

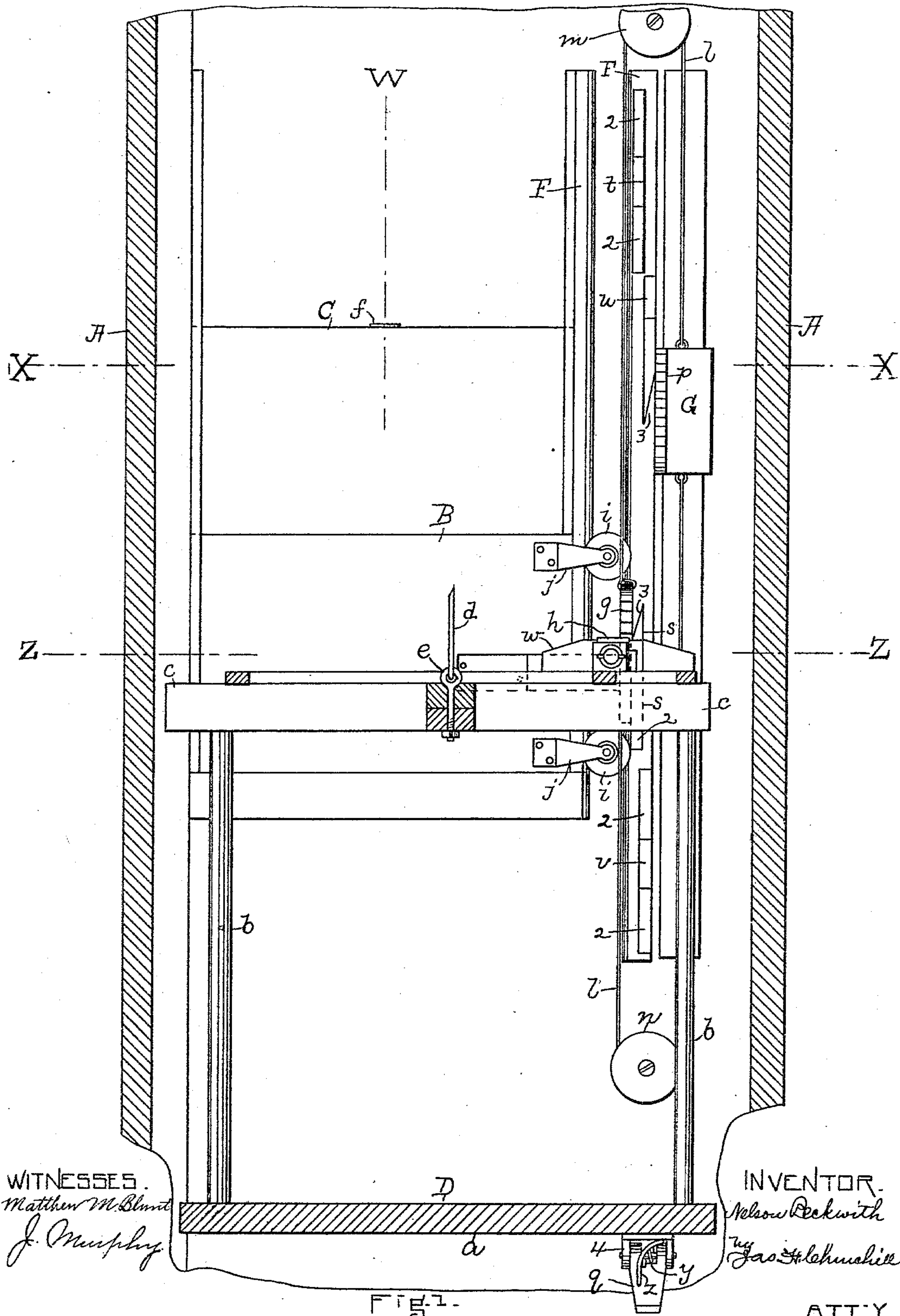
(No Model.)

5 Sheets—Sheet 1.

N. BECKWITH.
ELEVATOR.

No. 545,146.

Patented Aug. 27, 1895.



(No Model.)

