No. 689,510. Patented Dec. 24, 1901.

M. E. NEENAN.

ELEVATOR.

(Application filed Feb. 23, 1901.)

(No Model.) 2 Sheets—Sheet 1.

FIG. 1.

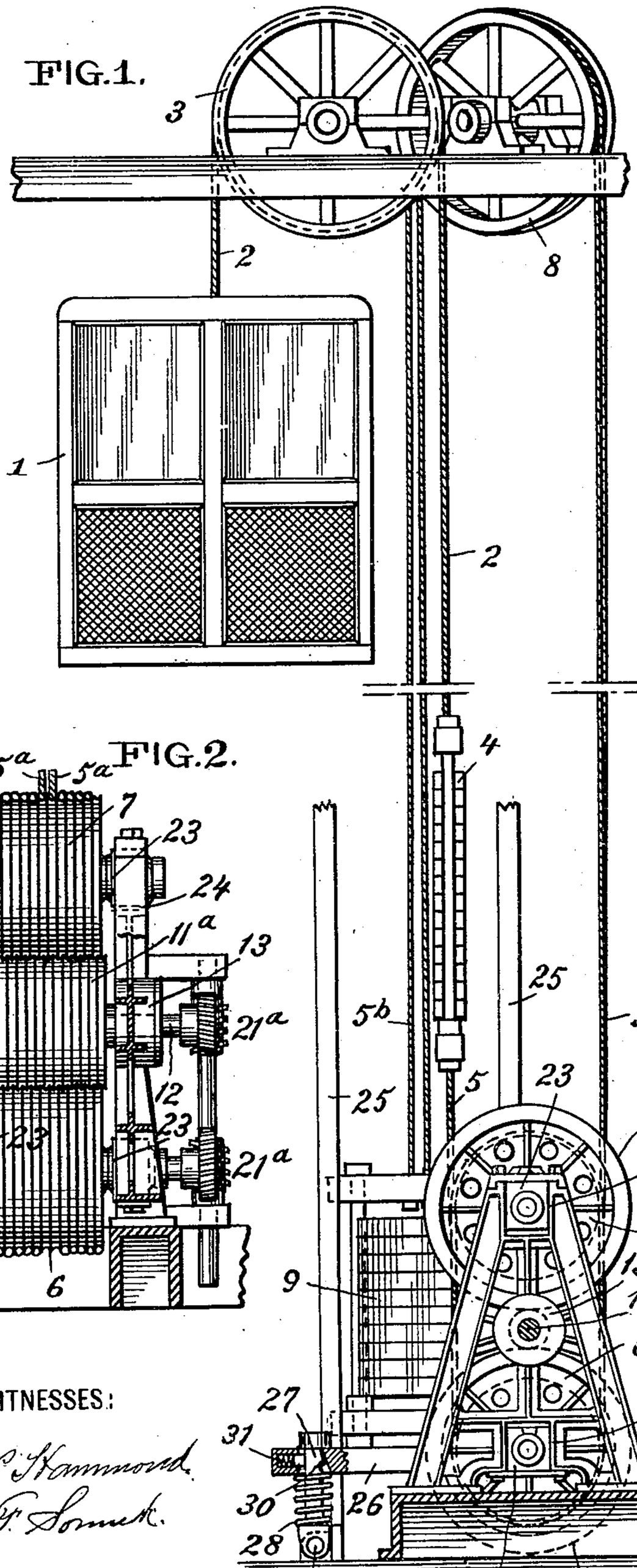

FIG. 1a.

