

UNITED STATES PATENT OFFICE.

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HOISTING MECHANISM FOR ELEVATORS OR LIFTS.

SPECIFICATION forming part of Letters Patent No. 611,693, dated October 4, 1898.

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To all whom it may concern:

Be it known that we, ROBERT LUNDELL, a citizen of the United States, residing at New York, (Brooklyn,) in the county of Kings, and GUSTAF T. RENNERFELT, a subject of the King of Sweden and Norway, residing at New York, in the county of New York, State of New York, have made a new and useful Improvement in Hoisting Mechanism for Elevators or Lifts, of which the following is a specification.

Our invention has for its object to provide a simple and efficient hoisting mechanism for elevators or lifts.

It is customary in some types of elevators or lifts to use drums around which a cable attached to the car is wound, and in order to take up sufficient length of the cable for high lifts these drums must be of enormous size. In fact, the drum-elevator becomes cumbersome and impractical for very high buildings and is usually abandoned in favor of the multiple-sheave type. The multiple-sheave type is by no means simple, particularly when rotary motion has to be transformed into a horizontal or vertical movement of the sheaves, but may be considered simple enough for hydraulic elevators when a piston is employed for moving the sheaves.

Referring now to the drawings, which fully illustrate our invention, Figure 1 is a front elevational view of the entire apparatus, and Fig. 2 a sectional view thereof as seen looking from left to right in the direction of the arrows, Fig. 3 being a side elevational view of the sprocket-wheels, showing the rear set of staggered teeth in dotted lines.

M represents the motor, (for convenience an electric motor with its electric brake E is shown;) but it should be clearly understood that a steam-engine or any other kind of motive power may be employed, the invention being strictly confined to the mechanism employed between the motor-shaft and the car.

T T' represent two sprocket-wheels mounted upon the motor-shaft in such manner that the teeth of the two wheels are staggered, as shown in detail upon the drawings, the object of this being fully described in the latter part of this specification.

O and O' represent oil-pans in which the sprocket-wheels T T' and chains S and S' run freely. The length of each of these chains is

approximately equal to the height of the lift. To one end of the chains S S' wire ropes or cables R and R' are attached, which in turn are secured to the opposite ends of a rocking-lever equalizing-bar L after running over the sheaves P and P'. The other ends of the chains are attached to similar cables r and a second cable, (not here shown,) said cables being in turn secured to counterweight W and a second counterweight (not shown) after they (the cables) have passed over sheave p and a second sheave. (Not shown.) The rocking bar L supports the car C through the medium of a rubber spring or buffer D and yoke Y, as clearly shown on the drawings.

Suppose the mechanism is to be used for a passenger-elevator with a speed of the car of five hundred feet per minute. If the speed of the motor-shaft should happen to be one hundred and twenty-five revolutions per minute, at the above speed of the car it follows that the circumference of the pitch-circle of the sprockets must be four feet or that the pitch-diameters must be about fifteen and one-fourth inches. With such a large diameter a fairly large number of teeth can be used, which is absolutely essential for even running. The speed of the chain running over a sprocket is not absolutely uniform, and the ratio between the minimum and maximum speeds is given by the following formula:

$$\frac{\text{Minimum speed}}{\text{Maximum speed}} = \cos. \frac{\alpha}{2}, \text{ where } \alpha \text{ denotes the pitch-angle or } \frac{360^\circ}{\text{number of teeth.}}$$

This formula shows that uniform speed could not be obtained unless the pitch-angle equals zero, which means an infinite number of teeth. A fairly uniform speed can, however, be obtained by using a tolerably great number of teeth. If the car were directly suspended from one chain, considerable vibration would be felt on account of this variation of speed. To overcome this defect, as well as to insure additional safety, a second chain is employed. It will be understood that when the teeth of the two sprocket-wheels are staggered with relation to each other, as shown, chain S will have its maximum speed at the time chain S' has its minimum speed, and vice versa, the result being that the lever L will rock slightly

around its fulcrum, the speed of which will be practically uniform, although not absolutely so. The slight vibration which might be felt in the car is easily overcome by a rubber cushion D.

It will be understood from an examination of the drawings that the ends of the chains S and S' never travel higher than the sheaves PP' and pp'. Consequently the oil in which the chains run will never drip down upon the car, but will always run back along the chains into the oil-pans O and O'.

Having thus described our invention, what we claim, and desire to secure by Letters Patent of the United States, is—

1. In an elevator the combination of two sprocket-chains with two sprocket-wheels, the teeth of one of said sprocket-wheels being staggered with relation to those of the other.
2. In an elevator two sprocket-wheels having their teeth staggered with relation to each

other, in combination with two chains attached to the ends of a lever from the center of which the load to be lifted is suspended.

3. In an elevator the combination of a car and an equalizing-lever therefor, a shaft, two sprocket-wheels so placed on said shaft that each tooth on each wheel will be opposite the space of two consecutive teeth on the other wheel; a sprocket-chain passing around each of said wheels and respectively connected one to one end and the other to the opposite end of said equalizing-lever, substantially as described.

In testimony whereof we have hereunto subscribed our names this 3d day of May, 1897.

ROBT. LUNDELL.

GUSTAF T. RENNERFELT.

Witnesses:

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