5 Sheets—Sheet 2.

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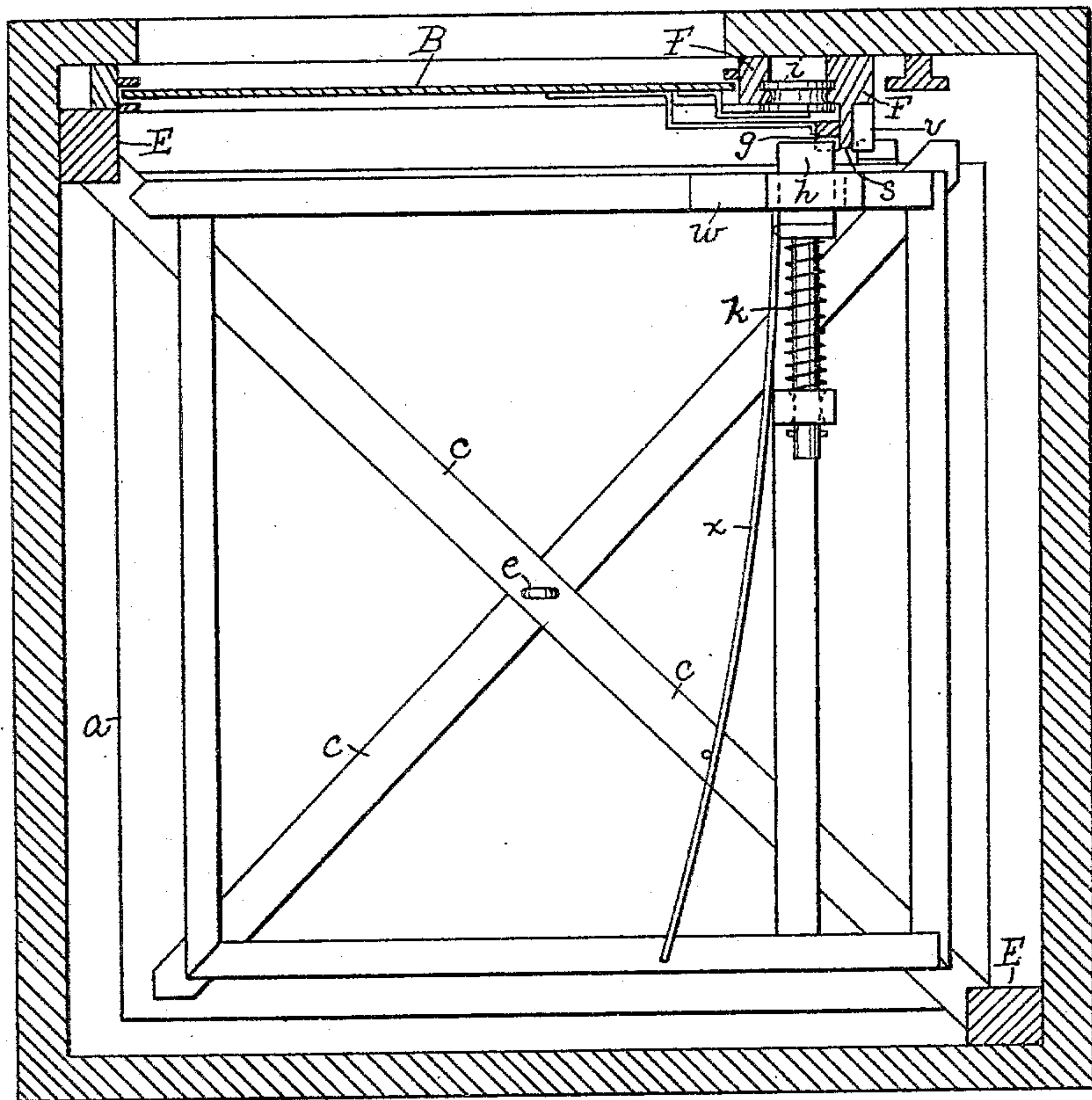


Fig. 2.

