R. C. SMITH.

ELEVATOR SAFETY DEVICE.

APPLICATION FILED AUG. 31, 1908.

991,658.

Patented May 9, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

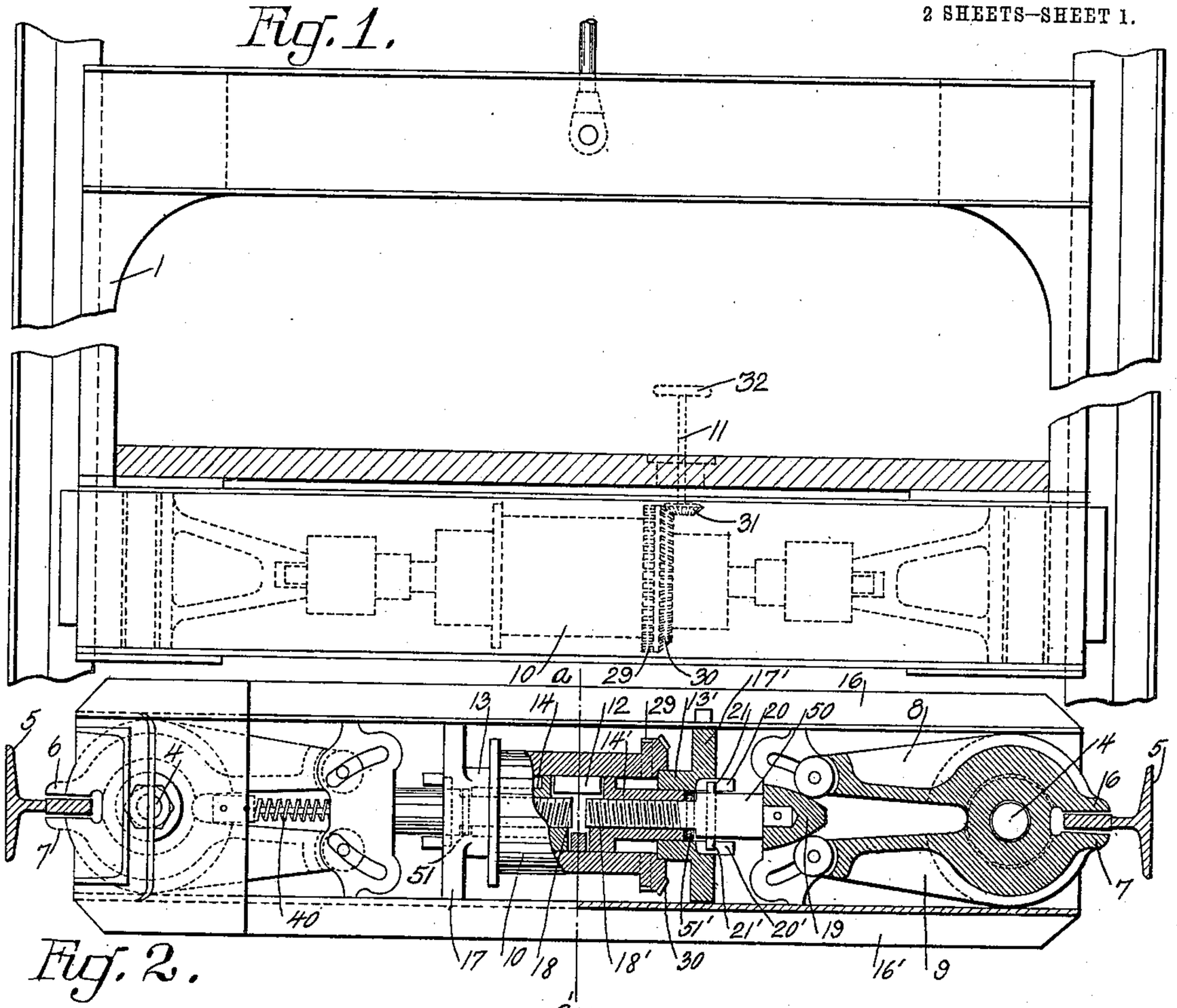


Fig. 2.

Fig. 3.

