No. 753,135. PATENTED FEB. 23, 1904.

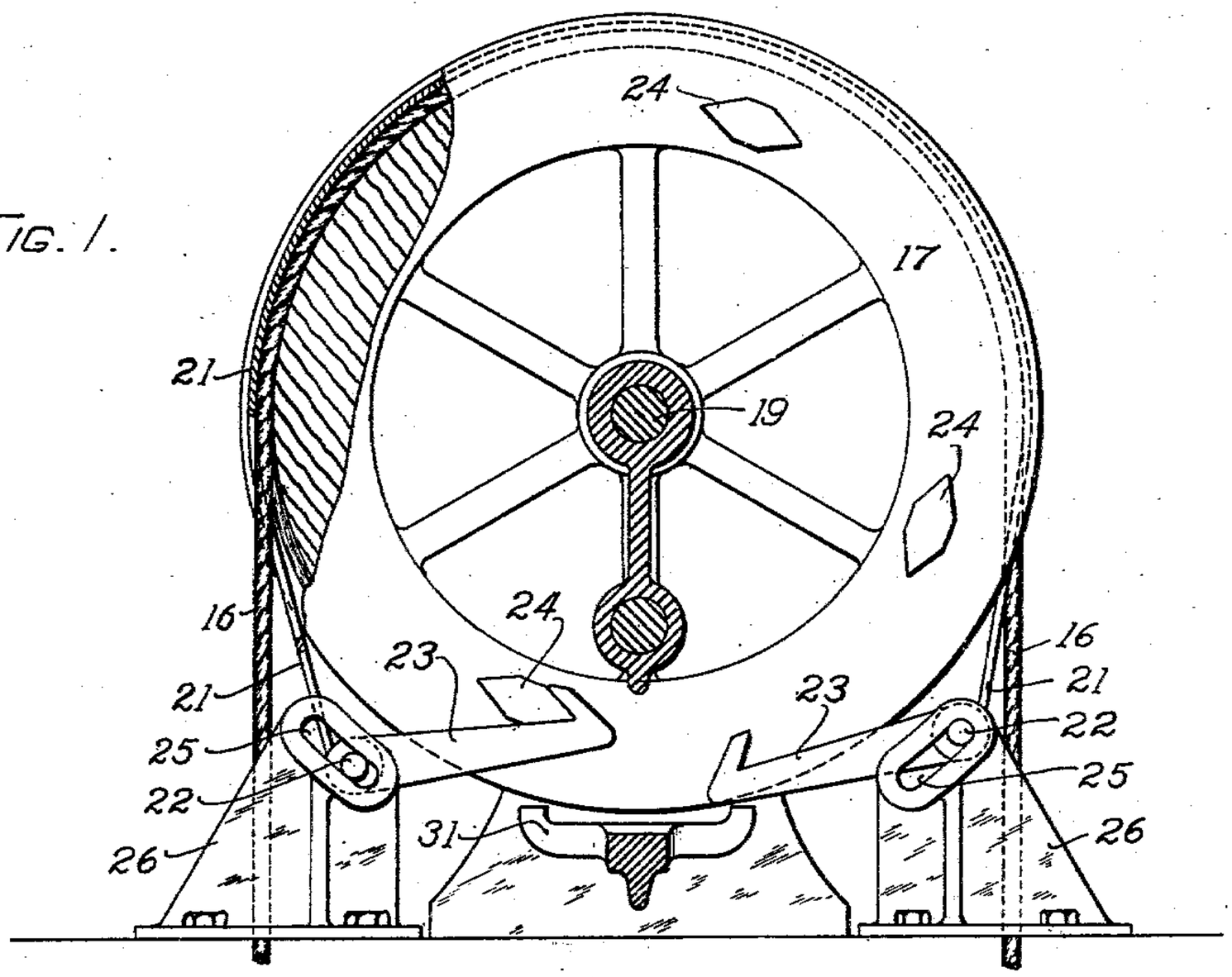
M. HANFORD.

ELEVATOR SAFETY APPARATUS.

APPLICATION FILED APR. 27, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

FIG. 1.



