(No Model.) 3 Sheets—Sheet 1.

C. E. ALBRO.

HOISTING MECHANISM FOR ELEVATORS.

No. 502,600. Patented Aug. 1, 1893.

FIG. 1.

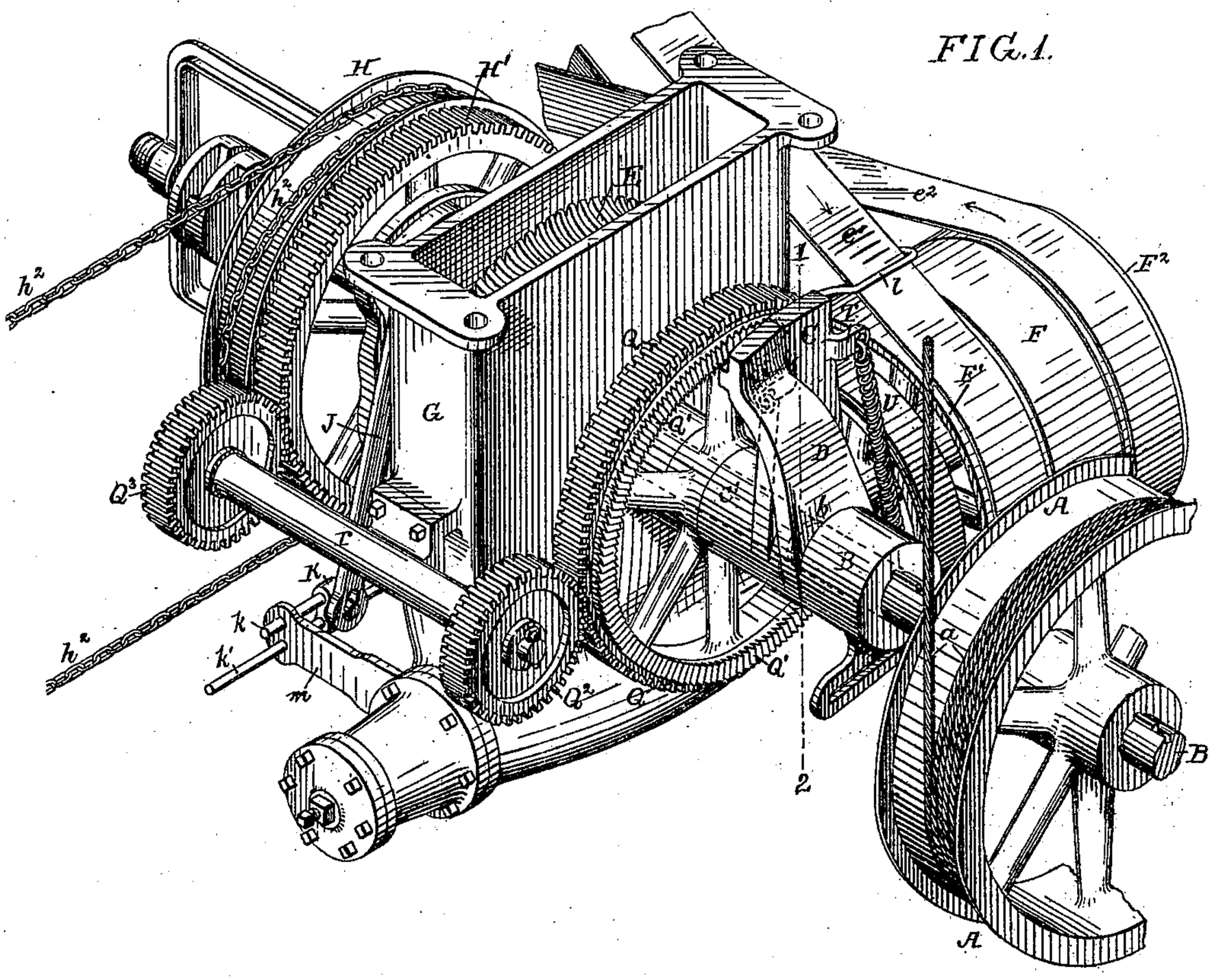


FIG. 4.

