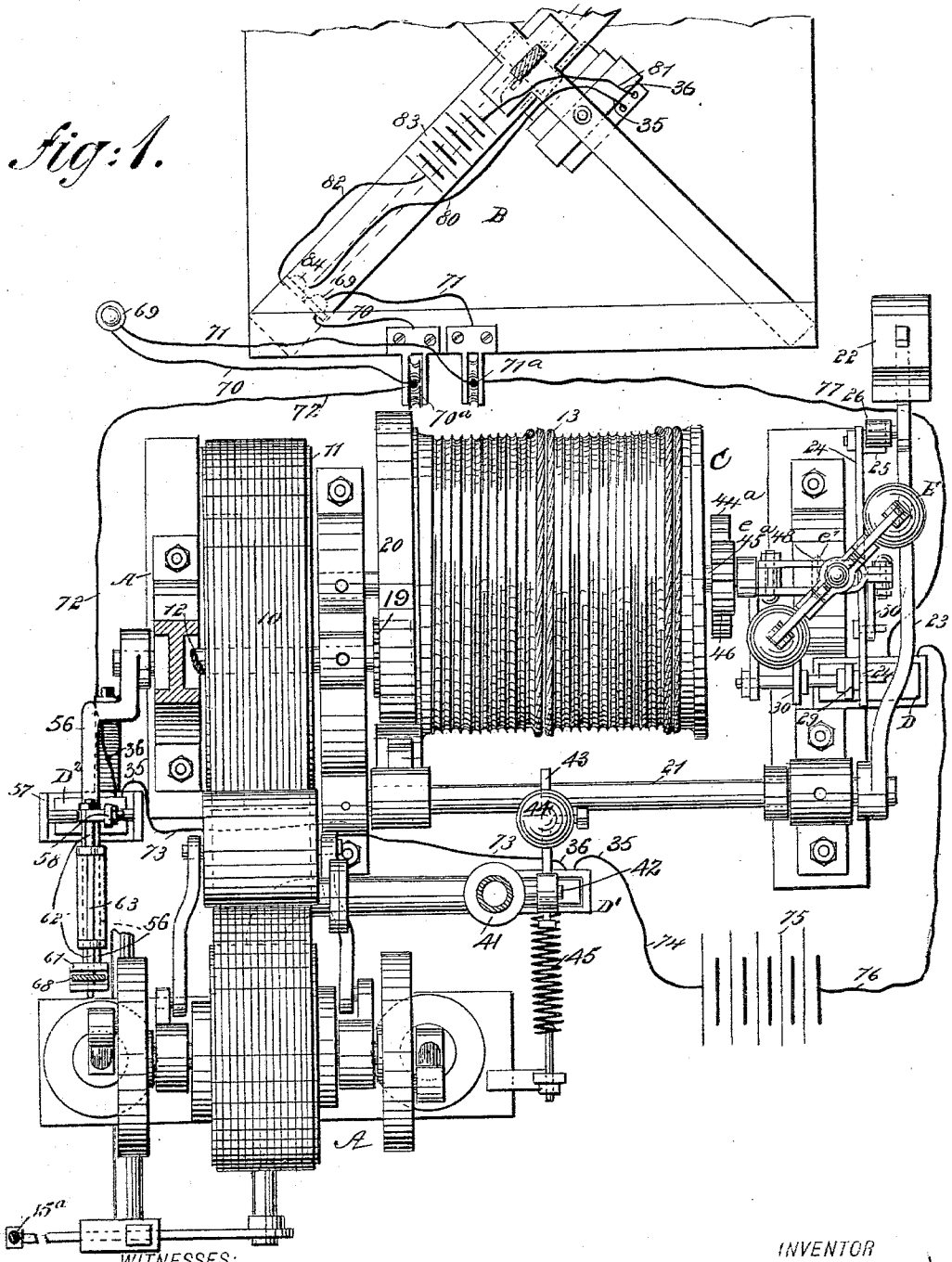
(No Model.) 5 Sheets—Sheet 1.

J. H. TENNYSON.

SAFETY APPLIANCE FOR ELEVATORS.

No. 559,633. Patented May 5, 1896.

Fig: 1.



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(No Model.) 5 Sheets—Sheet 2.

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SAFETY APPLIANCE FOR ELEVATORS.

No. 559,633. Patented May 5, 1896.

Fig. 2.

