(No Model.) 4 Sheets—Sheet 1.

J. H. BELSER.

ELEVATOR.

No. 489,359. Patented Jan. 3, 1893.

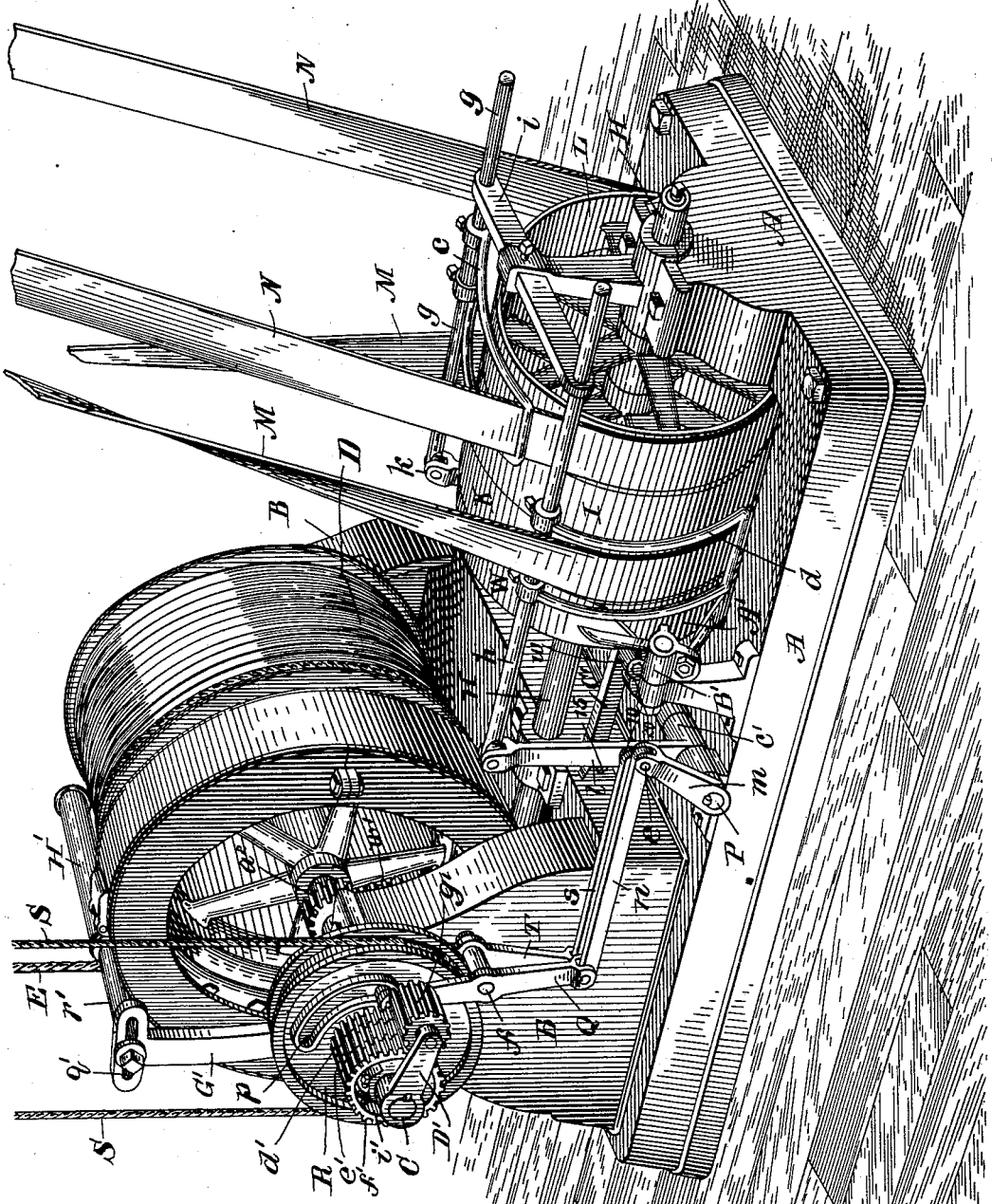

Fig. 1.

