No. 791,950. PATENTED JUNE 6, 1905.

F. G. SEYFFARTH.

SAFETY DEVICE FOR ELEVATORS.

APPLICATION FILED OCT. 21, 1902. RENEWED MAY 8, 1905.

3 SHEETS—SHEET 1.

Fig. 1.

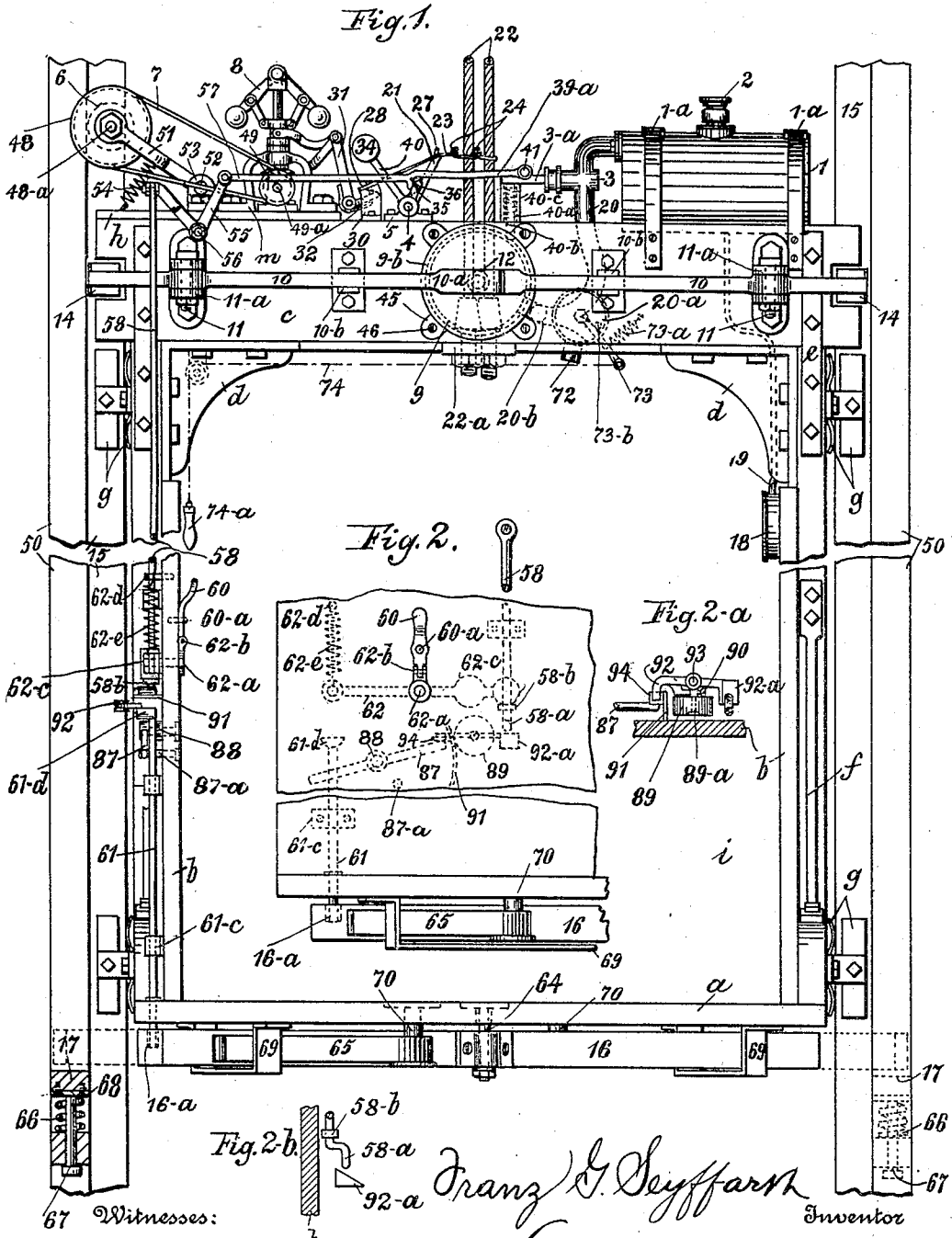

Fig. 2.