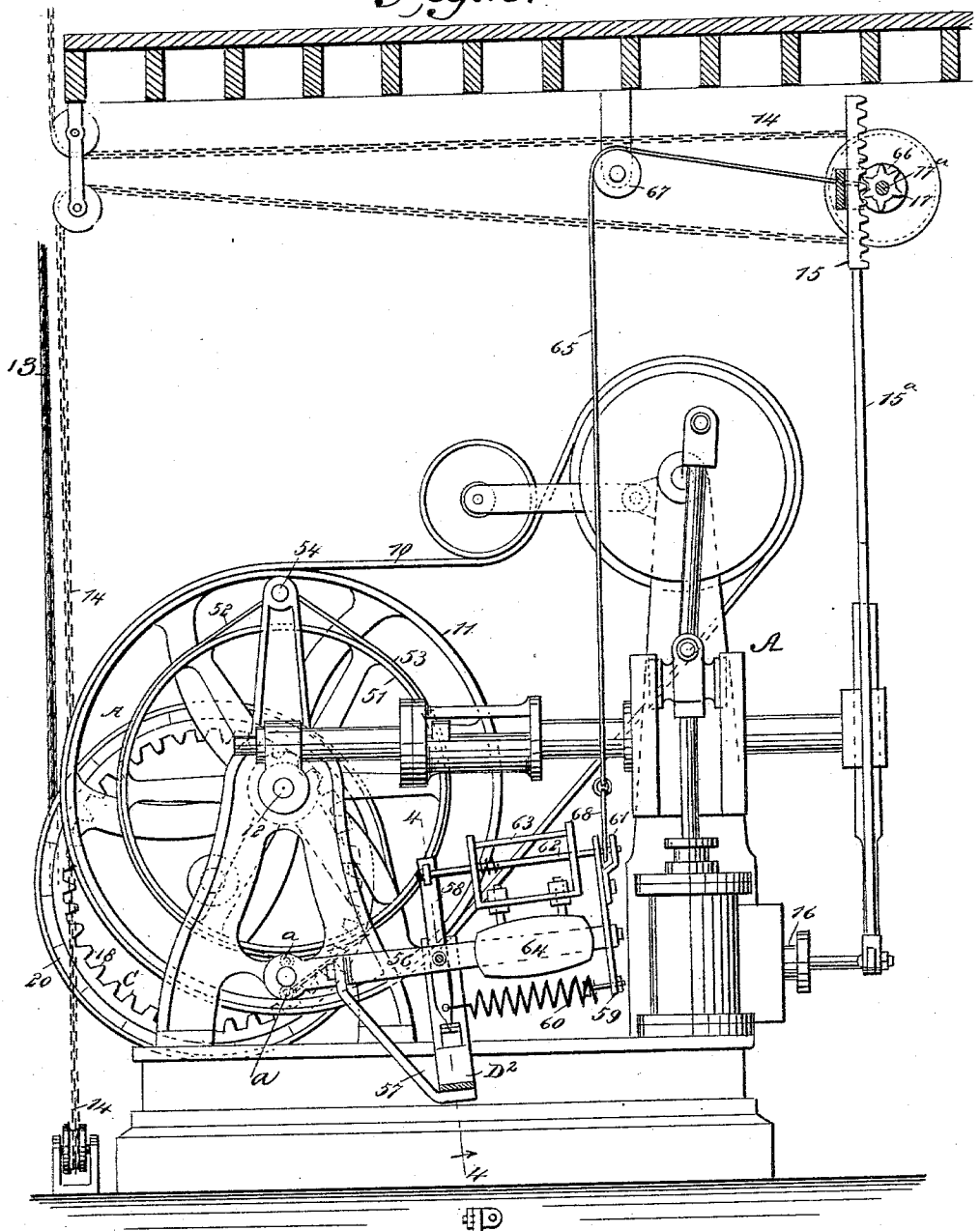
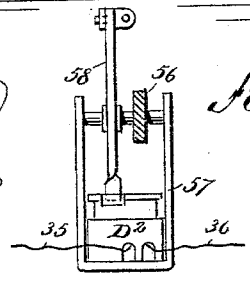


Fig. 4.



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(No Model.) 5 Sheets—Sheet 3.

J. H. TENNYSON.

SAFETY APPLIANCE FOR ELEVATORS.

No. 559,633. Patented May 5, 1896.