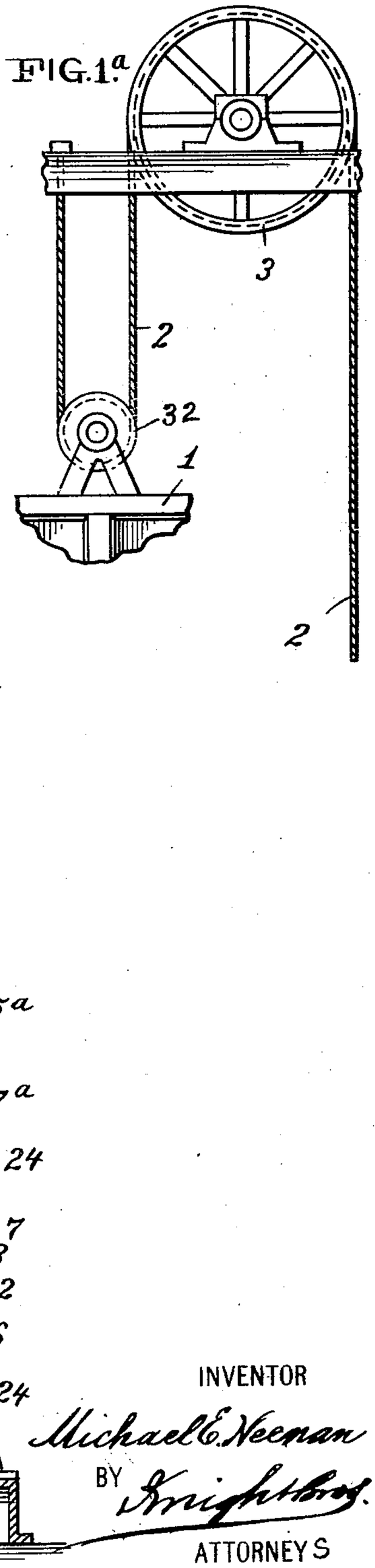

FIG. 2.

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FIG. 3.

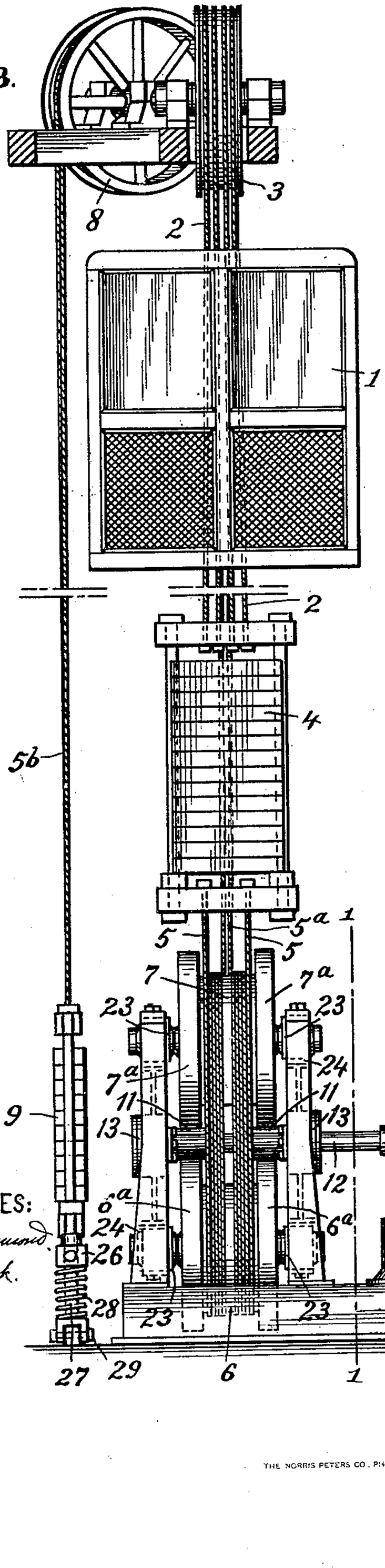


FIG. 4.

