(No Model.) 3 Sheets—Sheet 1.

J. S. TROTT.

ELEVATOR.

No. 547,972. Patented Oct. 15, 1895.

Fig. 1.

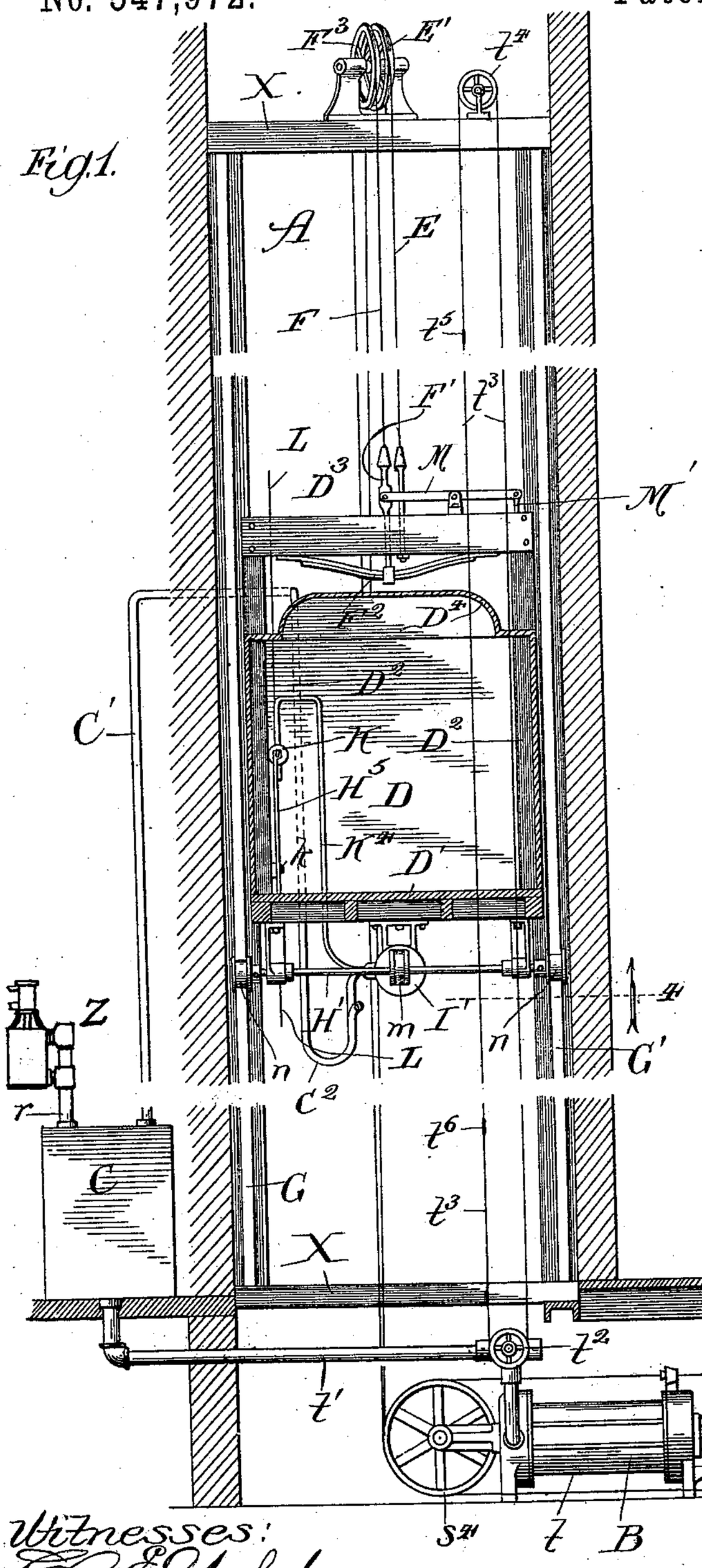


Fig. 3.

