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SAFETY DEVICE FOR ELEVATORS.

No. 390,052. Patented Sept. 25, 1888.

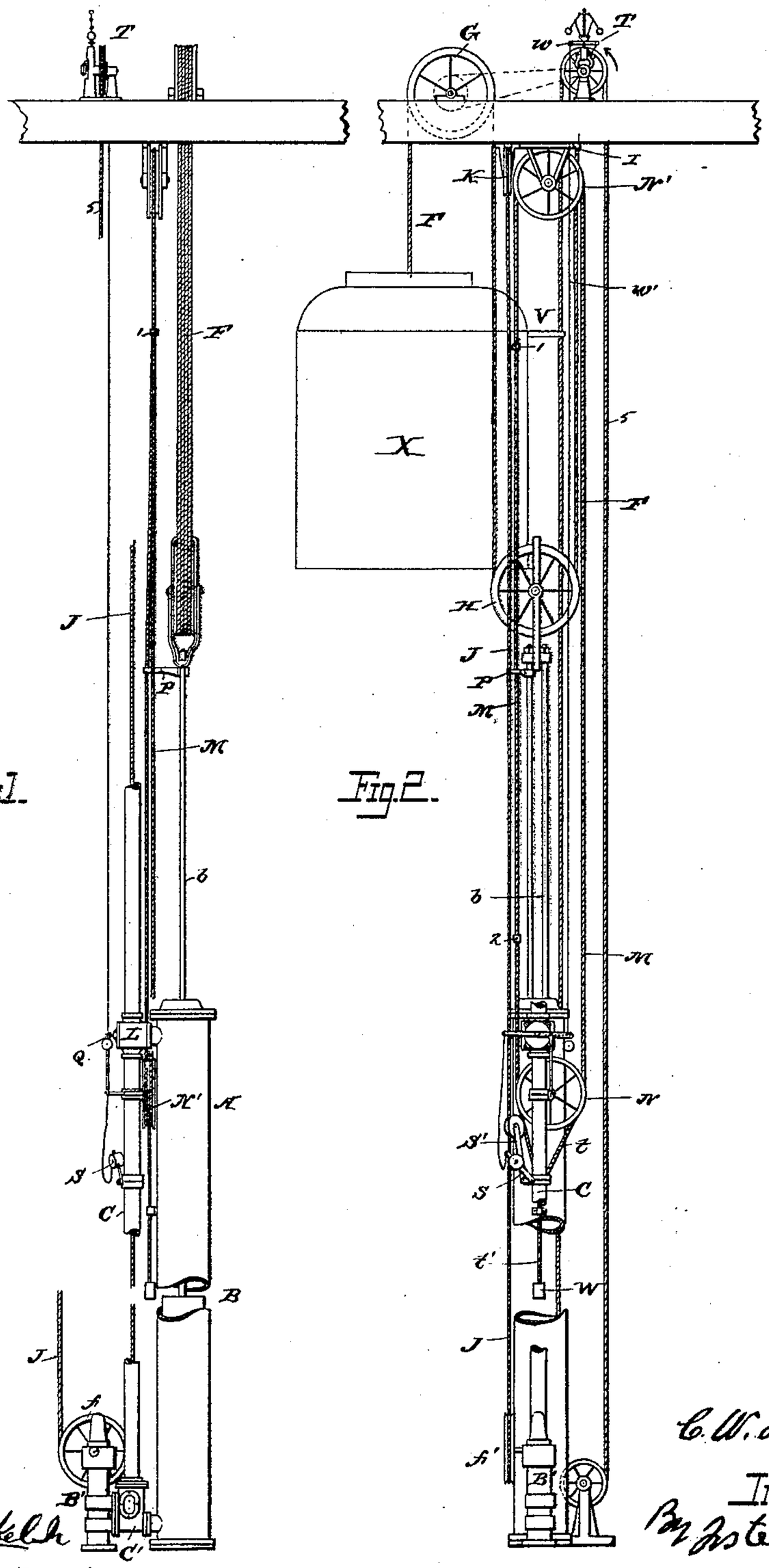

Fig. 1.

Fig. 2.

