substantially as specified.

4. In a hydraulic elevator, the combination with a valve case or shell of a reciprocating valve-stem furnished with a pair of buttons or collars rigidly secured thereto, a pair of valves mounted loosely thereon, a pair of springs for moving said valves in one direction, one of said valves serving to open and close the supply-passage and the other the discharge-passage, substantially as specified.

5. A valve and its perforated seat consisting of two telescoping parts furnished each with a shoulder against which the end of the other abuts to form a tight closure at each side of the perforations in the seat, substantially as specified.

6. The combination of valve case or shell C, having supply-passages *c*, exit-passages *c'* leading to the hydraulic cylinder and discharge-passage *c²*, of the valve-stem *d*, valves D D', valve-seat sleeves F F' having ports *f*, valve-stem *h*, automatic valves H H' mounted thereon, and valve-seat sleeves K K', substantially as specified.

7. The combination of valve case or shell C having supply-passages *c*, exit-passage *c'* leading to the hydraulic cylinder and discharge-passage *c²*, of valve-stem *d*, valves D D', valve-seat sleeves F F', having ports *f*, valve-stem *h*, automatic valves H H' mounted

thereon and valve-seat sleeves K K', said valves D D' and H H' fitting loosely on said valve-stems and said valve-stems being provided with collars or buttons for moving the valves in one direction, and springs for moving them in the other direction, said collars and springs being reversely arranged on the two valve-stems, substantially as specified.

8. The combination of valve case or shell C, having supply-passages *c*, exit-passage *c'* leading to the hydraulic cylinder and discharge-passages *c²*, of valve-stem *d*, valves D D', valve-seat sleeves F F' having ports *f*, valve-stem *h*, automatic valves H H' mounted thereon and valve-seat sleeves K K', said valves and valve-seat sleeves telescoping with each other and having each shoulders against which the ends abut to form a tight closure, substantially as specified.

9. The combination of valve case or shell C having supply-passages *c* exit-passage *c'* leading to the hydraulic cylinder, and discharge-passage *c²*, of valve-stem *d*, valves D D', valve-seat sleeves F F' having ports *f*, valve-stem *h*, automatic valves H H' mounted thereon and valve-seat sleeves K K', said valves D D' and H H' fitting loosely on said valve-stems and said valve-stems being provided with collars or buttons for moving the valves in one direction and springs for moving them in the other direction, said collars and springs being reversely arranged on the two valve-stems, said valves and valve-sleeves telescoping with each other and having each shoulders against which their ends abut to form a tight closure, substantially as specified.

10. In a hydraulic elevator, the combination with a valve case or shell of a reciprocating valve-stem furnished with a pair of buttons or collars rigidly secured thereto, a pair of valves mounted loosely thereon, a pair of springs for moving said valves in one direction, one of said valves serving to open and close the supply-passage and the other the discharge-passage, each of said valves being furnished with a shoulder and being provided with a loose-fitting perforated valve-seat sleeve having a corresponding shoulder, said valve telescoping with the valve-seat sleeve, substantially as specified.

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Witnesses:

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EMMA HACK.