(No Model.) 2 Sheets—Sheet 1.

L. CHRISTIANSEN.

ELEVATOR MECHANISM.

No. 551,488. Patented Dec. 17, 1895.

FIG. 1.

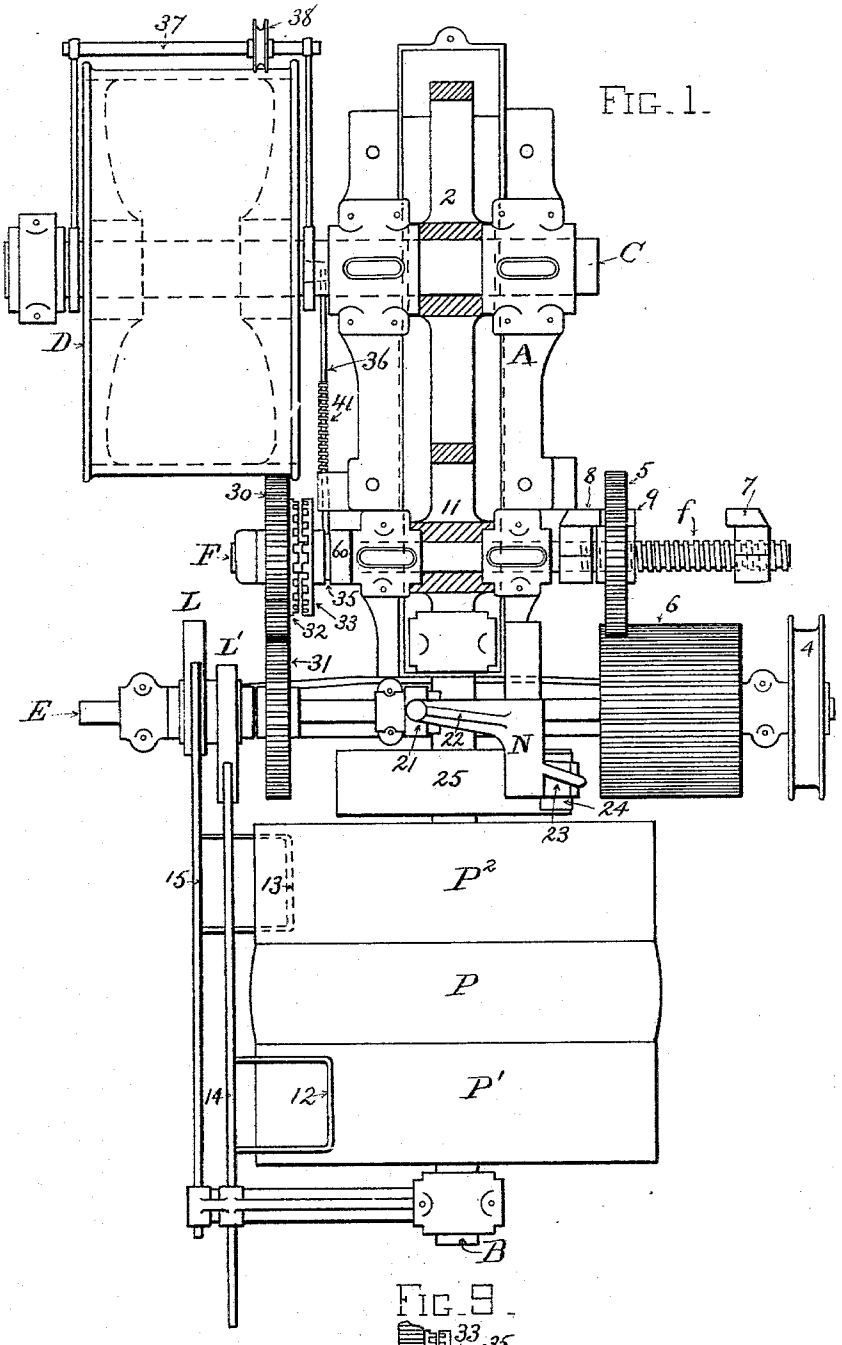
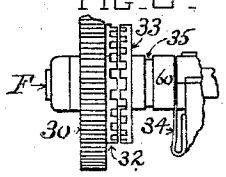


FIG. 3.



WITNESSES.

Fred V. Hart.

Leonard A. Tirrill

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Benjamin Phillips

(No Model.) 2 Sheets—Sheet 2.

L. CHRISTIANSEN.

ELEVATOR MECHANISM.

No. 551,488. Patented Dec. 17, 1895.

FIG. 2.