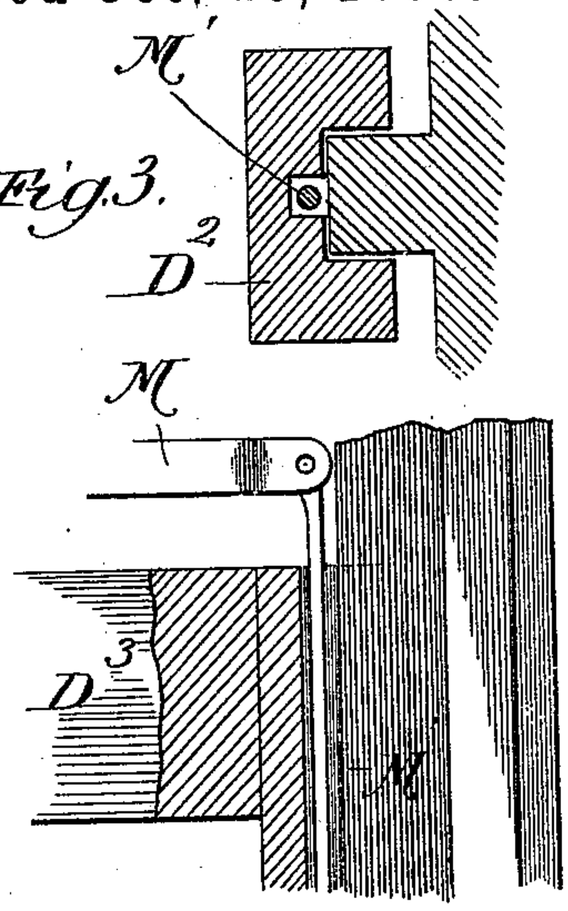
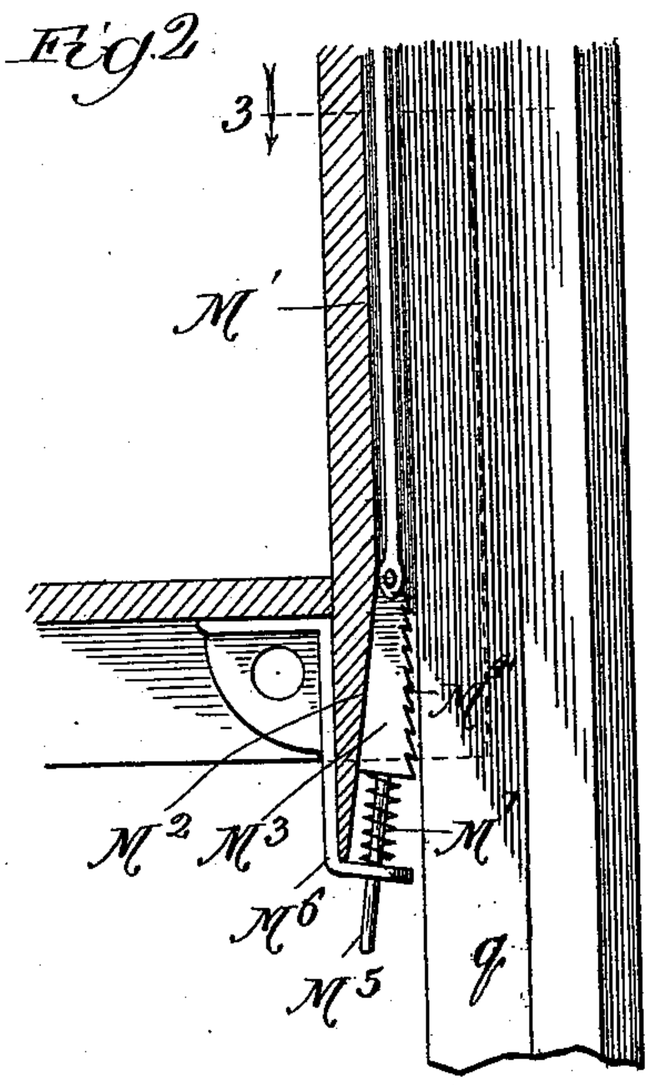


Fig. 2.



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(No Model.) 3 Sheets—Sheet 2.

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Fig. 4.