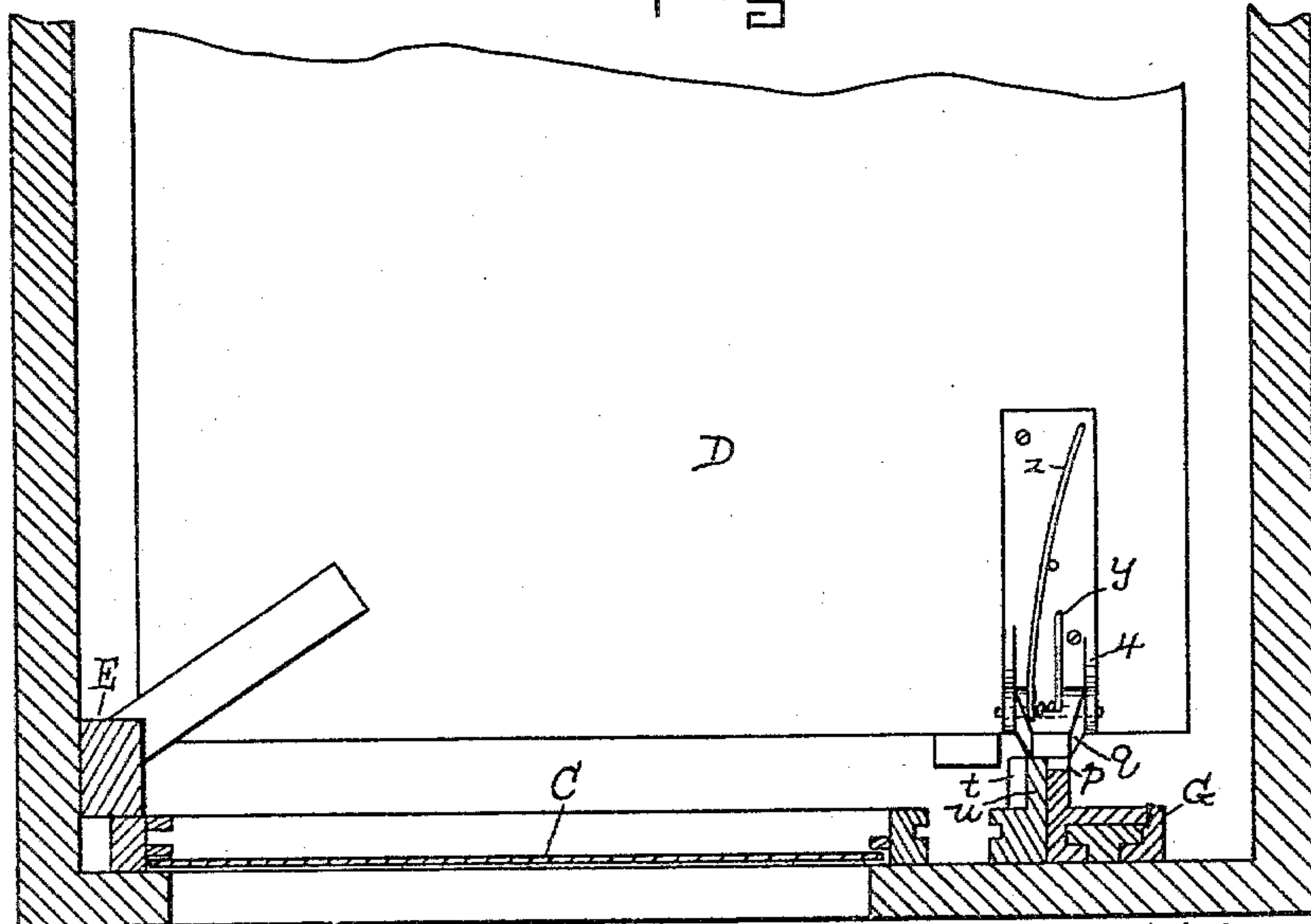


Fig. 3.

WITNESSES.

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J. Murphy

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By Jas. H. Churchill
ATT'Y

(No Model.)

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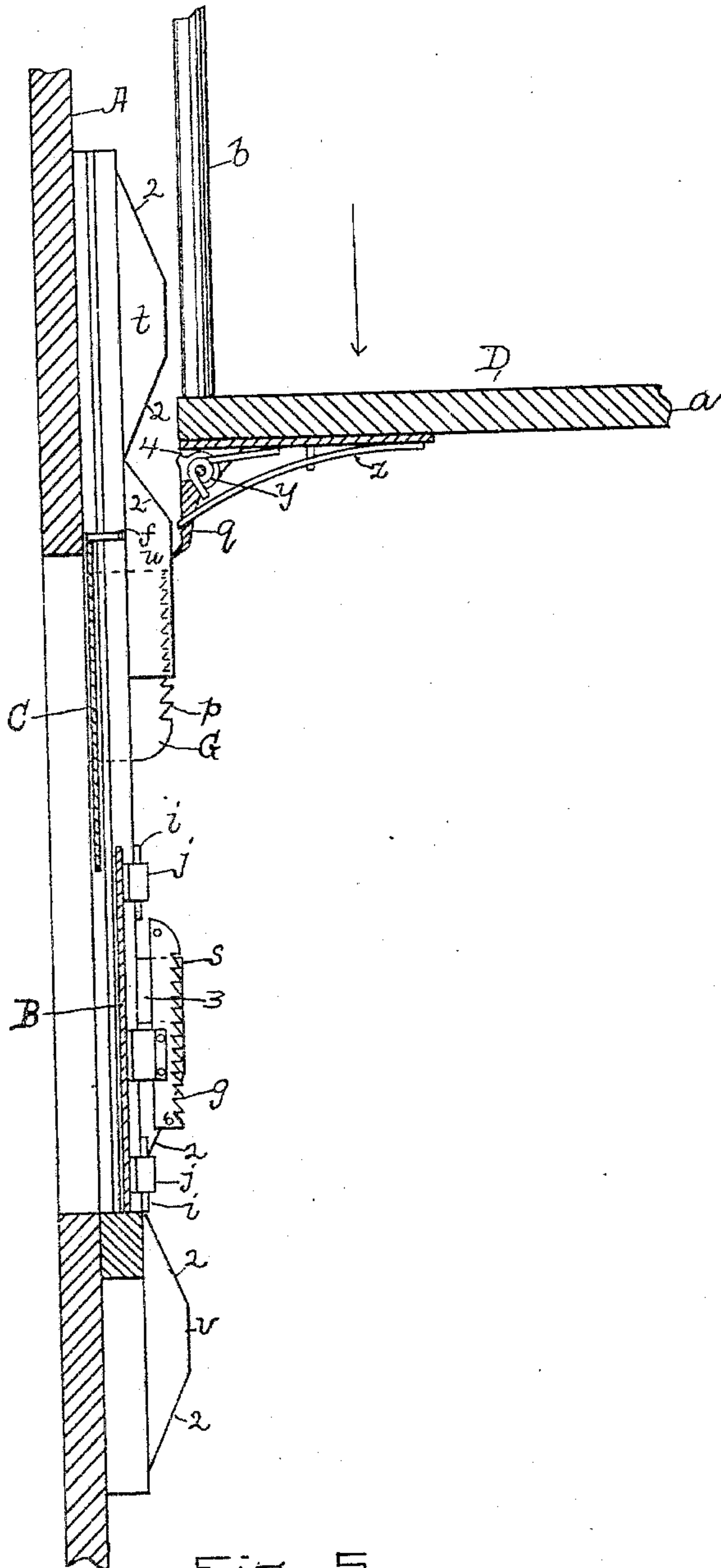


Fig. 5.