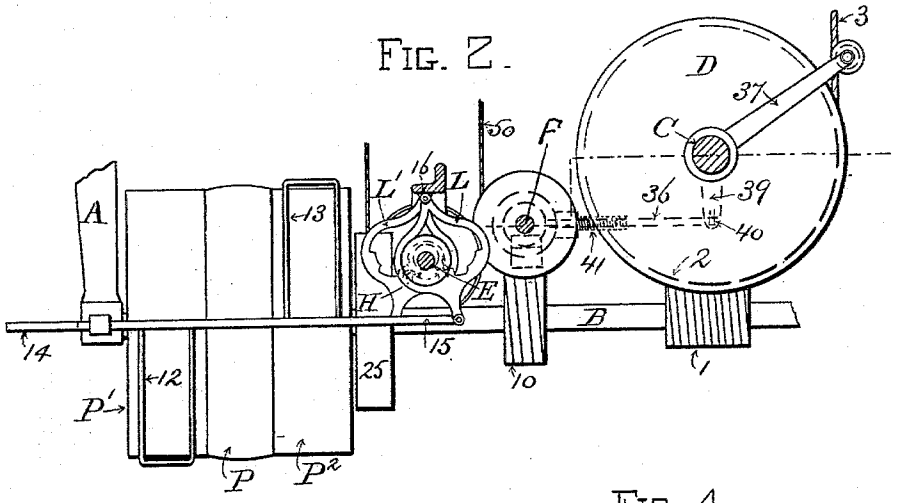


FIG. 4.

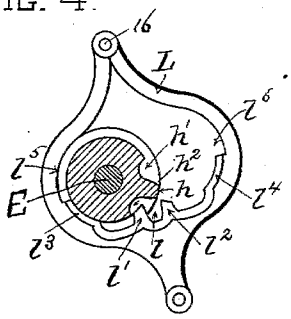


FIG. 3.

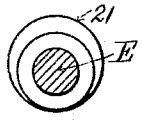


FIG. 5.

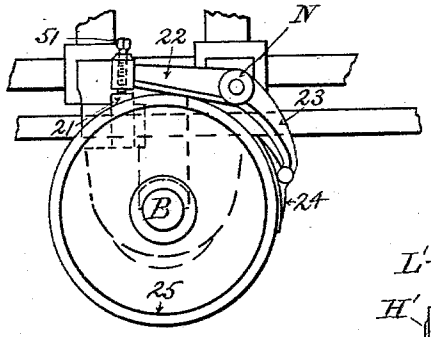


FIG. 6.

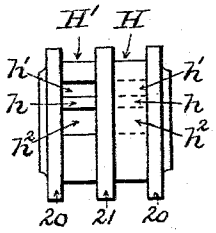


FIG. 7.

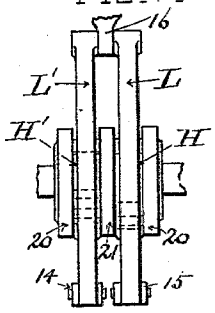
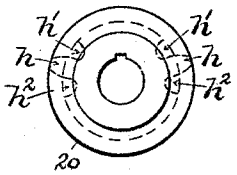


FIG. 8.



WITNESSES.

Fred. C. Hart.

Leonard A Terrill

INVENTOR.

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Benjamin Phillips

UNITED STATES PATENT OFFICE.

LUDWIG CHRISTIANSEN, OF LYNN, MASSACHUSETTS.

ELEVATOR MECHANISM.

SPECIFICATION forming part of Letters Patent No. 551,488, dated December 17, 1895.

Application filed March 25, 1895. Serial No. 543,028. (No model.)

To all whom it may concern:

Be it known that I, LUDWIG CHRISTIANSEN, a subject of the King of Sweden and Norway, and a resident of Lynn, in the county of Essex and Commonwealth of Massachusetts, have invented a new and useful Improvement in Elevator-Hoisting Mechanisms, of which the following, taken in connection with the accompanying drawings, is a specification.

This invention relates to improvements in devices of the above class; and it consists of the devices and combinations of devices hereinafter set forth and claimed.

The object of this invention is to provide a device of the above class simple in construction and safe and effective in operation.

This invention is illustrated in the accompanying drawings, in which—

Figure 1 is a reverse plan view of mechanism embodying the invention. Fig. 2 is a side view partially in section. Figs. 3 and 5 are detail views illustrating form and arrangement of the brake and its operating mechanism. Figs. 4, 6, 7, and 8 are detail views illustrating the several features of the belt-shifting mechanism, and Fig. 9 is a detail of the clutch forming part of loose-cable stop.