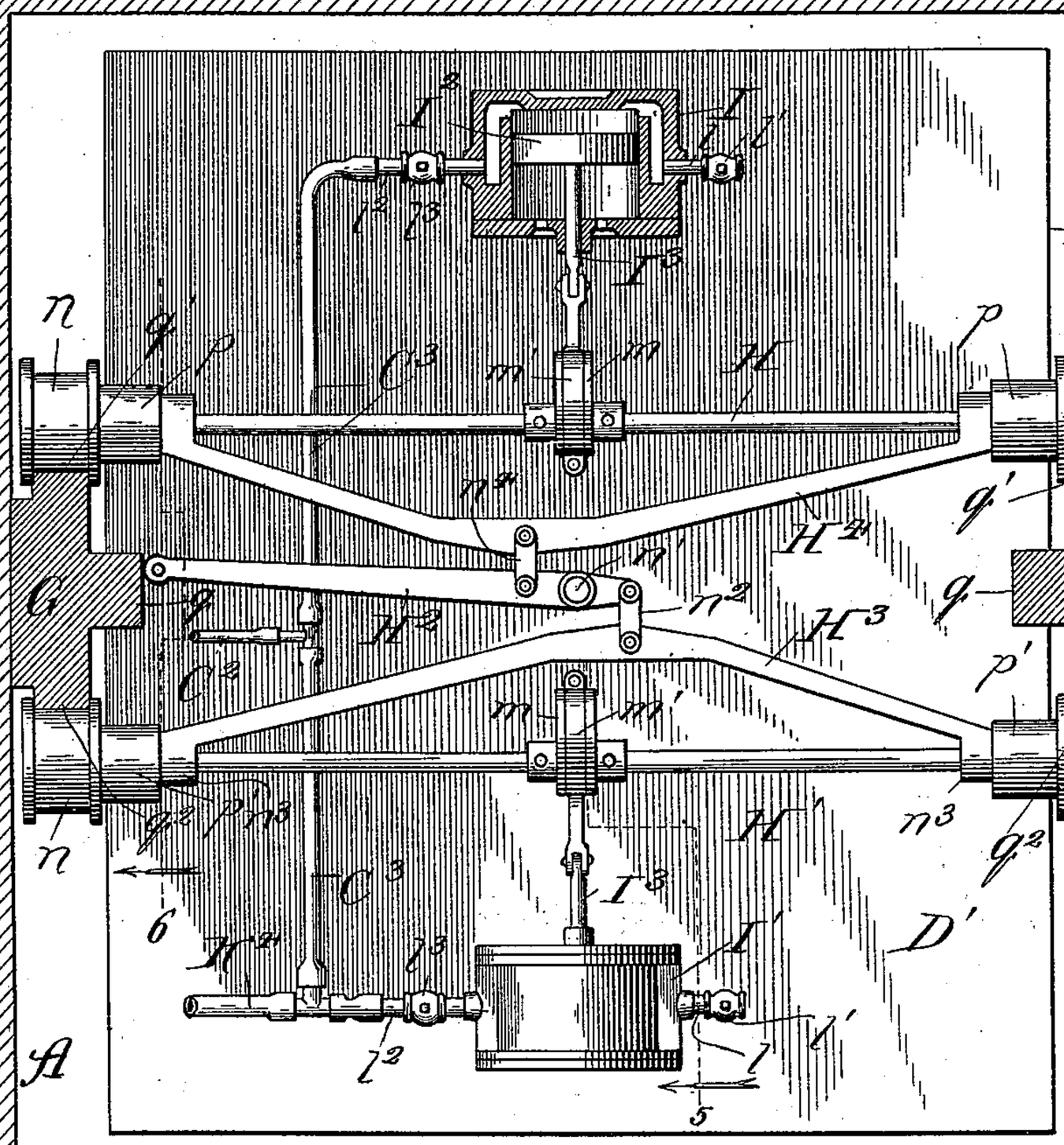

Fig. 5.