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John G. Hinkel Jr
Court A. Cooper

C. W. Baldwin
Inventor:
By Foster & Freeman
Attys

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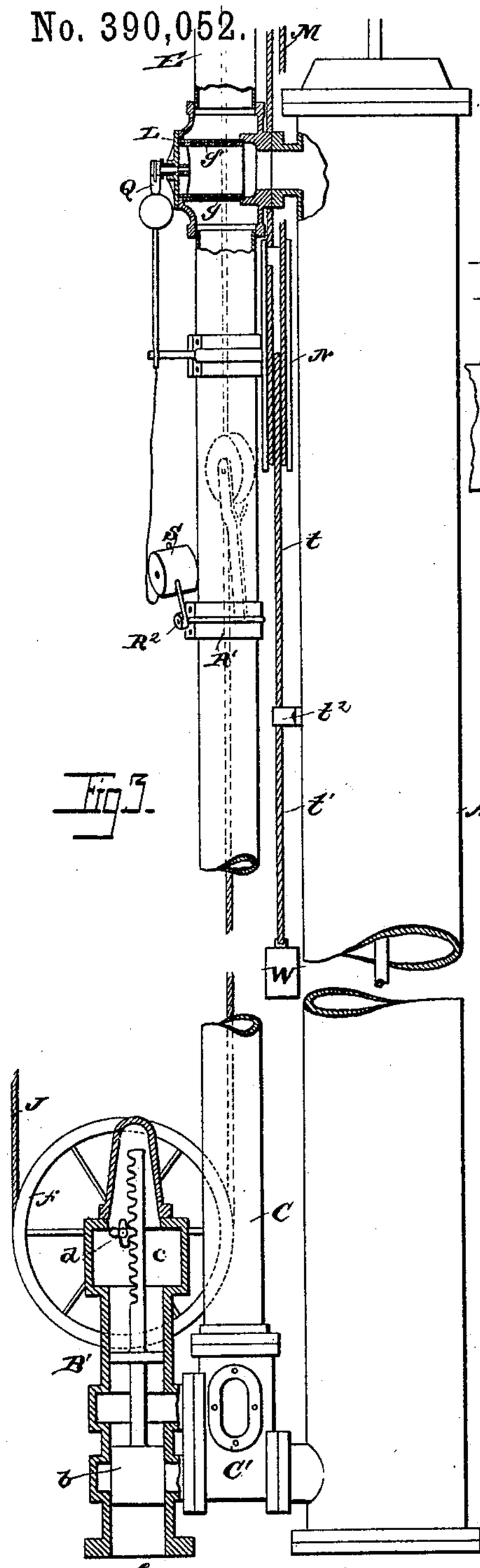

Fig. 3.

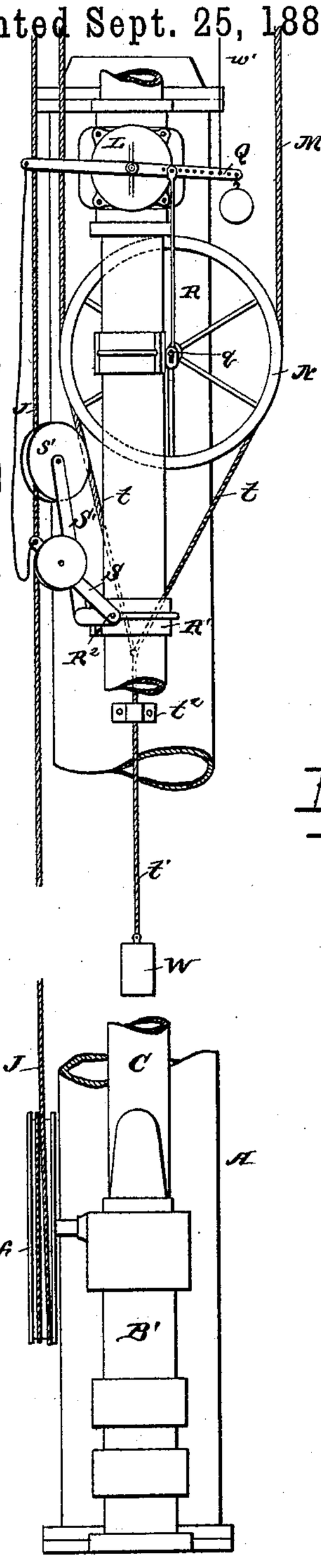

Fig. 4.

Attests:
John G. Hinkel Jr.
Court. A. Cooper.

C. W. Baldwin Inventor:
By Foster & Freeman
Attys

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Fig. 8.