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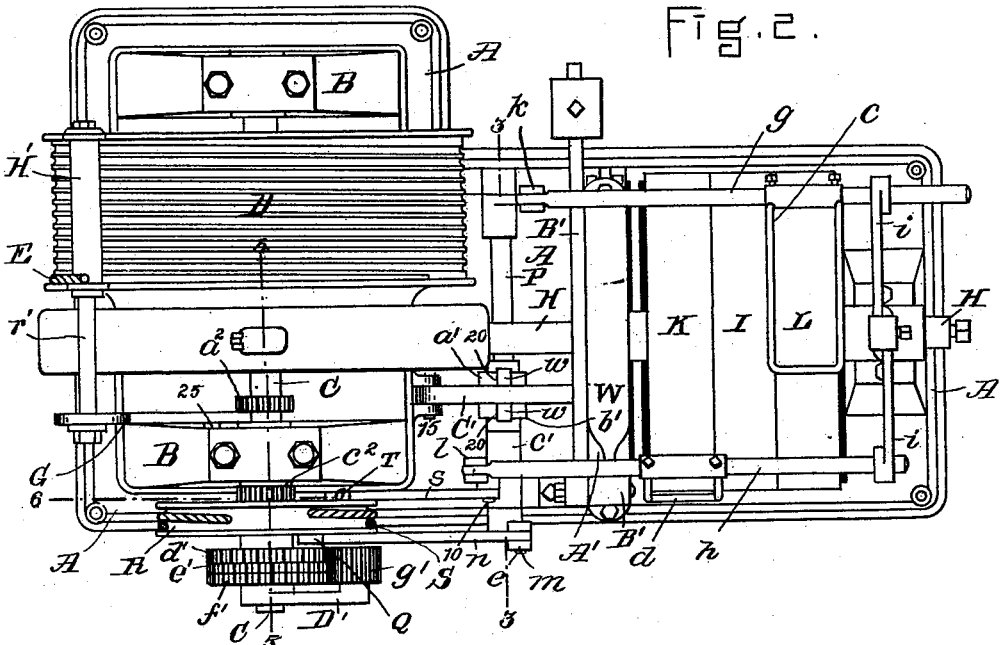
Fig. 2.



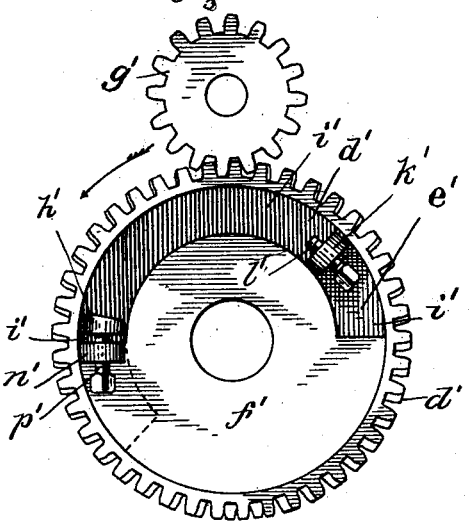


Fig. 7.

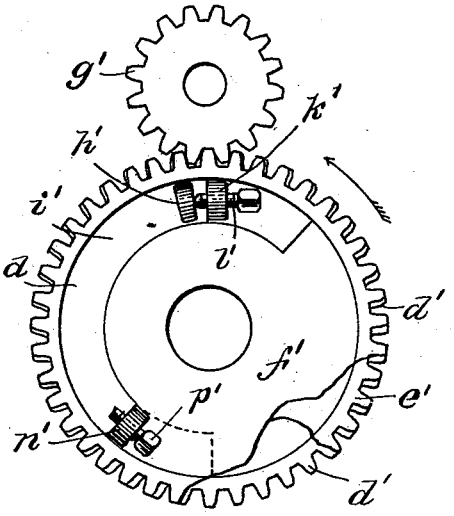


Fig. 8.

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Fig. 3.