Fig. 2-a.

Fig. 2-b.

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3 SHEETS—SHEET 2.

Fig. 3.

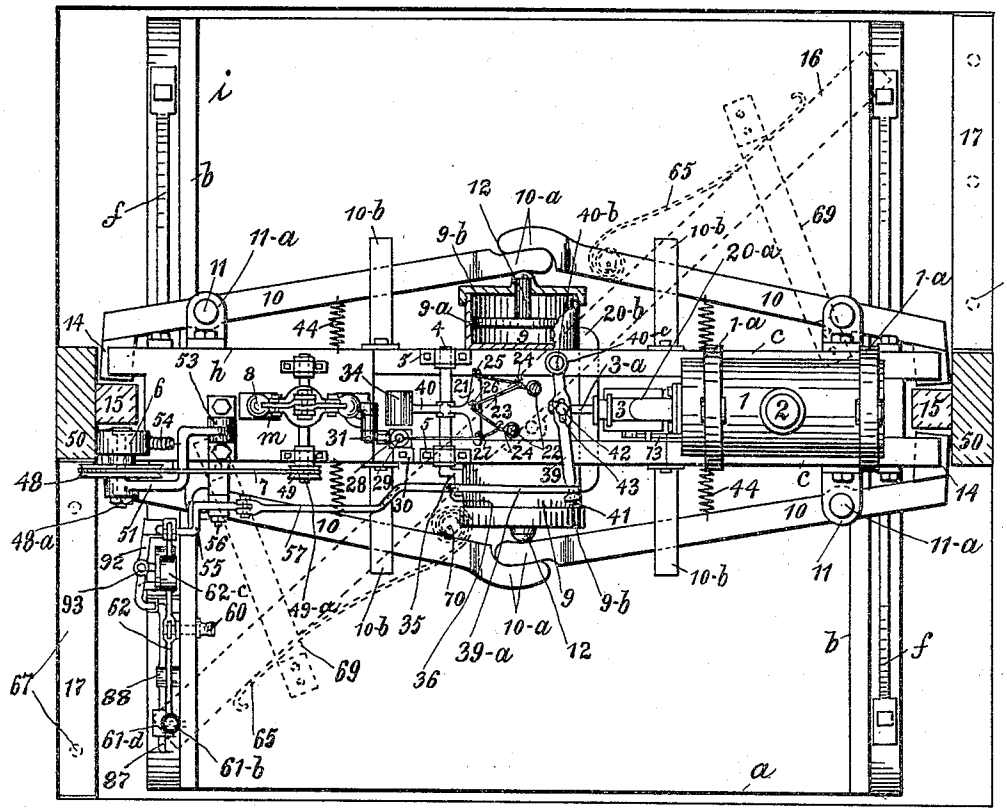


Fig. 4.

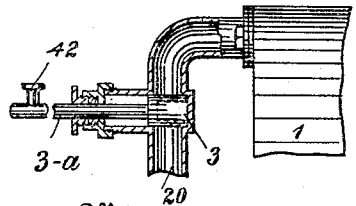
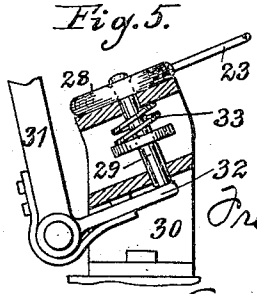


Fig. 5.



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3 SHEETS—SHEET 3.

Fig. 6.