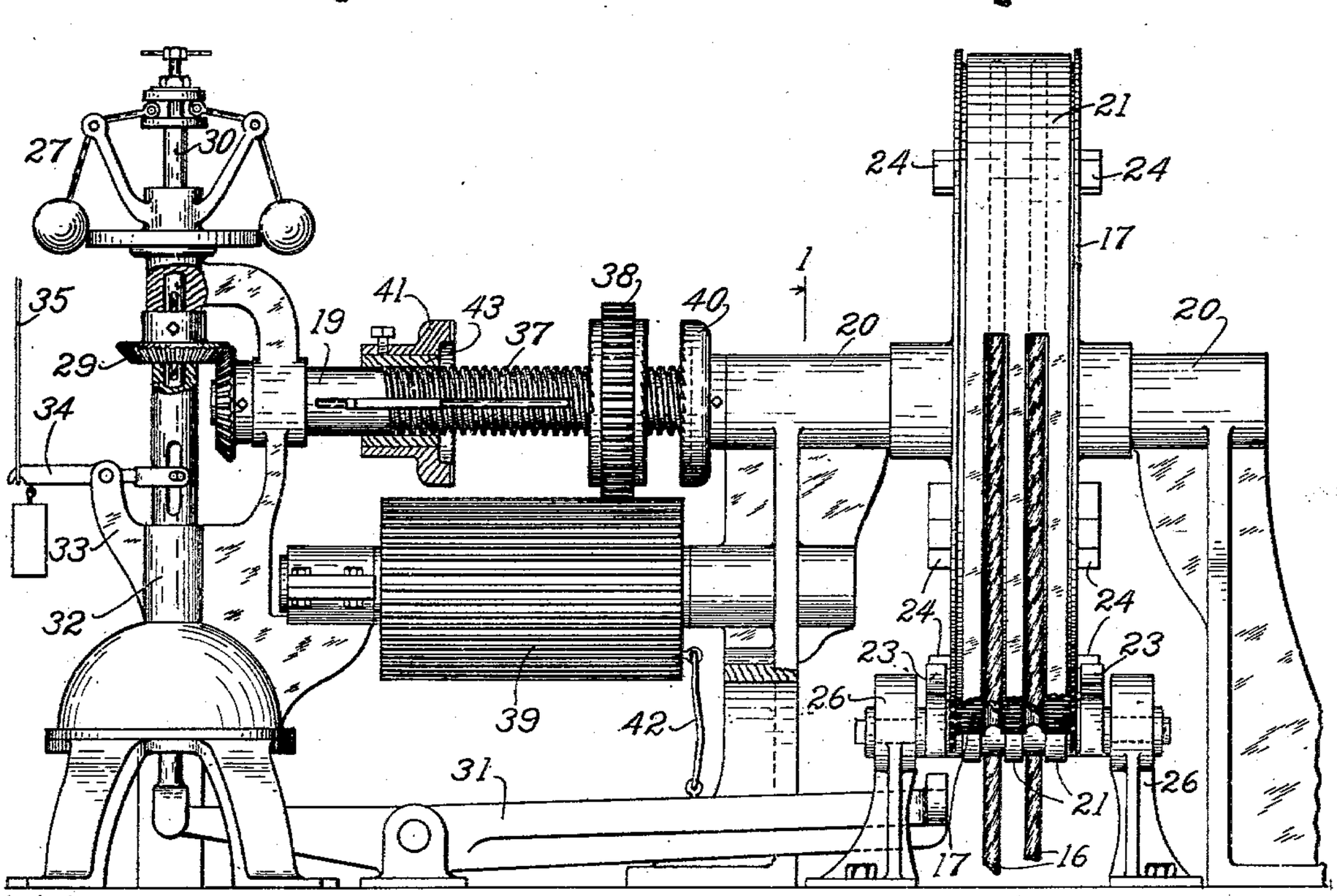


FIG. 2.

WITNESSES:
A. T. Palmer
H. N. Ladd

INVENTOR
Melancthon Hanford,
by S. A. Reed & Co., Attys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 753,135. PATENTED FEB. 23, 1904.