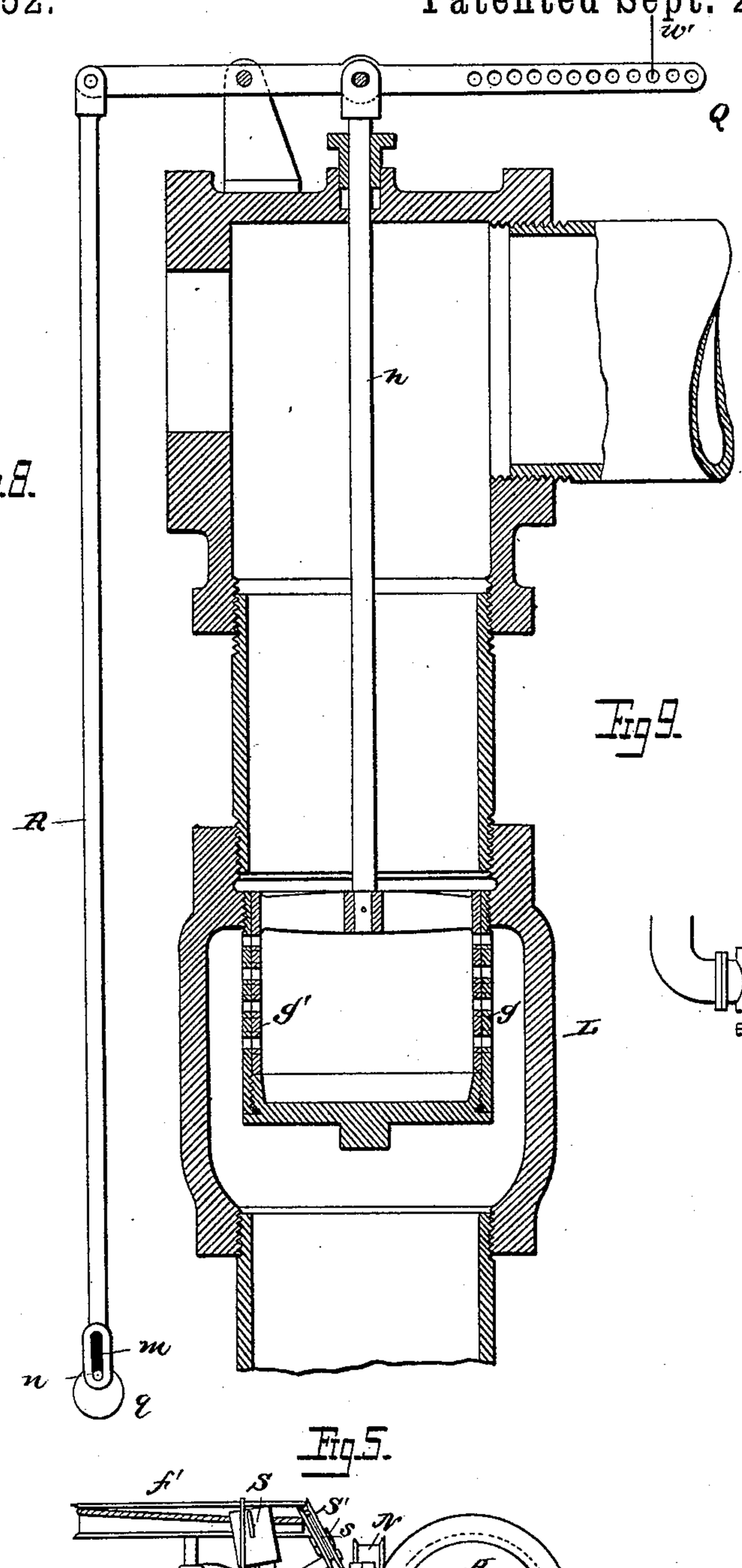


Fig. 9.

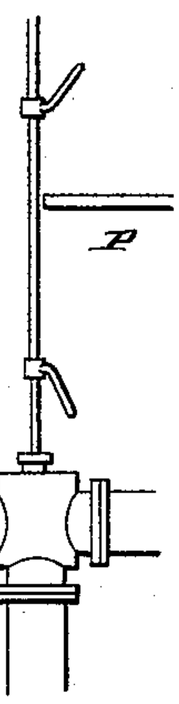
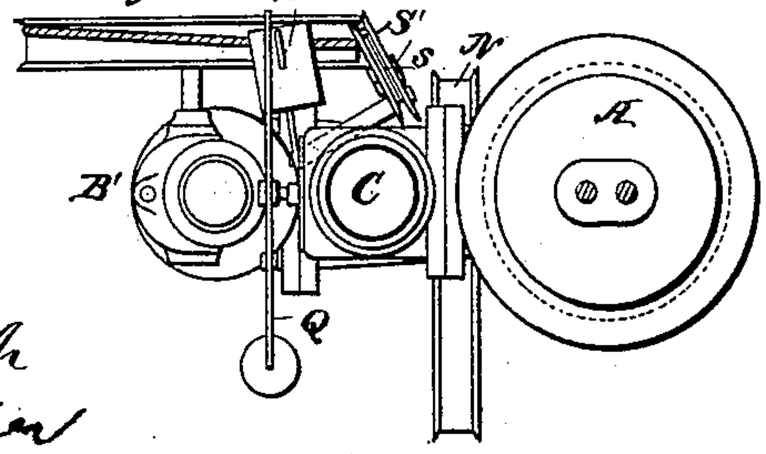