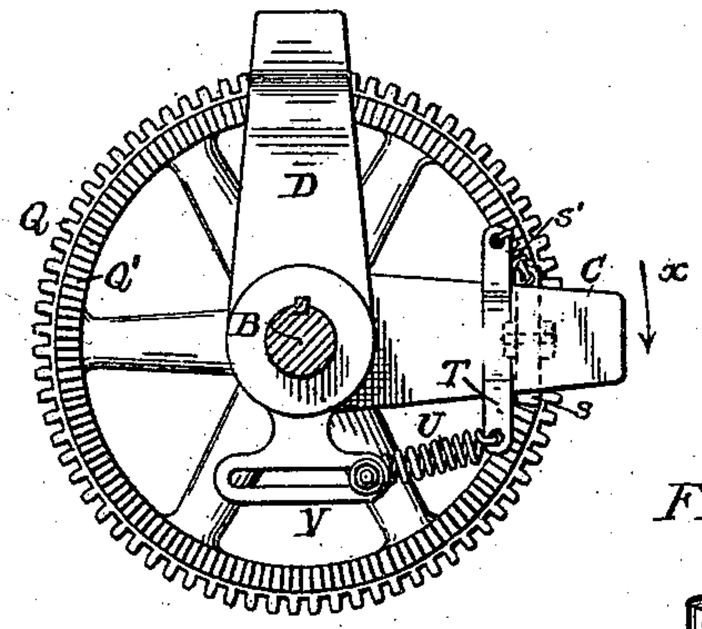


FIG. 2.

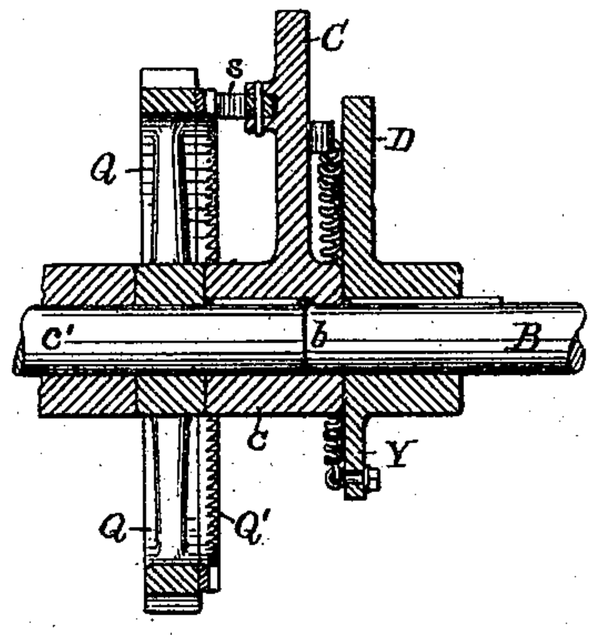
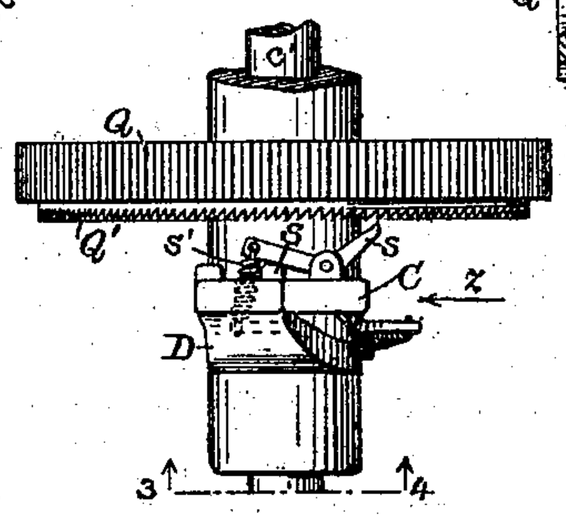


FIG. 3.



Witnesses
F. D. Goodwin
William A. Parr.

Inventor.
Charles E. Albro
By his Attorneys
Hinson & Hinson

(No Model.) 3 Sheets—Sheet 2.

C. E. ALBRO.

HOISTING MECHANISM FOR ELEVATORS.

No. 502,600. Patented Aug. 1, 1893.

FIG. 10.

