No. 618,141. Patented Jan. 24, 1899.

R. C. SMITH.

ELEVATOR.

(Application filed June 23, 1898.)

(No Model.) 2 Sheets—Sheet 1.

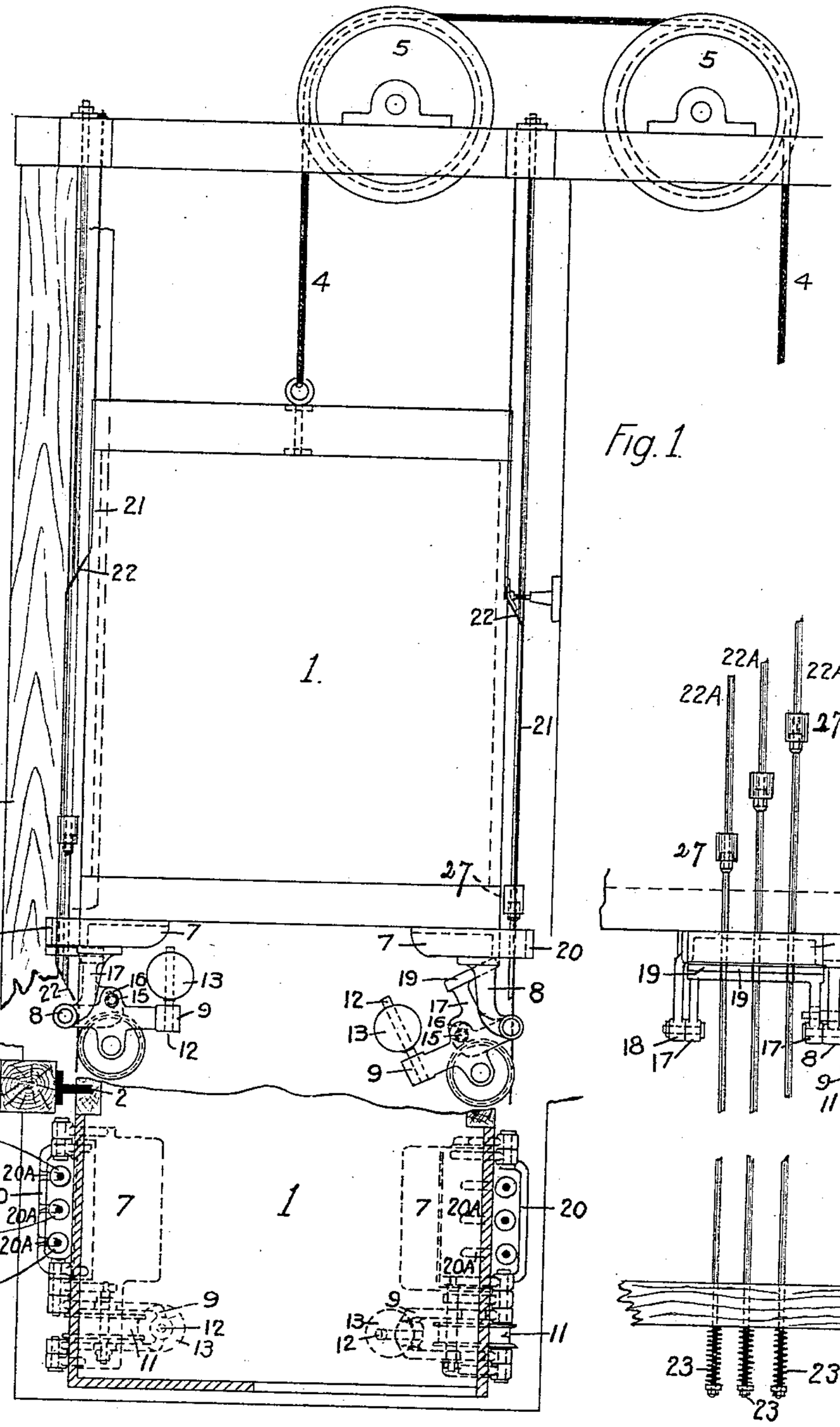

Fig. 1.