Fig. 5.



Attests:
John G. Hinkel Jr
Court. Cooper

Inventor:
C. W. Baldwin
By Foster & Freeman
Attys

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Fig. 6.

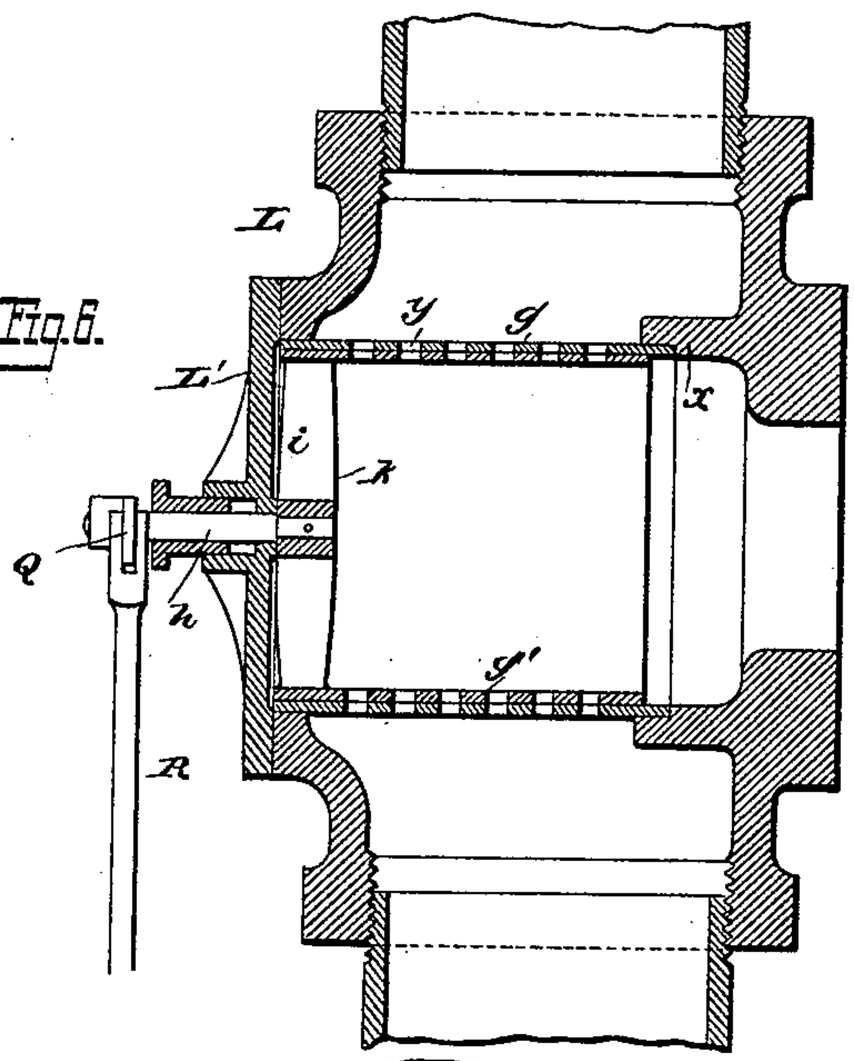
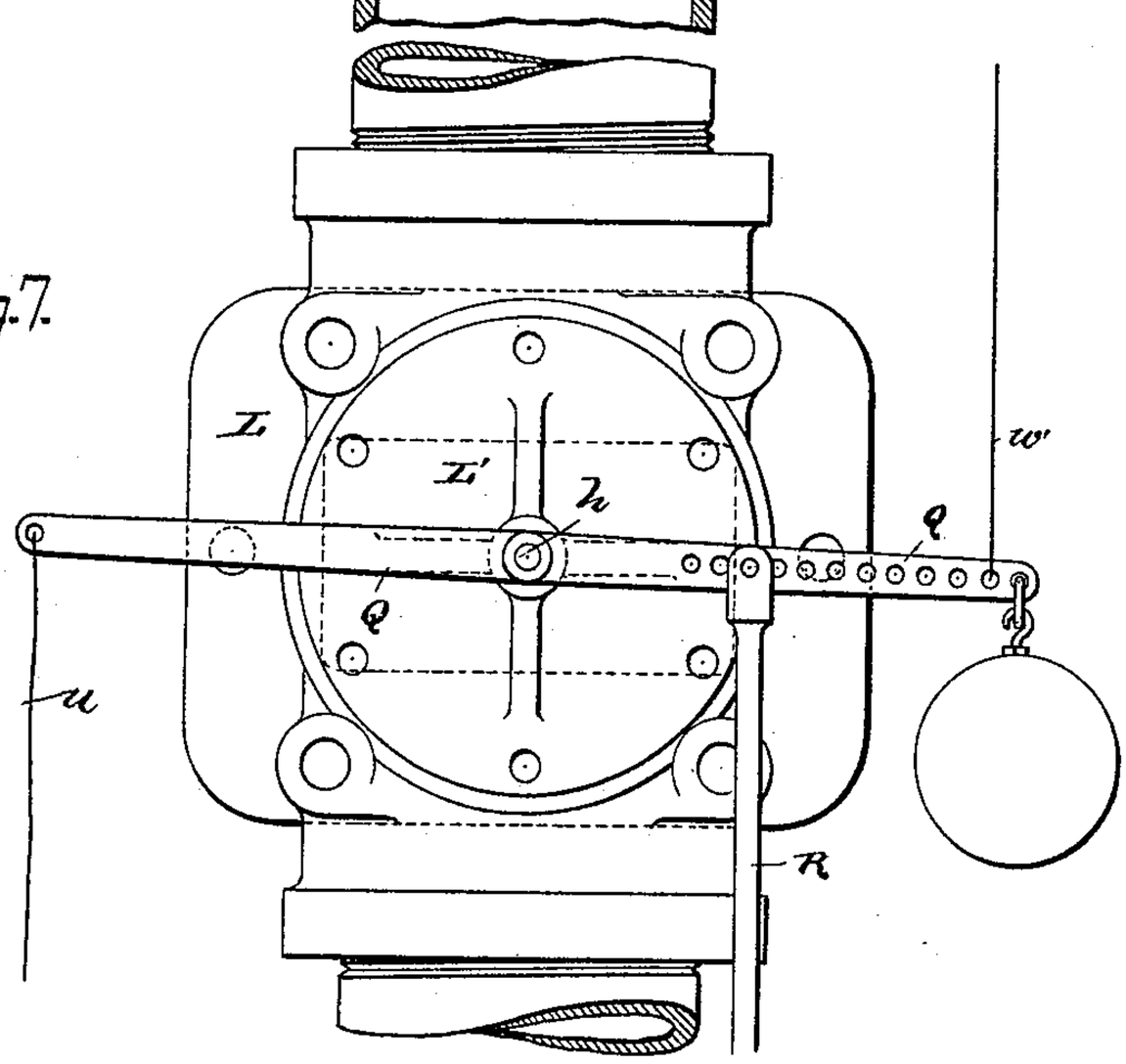
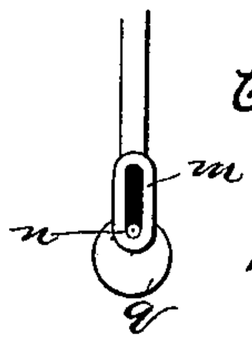


Fig. 7.





Attests:
John G. Hinkel Jr
Court. A. Cooper,

C. W. Baldwin
Inventor:
By Foster & Freeman
Atty's

UNITED STATES PATENT OFFICE.

CYRUS W. BALDWIN, OF YONKERS, NEW YORK, ASSIGNOR TO THE HYDRAULIC ELEVATOR COMPANY, OF CHICAGO, ILLINOIS.

SAFETY DEVICE FOR ELEVATORS.

SPECIFICATION forming part of Letters Patent No. 390,052, dated September 25, 1888.

Application filed April 22, 1885. Serial No. 163,066. (No model.)