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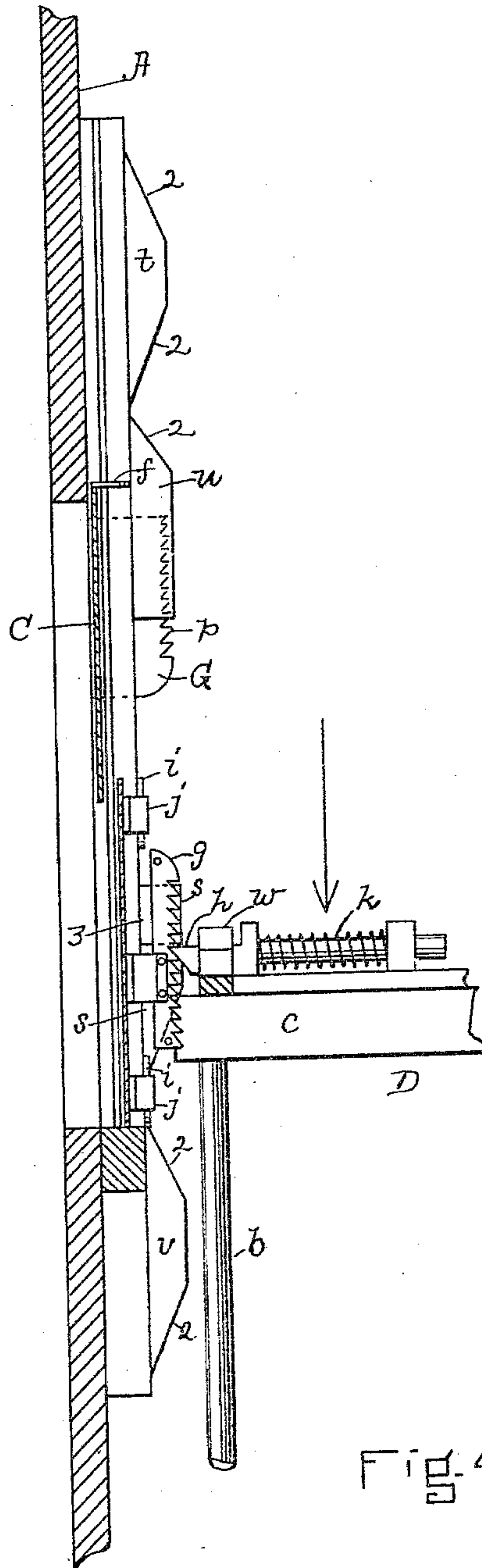


Fig. 4.