Fig. 2.

Fig. 3.

WITNESSES

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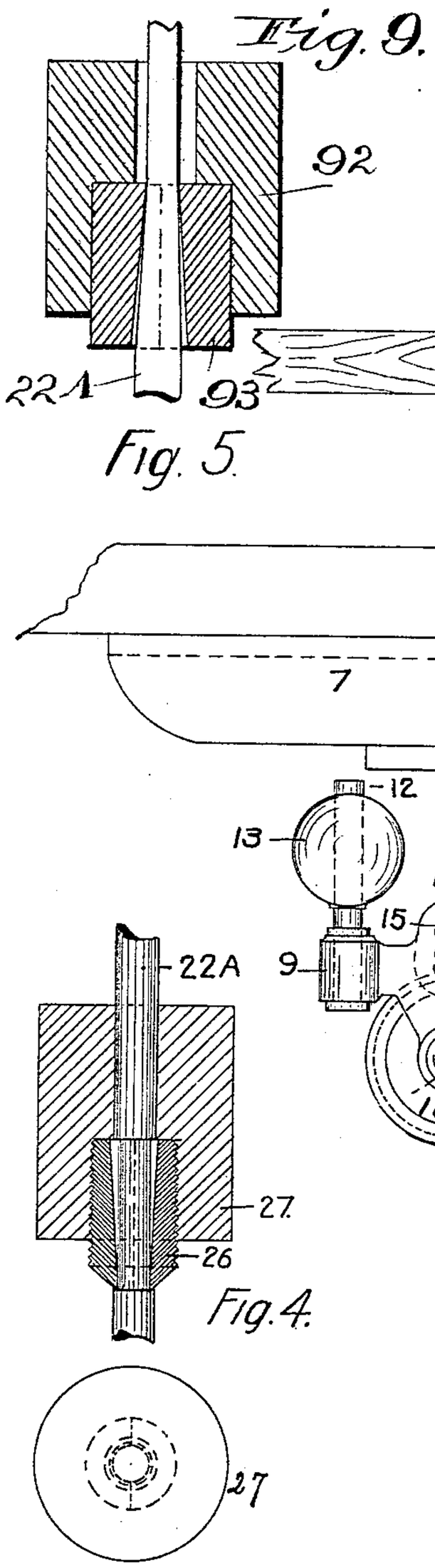

Fig. 9.