Fig: 3

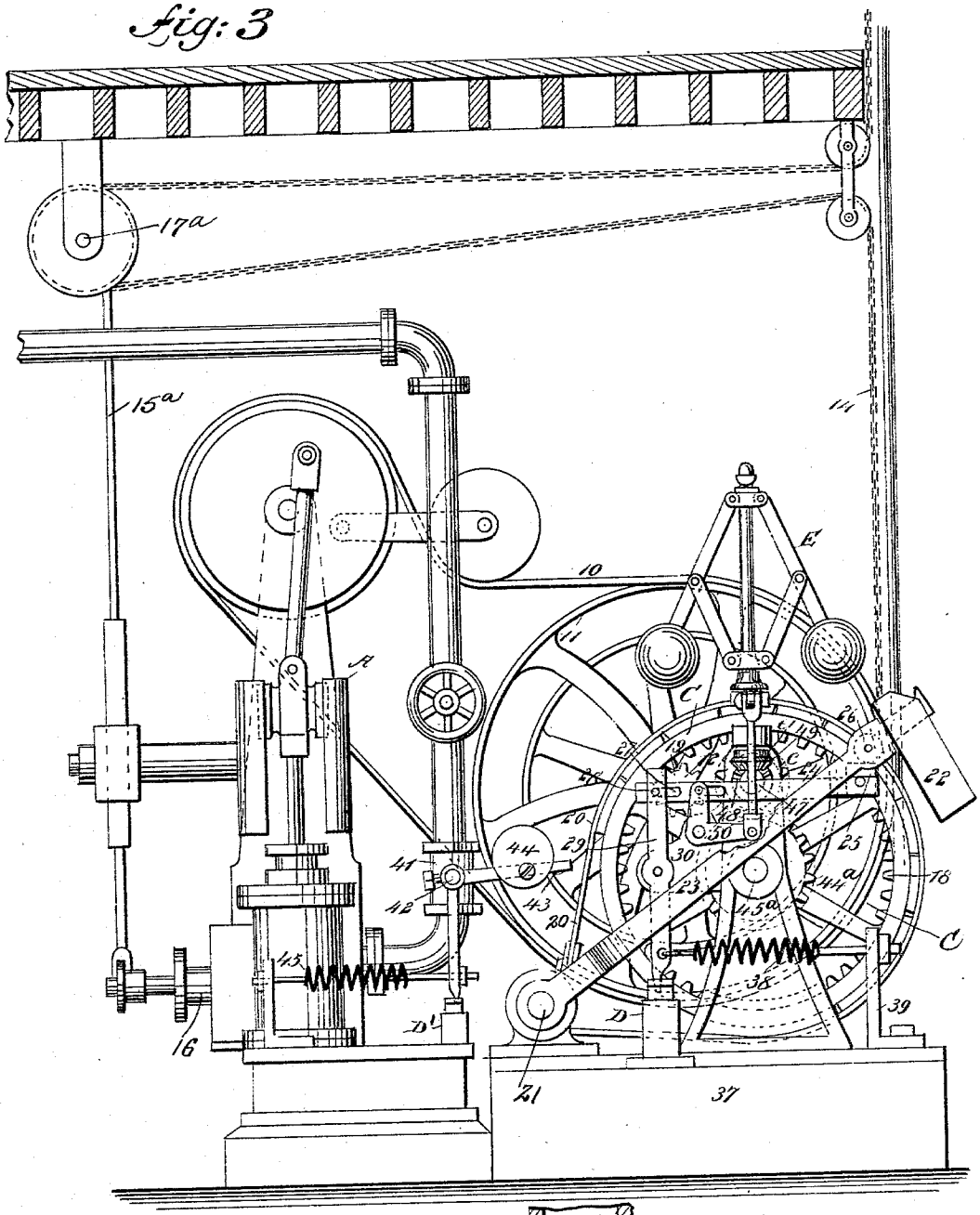
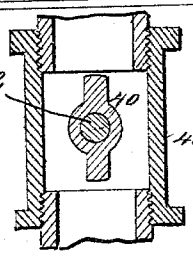


Fig: 5.



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(No Model.) 5 Sheets—Sheet 4.

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SAFETY APPLIANCE FOR ELEVATORS.

No. 559,633. Patented May 5, 1896.

Fig: 6.