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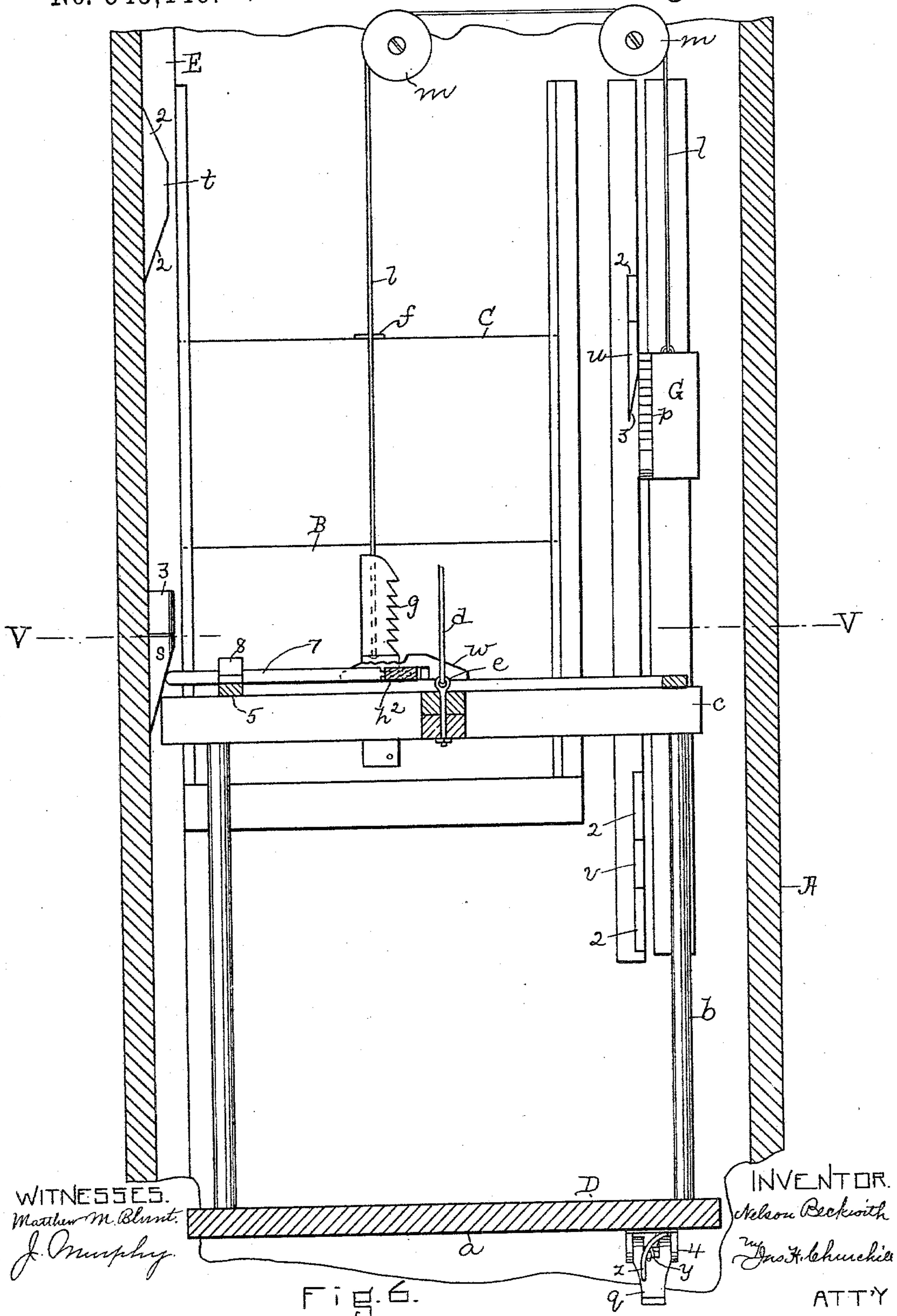
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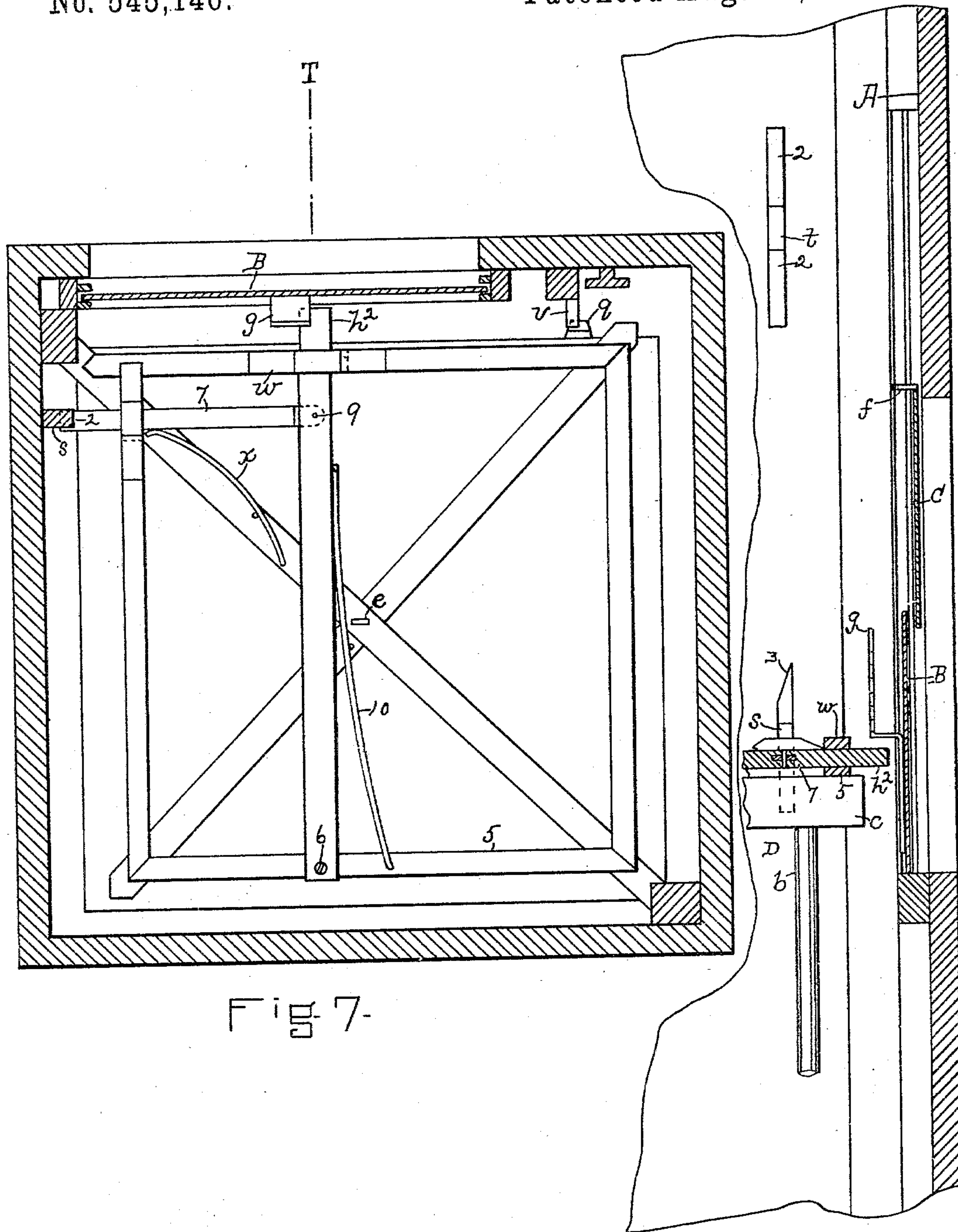


Fig 7-

Fig. 8.

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WITNESSES.

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UNITED STATES PATENT OFFICE.

NELSON BECKWITH, OF SOMERVILLE, MASSACHUSETTS.

ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 545,146, dated August 27, 1895.

Application filed July 25, 1894. Serial No. 518,540. (No model.)