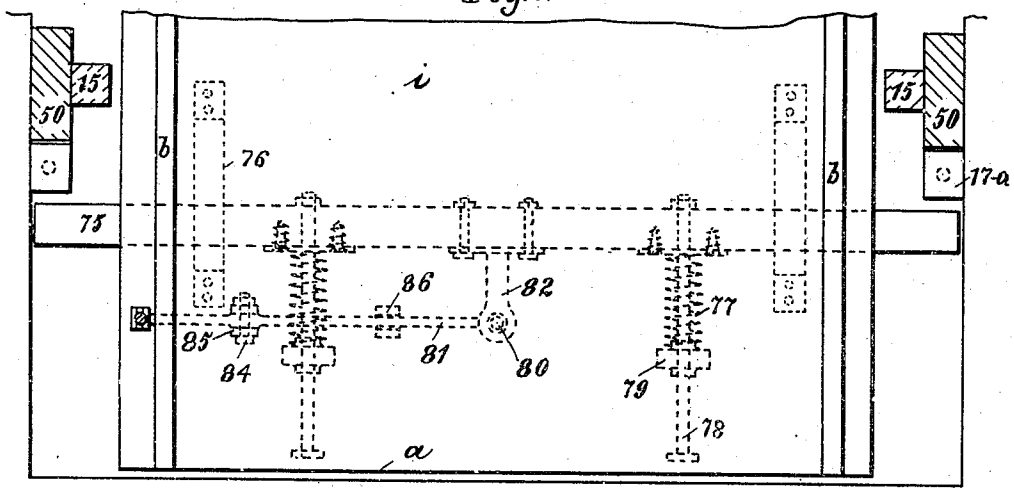


Fig. 7.

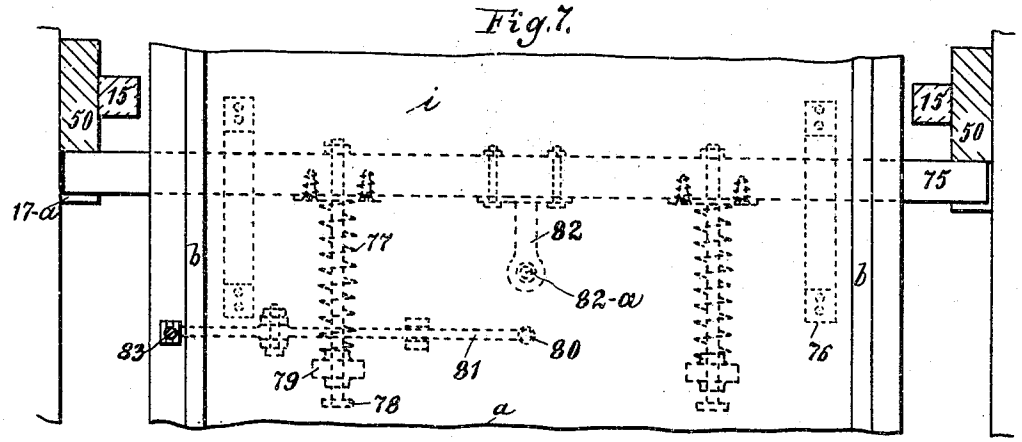
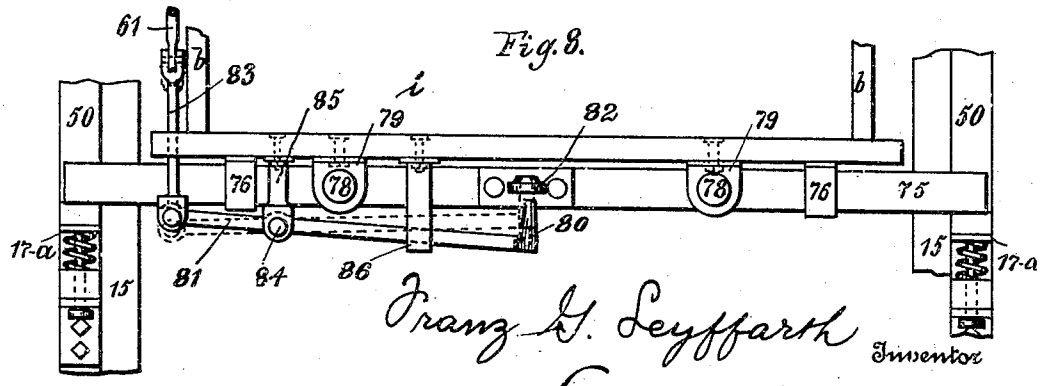


Fig. 8.



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No. 791,950. Patented June 6, 1905.

UNITED STATES PATENT OFFICE.