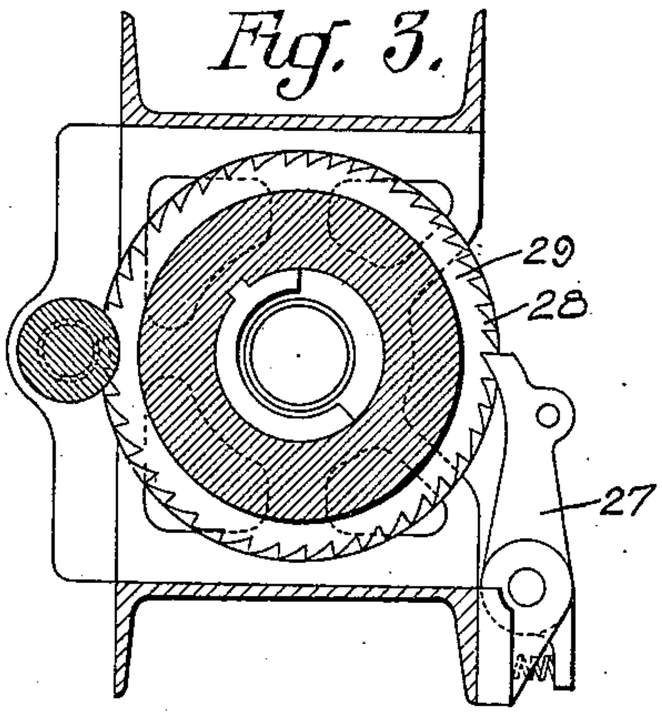


Fig. 4.

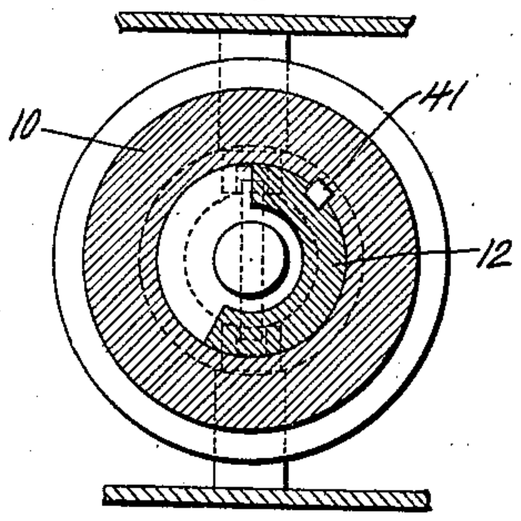
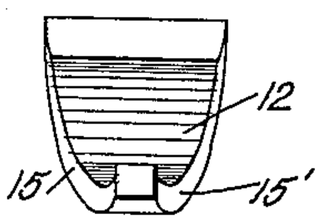


Fig. 5.