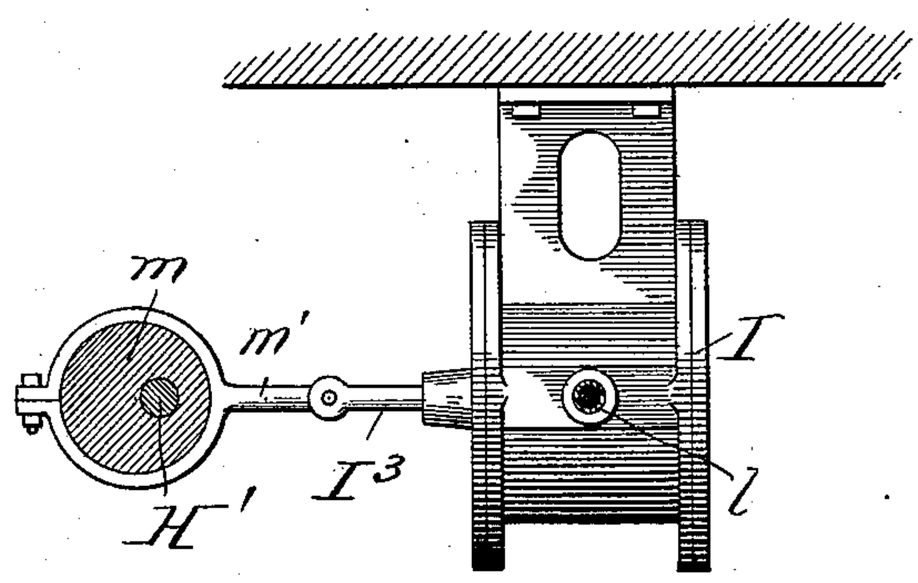

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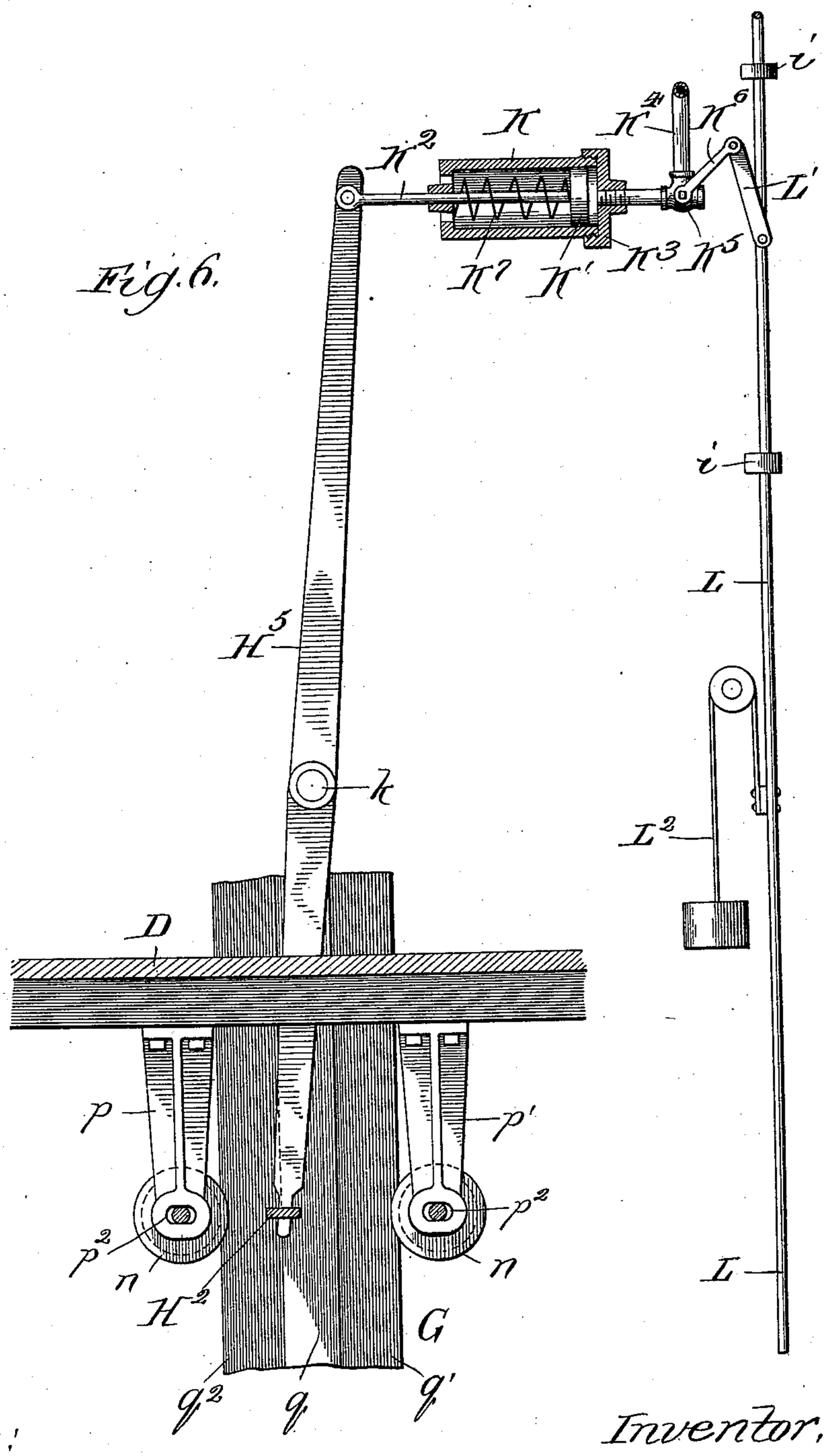
Fig. 6.