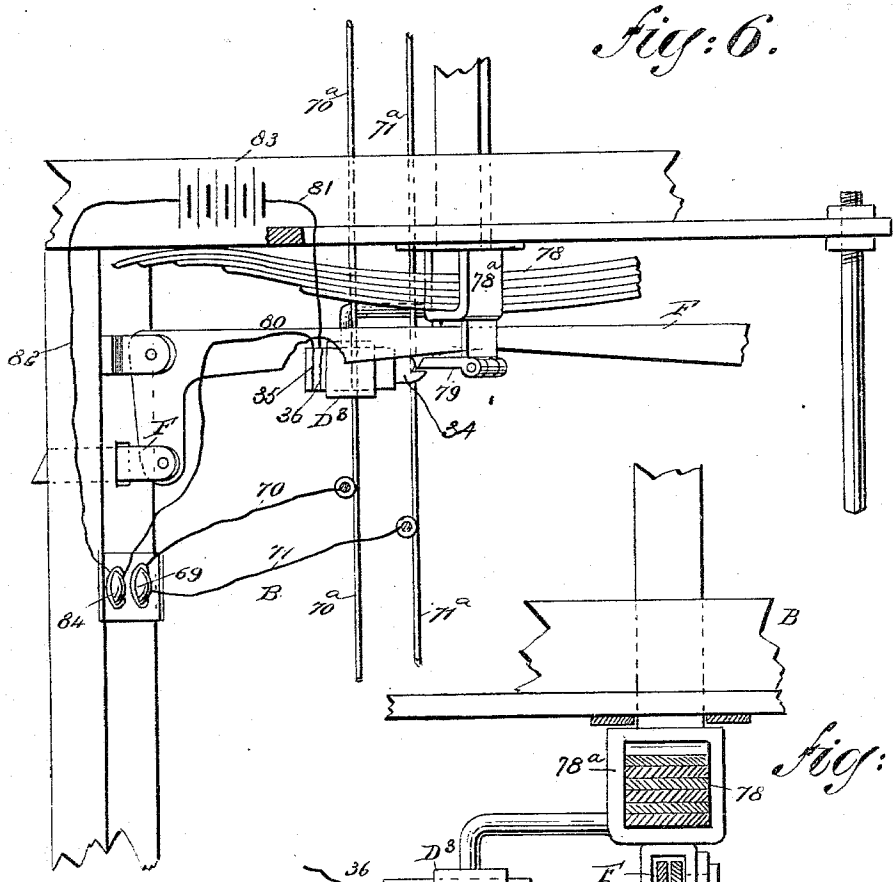


Fig: 7.

Fig: 8.

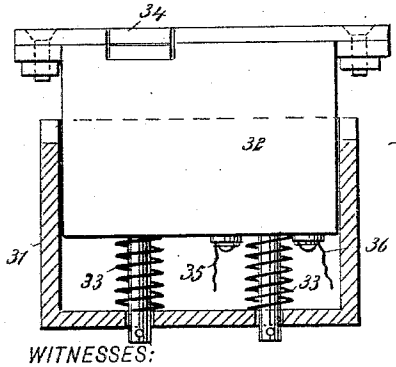


Fig: 9.

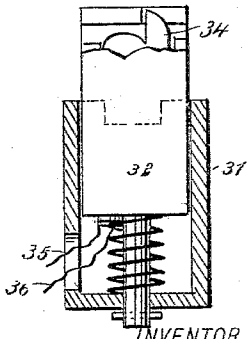
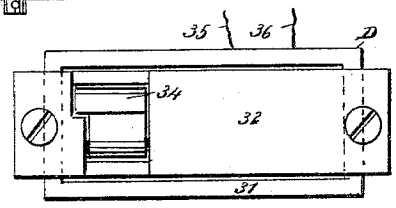


Fig: 10.



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SAFETY APPLIANCE FOR ELEVATORS.

No. 559,633. Patented May 5, 1896.

Fig: 11.

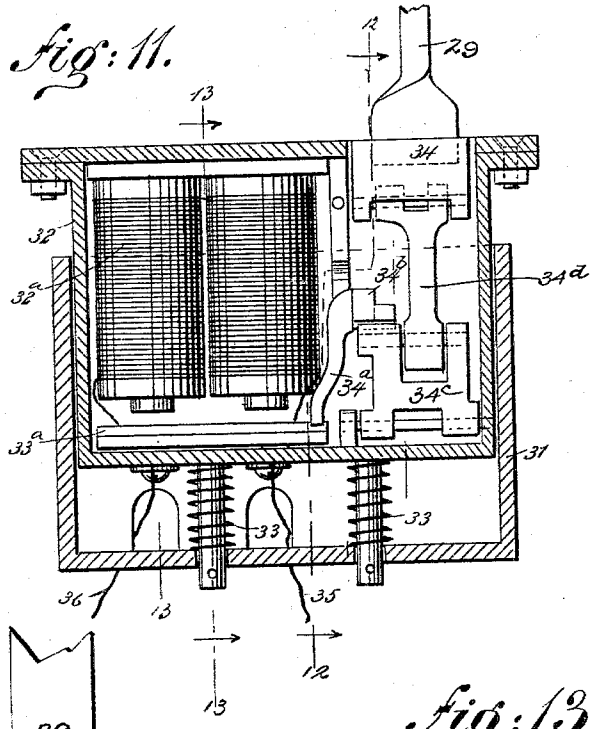


Fig: 12.

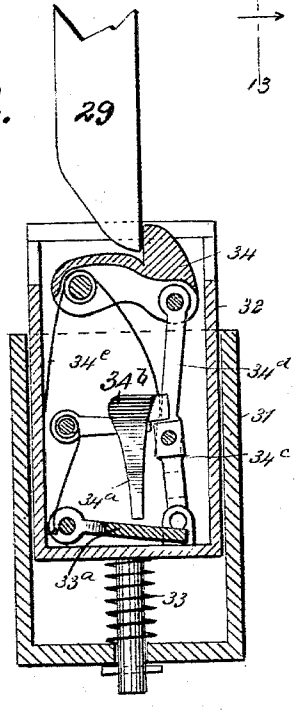
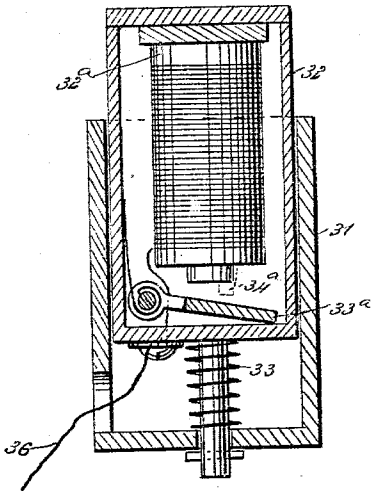


Fig: 13.