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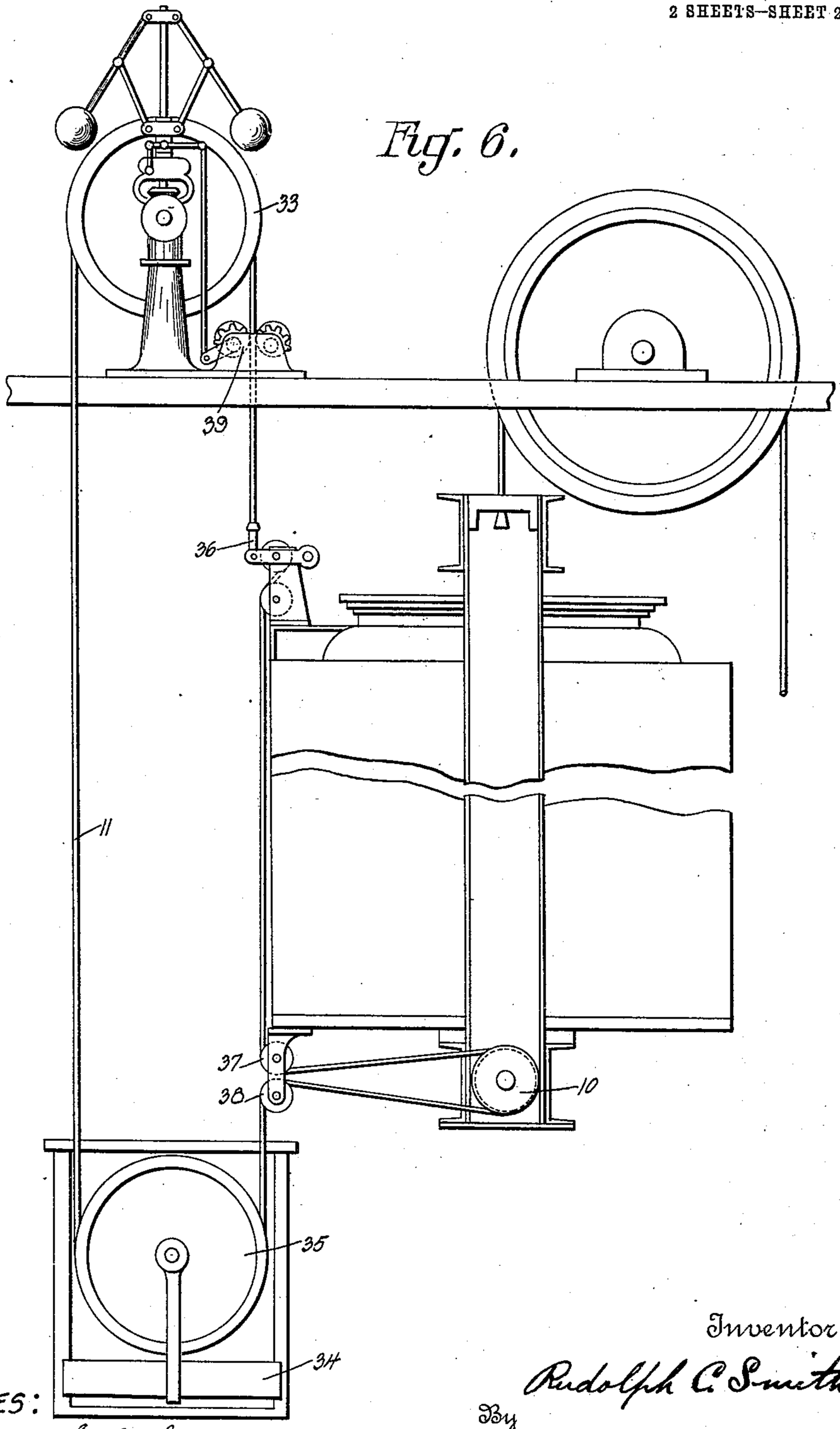
2 SHEETS—SHEET 2.

Fig. 6.



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UNITED STATES PATENT OFFICE.

RUDOLPH C. SMITH, OF YONKERS, NEW YORK, ASSIGNOR TO OTIS ELEVATOR COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

ELEVATOR SAFETY DEVICE.

991,658. Specification of Letters Patent. Patented May 9, 1911.

Application filed August 31, 1908. Serial No. 451,045.

To all whom it may concern:

Be it known that I, RUDOLPH C. SMITH, a citizen of the United States, residing in Yonkers, in the county of Westchester and State of New York, have invented a new and useful Improvement in Elevator Safety Devices, of which the following is a specification.

My invention relates to elevator safety devices, and more particularly to that type of car brake in which gripping jaws carried by the car are adapted to grip the stationary vertical guide rails on opposite sides of the car.

The present application discloses a modification of the construction set forth and claimed in my co-pending application, Serial No. 289,431, filed November 28, 1905, and one of the objects of the present invention is the provision of an improved construction for insuring the proper successive operation of the means for quickly bringing the gripping jaws into contact with the guide rails, and the means for securing a continued operation of the jaws to powerfully grip the guide rails.

Other objects of the invention will appear hereinafter, the novel combinations of elements being pointed out in the appended claims.