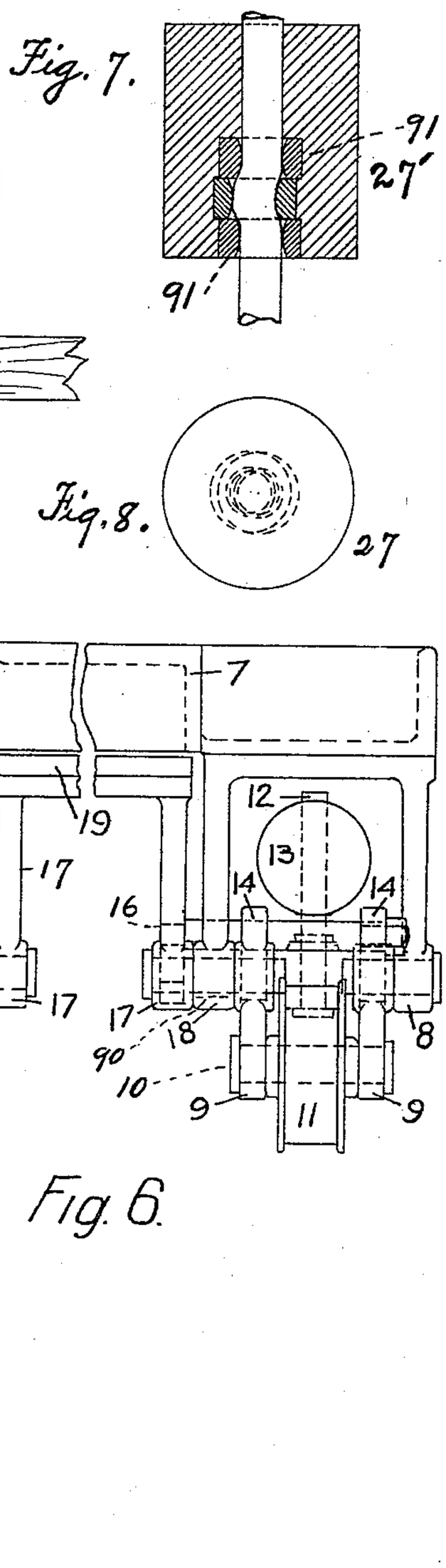

Fig. 7.

Fig. 5

Fig. 8.

Fig. 4.

Fig. 6.

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ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 618,141, dated January 24, 1899.

Application filed June 23, 1898. Serial No. 684,231. (No model.)

To all whom it may concern:

Be it known that I, RUDOLPH C. SMITH, a citizen of the United States, and a resident of Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Elevators, of which the following is a specification.

The invention relates to improvements in elevators; and it consists in a novel safety appliance to prevent the accidents and consequences due to or likely to result from a fall or runaway of an elevator-car.

The invention is shown and described herein in an elevator comprising the usual car and shaft, the latter being provided with a multiplicity of suspended galvanized-wire rods, each having a safety-stop cutter or equivalent device thereon and the car being provided with a projection normally in the path of such stop, but capable of being withdrawn therefrom at a definite point in order that said projection may at a safe speed of the car pass the stops instead of striking on them, which latter results only, but always, on the fall or runaway of the car.

The invention will be more fully understood from the detailed description hereinafter presented, reference being had to the accompanying drawings, in which—

Figure 1 is a vertical section through a portion of an elevator-shaft, showing the car connected to a hoisting-gear, the car and shaft being equipped with safety appliances constructed in accordance with and embodying the invention. The slide-wires are shown in Fig. 1 as fastened at their upper ends to the upper work or framing, on which are placed the usual sheaves for the hoisting-cables. Fig. 2 is a horizontal section of same through the car and shaft, looking downward toward the floor of the car and indicating the automatic safety-governor and the position of the safety-stops. Fig. 3 is a side elevation of a portion of the car and wire slideways and illustrates the automatic safety-governor and the safety-stops containing the cutters for engaging the wires. Fig. 4 represents an enlarged vertical section and a top view of one of the safety-stops and the cutter held thereby. Fig. 5 is an enlarged side elevation of the devices embodying the invention, a portion only of the car and shaft framing being illustrated. Fig. 6 is an end view, partly broken away, of the automatic governing devices. Fig. 7 is a vertical section of a safety-stop provided with means for deflecting the wire in lieu of cutting the wire. Fig. 8 is a top view of same and Fig. 9 is an enlarged vertical section of a safety-stop provided with a draw-plate for drawing the wire in lieu of cutting or deflecting the same.

In the drawings the numeral 1 designates the elevator-car; 2, the customary guide-rails for the same; 3, the usual guide-posts, to which the rails 2 are secured; 4, the usual hoisting cable or rope suspending the car 1, and 5 the customary sheaves over which the cable 4 passes to any suitable hoisting apparatus. (Not shown.)

The car may be provided with any of the usual forms of control—hand-rope, lever, or electrical connections—and switches for starting, stopping, and controlling the same.