To all whom it may concern:

Be it known that I, NELSON BECKWITH, residing at Somerville, in the county of Middlesex and State of Massachusetts, have invented an Improvement in Elevators, of which the following description, in connection with the accompanying drawings, is a specification, like letters and numerals on the drawings representing like parts.

This invention relates to that class of elevators shown in my United States Patents No. 372,107, dated October 25, 1887, and No. 413,643, dated October 29, 1889, and has for its object to provide a controlling mechanism for the gate or door of the elevator-well which shall be more efficient in its operation and will relieve the flexible suspension for the said gate or door from strain and liability of becoming broken, as will be described.

In accordance with this invention the gate or door for the elevator-well is placed under the control of two pawls carried by the elevator-cage and co-operating with two ratchet-bars having reversely-inclined teeth which co-operate with and are engaged by both pawls before the gate or door ceases to rise—that is, the said gate or door is placed under control of its holding-pawl at or about the time it is released by its lifting-pawl—and by providing the ratchet-bar co-operating with the holding-pawl with a plurality of teeth provision is made by which the engagement of the holding-pawl with a tooth of its co-operating ratchet-bar may take place substantially simultaneously with the disengagement of the lifting-pawl from its co-operating ratchet-bar, even when the flexible suspension for the gate has become elongated or stretched, and also when the parts are not closely arranged or adjusted with relation to the other. In either case the first tooth on the ratchet-bar co-operating with the holding-pawl may have passed by the holding-pawl a considerable distance before the lifting-pawl is disengaged, and yet, in this case, when the lifting-pawl is disengaged the gate or door is not permitted to drop more than the distance of one tooth of the ratchet-bar, as the holding-pawl will engage one of the plurality of teeth on said ratchet-bar, thereby reducing to a minimum the distance the gate is permitted to fall, and consequently avoiding strain upon the flexi-

ble suspension and also liability of accident from said strain, as will be more specifically pointed out. Each of the pawls referred to as carried by the elevator-cage has a double function—that is, each pawl acts both as a lifting and a holding pawl, according to the direction of travel of the elevator cage or platform. The gate or door for the elevator-well may and preferably will be composed of two parts or leaves.

These and other features of this invention will be pointed out in the claims at the end of this specification.

Figure 1 is a central sectional elevation of the elevator, looking toward the door in one of the walls of the well. Fig. 2 is a sectional plan view taken on the line Z Z, Fig. 1, and the view being as from above that line. Fig. 3 is also a sectional plan view, the section being taken on line X X, Fig. 1, and the view as from below that line, but with the cage at the height shown in Fig. 5. Fig. 4 is a vertical section on line W, Fig. 1, and viewed as from the left in that figure. Fig. 5 is a view like Fig. 4, except that the cage is shown in a higher position than in Fig. 4. Fig. 6 is a view like Fig. 1, except that the door is shown as suspended and operated from the middle instead of from one side. Fig. 7 is a sectional plan view, the section being taken on line V V, Fig. 6, and the view as from above that line. Fig. 8 is a vertical section on line T, Fig. 7, the view being from the right therein.

Referring to the drawings, A represents the walls of the elevator-well, and B the lower leaf, and C the upper leaf, of the gate or door, which several parts are in all material respects like what is shown in said patents.

The cage is represented at D and as formed with platform *a* and the standards *b*, secured at their lower ends in said platform and at their upper end in diagonal bars *c*, which latter engage the guideways E, arranged in the well to steady the cage, the usual hoisting-rope *d* being attached to the eye bolt *e*, secured centrally in said bars *c*. The upper leaf C of the door is raised and controlled in its descent by the lower leaf B by its engagement with arm *f*, secured to said leaf C and projecting into the pathway of leaf B, and leaf B is raised by a ratchet-bar *g*, provided with a plurality of teeth and preferably secured directly there-

on, and a pawl or catch *h*, arranged upon the top of the cage.

In Figs. 1 to 5 said ratchet-bar is shown as attached to leaf B, near one edge thereof, in which case the door may be provided with sheaves *i*, pivoted in arms *j*, secured to said leaf, these sheaves being arranged between and bearing against the guideways F, thus preventing the cramping or binding of the leaf B. Said ratchet-bar *g* is formed with teeth that are horizontal at their lower face and oblique at their upper face. Hence when pawl *h* is moving upward and is thrust into contact therewith by its actuating-spring *k* it will engage therein and take the door along until disengaged therefrom, and in this upward movement the pawl *h* is a lifting-pawl. To control the descent of the door when pawl *h* is withdrawn from ratchet *g*, a flexible suspension or cord *l* is attached to leaf B through ratchet-bar *g*, if preferred, and said cord passes over sheave *m* above the doorway and sustains or carries the ratchet-block G, which moves in ways, as shown in Fig. 3, and to insure the proper descent of said block the cord may be extended from its lower end around sheave *n*, below the doorway, and thence up to and be secured to leaf B.

Upon block G is secured an inverted ratchet-bar *p*, provided with a plurality of teeth—that is, the upper faces of its teeth are horizontal and the lower faces oblique or inclined—and a pawl *q*, attached to the bottom of the cage, is arranged to engage (when the cage rises) the teeth of said ratchet-bar just before pawl *h* is disengaged from ratchet-bar *g*, and thus govern the descent of the door, for by the engagement of pawl *q* with ratchet-bar *p* the door can descend no faster than the cage rises, the pawl *q* in this case having the function of a holding-pawl; and when the cage descends said pawl *q* engages said ratchet-bar *p* and has the function of a lifting-pawl, thereby raising the door, and just before said pawl *q* is disengaged from the ratchet-bar *p* the pawl *h* is engaged with ratchet-bar *g* and has the function of a holding-pawl, thereby controlling the descent of the door, as it can only move coincidently with the cage by reason of said engagement of pawl *h* with the ratchet-bar *g*.