Witnesses:
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UNITED STATES PATENT OFFICE.

JOSEPH S. TROTT, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO EDWARD F. BROOKE AND SAMUEL W. BROOKE, OF SAME PLACE.

ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 547,972, dated October 15, 1895.

Application filed December 1, 1894. Serial No. 530,577. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH S. TROTT, 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 Elevators, of which the following is a specification.

My invention relates to improvements in elevators or lifts for passenger or freight service.

My object is, first, to provide an elevator of improved construction employing compressed air as the motive power; second, to provide compressed-air counterbalance mechanism for the elevator car or platform, which shall operate in the descent of the latter not only as a counterbalance, but also as means for recharging the compressed-air reservoir.

In the drawings, Figure 1 is a broken sectional view, partly diagrammatic, illustrating my improvements; Fig. 2, an enlarged broken sectional view of one side of the car and adjacent wall of the elevator-shaft, illustrating my improved safety mechanism; Fig. 3, an enlarged section taken on line 3 of Fig. 2; Fig. 4, a partly sectional and partly bottom plan view of the elevator-car, the section being taken on line 4 of Fig. 1; Fig. 5, an enlarged section taken on the irregular line 5 of Fig. 4; and Fig. 6, an enlarged sectional view, partly diagrammatic, illustrating counterbalance switch mechanism, the section being taken on line 6 of Fig. 4 and viewed in the direction of the arrow.

A is an elevator shaft or hatchway; B, an air-motor; C, a compressed-air reservoir, and D an elevator-car. The car D comprises a framework consisting of a platform D′, vertical side, bars D^2 D^2, and a top beam D^3, and mounted in the frame is a cage D^4, all being substantially of the construction usually employed for passenger service.

E is a cable rigidly secured to the beam D^3 and extending over a pulley E′ at the top and center of the shaft and thence to the motor.

F is a main or working cable secured at its end to a vertical bar F′, which passes loosely through the beam D^3 and is fastened at its lower end to a spring F^2 in a common manner. The cable F passes over a pulley F^3, adjacent to the pulley E′, and thence to the motor B. The pulleys F^3 E′ are at an acute angle with relation to each other, so that the cable E in Fig. 1, where it extends from the pulley E′ to the motor, is directly behind the cable F and hidden thereby. The motor has a piston-cylinder *t*, communicating through a pipe *t′* with the compressed-air reservoir C. The piston in the cylinder is upon the stem *s*, carrying pulley-wheels *s′*, the outer end of the stem being upon a carrier s^2, which travels upon guide-tracks s^3. Mounted at the opposite end of the cylinder are pulleys s^4, extending at their peripheries to the central line at one side of the elevator-shaft. The cables E F extend around the pulleys s^4 *s′*, whereby outward movement of the piston-stem *s* with the pulleys *s′* draws upon the cables to lift the car, and inward movement of the piston-stem and pulleys *s′* relaxes the cable and causes the car to descend. The motor B and its attendant parts described may be of a construction in the main hitherto employed for elevators using steam as the motive power, and no detailed description in the present connection is thought to be necessary. The compressed-air reservoir C connects by means of a pipe *r* with an air-compressor Z. Interposed in the pipe *t′* is a three-way valve operated by a wheel or pulley t^2 to direct air from the air-reservoir to the cylinder *t* to force the piston and attendant parts outward, or to close said communication and open the cylinder to the outside air, whereby the weight of the car causes the piston and attendant parts to travel inward, or to close communication between the cylinder and both the air-reservoir and outside air, whereby the piston and attendant parts remain at a standstill to hold the car at any elevation at which it is stopped. The said valve may be operated from the car through the medium of a rope or cable t^3, passing around the said pulley t^2 at the bottom of the shaft and a pulley t^4 at the top of the shaft, the rope or cable extending through the car in a common manner and provided near the top and bottom with stops t^5 t^6, respectively, which, when engaged by the car, cause the cable to be moved by the travel of the car to the position of closing the valve.