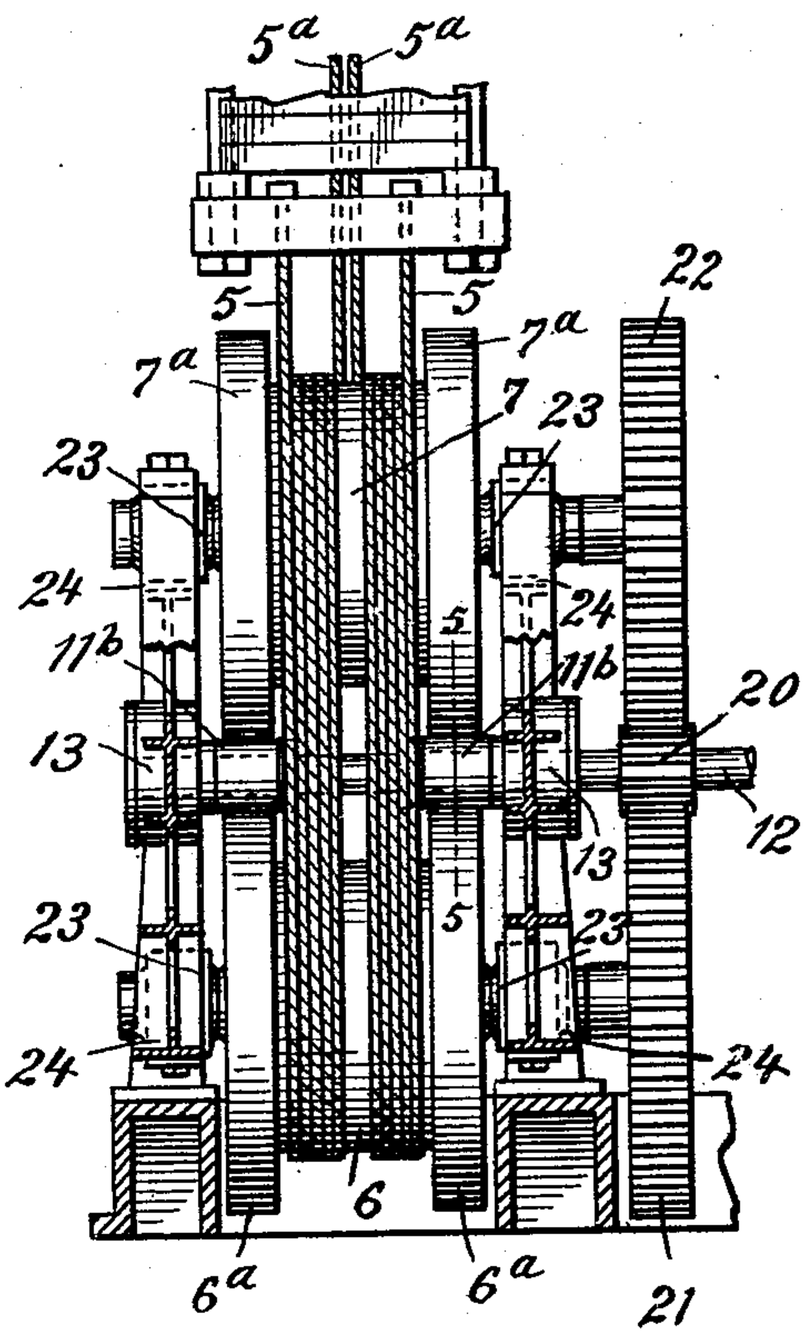
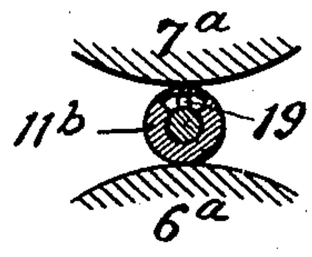


FIG. 5.



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ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 689,510, dated December 24, 1901.

Application filed February 23, 1901. Serial No. 48,523. (No model.)

To all whom it may concern:

Be it known that I, MICHAEL E. NEENAN, a citizen of the United States, and a resident of the borough of Manhattan, in the city and State of New York, have invented a new and useful Improvement in Elevators, of which the following is a specification.

The subject of my invention is a balanced, direct-draft, frictional rolling elevator mechanism having a pair of friction-drums and an interposed rolling thrust member, over and under which drums the elevator-rope is coiled, said mechanism constituting an intermedium for delivery of power from a motor to the rope from which an elevator-car is suspended, while the opposite end or part of said rope holds in suspension a suitable weight.

The improvements consist in features of novelty hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a side elevation of an elevator structure, illustrating my invention, partly in section, on the line 1 1, Fig. 3. Fig. 1ª is a detail elevation illustrating a modification in connecting the rope with the car. Fig. 2 is a front elevation illustrating one form of driving mechanism. Fig. 3 is a front elevation of the elevator structure. Fig. 4 is a front elevation of another form of driving mechanism, partly in section. Fig. 5 is a detail transverse section on the line 5 5, Fig. 4.