Underneath the framing of the car-bottom and below each side of the car are fastened by bolts the automatic governing or shunting devices, which at the proper time shunt the projections or plates carried by the car around or by the safety-stops located on the suspended slideway-wires 22^{A}, and one set of these automatic devices will now be described. The plate 7 is secured to the car bottom or framing, and on this plate is fastened the double hanger 8 8, which supports the pivotally-mounted frame 9. The frame 9 extends inward below the car, as shown in Fig. 5, and carries on a stationary shaft 10 the loose trolley-wheel 11. At the inner end of the frame 9 is provided a stud 12 to support the weight 13, one of whose functions is during the safe travel of the car to cause the trolley-wheel 11 to move closely along and against the trolley-wire or equivalent tramway 21, which extends from the upper to the lower end of the elevator-shaft. The pivotally-mounted or swinging frame 9 has two lugs 14 14, carrying a bolt 15, which projects at one end into a slot 16 of a swinging frame 17, (see Figs. 5 and 6,) which is pivotally supported between one of the hangers 8 and the hanger 18. Upon the frame 17 is secured the plate 19, which forms the projection or part

carried by the car and normally in the vertical path of the stops 27, located on the suspended slideway-wires 22^A. The outer portions of the plate 19 are slotted or recessed or cut out comb-like, as at 20^A, Fig. 2, to straddle the wires 22^A and to strike upon the upper ends of the safety-stops 27, except when the whole plate 19 is withdrawn by the downward tilting of the inner weighted end of the frame 9, as hereinafter described, to permit the plate 19 to pass the said safety-stops. The openings in the hubs on which the frame 17 swings are preferably somewhat larger in diameter than the pivots entering said hubs, as at 90, so as to enable the plate 19 to rest firmly under the support 20 when said plate descends upon the safety-stops and is pressed upward by its contact therewith. This support 20 consists of that part of the plate 7 which projects outward beyond the side of the car; but, as indicated by dotted lines in Figs. 1 and 5 and by full lines in Fig. 2, said support 20 contains a sufficiently wide and long opening to permit the uninterrupted passage through it of the safety-stops on the slide-wires, except when said opening is closed or partly closed by the outer comb-like portion of the plate 19. The slits or recesses 20^A, cut in the outer edges of the plate 19 to straddle the wires 22^A, are clearly shown in Fig. 2, which at the right-hand side thereof indicates the plate 19 as having been withdrawn inward to pass the safety-stops 27 and at the left-hand side thereof shows the plate 19 in its outward position below the opening in the support 20. Fig. 1 likewise at its right-hand side shows the plate 19 withdrawn inward to pass the safety-stops 27 and at its left-hand side shows the plate 19 in its outer normal position in the path of the safety-stops on the wires adjacent to it. The plate 19 and frame 9 never attain the position in which they are shown at the right-hand side of Fig. 1 until during the safe travel of the car the trolley-wheel 11 under the force of the weighted outer end of the frame 9 passes into and along the recessed or curved portion 22 of the trolley-wire or tramway 21, and thus permits the tilting downward of the frame 9 and the withdrawal inward of the plate 19, so that the latter at such time may freely pass the safety-stops 27. The curvature 22 in the trolley-wire or tramway 21 is of course so located with respect to the safety-stops 27 as to permit the tilting of the frame 9 at the proper time to effect the withdrawal of the plate 19, so that said plate may with certainty under safe conditions pass said stops, and said curvature 22 at its outlet end guides the trolley-wheel 11 back to its regular vertical path and restores the frame 9 and plate 19 to their upper outward position. (Shown in Fig. 5.) The frame 9 governs the position of the plate 19, since when the frame 9 tilts downward the bolt 15 will pull the frame 17 and plate 19, carried thereby, to follow the movement of the frame 9, and when the frame 9 is restored to its normal running position the bolt 15 will force the frame 17 and plate 19 upward and outward.

The mechanism above described may, as shown, and preferably will be, duplicated at each side of the car, and at each side of the car are the slideway-wires 22^A, which may at their upper ends be fastened to the side of the elevator-shaft or to the top supports for the sheaves 5 or otherwise, as may be found convenient. At their lower ends the wires 22^A may be attached to a tightening device 23, as shown in Fig. 3, which may comprise springs, as shown, or equivalent devices, such as weights.