FRANZ GUSTAV SEYFFARTH, OF BROOKLYN, NEW YORK.

SAFETY DEVICE FOR ELEVATORS.

SPECIFICATION forming part of Letters Patent No. 791,950, dated June 6, 1905.

Application filed October 21, 1902. Renewed May 8, 1905. Serial No. 259,432.

To all whom it may concern:

Be it known that I, FRANZ GUSTAV SEYFFARTH, a citizen of the United States, and a resident of the borough of Brooklyn, county of Kings, city and State of New York, have invented certain new and useful Improvements in Safety Devices for Elevators, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, wherein—

Figure 1 is a side elevation, partly sectional view, of an elevator-car provided with my improved safety devices. Fig. 2 is a side view of the mechanism disengaging simultaneously the safety-bar underneath the car and the brake-arms acting against the guide-bars. Figs. 2^a and 2^b are plan view and elevation, respectively, of parts of Fig. 2. Fig. 3 is a plan view of Fig. 1; Fig. 4, an enlarged sectional view of the valve; Fig. 5, a detail view of the pin acted upon by the governor, whereby the safety device is set in action. Figs. 6 and 7 are plan views of a modified construction of the safety-bar underneath the car, Fig. 6 showing the same out of and Fig. 7 in engagement. Fig. 8 is an end elevation of Fig. 7.

My invention relates to elevators, and particularly to devices having for their object to secure passengers and car in an accident.

It is well known in the art that an efficient safety device which will automatically stop the car in case of accident, not only in case of the breaking of the lifting-cables, but also in case of some difficulty with the machinery whereby the elevator is run, causing the car to move at unusual speed, a device capable of gradually diminishing the speed of the car, acting promptly and effectively, is a very desirable improvement. This desideratum is accomplished in the construction of my improved safety device by mechanism driven by compressed air or other expansible fluid acting upon brakes, pressing them against the guideways, and the action of the brakes is supplemented by a stop-bar, secured underneath the car, which brings the car to full stop upon cushioned stop-bars situated level with each floor, thus enabling the passengers to conveniently leave the car or to discharge the freight. The mechanism is set in action automatically by a governor driven by friction upon one of the guideways. The governor opens the valve, admitting the expansible fluid to act upon the brakes when the speed of the elevator increases above a certain point. This valve is also automatically opened if any of the lifting-cables breaks or slackens, and in addition thereto also means are provided whereby these devices can be set in action manually by the elevator man at any time.

The drawings show the devices applied to the car of a freight-elevator; but they may equally well be applied to passenger-elevators.

Reference-letter *a* indicates the floor, *b* the sides, *c* and *c* the cross-head beams, of the car *i*. Brackets *d* and clamps *e* and *f* bind the various parts of the elevator together.

g indicates springs sliding upon the guide-bars, insuring the elevator to run smoothly.

The brakes are made in form of arms 10, fulcrumed on pivots 11, set in lugs 11^a of cross-beams *c*, and guided in slotted brackets 10^b to prevent their sagging. These brake-arms are provided with heads 14, which are normally kept some distance from guideways 15 by tension-springs 44; but when the mechanism is set in action they are pressed against these guideways, thus retarding and finally stopping the motion of the car. The mechanism acting upon the brakes is actuated by pressure of some expansive fluid. For this purpose receptacle 1 is provided, filled with compressed air (or other expansible fluid) through the self-closing valve 2. Gage 18, connected thereto, indicates the pressure of the fluid and obviously also if any diminishing of the pressure has occurred. The receptacle, situated between cross-head bars *c* and *c* and secured to them by bands 1^a, is connected to cylinders 9 by pipe 20, valve 20^a, and branches 20^b. In these cylinders 9 are fitted pistons 9^a, whose rods 12 project through their perforated heads 9^b and act against the rear ends 10^a of brake-arms 10. Valve 3 governs the flow of the expansible liquid to the cylinders.