To engage and disengage pawl *h* with and from its said ratchet-bar I prefer to employ the cams *s* and *t*, the latter being of the usual form, having an upper and lower incline 2 at the front thereof, while cam *s* is formed with a lower incline 2 in the usual manner, but with a side incline 3 at its upper end. The contact point or end of pawl *h* is considerably wider than the thickness of ratchet-bar *g*, and is normally pressed in the direction of the cams—that is, to the right, as viewed in Figs. 1 and 2—and is provided with lateral play in its guide-block *w*, so as to extend across the front, or nearly so, of the cams, and hence when the cage moves upward and the pawl *h* arrives at the cam *s* it will move up over face

2 and along the said cam until the oblique side 3 allows its spring *k* to thrust it into engagement with ratchet-bar *g*, when the leaf B will be moved with the cage, taking up leaf C, as stated, and when said pawl arrives at cam *t* it will be forced out of contact with the ratchet-bar *g* by the cam *t*; but before such disengagement occurs pawl *q* will have so far passed cam *v* as to have engaged the teeth of ratchet-bar *p* on the descending block G, and will thereby hold the door suspended, allowing it to descend as the cage rises, and when the door shall be fully lowered the pawl *q* passes over the teeth that were above it as the cage continues to ascend, the cam *u* at its lower end being formed with a side face 3, that merely moves pawl *q* laterally without disengaging it from the ratchet-bar *p*; but when the cage descends the pawl *q* is by said side face 3 allowed to engage the ratchet-bar *p* before the said pawl reaches the lower end of the cam *u*, and the pawl *q*, by taking the ratchet-bar *p* and block G along with itself, opens the doors, and when said pawl *q* is, by cam *v*, disengaged from ratchet-bar *p* the pawl *h* will be in contact with ratchet-bar *g*, in readiness to control the descent of the doors as the cage descends.

It will be obvious that an important advantage is derived from the peculiar form of the cams *u s*—that is, with the front face 2 and a side face 3—for, by allowing an elastic side yielding of the pawls, they will, when they approach the cam at the end having said side face, be thereby moved laterally without being at all thereby disengaged from the ratchet-bar; yet, when they move in the opposite direction, they are held out of contact with the ratchet-bar until they have passed almost to the extreme point of the same, because the pawl in that case extends almost across the front face of the cam, and by these means, when the cage ascends, pawl *q* will remain in contact with the ratchet-bar *p*, not only till leaf B is fully lowered, but while the pawl passes over the portion of the ratchet-bar which was above the tooth thus engaged; and the same is true in relation to pawl *h* when it engages ratchet-bar *g* to control the descent of the door when the cage descends, the pawl not being disengaged by the cam, but only moved laterally by the side face 3; yet, when pawl *q* moves down or pawl *h* moves up, their said cam holds them out of contact with the ratchet-bars till they have nearly traversed the length of face 3 of the cam. Said pawl *h* is pressed laterally in the direction of the cams by arm-spring *x*, Fig. 2, secured to the top of the cage, and longitudinally by helical spring *k*, and is provided in its confining or guide block *w* with such lateral play that it may coact with the cams in the manner and for the purpose just explained. Said lower pawl *q* is pressed against the front face of its cams by spring *y* and is pressed laterally in the direction of its coacting cams by spring *z*, said pawl being so loosely pivoted in bracket

4, secured to the bottom of the cage, as to allow its outer end the required lateral movement to co-operate with the cams and pawls, as described.

5 In Figs. 6, 7, and 8 the ratchet-bar *g* and cord *l* are shown as attached to leaf *B* at its horizontal center, in which case two sheaves *m* are employed above the doorway to allow the arrangement of block *G* with its ratchet-bar *p* at the side of the doorway, as in the preceding figures; but the cams *s t* are arranged at the opposite or left-hand side of the doorway, and are engaged by push-bar 7, moving in its guide-block 8, both longitudinally and laterally, and pivoted at 9 to pawl *h*², which moves laterally in guide-block *w* and is normally pressed toward ratchet-bar *g* by arm-spring 10, said pawl being pivoted at 6 to one of the bars 5, secured to diagonal bars *c*.

20 Said push-bar 7 is normally pressed toward the cams *s t* by arm-spring *x* in the same manner as is pawl *h* in Figs. 1 to 5, and has the requisite lateral play in block 8 to co-operate with both the cam *t*, having both inclines upon its front, and cam *s*, having one incline upon its front and the other at the side, as has been explained with reference to the previous figures. By forming block *G* of sufficient weight to insure its descent and to hold cord *l* taut at all times, said cord may terminate at said block, as shown in Fig. 6, instead of passing around sheave *n* and thence up to leaf *B*, as in Fig. 1; but I prefer to attach said cord to the door, as shown in Fig. 1.