The elevator-car runs on customary vertical guide-rails (not shown) and is suspended by any desirable number of ropes 2, passing over a suspension-sheave 3 at top of the car-well, from whence they descend and are attached to a guided counterbalance-weight 4. From the bottom of this weight ropes 5 are carried downward beneath a pair of friction-drums 6 7, embracing the said drums and extending over and under the same in a sufficient number of coils to effect the movement of the car by the friction of the ropes on the drums, the drums being so mounted and placed as to guide the ropes straight from drum to drum. I have shown for the purpose of illustration suspension-ropes 2 from the car 1 to the top of the counterbalance-weight 4 (four in number) and two ropes 5 from the bottom of the weight 4, carried to the friction-drums near the ends of the latter, from whence the coils approach the longitudinal centers of the drums and are then carried upward, as shown at 5ª, over a suspension-sheave 8, from which they descend, as shown at 5ᵇ, to a tension-weight 9, the gravity of which maintains the necessary friction of the rope on the drums 6 7 to run the car, the interposed weight 4 between the car and the drums being so proportioned as to nearly and not quite counterbalance the weight of the car when light.

The shafts of the drums 6 7 run in suitable boxes 23, so mounted in suitable guiding-standards 24 as to permit the mutual approach of the drums under the pressure of the ropes coiled thereon. The mutual inward pressure of the drums is sustained by an interposed thrust member or members on the driving-shaft 12. The interposed thrust members may consist, as illustrated in Figs. 3 and 4, of friction pulleys or pinions 11 on the driving-shaft 12, which receive the inward thrust and pressure from enlargements or pulleys 6ª 7ª, rigidly mounted on the respective drums 6 7 and preferably formed integrally therewith. If preferred, an interposed thrust-drum 11ª, as illustrated in Fig. 2 and of any preferred diameter relatively to the drums 6 7, may be keyed on the shaft 12, sustaining direct pressure from the drums and imparting rotation thereto, and the drum pulleys or enlargements 6ª 7ª being dispensed with. The driving-shaft 12 runs in fixed bearings 13 and is driven by a motor 14 of any approved form and controlled in any suitable manner.

The transmission of power from the shaft 12 to the friction-drums may be wholly through the interposed friction thrust member or members, or it may be made positive by spur-gearing 21 22, as illustrated in Fig. 4, or worm-gearing 21ª, as illustrated in Fig. 2, connecting the motor-shaft 12 to one or both of the drum-shafts.

If preferred, friction thrust-pulleys 11ᵇ may be employed, as shown in Fig. 4, having loose movement on the motor-shaft 12, limited by tongues 19 on said shaft playing in radial recesses in the respective pulleys 11ᵇ, as shown in the detail section, Fig. 5. This loose or lost motion of the friction-pulleys 11ᵇ on the motor-shaft 12 enables the positive driving of the drums 6 7 by a cogged pinion 20, keyed

on the motor-shaft 12 and gearing with cog-wheels 21 22, keyed on the shafts of the respective drums 6 7. The extent of the possible lost motion of the friction-pulleys 11^b relatively to the motor-shaft 12 should be in excess of any possible lost motion between the teeth of the gearing 20 21 22, taking into consideration the wear of said teeth. With this last-described device the friction-drums 6 7, by which the elevator-ropes are operated, will be driven positively by cog-gearing, or in the event of breakage or derangement of this gearing the motor-shaft 12 will drive or hold the drums 6 7 by friction through the medium of the friction-pinions 11^b.

The motor-shaft 12 and drums 6 7 may be operated by electricity, steam, water, or any preferred power applied in any suitable manner. I have further shown at 18 a friction-brake which may be made to hold the motor-shaft and drums or retard their motion, as required, and this in common with the motor may be controlled from the car through the medium of electric or other connections and a proper power-controlling mechanism. With a motor adapted to hold the load when stationary the brake may be dispensed with.

A customary automatic safety device is of course employed connected to the car to arrest its motion in event of the car attaining too great velocity by reason of breakage of ropes or from other causes.

From the above description it will be apparent that the combined effective weight of the car 1 and tension-weight 9 on the opposite ends of the suspension-rope 4 will tend to draw the friction-pulleys 6^a 7^a into forcible frictional contact with the interposed friction-pinions 11 on the driving-shaft 12, so that the rotary motion of the driving-shaft will cause rotation to the drums 6 7, over and under which, respectively, the suspension-cable is coiled the requisite number of times to give adequate friction to the rope for raising and lowering the car and also to draw the frictional members of the drums and the interposed motor-shaft into contact with any requisite force. The surfaces of the drums, wheels, and pinions may be grooved, if preferred, or may be of suitable material to increase the friction.