At opposite sides of the car and forming part of the shaft construction are vertical guides G G′, extending from the bottom to the

top of the shaft. Each guide is formed of wood and is provided at its center with an inward-projecting tongue q, a laterally-projecting tongue or guide q' at one side, and a laterally-projecting tongue or guide q^2 at its opposite side. On the under side of the car are two pairs of hangers $p\ p$ and $p'\ p'$, in the relative positions shown, provided with elongated bearing-openings p^2. (See Fig. 6.) Extending near opposite end portions through the bearing-openings p^2 of the hangers p is a shaft H, and extending toward opposite ends through the bearing-openings p^2 of the hangers p' is a shaft H'. Rigidly secured to the ends of the shafts H H', beyond the sides of the car, are friction-wheels n, having, preferably, grooved peripheries, which embrace the tongues $q'\ q^2$ of the guides G G'.

H^2 is a lever fulcrumed at n' to the under side of the car-platform and connected at its short end by means of a link n^2 with a yoke H^3, near the center of the latter, the yoke being provided at opposite ends with bearings n^3, which loosely engage the shaft H' adjacent to the hangers p'. At the opposite side of its fulcrum the lever H^2 is connected by a link n^4 with a yoke H^4, of the same construction as the yoke H^3, and engaging the shaft H adjacent to the hangers p. Turning of the lever H^2 at its long arm in one direction causes the yokes H^4 H^3 to be drawn toward each other and move the shafts H H' in the bearing-slots p^2 to clamp the guides G G' between the friction-wheels n, the latter being pressed firmly against the tongues $q'\ q^2$.

At the center of each shaft H H' is an eccentric-disk m, which revolves in the ring or stirrup of a pitman m'. Adjacent to each disk m at cpposite sides of the platform are pump-cylinders I I', each containing a piston I^2 upon a stem I^3, pivotally connected with the adjacent pitman m'. The pumps may be either single-acting or double-acting, though the one shown in Fig. 4 is of the single-acting type, having each an inlet-pipe l, provided with a check-valve l', and an outlet-pipe l^2, provided with a check-valve l^3.

Extending from the air-reservoir C to the elevator-shaft, at a point about half-way between the upper and lower ends of the latter, is a pipe C', from the end of which extends a flexible hose C^2, connecting by means of branch pipes C^3 with the discharge-pipes l^2 of the pumps I I'. Fulcrumed between its ends at k upon the car is a shipping-lever H^5, at its lower end pivotally engaging the end of the long arm of the lever H^2. In the upper part of the car is a cylinder K, containing a piston K', having a stem K^2, which connects pivotally with the upper end of the lever H^5. Extending through the head K^3 of the cylinder K is a pipe K^4, communicating with one of the branch pipes C^3. Interposed in the pipe K^4 is a three-way valve K^5, which may be turned to direct pressure from the pipe K^4 into the cylinder K, or close said connection and open the cylinder to the outside air. The valve K^5 is provided with an operating-lever K^6.

Extending through guides $i\ i$ on the car is a vertical and reciprocatory rod L, connected by means of a link L' with the said operating-lever K^6. The lever L is provided with a counterbalance L^2, which may comprise a cord or other flexible medium connected with the rod, extending over a pulley and provided with a weight, as indicated in Fig. 6. In the cylinder K is a spring K^7, which tends normally to press the piston K' in the direction of the head K^3. The rod L extends at one end through the top of the car and at its opposite end through the floor of the car, and the beam X at the top of the shaft, which supports the pulleys F^3 E' t^4, extends across the path of the upper end of the rod L, and a beam X' at the lower end portion of the shaft extends into the path of the lower end of the rod L.

In the rise of the car to the top of the shaft the upper end of the rod L strikes the stop X and is plunged downward, whereby through the link L' and the lever K^6 the valve K^5 is opened to direct air air-pressure into the cylinder K, and thereby cause the piston to be moved against the resistance of the spring K^7 to turn the shipping-lever H^5 and lever H^2, whereby the shafts H H' are moved in the direction of each other and the friction-wheels n are caused to clamp the tongues $q'\ q^2$ of the guides G G'.

In the descent of the car the rod L strikes the stop X' and is moved upward to turn the valve K^5 and vent the cylinder K, whereby the spring K^7 moves the piston in the direction of the head K^3 and turns the levers H^5 H^2 to move the friction-wheels n in the direction away from each other to release the tongues $q'\ q^2$.