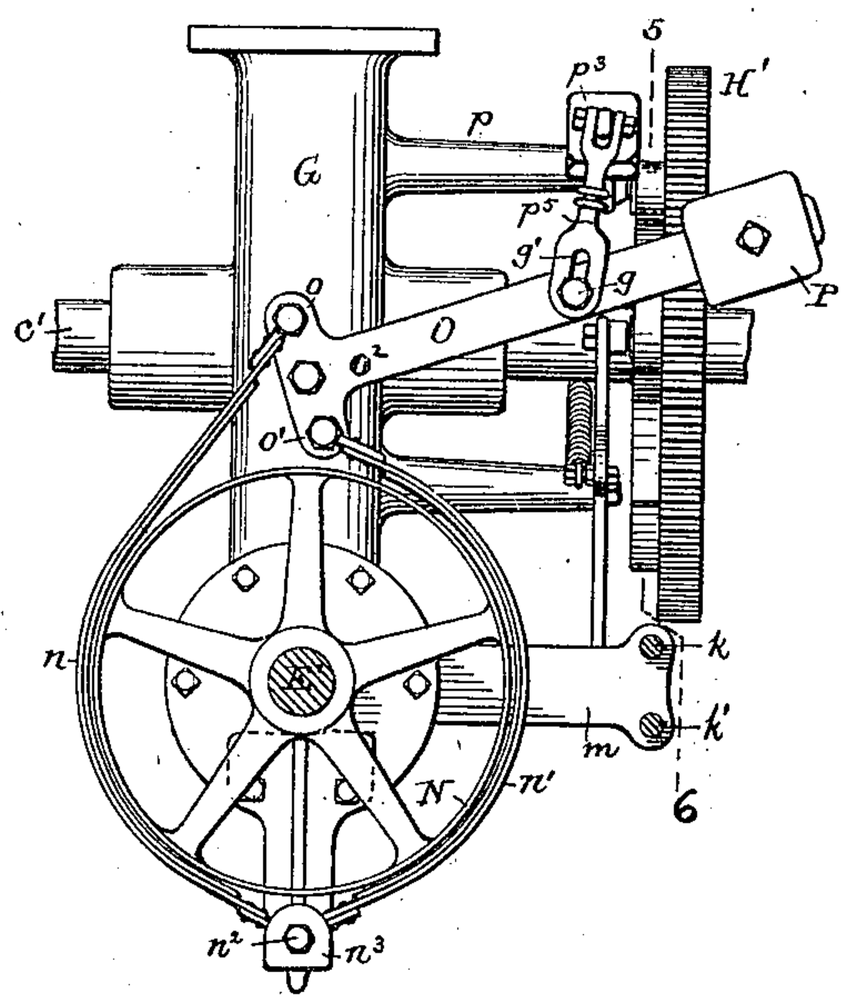


FIG. 7.

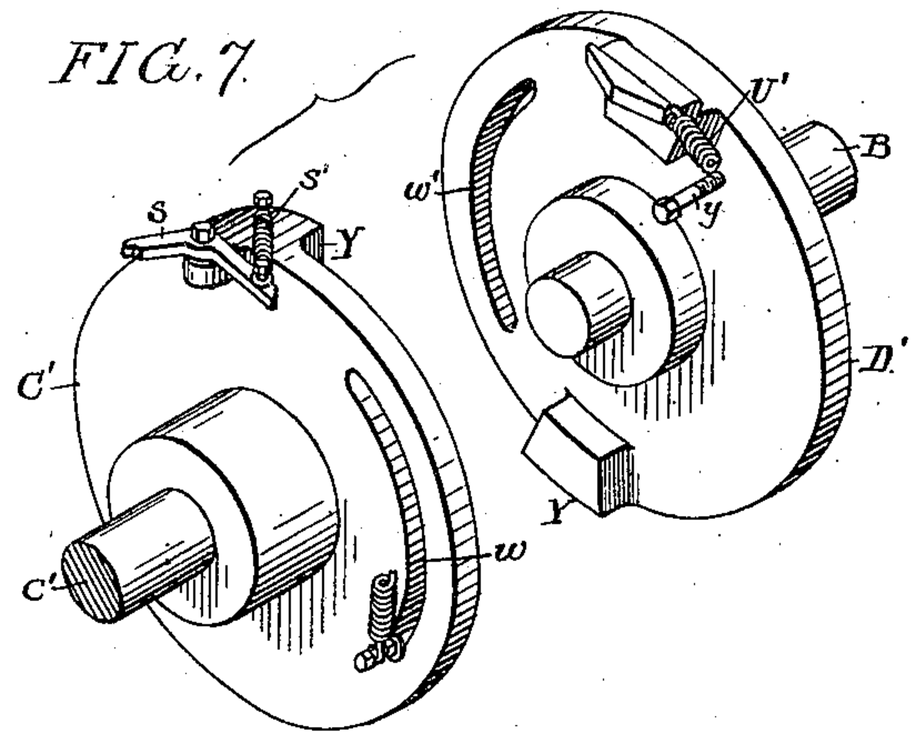


FIG. 6.

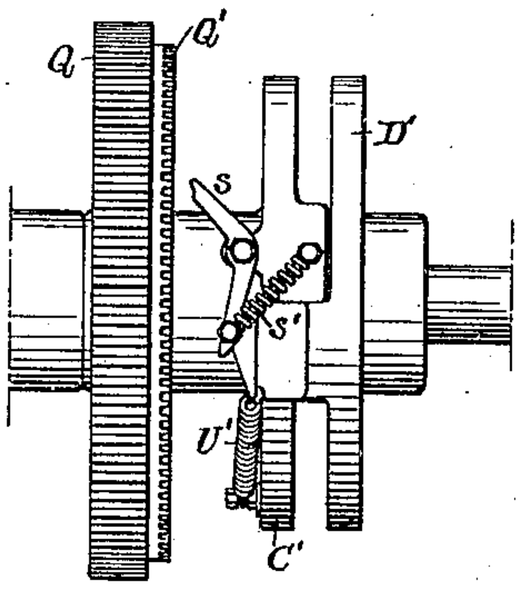
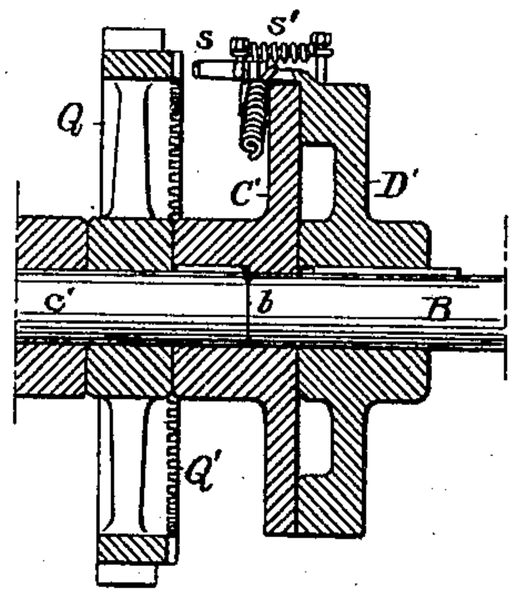