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UNITED STATES PATENT OFFICE.

JOHN H. TENNYSON, OF NEW YORK, N. Y.

SAFETY APPLIANCE FOR ELEVATORS.

SPECIFICATION forming part of Letters Patent No. 559,633, dated May 5, 1896.

Application filed April 20, 1895. Serial No. 546,507. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. TENNYSON, of New York city, in the county and State of New York, have invented a new and useful Safety Appliance for Elevators, of which the following is a full, clear, and exact description.

My invention relates to an improvement in safety attachments especially adapted for elevators, but which may be used in connection with other devices if desired.

The object of this invention is to provide a means whereby upon touching a button in the elevator cage or car, or at any predetermined point within one or more electrical circuits, the brake-drum of the elevator-engine will be instantly applied, together with the brake controlling the driving-shaft, and whereby, furthermore, the supply of steam will be at the same instant cut off from the boiler, thus instantly bringing the elevator cage or car to a standstill, and, furthermore, to provide a means whereby, either through the medium of the same button or in the customary manner, the safety clutches or catches of the elevator car or cage will be immediately brought into action.

Another object of the invention is to accomplish the above result through the medium of mechanism which will be exceedingly simple, durable, and economic in its construction and applicable to any form of engine or to any type of hoisting or manipulating machinery for elevators.

The invention consists in the novel construction and combination of the several parts, as will be hereinafter fully set forth, and pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar figures and letters of reference indicate corresponding parts in all the views.

Figure 1 is a plan view of the engine employed to manipulate the elevator and the attachments applied thereto, together with a plan view of the elevator cage or car, showing the electrical connection when the devices are electrically operated. Fig. 2 is a side elevation of the engine shown in Fig. 1, representing, likewise, a portion of the ground floor of the building in which the elevator is placed. Fig. 3 is a view similar to Fig. 2, illustrating, however, the opposite side of the engine. Fig. 4 is a vertical section taken substantially on the line 4 4 of Fig. 2. Fig. 5 is a detail view of the steam-cut-off valve of the engine. Fig. 6 is a detail view of a portion of the elevator car or cage. Fig. 7 is a transverse section through the spring adapted to operate the clutch mechanism of the car, illustrating, likewise, the lock-latch employed to normally hold the catches from the racks with which they are to engage. Fig. 8 is a sectional view through a portion of the latch. Fig. 9 is a section through the latch, taken at a right angle to that shown in Fig. 8. Fig. 10 is a plan view of the said latch. Fig. 11 is a longitudinal mid-section taken through the electrically-actuated latch device and showing the construction of the same; and Figs. 12 and 13 are sections taken through said device at right angles to Fig. 11 in the planes indicated, respectively, by the lines 12 12 and 13 13 in Fig. 11.

In carrying out the invention the engine A may be of any type suitable for running an elevator B, for example. In the drawings the driving-belt 10 is shown connected with a driving-pulley 11, mounted upon the driving-shaft 12, and the drum C is driven from the said shaft 12, and is made to carry the usual cables 13, and the ordinary manipulating chains or cables 14 are employed, by means of which the elevator is stopped or started, the latter chains or cables being arranged in the customary manner. The rack 15 or whatever equivalent device is employed for controlling the cut-off valve 16 is also operated in the usual manner, the said rack being connected with said valve by a stem 15^a, and the rack is operated through the medium of a pinion 17, in its turn manipulated by the aforesaid manipulating-chain 14 of the elevator.

The drum C is provided with an internal gear 18, and is revolved through the medium of a pinion 19, fast on the driving-shaft 12 of the engine and meshing with the said interior gear, as shown in Fig. 3. The drum is provided with a strap-brake 20, the strap being attached to one end of a brake-shaft 21, as