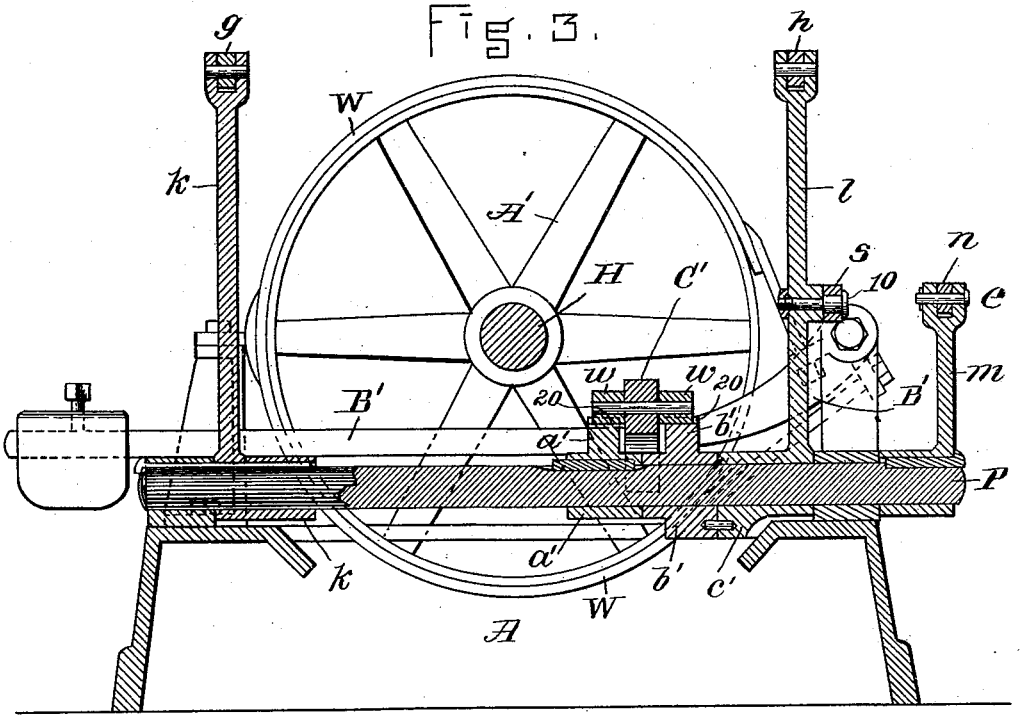
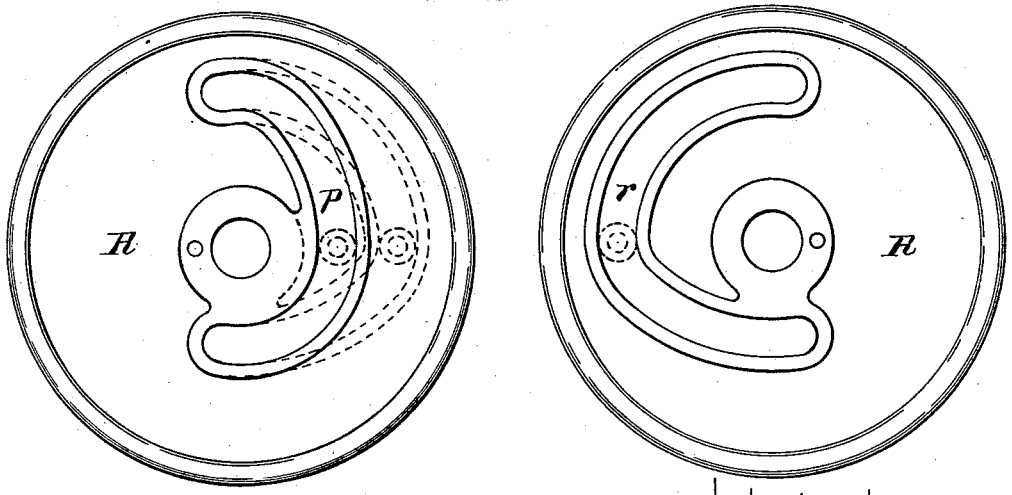


Fig. 4.



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(No Model.) 4 Sheets—Sheet 4.

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Fig. 5.