Valve 3 is actuated by the following mechanism: To rod 4, journaled in bearings 5, is

secured a double-armed lever 40, having cross-head 21 on one end. To the other end thereof weight 34 is attached, which causes lever 40 to turn toward the left when released. Lever 39 is fulcrumed on standard 40^c, secured in one of the cross-beams c, and valve-stem 3^a is connected to lever 39 by means of pin 42, engaging in slot 43. Spiral spring 40^a, slid on the pivot 40^b within the standard, is set so that it has a tendency to draw lever 39 to close valve 3. Hooks 25 and 26 and pin 27 are set in cross-head 21. Hooks 24 are fastened to cables 22, whose ends are secured in plate 22^a. A thin wire rope 23, secured to hook 25, is passed around hooks 24, hook 26, and pin 27, as shown in Fig. 3. Its end is attached to ring 28, placed loosely on pin 29, set in standard 30, and is held thereby. As long as ring 28 is held on pin 29 the mechanism for opening air-valve 3 cannot act. When, however, the arm 32 is withdrawn, and thus disengaged from pin 29, this pin is forced downwardly by spring 33. (See Fig. 5.) This releases ring 28, and with it also rope 23, and causes weight 34 to turn lever 35 toward the left. The projecting part of lever 35 acts against abutment 36 of rod 57. This rod is thereby drawn outwardly and being pivotally connected to lever 39 at 41 opens valve 3, admitting the compressed air from receptacle 1 to cylinders 9. This releasing of mechanism operating the valve is effected by governor 8, to which lever 31 is connected. Governor 8 is driven by friction-wheel 6, set on shaft 48^a, mounted in arm 51, pivoted at 52 in lug 53. Wheel 6 is in frictional contact with guide-post 50 during the motion of the elevator. Spring 54, fastened to arm 51 and plate h, draws arm 51 downwardly, and thus keeps the wheel 6 more securely upon the guide-post. Upon plate h are secured the standard m of the governor, supporting bearings for shaft 49^a and lug 53. Wheel 6 is secured to or made integral with pulley 48. Rope 7, passing from pulley 48 to and over pulley 49, set on shaft 49^a, transmits the motion from wheel 6 to the governor. A ratchet-wheel may be set on shaft 48^a with the ratchet on wheel 6, to prevent motion of the governor during the upward travel of the car. The speed of the revolving arms of governor 8 corresponds proportionately with the speed of the car. As long as the speed of the car is not exceeded the arms rotate in the position shown in Fig. 1 and lever 31, having one arm connected with the collar of the governor, engaging in the annular groove thereof, is held in such position where its arm 32 engages (and holds in position) pin 29. When the speed of the car exceeds its predetermined limit, the centrifugal force of the weights affixed on the ends of the arms of the governor forces the arms upwardly. Lever 31 is thereby turned on its fulcrum-point and its arm 32 withdrawn from its engagement with pin 29. This pin 29, actuated by spring 33, is then forced downwardly, releasing ring 28, and with it also rope 23, thus causing weight 34 to turn lever 35 toward the left, thereby opening the air-valve 3 and setting the apparatus for stopping the car in action. When lifting-cables 22 are slackened by stopping or derangement of machinery or if any of the lifting-cables break, the strain upon wire rope 23 is removed and the result of that upon the mechanism-actuating valve 3 is the same as when ring 28 is released from pin 29 by the described action of the governor. The compressed air when admitted to cylinders 9 by opening valve 3 forces pistons 9^a (and piston-rods 12) outwardly, and these turn the brake-arms on their respective pivots, driving heads 14 of the brakes against the sides of guide-ways 15. The force of the pressure is considerably increased by the leverage resulting from fulcruming of the brake-arms. Valve 3 can also be operated by hand from the interior of the car by the elevatorman. This is accomplished by swinging handle 60, hinged to lever 62 at 62^b, outwardly after withdrawing it from pin 60^a. Spring 62^e draws the free end of lever 62 upwardly. The weighted end of lever 62 bearing against collar 58^b draws the rod down, and by this motion, through bell-crank lever 55 and rod 57, valve 3 is opened.