To all whom it may concern:

Be it known that I, CYRUS W. BALDWIN, a citizen of the United States, residing at Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Safety Devices for Elevators, of which the following is a specification.

My invention consists in certain improvements in elevating apparatus, fully set forth hereinafter; and it consists, among other things, in a supplemental valve arranged in the fluid-supply pipe and interposed therein between the ends of the engine-cylinder, so as to cut off the motor-fluid therefrom and prevent the circulation of said fluid independent of the main valve, together with contacting devices carried by a moving part of the engine, whereby the circulation or flow of the motor-fluid is automatically regulated, so as to arrest the movement of the cage when it approaches the limit of its upper or lower movement, or should the hand-rope break or become inoperative, or should the cage acquire a dangerous velocity.

In the drawings, Figure 1 is a sectional elevation of a hydraulic elevating apparatus illustrating my improvements. Fig. 2 is a side view of parts shown in Fig. 1. Fig. 3 is an elevation, enlarged, of the operating-engine in part section. Fig. 4 is a side view of the parts shown in Fig. 3. Fig. 4ª is a detached view of the governor. Fig. 5 is a plan view of the part shown in Fig. 3. Fig. 6 is an enlarged view in section, showing the check-valve and casing. Fig. 7 is a front view of the parts shown in Fig. 6. Fig. 8 is a sectional elevation showing a modification of the stop-valve-operating mechanism. Fig. 9 is a view illustrating another modification.

My improvements are applicable to elevating apparatus of various kinds; but for the purpose of illustrating the same I have shown them in connection with an elevator provided with an engine consisting of a cylinder, A, piston B, connected to piston-rods *a*, circulating-pipes C C′, valve-casing B′, containing a valve, *b*, operated through the medium of a rack, *c*, and pinion *d*, upon a shaft carrying a pulley, *f*. (See Fig. 3.)

The motor-fluid is conducted to the cylinder A through a pipe, E, communicating with the circulating-pipe C, and the water is discharged from the valve-case through a port, *e*, all of the above described parts being well-known in connection with the "Hale elevator."

The cage X is connected to flexible cables or suspensories F, passing over a guide-pulley, G, at the top of the well and around a sheave, H, carried by the piston-rods and connected at their upper ends to a suitable support, I, so that as the piston descends the cage will rise, and an endless hand-rope, J, passes around a guide-pulley, K, and around the pulley *f*, and extends through the cage, so that the operator therein may by manipulating the rope adjust the valve and regulate the movements of the cage.

Heretofore it has been common to provide the hand-rope with stops or lugs arranged to be struck by some part of the cage when the latter approaches the limit of its movement in either direction, so as to then move the rope and close the valve. This arrangement is effective so long as the hand-rope and its connections are in operative condition; but should the hand-rope break or slip from the pulleys the arrangement is of no avail and the cage will continue its movement uncontrolled, with injurious consequences. I obviate this difficulty by providing the water-circulating passage with a supplemental valve and devices connected to the valve to close the valve and obstruct the circulation should the hand-rope break, and also whenever the cage approaches the limit of its movement in either direction, so that the motion of the cage is arrested positively whether the hand-rope and its connections are in operative condition or not. Different means may be employed for moving the said valve, and the same may be constructed in different ways. I will now describe those which I have found to be effective.

The valve may be situated in any portion of the circulating channel, or in the discharge, or wherever it will operate when closed to prevent the flow of water and the movement of the piston. As shown in the drawings, the supplemental valve *k* is arranged in the elbow or T-coupling at the junction of the circulating-pipe and inlet-pipe with the cylinder.

The said T-coupling is formed to constitute a valve-casing, L, with three branches, and an internal cylinder, *g*, extends across the casing and is perforated with openings *y* throughout its entire extent, the casing L having at one side an opening through which the cylinder may be inserted and at the opposite side an annular seat, *x*, for the end of the cylinder, the opening in the casing being covered by a detachable cap-plate, L′, through a packed opening in which extends a spindle, *h*, carrying the valve *k*.

The valve *k* consists of a cylinder fitting nicely, but so as to turn freely within the cylinder *g*, connected by arms *i* with the spindle *h*, and perforated with openings arranged to correspond with the openings *y* when the valve is in one position and to be closed by the solid portion of the cylinder *g* between the openings *y* when the valve is in the other position.