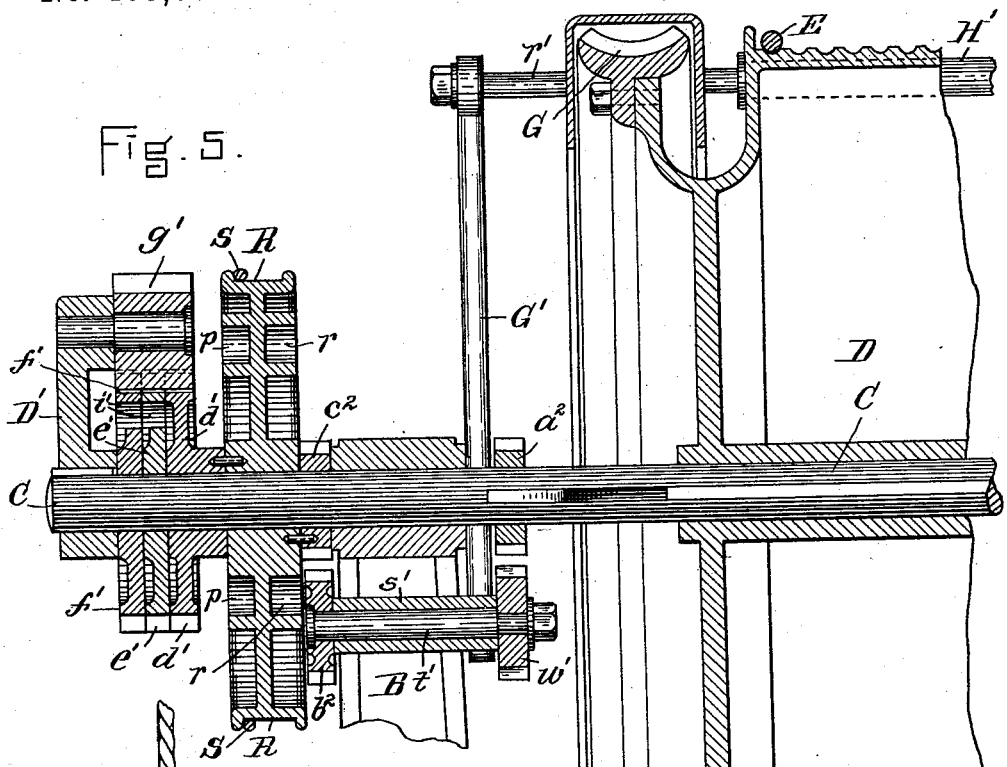
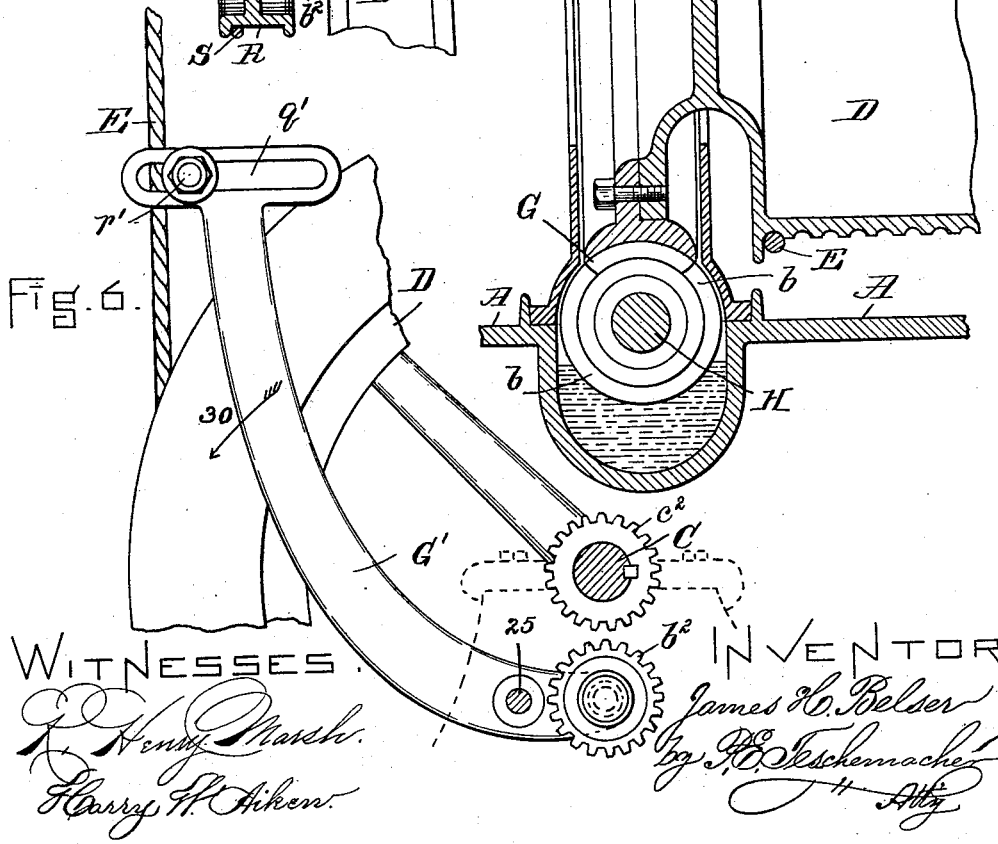