FIG. 5.



Witnesses:
F. D. Goodwin
William A. Barr

Inventor
Charles E. Albro
By his Attorneys
Howson & Howson

(No Model.) 3 Sheets—Sheet 3.

C. E. ALBRO.

HOISTING MECHANISM FOR ELEVATORS.

No. 502,600. Patented Aug. 1, 1893.

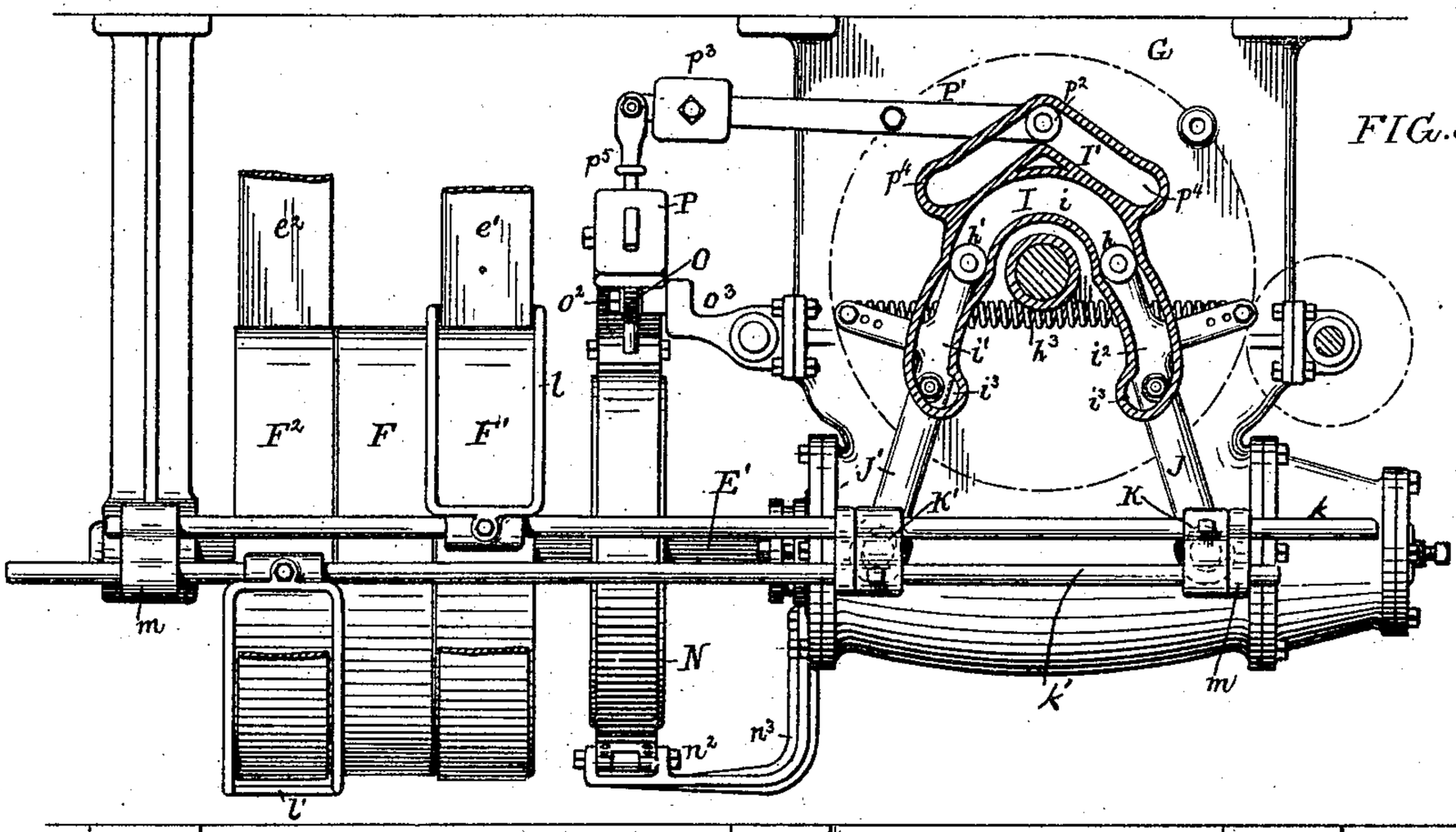


FIG. 8.