The stop-bar 16, located underneath the car, being centrally pivoted to the bottom of the car at 64, is provided as an additional device to insure the safety of the passengers in case of an accident. Its object is to bring the car to a full stop on the level of a floor. For this purpose bolsters 17 are set up on each side of the elevator-shaft. They are cushioned on springs 66, slid on pins 67, secured to or made integral with plate 68. When not in action, bar 16 is held receded by rod 61 engaging in bore 16^a. Springs 65, fastened to pins 70, press against stop-bar 16, and when rod 61 is withdrawn the bar, swung by the action of the springs, is brought in position to engage with bolsters 17 and stop the car.

The mechanism for setting the stop-bar 16 in position to stop the car is operated simultaneously with the mechanism for opening valve 3 by rod 58, pivoted to one end of lever 55. The free end of rod 58 is bent, as shown at 58^a, and above the bend a stop-collar 58^b is provided. This rod 58 is pushed down when lever 55 is moved to open the valve. The mechanism is constructed as follows: Rod 61, movably set in lugs 61^c, is seated in bore 16^a of stop-bar 16 and carries on its upper end a head 61^d. Lever-arm 62, centrally pivoted at 62^a, is provided on its inward end with weight 62^c and with a bore through which rod 58 passes. To the outer end of lever 62 and pin 62^d spring 62^e is attached. Lever-arm 87 is pivoted at 88. On the squared inward end of this lever is mounted (on pin 89^a) weight 89, which can be adjusted by set-screw 90 rela-

tively to segment 91 to regulate its frictional contact therewith. Lever 92 is fulcrumed on the outward end of pin 89[a] at 93. Its outer inwardly-bent end rests on plate 94 of segment 91. Its inward end 92[a] is wedge-shaped. When rod 58 is pushed down, (by the action upon it of lever 55,) its bent end 58[a] comes in contact with the wedge-shaped part 92[a] of lever 92, which latter is thereby drawn out of engagement with plate 94 and releases arm 87. Weight 89 then moves downward along segment 91, bringing the free outward end of arm 87 in contact with head 61[d], thus lifting rod 61 out of bore 16[a] and releasing the stop-bar. When arm 87 reaches stop-pin 87[a], its motion is arrested. Then springs 65, acting upon the ends of stop-bar 16 in opposite directions, swing it in the position indicated in Fig. 1 in dotted lines. In this position the ends of stop-bar 16 project beyond the floor of the car, and when the latter reaches the level of the next floor its projecting ends abut upon bolsters 17 and the car is brought to a full stop.

Although as described the stop-bar 16 is released nearly simultaneously with the opening of the air-valve, yet it is not desirable that it should be swung across the elevator-bottom instantaneously. The car is not to be brought to a full stop until after the brake-arms have obtained a firm hold upon the guideways and reduced the speed of the car to a minimum; otherwise there would be a jar produced that might result in damage to the car and passengers. For this reason in constructing the device care must be taken to have the end of arm 87 some distance from head 61[d] and weight 89 traveling upon segment 91, so there is sufficient time allowed for the brake-arms to reduce the speed of the car before the stop-bar is set for action. Should it occur that the car is stopped by the brakes above a floor before coming to rest upon the stop-bar, it can be lowered gradually. For this purpose the three-way valve 20[a] is provided. Normally there is an unobstructed passage through this valve from receptacle 1 to the cylinders 9, as indicated in dotted lines, Fig. 1; but the outlet 72 of the valve is closed. Valve 20[a] is operated by string 74, fastened to lever-arm 73. Spring 73[a] presses lever 73 constantly against pin 73[b], and thereby holds valve 3 closed and returns it to closed position after pull on handle 74[a] is released. Handle 74[a] is within reach of the car attendant.

Figs. 6, 7, and 8 show a modified construction of the stop-bar underneath the car. In this construction the bar 75 is disposed parallel to the edges of the elevator-bottom instead of diagonally, as shown in Fig. 3. It is set movably in brackets 76, secured to the car-bottom, and is actuated by springs 77, set on pins 78, secured in bar 75 between it and lug 79. Lug 82, secured to bar 75, has an eye 82[a], in which pin 80 of lever-arm 81 engages. Slotted bar 86 is provided to prevent twisting of lever-arm 81. Lever-arm 81 is fulcrumed on pin 84, set in hanger 85. Its outward end is pivoted to rod 83 and pin 80 is set on its inward end. When rod 61 (to which rod 83 is attached) is drawn upwardly, (as previously described,) pin 80 of lever-arm 81 is drawn out of eye 82, thus releasing stop-bar 75. Springs 77 then force the bar from its normal position (shown in Fig. 6) to that shown in Fig. 7, where the beam rests upon bolsters 17[a], which although smaller than the bolsters 17 previously described are similarly constructed.