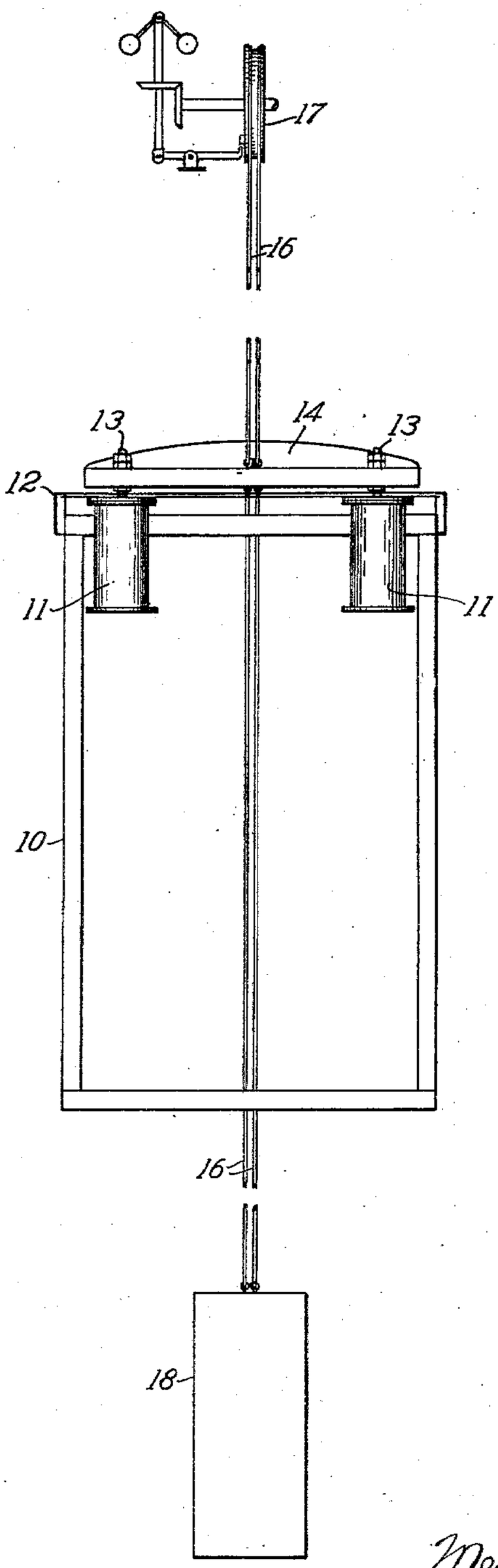
M. HANFORD.

ELEVATOR SAFETY APPARATUS.

APPLICATION FILED APR. 27, 1903.

NO MODEL. 2 SHEETS—SHEET 2.

FIG. 3.



WITNESSES
A. F. Palmer
H. W. Ladd

INVENTOR
Melancthon Hanford
by S. N. Spencer
atty

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 753,135. Patented February 23, 1904.

UNITED STATES PATENT OFFICE.

MELANCTHON HANFORD, OF MALDEN, MASSACHUSETTS.

ELEVATOR SAFETY APPARATUS.

SPECIFICATION forming part of Letters Patent No. 753,135, dated February 23, 1904.

Application filed April 27, 1903. Serial No. 154,556. (No model.)

To all whom it may concern:

Be it known that I, MELANCTHON HANFORD, of Malden, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Elevator Safety Apparatus, of which the following is a specification.

This invention is in the nature of an improvement on the elevator safety apparatus set forth in my United States Letters Patent No. 703,127, dated June 24, 1902. In said patent air-chambers permanently mounted at top of the elevator-well are provided with movable pistons normally held at the top of said chambers with their downwardly-projecting piston-rods secured to strong safety-cables extending thence at each side of the elevator-car to the bottom of the well, and gripping devices on the car, manually or automatically actuated when any failure of the hoisting-ropes occurs, instantly clutch the safety-cables and cause the car to be thereby stopped and supported on the pneumatic cushions beneath the pistons in said air-chambers.

By my present improvement the air-chambers, one or more, are carried on the elevator-car at either end. These chambers are closed at top or at both ends, with movable pistons at bottom, and the upwardly-projecting piston-rods extend, preferably, to a cross-beam above the car, such beam being connected to wire cables running over a grooved sheave or drum mounted at top of the elevator-well and thence downwardly to connect with a counterweight. The sheave or drum has a plurality of lateral lugs with which hooks actuated by a governor connection and levers engage automatically to support the car by pressure of a brake-band on said cables on the instant of any failure of the hoisting apparatus. The devices insuring action of the brake-band when required, either in the upward or downward movement of the car, also form part of my present invention, as do the means herein set forth for stopping the upward or downward movement of the car automatically at the end of its desired trip and for adjusting the length of such trip from time to time.