While the invention is not limited in every case to any special number of slide-wires 22^A, I prefer to employ a multiplicity of such wires on account of the advantages derivable therefrom. The slideways of wire may be manufactured in sufficient lengths to form a slideway of even strength and without joints, and the wire may be conveniently galvanized in great lengths to prevent rusting. Wires are manufactured to a very small deviation of gage and of uniform material, and this insures great safety and reliability and an even distribution of the load. When a multiplicity of the wire slideways are employed, one bad wire, which may have escaped detection, will leave a sufficient number of good wires to do the work, and hence safety is insured in all cases when a multiplicity of the wires are employed.

The safety-stops 27 will preferably be arranged in staggered order upon the slideway-wires 22^A, as shown in Fig. 3, and these stops 27 are preferably arranged to slide upon the wires 22^A when the projecting portions of the plate 19 contact with them. The stops may be constructed in various forms, one desirable form being illustrated in Fig. 4, in which it will be seen that the stop 27 consists of an exterior sleeve having a two-part cutter 26, whose lower cutting edges normally rest upon a shoulder formed upon the wire 22^A. When the stops employing the cutters 26 are made use of, the action of the cutters upon the plate 19 striking the safety-stops will be to abrade or cut the wire 22^A during the downward motion of the safety-stops due to the force of the descending elevator-car and plate 19. The flexible wire 22^A will during the downward motion of the stop 27 and cutter 26 receive a uniform cut, since the wire is not stiff enough to stand the pressure of the cut without a support, the result being that the cutter will not dig into the wire, but will operate uniformly upon the latter. The stops 27, employing the cutter 26, are illustrated in Figs. 3 and 4, and in Fig. 5 I illustrate at 24 one of the cutters in an inverted position and secured upon the upper framework of the elevator-shaft. In Fig. 5 I show the wire 22^A as provided with the safety-stops and as passing from the reel 26 downward through the stationary cutter 24. Upon the plate 19, con-

tacting with the safety-stops in the construction shown in Fig. 5, the wire 22[A] will in the event that the stops 27 do not yield be pulled downward through the cutter 24, which will then act upon the wire 22[A] and effect the gradual predetermined stoppage of the elevator-car. With the construction shown in Fig. 5 the wire 22[A], having considerable length, could unwind from the reel 25 and be pulled down through the stationary cutter 24, if the car should rest upon the safety-stops 27, without causing the latter to slide downward. The cutter 24 may be used in connection with the stop 27, having the cutter 26, or independently of the cutter 26. When the stationary cutter 24 is made use of, the stops 27 might be rigidly fastened upon the wires 22[A], or the stops 27, containing the cutters 26, may be employed as duplicates of or auxiliary to the stationary cutter 24, and in this latter instance the cutters 24 would allow a great length of the wire 22[A] to slide through them under any condition which might result, whereby the sliding stops 27 would refuse to move. When both the cutters 24 and 26 are employed, the resistance of the stationary cutter 24 should be somewhat greater than that of the sliding cutter.

In lieu of employing the safety-stops having cutters 26 I may employ the safety-stops 27′, of the character illustrated in Figs. 7 and 8, in which it will be observed that the stops 27′ are provided, by means of the rings 91, with channels of irregular shape, through which the wire 22[A] must pass, and which will, as shown in Fig. 7, deflect the fiber of the wire without cutting or separating it. The stops 27′, having the rings 91, effect the same result, as far as the stoppage of the car is concerned, as do the stops 27. (Shown in Fig. 4.) The invention is not limited either to the stops having the cutter 26 or to the stops having the channels for deflecting the fiber of the wire, since other means may be provided within the stops for acting upon the wire 22[A], and as a further illustration it may be said that within the stops 27 may be provided a draw-plate, whose function will be to draw the wire thinner during the downward descent of the stops due to the fall or runaway of the car. The use of the draw-plate will be understood by reference to Fig. 9, which represents a safety-stop 92, having a draw-plate 93 of known form and operation.