Similar letters and figures of reference refer to similar parts throughout the several views.

In the drawings, A represents a frame suitable to support the working parts of the apparatus. Mounted in the frame A is a power-shaft B and a drum-shaft C carrying the hoisting-drum D and in operative connection with the power-shaft B. The connection between the power-shaft B and the drum-shaft C may conveniently consist of a worm 1 on the shaft B, which engages with a gear 2 on shaft C; but such arrangement is common in this class of machines and forms no part of this invention. A hoisting-cable 3 is wound about the drum D in the usual manner. The power-shaft B carries two loose pulleys P′ and P² and the fast pulley P. Two belts (not shown) running in opposite directions are applied to the pulleys P′ and P², and by shifting the belts alternately from the pulley P′ and P² to the pulley P the shaft B may be rotated in opposite directions and the drum D operated to raise or lower the car.

The above-described arrangement of pulleys and belts is old in the art for a similar purpose, and it is described herein solely for the purpose of more clearly illustrating other features hereinafter described.

Mounted in the frame A is the shipping-shaft E, the rotation of which actuates the belt-shifting mechanism hereinafter described, and which is rotated in either direction at all intermediate positions of the car by means of a shipping-rope 50, which passes over the sheave 4 and through the car in the usual manner.

To stop the elevator at upper and lower limit of passage of the car the shipping-shaft E is connected with the shaft F conveniently in the following manner: The shaft F is suitably mounted in the frame A and at one end carries a threaded extension *f*, upon which works a gear 5, which has a correspondingly-threaded hub, and which meshes with the elongated gear 6 upon the shipping-shaft E, the arrangement being such that as the shaft F rotates the gear 5 travels along the threaded portion *f* without rotation and keeping in engagement with the gear 6. Near the ends of the threaded portion *f* are the dogs 7 and 8, rigid on shaft F, which respectively engage with the dog 9, which projects upon each side of the gear 5, and cause the gear 5 to rotate, rotating the gear 6 and the shipping-shaft E. The shaft F is rotated by the power-shaft B conveniently by means of the worm 10 and gear 11.

Since the function of the shaft F is to stop the rotation of the drum when the cam has reached the upper or lower limit of its passage, it may be properly termed the "stop-shaft" and for convenience will be so termed in the following parts of this specification. I also desire to say in regard to the shaft F and the form and arrangement of the mechanism connecting it with shaft E, as hereinbefore described, that the same does not in itself form part of this invention, and in so far as it enters into the combination hereinafter claimed I do not consider this invention as limited thereto, for it is evident that other well-known devices may be substituted therefor without affecting the operation of the features which I claim as novel and which I will now proceed to describe.

To effect the shipping of the belts from the pulleys P′ and P² to the pulley P (and vice

versa) by the rotation of the shipping-shaft E, I have provided the following mechanism: On the shipping-shaft E is mounted a pair of rigidly-connected gears H and H', the form of which will be hereinafter more fully described. The gears H and H' are arranged to engage with the internally-toothed swinging links L and L', which are pivotally supported at 16 by the frame A or other suitable support. The form and arrangement of the internal teeth upon links L and L' will be hereinafter more fully described. To the link L is pivoted a rod 15, which is arranged to slide in suitable bearings supported by frame A or other suitable support, (provision being made for a slight swinging motion.) The rod 15 carries a belt-shifting bracket 13, through which runs the belt which passes over pulley P^2. The belt on pulley P' is controlled by a bracket 12 on rod 14 similarly arranged and pivotally connected with link L'.

The above-described arrangement is such that the swinging motion of the link L limited as hereinafter described will move the belt in bracket 13 from pulley P^2 to pulley P and vice versa, and a similar result for pulleys P' and P is effected by the similar motion of link L'.

As shown in the drawings each of the gears H and H' is turned off on the pitch-line, leaving a single tooth h and the spaces h' and h^2 adjacent thereto, all other portions of the periphery of the gear being preferably unbroken without teeth or spaces.

In each of the links L and L' are formed two teeth l' and l^2, between which is the space l, and which engage the tooth h upon the respective gears H and H'. The sides of the links L and L' are formed with the curved portions l^3 and l^4, which correspond in curvature to the pitch-line of the gears H and H' and which come in contact with the periphery thereof as the tooth clears the teeth l' and l^2 when the gears H and H' are rotated in either direction. The tooth l' is cut away on the pitch-line of the gear when in contact with the curved portion l^3, and the tooth l^2 is cut away to the pitch-line of the gear when in contact with l^4 on the opposite side of the link.