shown in Fig. 1, and when the shaft is manipulated in one direction the brake is applied, while when the shaft is manipulated in an opposite direction the brake is loosened from the said drum. The manipulation of the shaft is accomplished primarily through the dropping of a weight 22, which is fast upon an arm 23, the said arm being secured to the said shaft 21, as shown in Figs. 1 and 3. When this arm is in an upper position, or that shown in Fig. 3, the drum is released from engagement with the strap-brake, and the said arm is held in the said upper position by means of a horizontal bar 24, usually provided with a block or offset 25, engaging with a friction-roller 26 on the said arm. (Shown in Fig. 3.) The bar 24 is mounted to slide in suitable supports, and at what may be termed its "inner" end is formed with a longitudinal slot 27, and in this slot the pin 28 of a trip bar or lever 29 is made to pass, and is fulcrumed at or near its center upon a support 30, suitably located, the opposite or lower end of the lever being adapted for engagement with a latch or locking device D. This latch device is shown in detail in Figs. 7, 8, 9, 10, 11, 12, and 13, and comprises a casing 31 and a lock 32, which has sliding movement in the casing, being bolstered by or projected beyond its casing proper through the medium of springs 33. This latch device is to be electrically controlled and constitutes one feature of the present invention. It embodies a pivoted bolt 34, one end of which is arranged to extend through an opening in the frame of the lock 32, as seen in Figs. 11 and 12, being connected to a pair of toggle-levers 34^d and 34^e, pivoted together, opposite ends of the pair being pivoted to the said frame. A spring 34^e is provided, being of suitable tension to hold said bolt 34 normally in an operative position, as seen in Fig. 12, and when in this position the toggle-levers are adapted to be held against folding when pressure is brought to bear on the bolt 34 by means of a locking lever or catch 34^b, pivoted in the frame with its end arranged to engage the toggle. The locking-lever 34^b is provided with a depending arm or finger 34^a, adapted to rest on an armature-lever 33^a, pivoted in the frame in the field of a pair of electromagnets 32^a, arranged in an electric circuit comprising circuit-wires 35 and 36. Thus it will be seen that when said electric circuit is closed the magnets 32^a will be excited and will act to raise the pivoted armature 33^a, so as to lift the locking-lever 34^b out of engagement with the toggle and permit the bolt 34 to be pressed into the frame.

A locking device D, such as has been described, or the equivalent thereof is placed upon a pedestal or equivalent support, as illustrated in Fig. 3, and normally the lower end of the trip-lever 29 is held perpendicular by engagement with the bolt 34, and when the lever is so held the slide-bar 24, influenced by the lever, will hold the weight 22 in its upper or normal position. A contractile spring 38 is attached to the lower end of the trip-lever 29 and to a support 39, the tension of the spring being in a direction to draw the end of the trip-lever 29 out of position to be engaged by the bolt of the locking device when the same is actuated as above described, and at that time the slide-bar 24 will be drawn inward, the weighted arm 23 will be released, and the weight will cause the said arm to fall down instantly and will at the same time apply the aforesaid strap-brake 20 to the drum.

The steam-supply valve 40 may be of any approved construction. One form, however, is shown in Fig. 5, in which the valve is represented as in the open position; but when closed its wings will engage with the sides of the valve-casing 41. The stem 42 of this valve has secured firmly thereto an arm 43, which is preferably an angle arm or lever, its upper member being provided with a weight 44, which may be adjustable, and its lower member being adapted for engagement with a second locking device D', preferably of the same construction as the locking device D heretofore illustrated and alluded to, being shown in Fig. 3. A spring 45 exerts tension upon the vertical member of the valve-lever 43 in a direction to draw the said member from engagement with the bolt of the locking device the moment said bolt is drawn within the frame of the locking device, and at that time the steam-supply valve will be thoroughly closed and the engine will be without a supply of steam from the boiler.

With reference to the safety attachment applied to the drum I desire it to be thoroughly understood that the said attachment in no manner interferes with the ordinary action of the governor E, which is of the ordinary type and is driven by suitable gear connection e and e' from the drum-shaft. In the drawings this gear connection consists, first, of a gear 44^a, secured on the drum-shaft 45^a, meshing with a pinion 46, secured upon the governor drive-shaft 47, and, secondly, the immediate gear connection between the governor-shaft and governor-stem consists of two beveled gears 48 and 49, as shown in Fig. 3.

The governor-stem at its lower end is connected with a bell-crank lever 50, and the latter is usually fulcrumed upon the support 30, fulcruming the trip-lever 29, or any other convenient support, and one arm of the elbow-lever 50 is provided with a pin which enters a slot in the slide-bar 24. Thus the governor is free to act in its ordinary capacity without in any manner interfering with the action of the safety appliance connected with the drum, since it will be seen that when the governor acts to slide the bar 24 endwise the slot 27 permits said bar to move without acting on the trip-lever 29.

A third safety appliance is employed in connection with the engine and is applied to the stopping of its drive-shaft 12. A pulley 51 is to that end located on the said drive-

shaft and is provided with a double strap-brake, comprising two members 52 and 53, connected above the pulley to a common support 54 and extending downward in engagement with the periphery of the pulley at opposite sides, being attached at their lower ends at opposite points upon the brake-lever 56, as shown at *a* in Fig. 2. Thus when the lever moves in one direction the brakes on each side will be brought into action, thus permitting the elevator to be stopped in the usual manner.

A frame 57 (shown in Fig. 4) is attached to the brake-lever 56, extending down below the same, and this frame, which is preferably in the nature of a stirrup, is made to support a locking device D^2 of the character heretofore set forth and shown in Figs. 11, 12, and 13. This frame likewise fulcrums a trip-lever 58, which is normally in engagement with the bolt of the locking device, and at the free end of the brake-lever a bar 59 is secured, extending both above and below it, and to the lower end of this bar a spring 60 is attached, which likewise engages with the lower end of the trip-lever 58 and has a tendency to draw this lever from engagement with the bolt of the locking device.