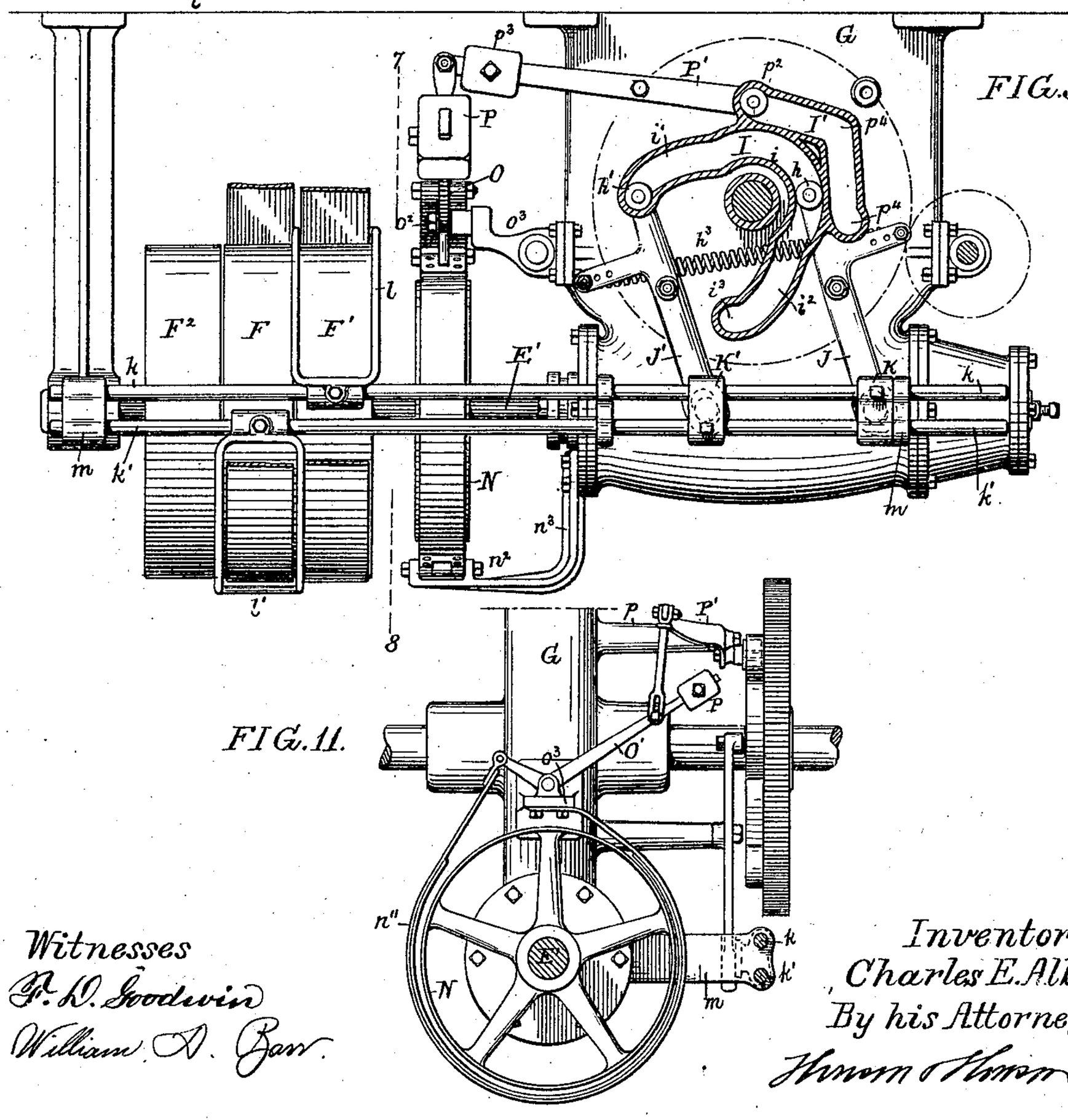


FIG. 9.

FIG. 11.

Witnesses
F. D. Goodwin
William A. Barr.

Inventor
Charles E. Albro
By his Attorneys
Munn & Munn

UNITED STATES PATENT OFFICE.

CHARLES E. ALBRO, OF PHILADELPHIA, PENNSYLVANIA.

HOISTING MECHANISM FOR ELEVATORS.

SPECIFICATION forming part of Letters Patent No. 502,600, dated August 1, 1893.

Application filed January 28, 1893. Serial No. 460,005. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. ALBRO, a citizen of the United States, and a resident of Philadelphia, Pennsylvania, have invented certain Improvements in Hoisting Mechanism for Elevators, of which the following is a specification.