I claim as my invention—

1. The combination with an elevator-frame provided with guideways, a car, movably mounted in the frame and engaging with the guideways, and means for raising and lowering the car; of brake-levers, fulcrumed to the car and having gripping-surfaces in position to engage with the guideways; springs connected to the levers and to the car in position to withdraw the former from the guideways; working cylinders secured to the car, pistons set in the cylinders, and piston-rods secured to the pistons and engaging with the rear ends of the brake-levers; a compressed-air receptacle secured to the car, a conduit connecting it with the working cylinders, a valve set in the conduit, and mechanism, secured to the car and operatively connected with the elevator, for operating the valve, substantially as herein shown and described.

2. The combination with an elevator-frame provided with guideways, a car, movably mounted in the frame and engaging with the guideways, and means for raising and lowering the car, of brake-levers, fulcrumed to the car, and having gripping-surfaces in position to engage with the guideways; springs connected to the levers and to the car, in position to withdraw them from the guideways; working cylinders secured to the car, pistons set in the cylinders and piston-rods secured to the pistons and engaging with the rear ends of the levers, a compressed-air receptacle secured to the car, a conduit connecting it with the working cylinder, a valve set in the conduit, a speed-governor mounted on the car, a friction-pulley set on the car and in contact with the frame of the elevator, means for transmitting the motion of the friction-pulley to the governor, a bell-crank lever and a pin set intermediate between the valve and the governor and connected therewith.

3. The combination with an elevator-frame provided with guideways, a car movably mounted in the frame and engaging with the guideways, and means for raising and lowering the car; of brake-levers, fulcrumed to the car and having gripping-surfaces in position to engage with the guideways; springs connected to the levers and to the car in position to withdraw them from the guideways; work-

ing cylinders secured to the car, pistons set in the cylinders and piston-rods secured to the pistons and engaging with the rear ends of the levers; a compressed-air receptacle secured to the car, a conduit connecting it with the working cylinder, a valve set in the conduit, and mechanism for actuating the valve manually from the interior of the car, substantially as herein shown and described.

4. The combination with an elevator-frame provided with guideways, a car, movably mounted in the frame and engaging with the guideways, and means for raising and lowering the car; of brake-levers, fulcrumed to the car and having gripping-surfaces in position to engage with the guideways; springs connected to the levers and to the car in position to withdraw them from the guideways; working cylinders secured to the car, pistons set in the cylinders and piston-rods secured to the pistons and engaging with the rear ends of the lever; a compressed-air receptacle secured to the car, a conduit connecting it with the working cylinder, a valve set in the conduit, a bell-crank lever fulcrumed to the car and having one arm operatively connected with the valve; a weight attached to the other arm, and means for holding the weighted arm in position while the car travels at or below a predetermined speed, and for releasing it automatically when the speed is exceeded, substantially as herein shown and described.

5. The combination with an elevator-frame provided with guideways, a car, movably mounted in the frame and engaging with the guideways, and means for raising and lowering the car; of brake-levers, fulcrumed to the car and having gripping-surfaces in position to engage with the guideways; springs connected to the levers and to the car in position to withdraw them from the guideways; working cylinders secured to the car, pistons set in the cylinders and piston-rods secured to the piston and engaging with the rear ends of the levers; a compressed-air receptacle secured to the car, a conduit connecting it with the working cylinder, a valve set in the conduit, mechanism for operating the valve, actuated by the motion of the car and operatively connected with the ropes supporting the car, a three-way valve set in the conduit, and mechanism for operating it manually from the interior of the car, substantially as herein shown and described.

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