During the ordinary travel of the car the wires 22[A] and the stops 27 thereon remain idle and the plates 19, except when approaching the stops 27, remain in their upper outward position, (shown in Fig. 5,) the outer slitted or comb-like portion of the said plates straddling the wires 22[A] and being normally in the plane of the stops 27. Each plate 19 is maintained in its upper outer position, just above referred to, by the contact of the trolley-wheel 11 with the trolley-wire or tramway 21. When the car is traveling at a safe speed and is approaching the stops 27, the trolley-wheel 11 will enter the curvature 22 of the trolley-wire 21, and this will result in the frame 9 tilting downward, as shown at the right-hand side of Fig. 1, and through the bolt 15 pulling the frame 17 and said plate 19 inward and downward from the plane of the stops 27, and thereby during the safe travel of the car the plate 19 is prevented from striking the stops 27, but is compelled to pass said stops and is then returned to its normal running position. (Shown in Fig. 5.) When the car is traveling at an unsafe speed, the trolley-wheel 11 will not have sufficient time to enter the curvature 22 of the trolley-wire or tramway 21, and hence at such time the frame 9 will not tilt downward and the plate 19 will not be withdrawn from the plane of the stops 27, but will remain in its normal position and contact with said stops.

As above described, the plate 19 has a normal position in the plane of the stops 27, and in the event of a fall or runaway of the car said plate 19 will contact directly upon the stops 27 and cause the latter to slide downward upon the wires 22[A] until the car is brought to a standstill, the stoppage of the car being effected with a uniformly-decreasing motion due to a constant retarding resistance thereto. This constant retarding resistance may be effected, as above described, by the cutters 26 or by deflecting the fibers of the wire by the means shown in Fig. 7, or by any other suitable means acting upon the wires 22[A].

The present invention is intended only as an emergency brake and may only come into use a few times during the entire life of the elevator apparatus.

The operation of the elevator illustrated is the same as usual, the safety appliances being entirely automatic and requiring no attention on the part of the elevator-attendant.

It is desirable in the construction of the plate 19 that the slits or recesses therein through which the wires 22[A] pass be widened at their entering edges, so as to easily pass upon the opposite sides of the wires 22[A].

The slideway-wires 22[A] and trolley-wire or tramway 21 will preferably be duplicated at opposite sides of the car, and this will result in a duplication at each side of the car of the trolley-wheel 11 and plate 19 and the parts connected therewith.

The stops 27 will be arranged or grouped at any suitable point in the elevator-shaft and may be duplicated at intervals along the length of the wires 22[A] in accordance with the height of the building or other conditions.

The bolt 15 and slot 16 form a loose connection of the frame 9 with the frame 17, which contains said slot, and this loose connection permits the frame 9 to move a given distance before the frame 17 and plate 19 are acted on. Thus the plate 19 is moved during a short part only of the movement of the frame 9, and consequently has a quick movement, which feature of the operation I consider very desirable.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The car having a projecting part, combined with the wire slideway in the elevator-shaft, the stop on said slideway and in the path of said projecting part, and the stationary cutter, as at 24, through which said wire slideway passes and which is adapted to act upon the same, while permitting said slideway to move downward, upon the contact of said projecting part with said stop; substantially as and for the purposes set forth.

2. The car having a projecting part, combined with a series of suspended flexible-wire slideways in the elevator-shaft, and the stops on said wire slideways and normally stationary therewith and in the path of said projecting part; substantially as set forth.

3. The car having a projecting part, combined with a series of suspended flexible-wire slideways in the elevator-shaft, the stops on said slideways and normally stationary therewith and in the path of said projecting part, and means for withdrawing said projecting part from the path of said stops, to pass the latter, when the car is traveling at a safe speed; substantially as set forth.