My invention relates to certain improvements in mechanism for hoisting elevator cars, and has for its principal object the construction of a simple and effective automatic stopping and reversing device for the winding drum when, during the lowering of the load, the bottom of the elevator car comes into contact with any object projecting over the hatchway from any of the floors of the building or at the bottom of the elevator well, as more fully set forth hereinafter.

In the accompanying drawings:—Figure 1, is a perspective view of a hoisting machine constructed in accordance with my invention. Fig. 2, is a sectional view of a portion of the same on the line 1—2, Fig. 1. Fig. 3, is a plan view of that portion of the mechanism illustrated in Fig. 2. Fig. 4, is a sectional view on the line 3—4, Fig. 3, but showing the parts in a different position from that illustrated in said figure. Figs. 5 and 6, are respectively sectional and plan views of a modification of the construction illustrated in Figs. 2 and 3. Fig. 7, is a detached perspective view of details of such modification. Figs. 8 and 9, are sectional views on the line 5—6, Fig. 10, showing different positions of the belt shifting and brake cams. Fig. 10, is a transverse section on the line 7—8, Fig. 9; and Fig. 11, is a similar sectional view illustrating a modification.

The device is intended for the hoisting and lowering of that class of elevators in which the hoisting rope is wound upon a drum and the invention relates more particularly to a device by means of which the lowering of the elevator car may be stopped or its direction of travel reversed, when from any cause the descending elevator car meets with an obstruction, such as an object projecting over one of the hatchway openings, and in this way prevent the unwinding of the cable and entangling it in the hoisting mechanism.

Referring to the drawings, A represents the winding drum on which is wound the cable *a* which runs up over suitable sheaves at the top of the building and down the well to the elevator car; this winding drum is keyed to a shaft B which terminates at *b* as shown in Fig. 2 and by dotted lines in Fig. 1, being supported at that end in a hub *c* forming part of a radial arm C keyed to a driving shaft *c'*. The opposite end of the shaft B is supported in a suitable bearing (not shown) and the necessary motion in opposite directions is imparted to it from the driving arm C through the medium of a radial arm D which is keyed to the shaft B, the outer arm D being curved as shown so as to project into the path of, and engage with the projecting arm C on the driving shaft. These connections, C and D, between the shafts tend normally to compel the said shafts to rotate together.

On the driving shaft *c'* is mounted a worm wheel E with which engages a suitable worm inclosed in the framework of the machine and on the worm shaft E' are three belt pulleys F, F' and F^2, the central pulley F being keyed to the shaft and the pulleys F', F^2 being loose and being driven in opposite directions by belts *e'*, e^2 from any source of power; the belts being arranged under the control of suitable automatic shifting mechanism hereinafter described so that either one or the other may be shifted to the fast pulley and the worm shaft be driven in either direction to effect the winding or unwinding of the cable, the belt *e'* effecting the winding movement, while the belt e^2 turning in the opposite direction revolves the drum and permits the unwinding of the cable and the lowering of the elevator car. The worm wheel E, the worm shaft E' and the driving shaft *c'* are supported in a suitable casing G which may be attached either to the ceiling or floor of a room adjacent to the elevator and mounted loosely on the shaft *c'* on that side of the casing opposite the winding drum A is a drum H over which passes a chain or cord h^2 which forms part of or is secured to the usual rope or rod extending up the elevator well and by operating which the winding mechanism may be started or stopped as desired.

Secured to or forming part of the chain drum H is a gear wheel H' on one side of

which are two cams one of which, I, governs the belt shifting mechanism and the other of which I′, controls the braking mechanism.

The belt shifting device comprises the cam I, levers J. J′., rods *k*. *k′*. and the loops *l*. *l′*., a further description of which is given below. In the cam I are adapted to travel, antifriction rollers *h* *h′*, mounted respectively on levers J J′, and one end of each lever is connected by guide blocks K, K′ to rods *k*, *k′* which carry shifting loops *l*, *l′* embracing respectively the belts *e′*, e^2 so that as the drum H is turned in one direction or the other by manipulating the starting rope or rod, the cam, acting through the lever J or the lever J′, causes the shifting of the desired belt to the fast pulley F and the consequent movement of the worm E and the driving shaft *c′* in the proper direction.