At the upper end of the bar 59 a fork 61 is preferably formed, apertured to receive a bolt 62, this bolt being secured at what may be termed its "inner" end to the upper portion or upper extremity of the trip-lever 58, the bolt being within the fork of the bar 59 only when the trip-lever 58 is locked. A frame 63 is held to slide upon this bolt and is connected with a weight 64, located upon the upper or free end portion of the brake-lever 56, as is best shown in Fig. 2. Consequently when the trip-lever 58 is released from the locking device the weight 64 will carry the brake-lever 56 downward and cause the strap-brakes to be instantly applied.

The brake-lever is held in its upper normal or inoperative position by a connection with the shaft upon which the pinion 17 is secured, controlling the cut-off valve 16, and this connection is preferably in the nature of a strap 65, chain, or cable, which is connected with the shaft upon which the pinion 17 is secured or with a pulley or boss 66, secured on the shaft. The strap, cable, or chain is then passed over a guide-pulley 67 and downward in direction of the brake-lever 56, the lower end of the strap terminating in a link 68 or the equivalent thereof, through which the bolt 62 passes. Thus as the shaft to which the pinion 17 is attached, and which may be designated as 17^a, revolves in one or the other direction the attachment controlling the brakes 52 and 53 will be raised or lowered to stop the car; but I desire it to be understood that the very moment the trip-lever 58 is disconnected from the locking device D^2 the spring 60 will act to draw the lever from the bolt of this device, and the said trip-lever, moving in direction of the spring, will carry the bolt 62 from engagement with the strap 65 or its link 68, and the entire device will drop downward, applying at once the brakes 52 and 53 without requiring any action on the part of the persons in the car.

When the car is passing downward and the controller-rope is pulled in one direction, the brakes 52 and 53 will be applied so as to stop the car, and when it is desired to again start the car the controller-rope will be pulled in the opposite direction, so that the brakes 52 and 53 will be raised and the car be again permitted to move down. When the car reaches the bottom of the shaft and it is desired to reverse its movement, the controller-rope is pulled in the direction in which it was pulled to stop the car while moving down, and when the car is ascending and it is desired to stop it is only necessary to pull the controller-rope in the same direction as that in which it was first pulled. Either of these safety attachments may be applied or operated singly and from any desired point, or they may all be made to operate simultaneously, and such an arrangement is shown in Fig. 1, in which it will be observed that a push-button 69 is shown on the elevator cage or car, having wires 70 and 71 connecting it with guide-rods 70^a and 71^a, as shown also in Fig. 6. The guide-rod 70^a is, for example, connected with one end of the coils of the magnets contained in the locking device D^2, operating the safety attachment applied to the brakes of the drive-shaft, the connection being made through the medium of a wire 72, and a second wire 73 is carried from the other end of the magnet-coils of this particular locking device D^2 to the locking device D', connected with the safety appliance operating the steam-supply valve, while this particular locking device D' is connected by a wire 74 with a battery 75, and a return-wire 76 is carried from the battery to the locking device D, connected with the drum-brake, from which another wire 77 is carried to a connection with the guide-rod 71^a, thus making a circuit through all the locking devices the moment that the push-button is operated. It will therefore be observed that no matter from what point in the elevator-shaft, or in the elevator, or throughout the building the devices are manipulated the elevator may be instantly stopped and brought to a complete standstill, and after the stoppage of the car or cage all of the safety appliances may be conveniently placed in normal position by moving the various levers into engagement with their respective locking devices.

In Fig. 6 I have illustrated the application of my improvements to the clutches of safety-catches F of the elevator cage or car. In this construction 78 represents the spring which is employed to operate the said safety-clutches F in case the cable should break, said spring being held at its central part in a casing 78^a, connected with the cable by means of a strap or bar arranged to slide through the top of

the car in the ordinary manner, whereby the weight of the car rests upon the ends of said spring 78 and tends to keep the same normally under tension.

At the lower end of the casing 78^a is pivoted a latch 79, the free end of which is adapted to be engaged and held in its raised position by the bolt 34 of the locking device D^3, suitably mounted in the car and of the construction heretofore described. The said latch 79 is adapted, when in its raised position, to engage the inner ends of the safety catches or clutches F, so as to hold the same in a raised position out of engagement with the walls of the shaft, and the locking device D^3 is connected by wires 80, 81, and 82 with the poles of a battery 83 on the car and with the push-button 84, by means of which the circuit may be made and the bolt 34 of the locking device withdrawn from engagement with the latch 79 on the casing 78^a, so as to permit the safety-catches F to fall by gravity into the position to clutch the walls of the shaft, this movement being independent of that caused by spring 78 in case the cable should break. Thus it will be seen that I provide means for controlling the operation of the safety-catches F, so as to throw the same into operative position without impairing the efficiency of the spring 78 or in any way affecting the operation thereof, the said spring being adapted at all times to act in case of accident to throw the casing 78^a, carrying the safety-catches, forcibly downward into position to clutch the walls of the shaft.