The above-described arrangement is such that when the tooth h clears the teeth l' and l^2 the swinging motion of the link L or L' brings one of its curved portions l^3 or l^4 in contact with the gear H or H' and such curved portion l^3 or l^4 with its adjacent tooth l' or l^2 closes around the periphery of the gear H or H', engaging with the same in such manner that no further swinging motion of the link L or L' is possible in either direction until the tooth h again engages with the teeth l' and l^2.

Since the curved portions l^3 and l^4 of the link L or L' are respectively formed upon a curve corresponding to the pitch-line of the gear H or H' when in contact therewith, and since the adjacent tooth l' or l^2 is cut off on said pitch-line, and since the gears H and H' have only the single tooth h projecting beyond said line, when in engagement with either of the curved portions l^3 or l^4 and its adjacent tooth l' or l^2, either of the gears H or H' is free to make a partial rotation without imparting any swinging motion to the link L or L' with which it is in engagement.

Each of the links L and L' may be cut away at l^5 and l^6 to allow a sufficient rotation of gears H and H', for the purposes hereinafter described, to occur without bringing tooth h in contact with side of link L or L'.

The brackets 12 and 13 are preferably so placed upon the rods 14 and 15 that when the links L and L' are in the position shown in Fig. 2, with opposite sides in contact with the respective gears H and H', the belts are upon the loose pulleys P' and P^2.

The relative angular positions of the teeth h and h upon their respective gears H and H' are preferably such that when the links L and L' are in the position just described a rotation of the gears in one direction will engage one tooth h with the teeth on link L and clear the other tooth h from the teeth of the link L', and a rotation in the opposite direction will engage one tooth h with teeth on L' and clear the other tooth h from teeth upon link L.

The operation of the device as shown in the drawings is described as follows: Presuming the links L and L' to be in the positions shown in Fig. 2, a right-hand rotation of the gears H and H' will move over the link L until its opposite side comes in contact with the gear H, which motion of the link L shifts the belt from pulley P^2 to P, and said belt acting upon the pulley P sets shaft B in rotation. A rotation of the gears H and H' in an opposite direction moves the link L back to its former position, shifting the belt from the pulley P back to the loose pulley P^2. The links L and L' being in the position shown in Fig. 2, a left-hand rotation of the gears H and H' will move over the link L' until its opposite side engages with gear H' (see Fig. 4) and shifts the belt from pulley P' to P. and since the belt on P' is run in an opposite direction to that on pulley P^2 said belt will rotate the pulley P and shaft B in a direction opposite to that of its rotation hereinbefore described. A reverse movement of gears H and H' moves the link L' back to its former position and shifts the belt from pulley P to P'. It will be noted that while the link L is being moved by rotation of the gear H to shift the belt from the pulley P^2 to pulley P and vice versa the link L' remains stationary locked around the gear H', and while the link L' is shifting the belt from pulley P' to pulley P and back the link L remains stationary locked around its gear H. It will be further noted that when each link reaches the limit of its swinging motion it locks around its operating-gear and is held thereby in such manner that it cannot be swung in either direction except by the operation of said gear, as hereinbefore described, the result of this ar-

rangement being that any accidental shifting of belts except by rotation of the shipping-shaft is prevented.

The gears H and H′ may be conveniently made in a single casting forming a roll, as shown in Fig. 6, provided with the outer flanges 20 20 and the central flange 21, the function of the flanges being to steady the links and prevent lateral play thereof.

The rotation of the shipping-shaft E is limited to secure the results above described by suitable stops on the shipping-ropes, which are not shown in the drawings, but which are similar in form and arrangement to such devices common in the art.

My improved brake-operating mechanism is described as follows: Upon the shaft B is mounted a brake-wheel 25, upon which bears a brake 24 supported and operated by the arm 23 of the bell-lever N. The bell-lever N is pivoted at its angle to the frame A or other suitable support. On the shipping-shaft E is a cam 21, against which the arm 22 of the bell-lever N is arranged to bear, the rotation of the cam 21 applying and releasing the brake. The arm 22 of the bell-lever N is preferably provided with a threaded bearing-rod 51, which bears upon the cam 21 and is arranged to take up the wear upon the brake 24. The cam 21 is formed and timed with reference to the gears H and H′ in such manner that whenever said gears are brought into position to bring the belts onto the loose pulleys P′ and P² the most eccentric part of the cam 21 comes in contact with the arm 22 and applies the brake 24 to the wheel 25, stopping the rotation of shaft B and of drum D.