Fig. 6.



WITNESSES.

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Atty

UNITED STATES PATENT OFFICE.

JAMES H. BELSER, OF MARLBOROUGH, MASSACHUSETTS, ASSIGNOR TO WOOD & WILLARD, OF SAME PLACE.

ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 489,359, dated January 3, 1893.

Application filed May 18, 1892. Serial No. 433,463. (No model.)

To all whom it may concern:

Be it known that I, JAMES H. BELSER, a citizen of the United States, residing at Marlborough, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Elevators, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a perspective view of an elevator constructed in accordance with my invention. Fig. 2 is a plan of the same. Fig. 3 is an enlarged transverse vertical section on the line 3, 3, of Fig. 2. Fig. 4 represents in elevation, on an enlarged scale, the opposite sides of the hand-rope cam wheel employed for operating the belt-shifting or starting and stopping mechanism. Fig. 5 is an enlarged vertical section on the line 5, 5, of Fig. 2. Fig. 6 is a sectional detail representing, on an enlarged scale, a portion of the slack-cable stop-motion, taken on the line 6, 6, of Fig. 2. Figs. 7 and 8 enlarged details of the differential gears and the pinion engaging therewith.

My invention relates to elevator-operating machines, and has for its object to simplify the construction of such machines and reduce the number of their working parts, thereby lessening the cost of manufacture.

To this end my invention consists in certain novel mechanism for automatically stopping the hoisting-machine when the elevator-car has reached the limit of its travel in either direction; and also in an improved slack-cable stop-motion for preventing the continued unwinding of the hoisting cable or rope in case the elevator-car should encounter any obstruction in its downward movement, as hereinafter fully set forth and pointed out in the claims.

In the said drawings, A represents the bed of the machine, from which rise standards B, B, containing suitable journal boxes for the drum shaft C to which, between said standards B, B, is secured the drum D upon which the cable or hoisting rope E is wound and unwound in the usual manner. To the shaft C at one end of the drum D is also secured the worm wheel G, Fig. 5, with which engages a worm *b* on a horizontal shaft H supported in suitable bearings in the bed A and provided with a fast pulley I and loose pulleys K, L, around which pass in the ordinary manner, the reversely-acting belts M, N, shown in Fig. 1, adapted to be alternately shifted from loose to fast to start, and from fast to loose to stop the rotation of the winding drum D. The belt shippers *c*, *d*, through which the belts N, M, pass, are secured to horizontally sliding rods *g*, *h*, passing through apertures at the ends of a supporting bar *i* and pivoted respectively to the upper ends of levers *k*, *l*. The lever *k* is secured at its lower end to a rock-shaft P having its bearings in the bed A and carrying at one end a rocker arm *m* to which is pivoted at *e*, one end of a rod *n*, the opposite end of which is pivoted to a lever Q centrally pivoted on a stud *f*, Fig. 1, projecting from one of the standards B and carrying at its upper end an anti-friction roll fitting within a cam-groove *p* in the outer face of the hand-rope cam-wheel R, which is mounted upon the drum-shaft C outside one of the standards B and is free to turn upon said shaft in either direction when actuated by the hand-rope S, attached thereto and passing as usual in close proximity to the elevator car not shown. Upon the opposite or inner face of the wheel R is another cam-groove *r* in which fits an anti-friction roll at the upper end of a lever T also fulcrumed on the stud *f* and having pivoted to its lower end a rod *s* the opposite end of which is pivoted to the lever 1 at 10, which lever is pivoted loosely upon the rock-shaft P, the turning of the hand-rope cam-wheel R thus operating the belt shifters through the mechanism described, to start or stop the machine as required. The two cam grooves *p*, *r*, on the opposite sides of the cam-wheel R are so shaped and arranged with relation to each other, as seen in Fig. 4, as to cause the lever *k* to remain at rest while the lever *l* is being actuated to move the belt-shifter connected therewith, and vice versa.