The cam I is made in three well defined parts, one, the portion *i* being concentric with the shaft, and the portions *i′*, i^2 being on lines extending toward the periphery of the gear wheel to which the cam is attached and being provided at their extreme ends with pockets i^3, in which the rollers *h*, *h′* may be held; while to aid this holding action the two arms J, J′ are connected by a tension spring h^3. The rollers *h*, *h′*, normally rest at the junction of the portions *i′*, i^2 with the portion *i*, as shown in Fig. 8, so that if the cam be moved in one direction or the other, one of the levers will be moved to shift one of the belts, and the other will remain stationary by reason of the travel of the roller in the concentric portion *i* of the cam; thus for instance in Fig. 9, is shown a movement of the cam which results in the travel of the roller *h′* and the lever J′ to move the belt e^2 onto the fast pulley F and effect the lowering of the elevator, while the roller *h*, being traveled in the portion *i* of the cam does not effect any movement of the lever J. The pockets i^3 at the end of the portions *i′*, i^2 serve to retain the rollers of the levers J, J′ in position against the action of the spring h^3 which normally tends to draw them toward each other. The rods *k*, *k′* are guided in bearings *m* secured to the frame and are further guided by the blocks K, K′ which serve to connect them to their respective levers J, J′; each block being secured to one of the rods and having a passage or guide for the reception of the other rod and the connection between the levers and the blocks being of such character as to permit the horizontal movement of the block while the lever moves in the arc of a circle.

Referring now to the braking mechanism, N represents a brake wheel secured to and rotating with the worm shaft E′, and *n*, *n′* two friction strips, preferably faced with leather and secured at one end to a bolt n^2 carried by a bracket n^3 projecting from the frame and at their opposite ends to the smaller arms *o*, *o′*, of a three armed lever O, pivoted at o^2 to a bracket o^3 projecting from the frame and carrying at its free end an adjustable weight P, which when the mechanism is in the position illustrated in Fig. 8, and out of action, tends to draw the sections of the friction band tightly against the brake wheel N, and the lever in this position being free to act in this manner, or as shown in Fig. 11, a single band n^{11} may be employed, one of its ends being secured to the bracket o^3 and the other secured to the shorter arm of a lever O′. On a stud *p* projecting from the frame G is pivoted a lever P′ carrying at one end an antifriction roller p^2 and at its opposite end an adjustable weight p^3, which normally tends to keep the roller p^2 in any one of the three pockets p^4 of the cam I′, so that when once moved to one of the pockets the roller will remain there until the cam is rotated by the movement of the starting rod or rope. The lever P′. is connected by a link p^5 to a lever O., the latter lever being provided with a pin *g*. adapted to a slot *g′*. in one end of the link so that the said link has a lost motion and the lever O. is, therefore, not operated until the belt is entirely shifted. The slot in the link p^5 is sufficiently long to permit the lever O to move gradually down as the leather faces of the friction bands wear away and thus automatically provide for wear. In winding up the cable the driving shaft *c′* moves in the direction of the arrow *z*, Fig. 3, and the arm C thereon coming into engagement with the arm D effects a similar movement of the shaft B and the winding drum A mounted thereon. In descending or unwinding the drum the shaft *c′* moves the arm C in the opposite direction and the arm D on the drum shaft B is held against the arm C and turns with said arm at the same speed, the weight of the elevator car being sufficient to hold the two arms in engagement with each other. On the driving shaft *c′* is mounted, so as to rotate loosely thereon, a gear wheel Q having on one of its faces a series of ratchet teeth Q′, and the teeth of the wheel Q engage with the teeth of a pinion Q^2 mounted upon a shaft *r* supported in suitable bearings and carrying at its opposite end a pinion Q^3 engaging with the gear wheel H′ which carries the shifting and brake cams I, I′. On that face of the arm C nearest the gear wheel Q is pivoted a pawl *s*, which is under the control of a spring *s′* tending to force it into engagement with the ratchet teeth Q′, but the action of the spring being normally prevented by a lug S on the arm D which, when the two arms D and C are in contact, extends under the projecting arm of the pawl and holds it in the position more clearly illustrated in Fig. 3. The mechanism which I have just described comprising the pawl *s*., the spring *s′*., ratchet Q′., gears Q. Q^2., Q^3., H′. and shaft *r*., constitute the means whereby the belt shifting device is operated to shift the belt from the fast to the loose pulley when the driving shaft rotates independently of the drum shaft.

On the arm C is a projection T from which extends a tension spring U, to a projection V

on the hub of the arm D; this spring tending, at all times, to draw the contact faces of the arms D and C away from each other but the action being prevented by the weight of the car which normally holds the two arms in contact. If, however, during the descent of the elevator car, the elevator car should meet with an obstruction and its weight be removed from the cable, the winding drum not being positively connected to the driving mechanism will, for the time being, stop and the driving mechanism still continuing to rotate, the arm C will be moved out of contact with the arm D, moving to the position shown in Fig. 4, and continuing its movement in the direction of the arrow *x* in said figure; the tension of the spring U in this event exerting sufficient force on the arm D to keep the cable taut. The first effect of this movement is to remove the pawl *s* from engagement with the lug S permitting the spring *s'* to act upon said pawl and cause its engagement with the ratchet teeth Q' and effecting the movement of the gear wheel Q, and by means of the gears Q^2, Q^3 and H' effect the turning of the shifting cam I, which will act upon the lever J' to shift the driving belt to the loose pulley F^2 and thus stop the machine, or the movement of the cam may be sufficient to shift the belt *e'* to the pulley F and reverse the motion.