To stop the rotation of the drum D when the cable 3 is slackened or broken I provide the following device: On the stop-shaft F runs a gear 30, turning loosely and free to rotate about the same. The gear 30 meshes with a gear 31 on the shipping-shaft E. Upon the gear 30 is one member 32 of a clutch mechanism, the other member 33 of which is secured to a sleeve 60 splined upon shaft F, rotating therewith and free to slide along the same. The members 32 and 33 are adapted to be thrown in engagement by a suitably-placed spring 34, Fig. 9. In the sleeve 60 is a groove 35 which is engaged by the end of the sliding rod 36, supported and free to slide in suitable bearings in the frame A. The rod 36 when in engagement with the groove 35 acts to prevent the spring 34 from sliding the sleeve 60 along the shaft H to close the clutch. On the shaft C is mounted a swinging lever 37, preferably in form of a rod extending across the periphery of the drum D and supported from the shaft C on both sides of the drum. To the swinging lever 37 is secured a rigid arm 39, Fig. 2, which by means of a pivotal slotted connection 40 is connected with the sliding rod 36. A suitably placed spring 41 is arranged to keep the lever 37 in contact with the cable 3, and a sheave 38 is conveniently provided against which the cable 3 runs. The lever 37 pressing against the cable 3 holds the rod 36 in engagement with the groove 35 against the action of the spring 41, and the above-described arrangement is such that if the cable 3 becomes slackened or breaks, the lever 37 is raised by the action of the spring 41 and the rod 36 withdrawn from the groove 35, when the spring 34 slides the sleeve 60 along the shaft F and closes the clutch, which causes the gear 30 to rotate with shaft F and by means of gear 31 rotates the shipping-shaft E, operating the belt-shifting mechanism and stopping the rotation of the drum, as hereinbefore described.

The operation of my invention has already been sufficiently described in connection with the description of the several parts.

I therefore claim as novel and desire to secure by Letters Patent of the United States—

1. The combination with the associated parts of an elevator hoisting mechanism, of suitable belt shifters, a pair of rigidly connected gears mounted upon the shipping shaft, a pair of swinging links embracing said gears and operated thereby, suitable connections between the swinging links and the belt shifters, and provision upon each link and its operating gear whereby each link is locked around its gear at the limits of its swinging motions and held stationary during a partial rotation of the gear, substantially as described.

2. The combination with associated parts of an elevator hoisting mechanism, of suitable belt shifters, a pair of rigidly connected gears H and H′ mounted upon the shipping shaft, a pair of swinging links L and L′ embracing the gears H and H′ and actuated thereby, suitable connections between the links L and L′ and the belt shifters, there being a tooth h on each gear H and H′ and the teeth l' and l^2 and the curved portion l^3 and l^4 upon each of the links L and L′ formed and arranged substantially as described.

3. The combination with associated parts of an elevator hoisting mechanism, of a loose cable stop comprising a gear rigid on the shipping shaft, a connecting gear loose on the stop shaft, a clutch whereby said loose gear is rotated by the stop shaft, a spring arranged to engage the clutch members, a spring controlled sliding rod and suitable connections holding the clutch members out of engagement, a swinging lever arranged to bear against the cable and suitable connections between said lever and rod whereby said rod is actuated to permit engagement of clutch members when the cable becomes slackened or broken, substantially as described.

4. The combination with associated parts of an elevator hoisting mechanism, of suitable belt shifters, a pair of rigidly connected gears mounted upon the shipping shaft, a pair of internally toothed swinging links em-

bracing said gears and engaged thereby, and suitable connections between said links and the belt shifters, substantially as described.

5. The combination with the associated parts of an elevator hoisting mechanism of suitable belt shifters, a pair of rigidly connected gears upon the shipping shaft, a pair of swinging links embracing and actuated by said gears, suitable connections between said links and the belt shifters, a brake and connected mechanism, and a cam upon the shipping shaft formed and timed with reference to said gears whereby the brake is applied to the power shaft when said gears are rotated to bring both belts on the loose pulleys, substantially as described.

6. The combination with the associated parts of an elevator hoisting mechanism of suitable belt shifters, a pair of gears upon the shipping shaft, a pair of swinging links embracing and actuated by said gears, suitable connections between said links and the belt shifters, and connected mechanisms operating automatically to rotate said gears when the cable is slackened or broken, substantially as described.

In testimony whereof I have hereunto set my hand, in presence of two attesting witnesses, this 23d day of March, 1895.

LUDWIG CHRISTIANSEN.

Witnesses:
BENJAMIN PHILLIPS,
A. O. ORNE.