4. The car having a projecting part, combined with a series of suspended wire slideways in the elevator-shaft, the stops on said slideways and normally stationary therewith and in the path of said projecting part, the weighted frame connected with said projecting part, and means for maintaining said frame and projecting part in their normal running position except when arriving, at a safe speed, adjacent to said stops, and then under such safe condition releasing said frame sufficiently to temporarily withdraw the said projecting part from the path of said stops; substantially as set forth.

5. In an elevator, the suspended slideways composed of a series of flexible wires, and stops on said slideways and normally stationary therewith, combined with the car having a part to contact with said stops in case of accident to gradually arrest the car; substantially as set forth.

6. In an elevator, the suspended slideways composed of the multiplicity of flexible wires, and the independent stops on said slideways and normally stationary therewith, combined with the car having a part to contact with all of said stops in case of accident to gradually arrest the car; substantially as set forth.

7. In an elevator, the suspended slideways composed of the multiplicity of flexible wires, and the independent stops grouped in staggered order thereon and normally stationary therewith, combined with the car having a part to contact with all of said stops in case of accident to gradually arrest the car; substantially as set forth.

8. In an elevator, the flexible-wire suspended slideway, and the stop thereon and normally stationary therewith, combined with the car having a part to contact with said stop in case of accident to gradually arrest the car; substantially as set forth.

9. In an elevator, the flexible-wire suspended slideway, and the stop containing the cutter and normally stationary above a shoulder on said wire, combined with the car having a part to contact with and drive said stop and cutter downward on said flexible wire, in case of accident, to gradually arrest the car; substantially as set forth.

10. The car having a projecting part, combined with the series of slideway-wires, the stops normally stationary therewith and in the path of said projecting part, the tilting frame connected with and controlling said projecting part, the trolley-wheel carried by said tilting frame, and the trolley-wire or tramway engaging said wheel and having the curvature adjacent to said stops; substantially as set forth.

11. The car having the movable plate whose outer portion is slitted, the movable frame carrying said plate, the weighted frame connected with and controlling said movable frame, and means for maintaining said weighted frame in normal running position but permitting it to tilt downward to operate said plate at the proper time, combined with the series of wire slideways straddled by said plate, and the series of stops normally stationary on said slideways and adapted in case of accident to be engaged by said plate; substantially as set forth.

12. The car having the swinging weighted frame 9, the frame 17, connected to be operated from said frame 9, and the plate 19, carried by said frame 17, combined with means for controlling the position of said frame 9, the slideways extending lengthwise of the elevator-shaft, and the stops normally stationary with said slideways and adapted in case of accident to be engaged by said plate; substantially as set forth.

13. The car having the swinging weighted frame 9, the frame 17 connected to be operated from said frame 9, the plate 19 carried by said frame 17 and having the slitted outer portion, and the support 20 for said plate and having the enlarged opening through it, combined with the wire slideways extending through said opening and said slitted portion of said plate, and the stops on said slideway-wires and adapted to pass through said opening when said plate is removed therefrom and to be met by the slitted portion of said plate when the latter is in its outer position; substantially as set forth.

14. The car having the slitted plate combined with the suspended slideway-wires adapted to freely pass through the slits in said plate, and the stops on said wires and normally stationary thereon and in the path of the slitted portion of said plate; substantially as set forth.

15. The car having the slitted plate, combined with the slideway-wires adapted to freely pass through the slits in said plate, the

stops normally stationary with said wires, means for maintaining said plate in a normal operative position in the path of said stops, and means for withdrawing said plate to pass said stops during the safe travel of the car; substantially as set forth.

16. In an elevator, the vertical slideway in the elevator-shaft, and the stop thereon and normally stationary therewith, combined with the car having a movable part normally in the path of said stop, the movable frame carrying said movable part, the weighted frame loosely connected with said movable frame, and the tramway controlling the action of said weighted frame; substantially as set forth.

Signed at New York, in the county of New York and State of New York, this 21st day of June, A. D. 1898.

RUDOLPH C. SMITH.

Witnesses:

CHAS. C. GILL,

E. JAS. BELKNAP.