In the accompanying drawings, Figure 1 represents an elevator car with my improved safety device attached thereto; Fig. 2 is a bottom plan view of the safety device of Fig. 1; Fig. 3 illustrates a means for holding the drum of the safety device in position; Figs. 4 and 5 show in detail the actuating cam for moving the clamps into engagement with the guide rails; and Fig. 6 illustrates diagrammatically the governor mechanism for automatically effecting the operation of the safety device when the car speed is excessive.

In Fig. 1 is shown an elevator car 1, beneath the floor of which is suitably mounted my improved safety device. Wedge clamps pivoted at 4, 4 and comprising clamping jaws 6, 6 and 7, 7 are adapted to engage the stationary guides or T-rails 5, 5, and thus effect a stopping of the car. Normally, the jaws should preferably be held wholly out of engagement with said guides by means of springs 40, 40 acting on the arms 8, 8 and 9, 9 of the clamping apparatus. This being of well known construction, however, it is not disclosed in detail.

Rotatably mounted intermediate the clamps on bearings such as shown at 13, 13′ is the safety drum 10 on which the governor rope 11 (Fig. 6) is wound one or more times. Connected to the interior of the drum by means of a key 41, Fig. 4, is a V-shaped cam 12 shown in detail in Fig. 5. This cam may be loosely connected to the drum or rigidly secured thereto, or it may be integral with the drum. It may also be connected to the drum through intermediate means, as gearing, for example. Although Fig. 4 illustrates this cam extending through an arc of a little more than 180°, this arc may be varied as desired, and, furthermore, the particular shape of the cam may also be varied without changing the principle of my invention. Also within the drum 10 and in close proximity to the cam 12 are traveling nuts 14, 14′ which are here shown in the form of sleeves. The inner ends of these sleeves opposite the sides 15, 15′ of the cam 12 preferably conform in shape to said cam, so that said ends may be substantially parallel with said sides and at a short distance therefrom throughout when the safety is set. The peripheries of the inner ends of the sleeves are in loose frictional engagement with the interior of the drum 10 so that when said sleeves are actuated longitudinally outward they will be properly guided. The outer ends of the sleeves are adapted to slide back and forth in the cylindrical interiors of the drum bearings 13, 13′. The latter are rigidly secured to the beams 16, 16′ by suitable supports such as shown at 17, 17′.

Both sets of clamping jaws and the connections between the same and right and left-hand screws 18, 18′ may be considered in its entirety a clamping device, or each set and its connections may be termed a clamping device. Normally, the sleeves and the screws 18, 18′ are in frictional engagement with each other and move together when the cam 12 is rotated to move the clamping devices quickly into engagement with the guide rails. The combination of the sleeve and its screw forms a differential screw having a high pitch thread which is the inner face of the sleeve, and a low pitch thread which forms the screw in this instance rigidly connected to the wedge which operates

one set of clamping jaws. When the cam 12 is rotated it engages the threads of high pitch and positively moves the clamping devices quickly into engagement with the guide rails and the low pitch screws are arranged to effect a tightening of the clamping devices.

The sleeves 14, 14′ are internally screw-threaded to form nuts or rotary cams which fit over the screws 18, 18′, to the outer ends of which are secured the wedges 19, 19 for operating the clamps. Intermediate the wedges 19, 19 and screws 18, 18′ are suitable guides to direct the wedges longitudinally outward or inward. In this instance I have shown slots 20, 20 and 20′, 20′ in extensions of the drum bearings, in which slots are adapted to slide projections or pins 21, 21 and 21′, 21′ extending diametrically opposite each other through the bodies of the drum screws 18, 18′.

The screws 18, 18′ are each provided with an enlarged portion 50 having substantially the same diameter as the sleeves 14, 14′. Between the shoulders formed by the inner ends of these enlarged portions and the outer ends of the sleeves are placed rings or washers 51, 51′ of leather, rubber or other soft or compressible material having a high coefficient of friction. The purpose of this friction ring is to prevent relative rotation of the sleeves and screws until the clamping jaws have come in contact with the guide rails, as will appear more fully later.