In Figs. 5, 6 and 7, I have illustrated a modified construction of the arms C, D and their connections; the arms being in this instance in the form of disks C', D', for the sake of strength and in this case the disks are provided with concentric slots *w*, *w'*, through which may be passed bolts as *y*, tending to keep the disks in proper relative position but not preventing their independent rotative movement. Each disk has two projecting blocks Y adapted to work in contact with each other in the same manner as the ends of the arms C and D and a tension spring U' is provided to keep the cable taut when the rotation of the winding drum is stopped. The action of the parts is precisely the same as that set forth with reference to Figs. 2, 3 and 4.

In the drawings the parts have been illustrated with reference to the construction of a right and left hand machine, the projection T on the arm C being duplicated on the opposite side of the arm for the point of attachment of the spring U so that the position of this spring may be reversed and the projection V on the hub of the arm D is slotted and extends to the opposite side of the arm so that the spring can be attached to the opposite end of the slot for a right and left hand machine. It will also be noted that the lugs S are duplicated and the pivot points of the pawl *s* are centrally located so that these parts may be reversed if desired.

Having thus described my invention, I claim and desire to secure by Letters Patent—

1. The combination in a winding machine, of the winding drum, a shaft carrying the same, a radial arm secured to said shaft, a driving shaft and an arm on said driving shaft adapted to be brought into contact with the arm on the drum shaft, and a yielding connection between the two arms normally tending to hold them apart substantially as specified.

2. The combination of the winding drum, a shaft carrying the same, an arm, as D, thereon, a lug on said arm, a driving shaft, an arm, as C, thereon adapted to be brought into contact with the arm of the drum shaft, a pawl carried by said arm C, and normally held in inoperative position by the lug on the arm D, a belt shifting cam, driving mechanism controlled thereby, gearing connecting said cam to a ratchet wheel and a ratchet wheel with which said pawl may be brought into contact, substantially as specified.

3. The combination of the drum shaft, the drum thereon, an arm, as D, carried by said shaft, a lug thereon, a driving shaft, an arm, as C, thereon, a pawl pivoted to said arm C and normally held in inoperative position by the lug on the arm D, a spring acting on said pawl, a spring connecting the arms C and D, a ratchet wheel with which said pawl may be brought into contact, a cam, devices connecting said cam with the starting and stopping mechanism, and gearing connecting said cam to the ratchet wheel, substantially as specified.

4. The combination of the winding drum, a shaft carrying the same, an arm D on said shaft, a driving shaft, an arm C secured thereto, a hub on said arm C supporting one end of the shaft of the winding drum, a gear wheel mounted loosely on the driving shaft, ratchet teeth formed thereon, a pawl pivoted to said arm C, a spring acting on said pawl, a lug on the arm D normally holding said pawl out of contact with the ratchet teeth, a cam, mechanism connecting the same to the starting and stopping mechanism and gearing connecting said cam to the loose gear wheel, substantially as specified.

5. The combination with the winding mechanism, of the driving belts and pulleys, the shifting rods, a grooved cam adapted to effect the reciprocation of said rods, pivoted levers J J', connected to said rods, antifriction rollers carried by said levers, and adapted to the cam groove having pockets at the end thereof, and a tension spring connecting the two levers, substantially as specified.

6. In a winding mechanism, a belt shifting device, a brake mechanism, a gear wheel mounted upon the winding shaft and having on one face thereof a cam groove for operating the belt shifting mechanism and also a cam groove, on the same face for operating the brake mechanism, in combination with levers having studs provided with antifriction rollers, adapted to run in said grooves, two of said levers operating said belt shifting device and the other one said brake mechanism, substantially as described.

7. The combination with winding mechan-

ism, and the belt shifting device of the driving shaft, a brake wheel thereon, a friction band made in two sections, each of said sections having one end secured to a fixed point, and its opposite end secured to a weighted lever O, a cam, a lever P′, adapted to be acted upon by the cam, and a slotted link connecting said lever P′ to the weighted lever O, substantially as specified.

8. In a winding machine, the combination of a drum shaft, a driving shaft in line with said drum shaft, a fast and a loose pulley, connections between said fast pulley and said driving shaft, an arm on the driving shaft, an arm on the drum shaft which normally bears against said driving shaft arm so as to compel the two shafts to rotate together, and means whereby the belt shifting device is operated to shift the belt from the fast to the loose pulley when the driving shaft rotates independently of the drum shaft, substantially as described.

9. In a winding machine, the combination of a drum shaft, a driving shaft in line with said drum shaft, an arm on the driving shaft, an arm on the drum shaft which normally bears against said driving shaft arm so as to compel the two shafts to rotate together, and means whereby the rotation of the driving shaft is stopped by the rotation of said shaft independently of said drum shaft, substantially as described.

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

CHARLES E. ALBRO.

Witnesses:
JNO. E. PARKER,
JOSEPH H. KLEIN.