The tension-weight 9 is guided between vertical rails 25. An adjustable and cushioned rest 26 is provided, upon which the tension-weight 9 is received and supported in the event of the car rising beyond the proper upper limit of its movement. The effect of this is to relieve the tension of the ropes 5 on the friction-drums 6 7 and render it impossible to raise the car against the upper beams of the elevator-well in case of failure of the operator or controlling mechanism to control the car. The cushioning construction of the safety-rest prevents a too-sudden stop or jar of the tension-weight when it comes in contact therewith. The said rest is preferably constructed with a horizontal bar 26, faced with substantial yielding material and mounted in position to receive the weight 9 on guiding standards or bolts 27, one at each end, one of which appears in Fig. 1, the other being hidden by the hoisting mechanism. The standards or bolts 27 are (one or both) pivoted below, as shown at 29, and they are surrounded by springs 28, of suitable material, affording yielding support to the bar 26. Each of the said standards is formed with a detent notch or recess 30, adapted to engage the oblique side of the orifice in the bar 26, as shown in section in Fig. 1, when the bar is depressed by contact of the frame of the counterweight 9, a spring 31, contained in a socket in the end of the bar 26, yielding as the bar descends and then forcing the standard forward into engagement with the bar, so as to hold the latter in its depressed position and prevent upward recoil. This locking of the bar 26 in depressed position does not occur in the normal and proper operation of the elevator. When it has occurred, to prevent the possibility of the car running beyond its proper limit the bar 26 is afterward released by hand to restore it to operative position.

By applying the counterbalance-weight 4 between the suspension-sheave and the friction-drums the weight 9, connected to the end of the rope, is made to serve for tension to maintain the friction of the hoisting-ropes on the drums and to permit the automatic relief of such friction on emergency, as above explained, while the interposed counterweight 4 might be dispensed with by a corresponding increase of the weight 9. The function of the car-counterweight 4 is quite useful in decreasing the upward strain on the fixed bearings of the motor-shaft.

The rope 2 may, if preferred, be connected to the car through the medium of a sheave 32, as illustrated in Fig. 1^a, so as to increase the motion of the rope and reduce tension thereon.

It will be apparent that the drums 6 7 and their accessories may be arranged in any preferred and suitable position relatively to the elevator well and car.

In my invention strain and friction on the drum-shaft bearings are practically eliminated by the equalized and balanced strains applied to the drums by the coiled ropes, the drums being mounted in vertical position with interposed thrust members, as shown. The weight 4 is adapted to approximately balance the car, the weight of the hoisting-drums and their accessories is adapted to approximately balance the strain on the fixed motor-shaft bearings, due to the resistance of the motor or brake to the load of the car, and the weight of said drums and accessories being proportioned to a fixed or average load, as the case may be, the strain and friction on said bearings will be reduced accordingly. Within certain limits and under fixed conditions of load, which often obtain, the motor mechanism may be practically balanced. Any preponderant weight of the car and its load

beyond that which is counterbalanced by the counterbalance-weight 4 is of course sustained by the motor or brake through the medium of the friction-drums, so that the greater the load he greater the friction between the rope and the drums, and vice versa.

Figs. 1 and 3 of the drawings show the top and bottom portions of the elevator structure, the car being represented at the upper end of its run and the ropes cut to indicate indefinite length.

Having thus described my invention, the following is what I claim as new therein and desire to secure by Letters Patent:

1. In an elevator, the combination of the friction-drums 6, 7, suitable boxes in which the shafts of the drums have their bearings, permitting their relative approach; an interposed rolling thrust member, sustaining the mutual inward pressure of the drums; an elevator-car; a suspension-sheave at top of the car-well; a rope from which the car is suspended from the top of the car-well, and passing over the suspension-sheave, down to and around the friction-drums, and extending in coils over and under the same; and a tension-weight acting on the rope beyond the drums, substantially as and for the purposes set forth.

2. In an elevator, the combination of the friction-drums 6, 7, suitable boxes in which their shafts have their bearings, permitting their relative approach; an interposed shaft carrying a frictional rolling driving thrust member sustaining the mutual inward pressure of the drums; an elevator-car; a suspension-sheave at top of the car-well; a rope from which the car is suspended from the top of the car-well passing over the suspension-sheave, down to and around the friction-drums and extending in coils over and under the same; and a tension-weight acting on the rope beyond the drums, substantially as and for the purposes set forth.