By constructing the valve of two perforated cylinders arranged as described, I am enabled to secure an extended passage-way for the flow of water to and from the cylinder and yet nearly close the said passage-way by a very slight movement of the valve, and to secure a close joint without the use of packings and with but little friction. I am also enabled to make the valve and its casing at a comparatively small expense, as the case L may be cast with wide ports or passages bored out in an ordinary lathe for the reception of the valve-cylinder *g*, and securely sealed by the application of the cap L′, while the valve-cylinders *g g′* may be ground together and simultaneously drilled in position so as to insure an absolute coincidence of the perforations when the valve is open. When the parts are of the proportions shown in the drawings, the movement of the valve to the extent of about one-sixteenth of an inch will be sufficient to absolutely cut off or fully open the water-passage, and when the passage is open it is amply sufficient for the free flow of the water.

To enable the attendant to start the apparatus after it has been stopped automatically, the valve *k* must not absolutely close the passage.

It is immaterial whether the valve be rotated or reciprocated longitudinally in order to open or close the passage. In the construction described and illustrated in Figs. 1 to 6 means for rotating the valve are shown. In the construction shown in Fig. 8 the valve is connected to a sliding stem, whereby it may be moved longitudinally with like effect.

In order that the supplemental valve may be operated automatically independently of the hand-rope as the cage approaches either end of its travel, I provide an independent connection between the same and some moving portion of the apparatus—as, for instance, the cage or the piston-rod. One form of connection is an endless rope, M, passing around pulleys N N′, and provided with stops 1 2, arranged to be struck by an arm, P, extending from the piston-rod, so that as the latter approaches the limit of its movement in either direction it will strike one of the stops and move the rope and through suitable connections between the valve *k* and said rope close the valve. Different connections will suggest themselves to any skilled mechanic. I have shown a lever, Q, connected to the valve-stem *h*, and a rod, R, provided with an elongated slot, *m*, receiving an eccentric-pin, *n*, extending from the end of the shaft *q* of the pulley N, whereby the rotation of the pulley in either direction will lift the rod R and the lever Q to close the valve. The pulley N may, however, be turned to a limited extent when necessary without moving the valve, owing to the play of the pin *n* in the slot *m*.

It will be apparent that the pulley N may be placed directly on the end of the valve-stem *h*, and that a vertical shaft rocked by the contact of the arm P with arms on the shaft may be the means of communicating motion to the pulley or to the valve-stem. (See Fig. 9, showing the shaft vertically, as in Fig. 8.)

In order that the valve may normally occupy an open position, the stem or the pulley N should be weighted. As shown, the weight is applied to the pulley N by extending two cords, *t*, from opposite sides of the pulley to a cord, *t′*, and passing the latter through a guide-eye, *t²*, and connecting thereto a weight, W, so that the weight will be lifted by turning the pulley N in either direction, and will tend to restore the pulley to its position for holding the valve open when the rope or cable M is released.

In connection with the supplemental valve in the water-passage I use means whereby the valve may be operated to close the passage upon the breaking of the hand-rope. Different appliances for this purpose will occur to a skilled mechanic, it only being necessary that an arm or other movable piece or part shall be held in position by the rope when the latter is taut, and shall be moved when the rope becomes slack and close the valve. Thus a shaft, R², turning in bearings upon a clamp-sleeve, R′, upon the pipe C, is provided at one end with a weighted arm, S, and at the other with an arm, S′, carrying a grooved pulley, *s′*, which is caused to bear upon the hand-rope J by the weighted arm. The end of the arm S is connected to the end of the lever Q by a flexible connection or cord, *u*, so that should the hand-rope break or become slack the arm S′ will fall forward and turn the shaft R² until the cord *u* is tightened and the lever Q rocked to close the valve, when the motion of the cage will at once be arrested.

Inasmuch as accidents frequently result from a too rapid movement of the cage when there is no breaking of the parts—as, for instance, when there is an insufficient supply of water or a leakage—I provide means whereby the supplemental valve is closed automatically should the cage move downward with undue

rapidity. This is effected by means of a governor, T, connected to lift a lever, *w*, as the speed of the cage increases, and the said lever is connected by a wire or other connection, *w'*, with the lever Q, which is thereby raised upon any undue acceleration of movement and the valve closed, so as to prevent the further motion of the cage. The slot in the rod R permits this movement without the turning of the pulley N.