In the drawings, Figure 1 is an end view, partly in section, of the sheave or drum, showing the safety hooks and lugs. Fig. 2 is a side elevation, with parts in section, showing details of the invention. Fig. 3 is a diagram illustrating a suitable position of the air-chambers on the elevator-car.

In Fig. 3, 10 designates the elevator-car, which may be of any preferred construction and furnished with any suitable hoisting mechanism. 11 represents air-chambers carried on the car and preferably placed at the top thereof, where they are firmly secured to the frame in any suitable manner, as by substantial steel bars or bands 12 from the car bottom and sides engaging radial flanges on the cylindrical chambers or broad bars over their upper ends. To avoid interference with the hoisting-ropes, the air-chambers are shown placed at each side of the car-top, and their projecting piston-rods 13 are transversely connected by a cross-beam 14, so as to be operated simultaneously in case of any failure of the apparatus. These piston-rods extend downwardly to or nearly to the bottom of the air-chambers and are there provided with pistons transversely filling such chambers, so as to have a sliding fit therein, and by their movement to secure the resistance due to air compression or exhaust action, or both. Wire cables 16 run from the cross-beam 14, over a grooved sheave 17, connecting at bottom with a counterweight 18, which may be the usual counterweight of the car. The cross-beam may, however, be omitted and the cables directly connected to the piston-rods, two distinct sheaves and counterweights being provided.

The details of construction and operation of the gripping mechanism are illustrated on a larger scale in Figs. 1 and 2. The sheave 17 is a heavy grooved wheel fixed on a shaft 19 mounted in bearings 20, suitably supported. A substantial brake-band 21 extends in a semicircle over the sheave with barely space between them for the free movement of the cables 16 in ordinary use. The end portions of the brake-band are slotted or cut away to permit this vertical movement, the ends of the brake-band being drawn obliquely inward, as in Fig. 1, and secured by terminal

transverse bolts 22 to heavy hooks 23, which in pairs engage lugs 24, formed on or bolted to each side of the sheave whenever this brake is applied to the cables. There is a plurality of these lugs on each side of the sheave, so as to be near enough together for speedy engagement of one pair of them by one pair of the hooks 23 in case of any accident to the hoisting mechanism requiring the use of the safety apparatus. The projecting ends of the bolts 22 enter and have a limited lateral movement in oblique slots 25, formed in the flanged castings 26, such movement being sufficient to draw the brake-band down into binding contact with the cables when required. The hooks are reversed, as shown in Fig. 1, one pair being operative in case of accident when the car is going up and the other during the downward trip. The normal position of the hooks is shown on the right side of Fig. 1, where hook 23 is dormant. When both hooks are disengaged, tension on the brake-band is relaxed and its resilience springs its ends outwardly, causing the bolts 22 to rise in their slots 25, thereby lifting the brake out of clamping contact with the cables.

The gripping mechanism described is dormant under ordinary circumstances, but, as shown in Fig. 2, is automatically actuated by the governor 27 should the hoisting-ropes fail. The shaft 19, on which the sheave 17 is fixed, is connected by bevel-gearing 29 to the governor-shaft 30. The instant the elevator-car begins to fall the governor-arms separate, depressing shaft 30, the foot of which bears down on the short arm of a pivoted lever 31, causing its long arm to lift the hooks 23 into immediate engagement with the first pair of lugs 24, thereby arresting rotation of the sheave and gripping the cables between it and the brake-band, as shown at the left side of Fig. 1. The lever 31 is duplicated or forked at its free end, as in Fig. 1, so as to act on both the right-hand and left-hand hooks.

The gripping mechanism described may be manually operated and tested from the elevator-car when desired. For this purpose the governor-standard 32 has an arm 33, on which is pivoted a lever 34, connected at one end through a slot in the standard to the governor-shaft 30. A cord 35, secured to the free end of lever 34, as in Fig. 2, runs over pulleys and through the moving car, where it may be gripped at will by the operator, thereby depressing the governor-shaft 30 and causing the lever 31 to lift the hooks 23 into engagement with the lugs 24, thus stopping the sheave, clamping the cables, and arresting the descent of the car.