3. In an elevator, the combination of the friction-drums 6, 7, mounted one above the other, suitable boxes in which the drum-shafts have their bearings, permitting the relative approach of the drums; an interposed shaft carrying frictional rolling thrust members, sustaining the mutual inward pressure of the drums; an elevator-car; a suspension-sheave at top of the car-well; a rope from which the car is suspended, passing up over the suspension-sheave, down to and around the friction-drums and extending in coils over and under the same; a tension-weight acting on the rope beyond the drums; and a suitable brake to arrest the movement when required, substantially as and for the purposes set forth.

4. In an elevator, the combination of friction-drums 6, 7; suitable boxes in which the shafts of said drums have their bearings, permitting their relative approach; an interposed rolling driving thrust member, sustaining the mutual inward pressure of the drums; an elevator-car; a suspension-sheave at top of the car-well; a rope from which the car is suspended, passing up over the suspension-sheave, down to and around the friction-drums and extending in coils over and under the same; a tension-weight acting on the rope beyond the drums; and a car counterbalance-weight applied to the rope between the upper suspension-sheave and the friction-drums, substantially as and for the purposes set forth.

5. In an elevator, the combination of friction-drums 6, 7, mounted one above the other in boxes permitting their relative approach; an interposed rolling, frictional thrust member, sustaining the mutual inward pressure of the drums; an elevator-car; a suspension-sheave at top of the car-well; a rope from which the car is suspended, passing up over the suspension-sheave, down to and around the friction-drums and extending in coils over and under the same; and a tension-weight acting on the rope beyond the drums, substantially as and for the purposes set forth.

6. In an elevator, the combination of friction-drums 6, 7, mounted one above the other in slidable boxes permitting their relative approach; an interposed rolling frictional thrust member, sustaining the mutual inward pressure of the drums; an elevator-car; a suspension-sheave at top of the car-well; a rope from which the car is suspended, passing up over the suspension-sheave, down to and around the friction-drums and extending in coils over and under the same; and a tension-weight acting on the rope beyond the drums, substantially as and for the purposes set forth.

7. In an elevator, the combination of friction-drums 6, 7, mounted in suitable boxes permitting their relative approach; an interposed rolling frictional thrust member sustaining the mutual inward pressure of the drums; an elevator-car; a suspension-sheave at top of the car-well; a rope from which the car is suspended passing up over the suspension-sheave, down to and around the friction-drums and extending in coils over and under the same; a tension-weight acting on the rope beyond the drums operating to draw the rope into tight frictional contact with the drums; and a rest with which the tension-weight comes in contact near the bottom of its movement to relieve the friction of the rope on the drums and thereby arrest the upward movement of the car when it reaches a predetermined height, substantially as explained.

8. In an elevator, the combination of friction-drums 6, 7, mounted in suitable boxes permitting their relative approach; a driving-shaft extending between the drums having a rolling thrust member sustaining the mutual inward pressure of the drums; positive gearing between the said drums and interposed thrust-member shaft; an elevator-car; a suspension-sheave at top of the car-well; a rope from which the car is suspended, passing up over the suspension-sheave, down

to and around the friction-drums and extending in coils over and under the same; and a tension device acting on the rope beyond the drums, to draw the rope into tight frictional contact with the drums and the frictional surfaces of the drums into forcible contact with the interposed rolling thrust member, substantially as and for the purposes set forth.

9. In an elevator, the combination of the drums 6, 7, mounted one above the other, slidable boxes in which the shafts of said drums have their bearings, permitting the mutual approach of the drums; a driving-shaft interposed between the drums, and imparting rotation thereto, carrying a rolling frictional thrust member, sustaining the mutual inward pressure of the drums; an elevator-car; a suspension-sheave at top of the car-well; a rope from which the car is suspended, passing up over the suspension-sheave, thence down to a counterbalance-weight and from thence down to and embracing the drums, and extending in coils over and under the same; a tension-weight acting on the rope beyond the drums; a rest with which the tension-weight comes in contact near the lower limit of its run, to relieve friction of the rope on the drums and thereby arrest the ascent of the car when it reaches a determined height; and a brake suitably located to arrest the movement and hold the car at any desired point, substantially as set forth.

MICHAEL E. NEENAN.

Witnesses:
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