It is obvious that instead of making the connection of the clutch devices on the car a separate one they may be operated from the same button that is intended to operate the safety appliances at the engine. It is also obvious that the trip-levers may be mechanically operated instead of electrically, if in practice it is found desirable. Furthermore, if deemed necessary or desirable, the safety-catches F may be actuated when released by special springs provided for that purpose instead of by gravity.

In the event of the driving-belt 10 of the engine breaking the safety appliance connected with the braking-pulley of the drive-shaft may be brought into action to stop the elevator.

From the above description it will be seen that the clutch-levers F and the steam-supply valve 40 of the various brakes 20, 52, and 53 form stop devices adapted when actuated to stop the various parts of the apparatus whereto they are connected, and these stop devices are connected to trip bars or levers and are normally held out of operation by the several locking devices D, D′, D^2, and D^3.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In elevators and the like, a safety attachment adapted for application to the brake of the winding-drum, and comprising a trip-lever, a locking device normally locking the lever, means for releasing the locking device from the lever, a tension device arranged to release the lever from the locking device, a slide-bar operated by the said lever, and a weighted arm supported by the slide-bar and connected with the brake of the winding-drum, substantially as set forth.

2. In hoisting machinery for elevators and the like, the combination with a drum, a brake therefor, and a governor regulating the rotation of the drum, of a safety attachment comprising a trip-lever, a locking device normally in engagement with the trip-lever, means for operating the locking device to release the trip-lever, a tension device connected with the trip-lever and arranged to disconnect it from the locking device, a slide-bar operated by the lever, a weighted arm supported by the said slide-bar and connected with the brake, and a connection between the governor and the said slide-bar, the connection being such that the governor may operate independently of the said attachment, substantially as set forth.

3. In a hoisting machinery for elevators and the like, the combination of a steam-supply valve, a lever connected with the said valve and having a weight operating it in one direction, an electric locking device normally in engagement with the lever, and an electric circuit including said locking device, a generator and a circuit-breaker, for operating the locking device to release the lever, substantially as set forth.

4. In a safety attachment for elevators and the like, the combination of a stop device, means for moving the same when released into operative position, a slide-bar arranged to hold said stop device out of operative position, a trip-bar connected to the slide-bar, a spring arranged to move said trip-bar when the same is released, a locking device arranged to hold said trip-bar against movement, and means to actuate said locking device to release the trip-bar, substantially as set forth.

5. In a safety attachment for elevators and the like, the combination of a stop device, a weighted lever connected to and arranged to move the same when released, a slide-bar arranged to engage said lever whereby the stop device is held out of operation, a pivoted trip-bar connected to the slide-bar, a spring arranged to move the trip-bar, a locking device to hold the trip-bar against movement, and means to release the trip-bar, substantially as set forth.

6. In a safety attachment for elevators and the like, the combination of a stop device, means for moving the same when released into operative position, a slide-bar arranged to hold said stop device out of operating position, a trip-bar connected to the slide-bar, a locking device arranged to engage the trip-

bar and hold the same against movement, means to actuate the locking device to release the trip-bar, means for moving the trip-bar when released, and a governor connected to the slide-bar and adapted to operate the same independently of the trip-bar, substantially as set forth.

7. In a safety attachment for elevators and the like, the combination of a stop device, means for actuating the same when released, a slide-bar arranged to hold said stop device out of operative position, a trip-bar having a slotted connection with the slide-bar, a locking device to engage the trip-bar and hold the same against movement, means to actuate the locking device to release the trip-bar, means for moving the trip-bar when released, an elbow-lever having a slotted connection with the slide-bar, and a governor connected to the elbow-lever, substantially as set forth.

8. In a safety attachment for elevators and the like, the combination of a stop device, a lever connected thereto and arranged to actuate the same when released, apertured forks thereon, a bolt arranged to pass through the apertures of said forks, a trip-lever connected to said bolt, a locking device to hold said trip-lever against movement, means to actuate the locking device to release said trip-lever, means for moving the trip-lever when released, and means adapted to be engaged by said bolt between the apertured forks, for holding said stop device out of operation, substantially as set forth.

9. In a safety attachment for elevators and the like, the combination of a stop device arranged to move into operative position when released, a spring connected to the hoisting-cable and normally held out of operation thereby, a latch for holding said stop device normally in position to be operated by the spring when the hoisting-cable breaks, an electric locking device engaging the latch, and an electric circuit including said locking device, a generator and a circuit-closer, substantially as set forth.

10. In a safety attachment for elevators and the like, the combination of a stop device arranged to move into operative position when released, a spring connected to the hoisting-cable and normally held out of operation thereby, a latch carried on said spring for holding the said stop device normally in position to be operated by the spring when the hoisting-cable breaks, an electric locking device engaging the latch, and an electric circuit including said locking device, a generator and a circuit-closer, substantially as set forth.

JOHN H. TENNYSON.

Witnesses:
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