After the drum has been rotated to stop the car, as hereinafter explained, its backward rotation is prevented by a spring-pressed pawl 27 acting on a ratchet 28 of a wheel 29 secured to the drum 10 or made integral therewith. In order to enable the drum to be rotated in resetting, the right-hand end of said drum is provided with bevel gear teeth 30 which are always in mesh with a small bevel gear 31 directly beneath the floor of the car. A key 32 may be inserted through the floor of the car to turn the gear 31, and consequently the drum 10 in either direction; that is, to effect the operation of the safety device to stop the car as desired or to rotate the drum back to its original position in resetting the same. In the latter case, however, the pawl 27 must be held in releasing position.

In Fig. 6 I have shown an ordinary governor at the top of the elevator well. Around the sheave 33 of the governor passes an endless rope 11 which is held taut by means of the weight 34 and sheave 35 at the bottom of the well. The governor rope has the usual yielding connection with the car 1 at 36 and then passes over directing pulleys 37, 38 mounted on the lower portion of the car, and thence one or more times around the safety drum 10 on the bottom of the car.

The operation of my improved safety device may be understood from the following explanation. Normally, the governor rope travels with the car and rotates the sheaves at the top and bottom of the well, and also the centrifugal governor mechanism. When the car speed exceeds a predetermined limit or becomes excessive, the governor operates the gripping device 39 to hold the governor rope stationary. The car continues to move to disconnect itself from the rope at 36, and therefore the safety drum 10 will begin to revolve. The motion of the drum 10 begins substantially at the same time that the governor rope is gripped and the cam 12 immediately wedges in between the sleeves 14, 14′ to force the same apart. The friction rings 51, 51′ at this time offer sufficient resistance to any relative movement of the screws and sleeves to prevent the sleeves turning on the screws, and thus insures the sleeves and screws being moved bodily longitudinally in an outward direction, carrying with them the wedges 19, 19. The clamps are therefore moved into engagement with the guides very quickly immediately after the governor mechanism above the elevator well operates to grip the governor rope. As soon as the clamps are thus brought into firm engagement with the guides so that the sleeves are held against being moved bodily outward any farther, the frictional engagement between the cam 12 and the sleeves causes the latter to rotate with the drum 10. The sleeves 14, 14′ will therefore be turned as nuts or rotary cams on the left and right-hand screws 18, 18′, respectively, to move the wedges 19, 19 outwardly still farther and transmit gradually increasing clamping power to the jaws 6, 6, and 7, 7. When the sleeves commence to rotate on the screws 18, 18′ the outward movement of the latter removes the pressure from the friction rings 51, 51′ so that they no longer have any tendency to prevent rotation of the sleeves. The projections 21, 21 and 21′, 21′ sliding in the slots 20, 20 and 20′, 20′, respectively, prevent the screws 18, 18′ from rotating, but limit their motion to a longitudinal one. The relative widths of the ends of the cam 12 may be varied as described, and the distance between the sides 15, 15′ and the inner ends of the sleeves 14, 14′ may be predetermined so that the jaws 6, 6 and 7, 7, shall engage with the guide rails 5, 5 within a predetermined time after the governor grips the governor rope. After the governor has once operated to set the drum 10 in motion, the latter will rotate until the car has stopped. In order to prevent the release of the clamps should the governor rope break, for example, I provide the pawl and ratchet mechanism shown in Fig. 3 where the pawl 27 is pivoted on the framework of the safety device and the wheel 29 having the ratchet

28 in its periphery is rigidly secured to the drum 10. It is therefore evident that when the governor mechanism grips the rope 11, the drum 10 is rotated by the continued motion of the car, and that the clamps are at once positively moved into engagement with the guide rails and this operation may take place during a certain distance of car travel. After this operation, the further actuation of the drums causes the clamps to be operated with gradually increasing power to bring the car gradually and positively to a stop with minimum shock or jar and also, if desired, within a predetermined distance. The power exerted by the drum and screw mechanism may be limited and regulated by the weight attached to the lower sheave around which the governor rope passes, or by the number of turns of the governor rope around the drum, or by both. Since the governor rope is not fastened to the drum 10, but merely in frictional engagement therewith, it will slip upon the tension exerted on the governor rope reaching a predetermined value less than what would injure the rope. For instance, after full power has been exerted to tighten the clamps onto the guides, the car, by reason of the heavy load, may continue to move a short distance farther, tending to put an excessive strain on the governor rope. In order to prevent breakage of the rope, therefore, I arrange the apparatus so that the governor rope shall slip on the drum at this time.