In operation the air-reservoir is kept charged by means of the compressor, and the motor is operated through the medium of the rope or cable t^3 to raise and lower the car. In the rise of the car the friction-wheels n are disengaged, as described, from the guides G G' and the pumps I I' are quiet. In the descent of the elevator, however, the friction-wheels n are caused to clamp the guides G G', and by their frictional engagement therewith cause the shafts H H' to rotate and operate the pumps, whereby air is compressed and forced through the pipes C^3 C^2 C' to the reservoir C. Thus the descending force of the car operates as supplemental charging means for the air-reservoir C, and the frictional engagement of the wheels n with the guides G G', owing to the resistance at the pumps I I', operates as a counterbalance to the car. In operation, therefore, the pressure taken from the reservoir C to lift the car is replenished to a material extent by the descent of the car, and the action of the main compressor mechanism is thus greatly relieved. It will be understood, of course, that the object of reducing the action of the compressor is to economize

in the steam and fuel employed for operating it. Fulcrumed between its ends on the beam D^3 is a lever M, pivotally connected at one end with the rod F′ and at its opposite end pivotally connected with a vertical rod M′, which extends down the side of the car. At the lower end of the car at its side is a recess having an inclined rear wall M^2. In the said recess is a wedge-block M^3, having an inclined rear face and provided at its opposite side with a serrated face M^4. The block M^3 has a stem M^5, which works through an opening in a bearing-bracket M^6, fastened to the under side of the car. Around the stem and confined between the lower end of the block and bracket M^6 is a spring M^7. The serrated face of the block M^3 moves normally close to but out of contact with the tongue *q* on the guide G′, the weight of the elevator-car causing the spring F^2 to be drawn in the direction of the beam D^3, whereby the lever M is normally turned to the position shown to press the block or dog M^3 downward on the inclined guide formed by the wall M^3 of the recess. In the event of breakage of the cable F the spring F^2 will expand in the downward direction and swing the lever M in the direction of raising the rod M′ and block or wedge M^3 in the inclined guide, causing the serrated face M^4 to grip and become bound against the adjacent edge of the tongue *q*. The engagement of the serrated face of the wedge with the face of the wooden tongue *q* will stop the descent of the car and hold it with great security.

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

1. In an elevator, the combination with the hatchway, of a car, operating means therefor comprising an air-motor, cable connecting the car with the motor and a compressed air reservoir for supplying the motor, a main air compressor connected with the said reservoir and supplemental air compressing means upon the car comprising an air-pump connected with the said reservoir, an operating shaft for said pump, wheels upon the shaft, longitudinal and stationary bearing guides in the hatchway, and means upon the car for clamping the said wheels against the said bearing guides, whereby movement of the car causes operation of the pump thereon, substantially as and for the purpose set forth.

2. In an elevator, the combination with the hatchway, of a car, operating means therefor comprising an air-motor, cable connecting the car with the motor and a compressed air reservoir for supplying the motor, a main air compressor connected with the said reservoir and supplemental air compressing means upon the car comprising an air-pump connected with the said reservoir, an operating shaft for said pump, friction-wheels upon the shaft, longitudinal and stationary bearing guides in the hatchway, movable shifting mechanism, upon the car, for the friction-wheels operating, when moved in one direction, to clamp the friction-wheels against the said bearing guides and cause working of the pump by movement of the car, and operating, when moved in the opposite direction, to release the friction wheels from the bearing guides, movable shifting-mechanism actuating-means projecting from the car, and stops in the hatchway, toward opposite ends thereof, in the path of the said actuating means, whereby in the rise of the car the friction-wheels are released from the said guides and in the descent of the car they engage the said guides, substantially as and for the purpose set forth.

3. In an elevator, the combination of a hatchway, having longitudinal bearing guides, an elevator-car, a compressed-air reservoir, a motor actuated by air-pressure from said reservoir to raise the car, means for counterbalancing the car, comprising an air-pump on the car connected with the reservoir, and pump operating means on the car, actuated by the descending movement of the car, substantially as and for the purpose set forth.

4. In an elevator, the combination of a hatchway having longitudinal bearing guides G G′, an elevator-car, a compressed-air reservoir and main compressor connected therewith, a motor actuated by air-pressure from said reservoir to raise the car, pumps on the car connected with the said reservoir, parallel operating shafts for the pumps, friction wheels on the shafts at opposite sides of said guides, lever mechanism on the car connected with the shafts for moving the friction-wheels into and out of engagement with the said guides, substantially as and for the purpose set forth.

JOSEPH S. TROTT.

In presence of—
M. J. FROST,
J. H. LEE.