The brake-band W is caused to act upon the brake-wheel A′ by means of a weighted lever B′ which is raised to release the brake-wheel from the pressure of the brake-band by mechanism connected with the belt shifting device, and so arranged as to apply the brake whenever either of the belts is shifted

from the fast to its loose pulley. This mechanism consists of a short lever C′, Figs. 2 and 4, fulcrumed at 15, its opposite end extending under and being adapted to raise the lever B′. On the opposite sides of the lever C′ are two studs carrying anti-friction rolls w, w, which when the brake is on, fit into grooves or notches 20 in heavy collars a', b'; the collar a' being fixed upon the rock-shaft P and the collar b' turning loosely thereon and being secured to the hub c' of the lever l, whereby when either the rock-shaft P or the lever l is oscillated, the said rolls w, w, are lifted out of the grooves 20 of the collars a', b', thus raising the lever C′ which lifts the weighted lever B′ thereby slackening the brake-band W and releasing the brake-wheel of its pressure. When either the collar a' or b' after having been moved, is returned to its normal position, the rolls w, w, drop into their respective notches 20, allowing the lever B′ to descend and apply the brake at the required time.

The parts thus far described are of ordinary and well known construction, and form no part of my present invention their construction and mode of operation being described in order to more closely illustrate the improvements which form the subject of my present invention and which will now be particularly described.

Upon the end of the drum-shaft C which projects out beyond the front face of the cam-wheel R, are loosely mounted side by side, three differential gears d', e', f', the inner gear d' having forty teeth, and being securely fastened to the outer face of the cam-wheel R, while the two gears e', f', which are arranged to turn upon the shaft C independently of the gear d', are each provided with forty one teeth. D′ is a crank-arm secured to the outer end of the drum shaft C and revolving therewith, said crank arm having at its outer end an inwardly projecting stud upon which is mounted a pinion g' which meshes with all three of the gears d', e', f', whereby as the crank arm D′ with its pinion g' is carried around the said three differential gears in either direction by the rotation of the winding drum D, the two loose gears e', f', will be moved a distance equal to one of their teeth at each complete revolution of the crank arm which thus causes the said gears e', f', to turn on the shaft C while the gear d' remains stationary by reason of its being securely fixed to the cam-wheel R. The inner stationary gear d' is provided with an outwardly projecting lug h', Figs. 7 and 8, which passes through curved slots i', i', in the gears e', f', and forms a stop as hereinafter described. The middle gear e' has at one end of its slot i' a lug k', which projects outward through the slot i' of the outer gear f' and is provided at its outer end, which projects beyond the face of the gear f', with an adjusting-screw or stop l' adapted to contact with the lug h' when said gear e' is turned in the direction of the arrow, Figs. 7 and 8, by the rotation of the winding drum as above described, and at one end of the slot i' of the outer gear f' is formed a lug n' provided with an adjusting-screw or stop p' which is adapted to contact with the opposite side of the lug h' when the gear f' is turned in a direction contrary to the arrow by the rotation of the winding drum in the opposite direction. The contact of the adjusting-screw or stop l' with the lug or stop h' of the inner gear as seen in Fig. 8, takes place when the drum has revolved a sufficient number of times to raise the elevator-car to its highest limit of travel, while the contact of the adjusting-screw or stop p' with said lug h', as seen in Fig. 7, takes place when the drum has revolved in the opposite direction sufficiently to lower the car to the limit of its descent, and it will be obvious that by varying the length of the slots i', i', and adjusting the screws l', p', to project more or less from their respective lugs, the time of their contact with the lug h' and the consequent stoppage of the machine may be regulated in accordance with the height of the building in which the elevator is placed. As soon as either of the adjusting screws or stops l', p', contacts with the lug or stop h', the gear with which said adjusting screw is connected can no longer revolve independently of the gear d', and as said gears each have a different number of teeth, the rotation of the pinion g' will be arrested by the clogging of its teeth with those of the differential gears, when the movement of the crank arm D′ will be instantly transmitted to the cam wheel R, which is thereby turned in a proper direction to shift the belt through the mechanism previously described, and stop the machine.