35 While it is feasible to operate and control an elevator-door by means of the cord, guide-block, and reversed ratchet-bars, respectively secured to the door and block, with a pawl for each, and with the several cams having both faces at the front instead of having in part side-faced cams, yet I prefer having side-faced cams in the position shown; but I do not desire to limit myself thereto in stating my invention.

45 From the foregoing description it will be seen that on the travel of the elevator-cage in one direction—namely, in an upward direction—the pawl *h* is the lifting-pawl and the pawl *q* the holding-pawl, and that the holding-pawl engages a tooth of its ratchet-bar at or about the time the lifting-pawl is disengaged from its ratchet-bar, and by providing the ratchet-bars with a plurality of teeth the engagement of the holding-pawl with one of the several teeth of its co-operating ratchet-bar is positively insured with a minimum drop of the gate, for by means of the ratchet-bar being provided with a plurality of teeth the flexible suspension or rope may stretch a considerable extent without causing a corresponding increase in the distance the gate will drop before the ratchet-bar is engaged with the holding-pawl, for in case of the rope stretching the holding-pawl will travel by a plurality of teeth of the ratchet-bar co-operating with it. Furthermore, the ratchet-bars provided with a plurality of teeth permit the work of apply-

ing the apparatus to be accomplished more quickly and with less accuracy, as the ratchet-bar can be arranged so that the holding-pawl may engage the second, third, or fourth tooth of the ratchet-bar when the apparatus is first put into operation rather than the first tooth, and yet provide for the stretch of the rope and the minimum drop of the gate, thereby relieving the flexible suspension or cord *l* from strain and avoiding the danger of the said cord breaking and accidents which might result therefrom. So, also, on the downward movement of the elevator-cage the pawl *q* becomes the lifting-pawl for the gate or door, and the pawl *h* the holding-pawl, and the latter pawl prevents dropping of the gate or door when the lifting-pawl *q* is released or disengaged from the ratchet bar.

I claim—

1. The combination of the following instrumentalities, viz:—an elevator cage, a gate or door in a wall of the elevator well, a lifting pawl and a holding pawl carried by the elevator cage, and two ratchet bars having a plurality of reversely inclined teeth co-operating with the said lifting and holding pawls and arranged with relation thereto to permit the holding pawl to pass by more than one tooth of its co-operating ratchet bar before the lifting pawl is disengaged from its co-operating ratchet bar, without increasing the distance the gate or door drops when the lifting pawl is disengaged from its co-operating ratchet bar, for the purpose specified.

2. The combination of the following instrumentalities, viz:—an elevator cage, a gate or door in a wall of the elevator well, a lifting pawl and a holding pawl carried by the elevator cage, and two ratchet bars having a plurality of reversely inclined teeth co-operating with the said lifting and holding pawls and arranged with relation thereto to permit the holding pawl to pass by more than one tooth of its co-operating ratchet bar before the lifting pawl is disengaged from its co-operating ratchet bar, without increasing the distance the gate or door drops when the lifting pawl is disengaged from its co-operating ratchet bar, and means to effect the disengagement of the pawls from their respective ratchet bars.

3. The combination with an elevator cage, a gate or door in a wall of the elevator well, two ratchet bars having a plurality of reversely inclined teeth and connected to the said gate or door to move therewith, and two pawls carried by the elevator cage to move both longitudinally and laterally and co-operating with said ratchet bars as described, and means to act on said pawls to disengage them from their ratchet bars, substantially as described.

4. The combination of an elevator cage, a door in the wall of the elevator well, a lifting ratchet secured to said door and provided with a plurality of teeth, a cord secured to the door and carried over supporting sheaves above the doorway, and attached to a guided

block, a down-acting ratchet secured to said block and provided with a plurality of teeth, a pawl arranged upon said cage at or near its top to engage the ratchet upon the door to raise or sustain the same, and a pawl arranged at the bottom of the cage to engage the ratchet upon said block to control and depress the same, and two cams arranged in the path of each ratchet as specified, whereby as the cage rises, the pawl at the top thereof will engage the ratchet upon the door and raise the same; while the pawl at the bottom of the door will engage the ratchet upon the block before the door ceases to rise; and when the cage descends the lower pawl by engaging the ratchet on said block will raise said door, and the upper pawl will engage the ratchet upon the door before it ceases to rise, substantially as specified.

5. The combination of cage D, the door, ratchet *g*, secured to the door and provided with a plurality of teeth, cord *l*, supported above the doorway, and block G, sustained by the door through said cord, reversed ratchet *p*, secured to said block and provided with a

plurality of teeth, pawls *h*, *q*, respectively secured to the top and bottom of the cage and provided with actuating springs, cams *s*, *t*, arranged in the path of pawl *h*, and cams *u*, *v*, arranged in the path of pawl *q*, all substantially as specified.

6. The combination of cage D, the door, ratchet *g*, pawl *h*, adapted to have longitudinal and lateral play, upper cam *t*, and lower cam *u*, formed with front incline 2, and side incline 3, all arranged to operate, substantially as specified.

7. The combination of cage D, the door, guided block G, connected with and sustained by the door through and by cord *l*, ratchets *g*, *p* having a plurality of teeth, pawls *h*, *q*, and cams *s*, *t*, *u*, *v*, all constructed and combined to operate, substantially as specified.

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

NELSON BECKWITH.

Witnesses:

JAS. H. CHURCHILL,

J. MURPHY.