Figs. 1 and 2 also illustrate automatic devices for stopping the upward and downward movement of the car at the end of each regular trip, such devices being shown as adjustable to vary the prescribed length of such trips. Shaft 19 of the sheave 17 is externally threaded, as at 37, for a portion of its length and carries a spur gear-wheel 38, internally threaded, to traverse it and having on its vertical sides ratchet-teeth reversely arranged. The peripheral teeth of wheel 38 engage and longitudinally traverse the elongated teeth of a geared drum 39, which does not revolve, but has a partial oscillation when the elevator-car reaches the normal limit of its upper or downward trip. This oscillatory movement is caused by the ratchet-teeth on either side of the traversing wheel or nut 38 engaging corresponding teeth on ratchet-collars 40 and 41, fixed on shaft 19 at the ends of part 37. Such engagement forces the wheel 38 to turn slightly with said shaft in one direction when the car is at its upper limit and wheel 38 clutched to ratchet-collar 40 and in the opposite direction when the lower limit is reached and said wheel is laterally engaged by the teeth of ratchet-collar 41. The geared drum 39 is connected by a link 42 or equivalent device to the lever 31, and when the described oscillation occurs said lever is lifted by such link until one of the lever-arms raises hook 23 into engagement with a lug 24 of the sheave and arrests the vertical movement of the car, the air-cushions relieving any incidental jar which might otherwise be felt.

Ratchet-collar 41 is shown as secured by a set-screw to a bushing 43, which is adjustable along shaft 19 or 37 by a longitudinal spline therein. This permits of increasing or diminishing from time to time the length of the elevator trip before movement of the car is automatically stopped by the devices last described. Both the ratchet-collars may be made adjustable.

I claim as my invention—

1. In an elevator safety apparatus, the car-frame, air-chambers suitably secured to and carried on the car-frame, with inclosed pistons and projecting piston-rods, in combination with safety-cables suitably connected to such pistons, with a rotatable sheave therefor at top of the elevator-well, and with gripping mechanism adapted to arrest the downward movement of said cables and thereby support the car on air-cushions carried upon it, in case of failure of the hoisting apparatus.

2. In an elevator safety apparatus, the car-frame, air-chambers suitably secured to and carried on the car-frame with inclosed pistons, and projecting piston-rods transversely connected by a cross-beam, in combination with safety-cables secured to said beam, with a rotatable sheave therefor at top of the elevator-well, and with gripping mechanism adapted to arrest the downward movement of said cables and thereby support the car on cushions carried upon it, in case of failure of the hoisting apparatus.

3. In an elevator safety apparatus, the car-frame, air-chambers suitably secured to and carried on the car-frame, with inclosed pistons,

projecting piston-rods and safety-cables suitably connected to such pistons, with a rotatable sheave therefor at top of the elevator-well and with a counterweight, in combination with a gripping apparatus comprising a brake-band anchored to the sheave-supports and applied to said cables where they pass over the sheave, hooks mounted on said support and adapted to engage lateral lugs on the sheave, and means for engaging said hooks and lugs when it is desired to support the car on its air-cushions.

4. In an elevator safety apparatus, the car-frame, air-chambers suitably secured to and carried on the car-frame, with inclosed pistons, safety-cables suitably connected to said pistons and a rotatable sheave over which said cables pass, in combination with a friction brake-band and mechanism automatically actuated by a governor and adapted to arrest the descent of the car and support it on air-cushions carried thereon, in case of failure of the hoisting apparatus.

5. In an elevator safety apparatus, a rotatable sheave fixed on a horizontal shaft at the top of the elevator-well, cables connected to the car-frame and running over said sheave, and ratchet-collars fixed on said shaft at each end of a threaded portion thereof and formed with reversely-set ratchet-teeth on its opposite faces, in combination with a spur-gear internally threaded to engage with and traverse the threaded portion of such shaft, an oscillatory drum having longitudinal teeth in its periphery traversed by the peripheral teeth of said spur-gear, a lever linked to said drum, and gripping mechanism automatically actuated through said lever to arrest the vertical movement of said cables at the desired terminal points.

In testimony whereof I have affixed my signature in presence of two witnesses.

MELANCTHON HANFORD.

Witnesses:

A. H. SPENCER,

H. W. LADD.