I will now describe the slack-cable stop-motion which is employed to stop the machine in case the cable or hoisting rope E becomes slackened by reason of the car encountering an obstruction in its descent. G′ is a long lever fulcrumed upon a stud 25, Figs. 2 and 6, projecting from one of the standards B and provided at its upper end with a horizontal slot q' within which is adjustably secured a horizontal rod or spindle r' upon which is mounted a roll H′ of a length corresponding to that of the winding drum and adapted to rest against the inner side of the hoisting rope E near the drum as seen in Figs. 1 and 6, the lever G′ which is thus supported by said rope being of such shape and so hung that it will drop or swing outward by its own gravity in the direction of the arrow 30, Fig. 6, in case the rope E should become slackened from any cause. The length of the roll H′ not only enables the rope E to lie constantly in contact therewith as it moves laterally from one end of the drum D to the other in winding and unwinding, but by reason of such length, is of sufficient weight to materially assist and insure the outward movement of the lever G′ when released. The lower end of the lever G′ is provided with a long bearing s' supporting a short shaft t'

having secured to one end a gear w' adapted to mesh with a gear a^2, secured to the drum shaft C, and at the opposite end a gear b^2, adapted to mesh with a gear c^2, securely fastened to the cam-wheel R, the shaft C turning freely within the gear c^2, and the said gears w', b^2, being normally disengaged from the gears a^2, c^2, when the roll H′ is in contact with the rope E and the machine is in its ordinary working condition as shown in Fig. 5. In case the elevator car should in any way become obstructed in its descent, the hoisting rope E will instantly become slackened when the lever G′ with its roll H′ being no longer supported thereby, will swing downward by gravitation, its lower end being thus raised and the gears w', b^2, caused to engage respectively with the gears a^2, c^2, when the rotation of the drum-shaft C will be instantly transmitted through said gears to the cam-wheel R, and thence to the belt-shifting mechanism, thereby stopping the machine and preventing any further unwinding of the rope from the drum. In subsequently taking up the slack of the rope it will be brought up against the roll H′, thus lifting the lever G′ to its normal position as seen in Figs. 1, 5, and 6, and disengaging the gears w', b^2, from the gears a^2, c^2, when the machine will be again ready for operation after the obstruction to the car has been removed.

It is obvious that my improvements may be applied to elevator hoisting machines adapted to be operated by electric motors, in which case the fast and loose pulleys and reversely acting belts above described would necessarily be dispensed with. With such construction the levers Q, T, actuated by the cam wheel R, would be connected with suitable electric switches or switch operating mechanism for starting, stopping, and reversing the motor in any suitable or well known manner.

What I claim as my invention and desire to secure by Letters Patent is:—

1. In an elevator, the combination, with the hoisting drum and its shaft, the starting and stopping mechanism, and a cam-wheel connected with the latter and adapted to actuate the same, said cam-wheel mounted on the drum-shaft and operated by the hand-rope, of differential gears mounted side by side upon the said drum-shaft and provided with suitable stops to limit their movement independently of each other, and a pinion mounted upon a suitable support and meshing with said differential gears, whereby when the elevator-car reaches the limit of its travel in either direction, said differential gears and pinion will become locked together by the contact of the said stops in such manner as to prevent the rotation of the pinion, and the movement of the drum-shaft thereby transmitted to the cam-wheel to actuate the mechanism connected therewith and stop the machine, substantially as set forth.