It is obvious that those skilled in the art may make various changes in the details and arrangement of parts without departing from the spirit and scope of my invention, and I desire therefore not to be limited to the precise construction disclosed.

Having thus fully described my invention, what I claim as new and desire to have protected by Letters Patent of the United Sates is:—

1. In a safety device for elevators, the combination with a car, of guides for the car, a clamping device, relatively movable clamp operating members, means to operate said members as a unit to move the clamping device to the guides and then to cause a relative movement of said members to tighten the clamping device on the guides, and a friction device of soft resilient material between said members.

2. In safety mechanism, the combination with a clamping device, of relatively movable clamp operating members, means for moving said members non-rotatably initially in a straight line as a unit and then imparting a relative rotary movement thereto to effect the operation of the clamping device, and a friction device between said members.

3. The combination with clamping mechanism, of an operating device comprising a rotatable and a non-rotatable member, means for effecting first a longitudinal movement and then a relative rotation of said members, and a friction device located between said members and resisting their relative rotation.

4. The combination with clamping mechanism, of a clamp operating device comprising relatively rotatable members having opposing faces, a friction ring interposed between said faces, and means for operating said members first together and then by a relative rotation thereof.

5. The combination with a clamp, of a clamp operating device comprising relatively movable members and a friction device of soft resilient material opposing the relative movement of said members, and means for imparting first a movement of said members together and then a relative movement in opposition to said friction device.

6. The combination with a screw-threaded member, of a threaded nut or sleeve working thereon, said parts having opposing faces, friction material interposed between said faces and resisting the relative rotation of said parts, means for moving the parts together and then effecting a relative rotation thereof, and a clamping device operated by said parts.

7. The combination with a non-rotatable screw-threaded member, of a threaded nut or sleeve thereon, a friction device between said parts, means for operating said parts, and a clamping device operated by said parts.

8. The combination with an internally screw-threaded sleeve, of a screw-threaded rod working in said sleeve and formed with a shoulder opposing the end of the sleeve, a ring of soft resilient friction material between said shoulder and the end of the sleeve, and means for effecting a longitudinal movement bodily and then a relative rotation of the rod and sleeve.

9. The combination with an internally screw-threaded sleeve, of a screw-threaded rod coöperating therewith, friction material compressed between said rod and sleeve and normally opposing their relative rotation, and means for imparting a longitudinal movement bodily to the sleeve and rod and then a relative rotation in a direction to release the friction material.

10. The combination with coöperating screw-threaded members, one of said members being provided with a cam surface, of positive means for holding the other of said members against rotation, a friction device interposed between said members, a cam engaging said cam surface, means for operating the cam, and a clamping device operated by said members.

11. The combination with a screw-threaded rod, of a sleeve threaded on the rod,

means for preventing the rod from rotating but permitting longitudinal movement thereof, a friction device interposed between said rod and sleeve, said sleeve being formed with a cam surface, a cam, means to operate the cam, and clamping mechanism operated by said rod.

12. In a safety device for elevators, the combination with a car, of guides for the car, a clamping device, screw-threaded cooperating members, positive means for preventing the rotation of one of said members a resilient friction device located between said members, a safety drum, and means carried thereby for effecting a longitudinal movement and then a relative rotation of said members to operate the clamping device.

13. In a safety device for elevators, the combination with a car, of guides for the car, a clamping device, a screw-threaded rod, means for guiding the rod in its longitudinal movements and preventing rotation thereof, a sleeve threaded on said rod and provided with a cam surface, a friction device between the rod and sleeve, a safety drum, a cam carried by the drum in position to engage said cam surface when the drum is rotated, means for rotating the drum and thereby effecting the operation of the rod and sleeve, and a device carried by the rod for operating the clamping device.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

RUDOLPH C. SMITH.

Witnesses:
JAMES G. BETHELL,
ERNEST L. GALE, Jr.