The governor T is driven so as to be operated on the movement of the cage and at a speed dependent upon that of the cage in any suitable manner. For instance, it may be driven by a belt and pulleys, as shown in dotted lines, Fig. 2. I prefer, however, to drive the governor by gears 12 13 from a shaft, 3, carrying a pulley, 4, around which and around a pulley at the bottom of the well passes a cable, 5, connected to the cage at *v*, the pulley 4 turning upon the shaft 3 freely in one direction, but being provided with a pawl, so as to rotate the said shaft by contact with a ratchet thereon when the pulley rotates in the opposite direction. (Indicated by the arrow, Fig. 2.) By this means the governor is rotated only when the cage descends, and should there be any undesirable increase in the rapidity of its downward motion the valve *k* will be closed and the fluid-passage obstructed, so as to arrest the movement of the engine and stop the cage.

It will be evident that while the above-described safety devices co operate to work upon the same valve they may be employed separately or in connection with different valves upon the same elevator.

Without limiting myself to the precise construction and arrangement of parts shown and described, I claim—

1. The combination, with a cage and elevating-engine connected to raise and lower the same, its main-valve operating appliances therefor, and a fluid-pipe in communication with both ends of the engine-cylinder, of a supplemental valve arranged in said fluid-pipe and interposed therein between the ends of the engine-cylinder, so as to cut off the motor-fluid from both ends of the engine-cylinder and prevent the circulation of said fluid independent of the main valve, and contacting devices carried by a moving part of the engine and connected with the supplemental valve, whereby to actuate said valve to cut off the flow of motor-fluid independent of the main valve as the cage reaches the limit of its movement in each direction, substantially as described.

2. The combination, with an engine provided with fluid pipes and passages in communication with both ends of the engine-cylinder, a main valve and operating appliances therefor, and with a cage connected to be moved by said engine, of a supplemental valve arranged in one of said pipes and interposed therein between the ends of the engine-cylinder independent of the main valve to arrest the flow of motor-fluid to both ends of the engine-cylinder and prevent the circulation of said fluid independent of the main valve, and a rope connected to said supplemental valve, stretched adjacent to a moving part of the apparatus and provided with upper and lower stops arranged to be struck by a contact-piece carried by said moving part as the cage approaches the limit of its movement in each direction, substantially as described.

3. The combination, with the engine, its main valve and operating hand-rope, and a supplemental valve for said engine independent of the main valve, of supplemental-valve-actuating devices, consisting of a rope connected to said supplemental valve, and provided with stops adapted to be struck by one of the moving parts of the engine, and arranged to close the valve as the piston approaches the limit of its movement in each direction, and an independent movable piece interposed between said supplemental valve and the hand-rope, whereby the said valve will be operated upon the breakage or slackening of the hand-rope, substantially as described.

4. The combination, with an engine and cage operated thereby, and a supplemental valve in one of the pipes of the engine independent of the engine-valve, of supplemental-valve-actuating devices, consisting of a rope connected to said supplemental valve, and provided with stops adapted to be struck by one of the moving parts of the engine, and arranged to close the supplemental valve as the piston approaches the limit of its movement in each direction, a hand-rope connected to operate the engine-valve, and a lever-connection between said supplemental valve and the hand-rope, bearing on and supported by the latter, whereby the said valve will be operated by the breakage or slackening of the hand-rope and as the piston approaches the limit of its movement in each direction, substantially as described.

5. The herein-described elevator-engine, connected with a cage and provided with a hand-rope and automatically-operated supplemental valve in one of the pipes, a movable piece bearing upon the hand-rope and connected with said valve, a governor, and a rope connecting the governor with said valve, whereby the latter will be operated by any excess in speed of the cage or by the breakage of the hand-rope, substantially as described.

6. The combination, with an elevating-engine, its piston, main valve, and actuating hand-rope, of a supplemental valve in the motor-fluid supply pipe, a lever connected with the stem of said valve, operating appliances connected with said lever and with a moving part of the engine, and an independent weighted lever bearing upon said main-valve hand-rope, and also connected to move said valve-lever, whereby the valve is operated independently as the piston reaches the limit of its movement in each direction and upon the breakage or slackening of the said hand-rope, substantially as described.

7. The combination, with the cage, of an ele-

vating-engine, its main valve, and actuating hand-rope, a supplemental valve in the motor-fluid-supply pipe, a lever connected with the stem of said valve, a weighted lever bearing upon said hand-rope and connected to move said valve-lever, and a governor operated by the movement of the cage and connected to move said valve-lever, whereby the breakage or slackening of the hand-rope and an excess in speed of the cage will actuate the supplemental valve, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CYRUS W. BALDWIN.

Witnesses:

HOWARD F. GARRISON,

HYATT L. GARRISON.