2. In an elevator, the combination, with the hoisting drum and its shaft, the starting and stopping mechanism, and a cam-wheel connected with the latter and adapted to actuate the same, said cam-wheel being connected with the hand-rope, of differential gears mounted side by side upon the drum shaft and provided with suitable stops adapted to limit their movement independently of each other, said stops being provided with adjusting screws for regulating the amount of said movement, a pinion mounted upon a suitable support and meshing with said differential gears, whereby when the elevator-car has reached the limit of its travel in either direction, the rotation of the said pinion will be arrested and the movement of the drum-shaft transmitted to the cam-wheel to actuate the mechanism connected therewith and stop the machine, substantially as set forth.

3. In an elevator, the combination, with the hoisting drum and its shaft, the starting and stopping mechanism and a cam wheel connected with the latter and adapted to actuate the same, said cam wheel mounted on the drum-shaft and operated by the hand-rope, of the differential gears d', e', f', mounted loosely on the drum-shaft, one of said gears, as d', being fast to the cam-wheel, and said gears being provided with lugs and slots forming stops, substantially as described, a crank arm secured to the end of the drum-shaft and provided with a pinion meshing with the said differential gears, whereby as it is carried around the same, the gears e', f', will be moved independently of the gear d' as far as permitted by the said lugs and slots, and the crank arm D′ on the end of the drum-shaft then caused to be locked with and turn the cam-wheel to operate the mechanism for stopping the machine when the elevator-car has reached the limit of its travel in either direction, substantially as set forth.

4. In an elevator, the combination, with the hoisting drum and its shaft, the starting and stopping mechanism and the hand-rope cam-wheel connected therewith and adapted to actuate the same, of the differential gears d', e', f', mounted upon the drum-shaft, the gear d' being fast to the cam-wheel and being provided with a lug h', and the gears e', f', being provided with slots i', i', through which said lug h' projects, and said gear e' having a lug k' projecting through the slot of the outer gear f' and provided with an adjusting screw l', and the gear f', having a lug n' provided with an adjusting-screw p', said adjusting-screws adapted to contact with opposite sides of the lug h' of the gear d' according to the direction of rotation of the drum-shaft, the crank arm D′ secured to the drum-shaft and carrying the pinion g' meshing with said differential gears, all constructed to operate substantially as described.

5. In an elevator, the combination, with the drum shaft having a fixed gear wheel and the hoisting rope, of a hand rope cam-wheel having a gear secured thereto a lever adapted to engage said rope and be normally supported

thereby, said lever swinging on its fulcrum by gravitation when released, and having a roll or other suitable bearing at its upper end in contact with said rope, a pair of gears secured to opposite ends of a shaft having its bearings in the lower arm of said lever one adapted to engage the drum-shaft gear and the other the cam-wheel gear when said lever is released and its upper arm swings downward, whereby when the hoisting rope slackens, the mechanism for stopping the machine will be operated, substantially as set forth.

6. In an elevator, the combination, with the hoisting rope, of a weighted lever G′ engaging the same near the drum and normally supported by said rope the hand-rope cam-wheel, a pair of gears w', b^2, attached to opposite ends of a shaft having its bearings in the lower arm of said lever and adapted to engage respectively a gear a^2 secured to the drum-shaft and a gear c^2 secured to the hand-rope cam-wheel connected with the starting and stopping mechanism, the gears w', b^2, being normally out of contact with the gears a^2, c^2, and being arranged to engage therewith when the upper arm of the lever G′ moves downward, whereby as the hoisting rope becomes slack, the cam-wheel will be connected with the drum-shaft and the mechanism for stopping the machine operated, substantially as set forth.

7. In an elevator, the combination, with the drum-shaft and cam-wheel and the gears a^2, c^2, secured respectively thereto, of the swinging lever G′, carrying at its lower end a shaft having secured thereto the gears w', b^2, adapted to engage the gears a^2, c^2, but being normally out of contact therewith, said lever G′ being provided at its upper end with a roll or bearing H′ forming a weight to insure the downward movement of the upper arm of the lever G′ as the rope slackens, and of sufficient length to engage the rope while the latter is moving from one end of the drum to the other in winding and unwinding, substantially as set forth.

Witness my hand this 7th day of March, A. D. 1892.

JAMES H. BELSER.

In presence of—
P. E. TESCHEMACHER,
HARRY W. AIKEN.