No. 699,511. Patented May 6, 1902.

W. A. FORMAN.

SAFETY ATTACHMENT FOR ELEVATORS.

(Application filed Mar. 23, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1

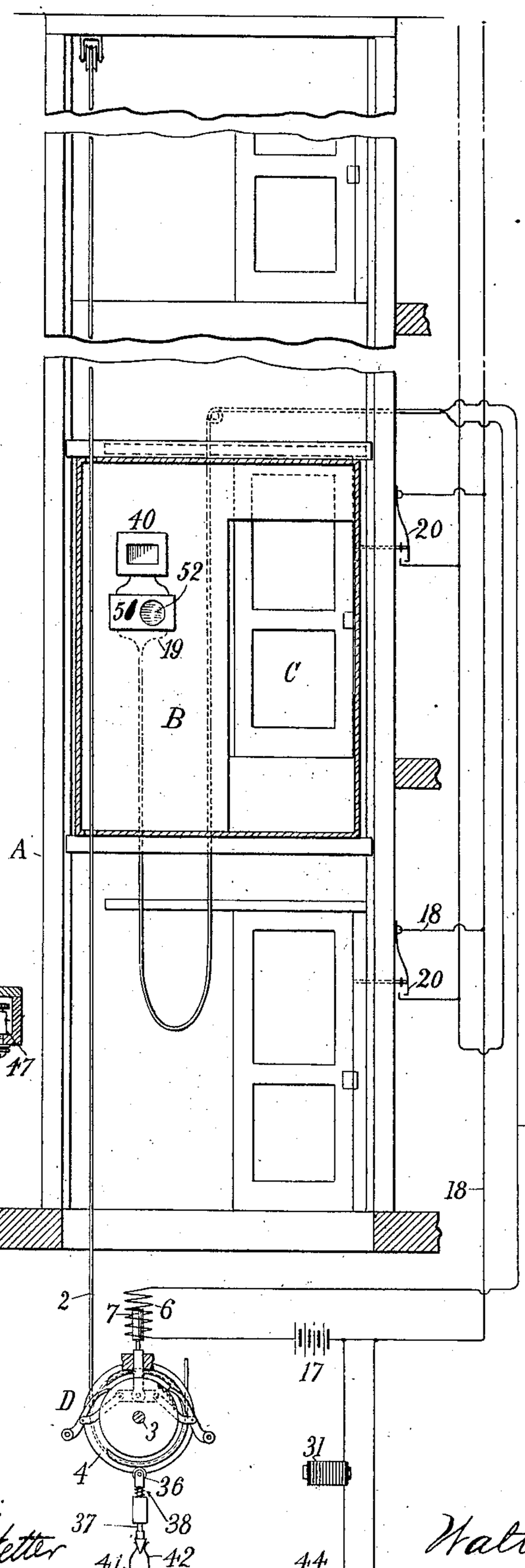


Fig. 2

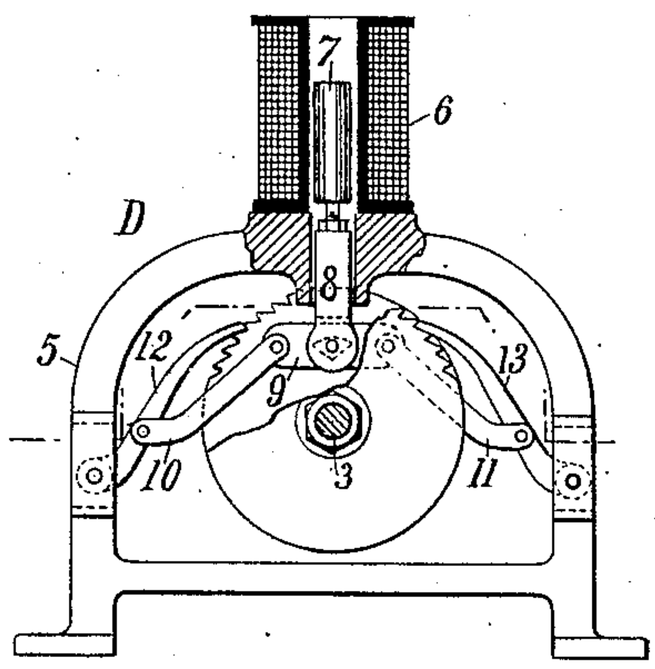


Fig. 3

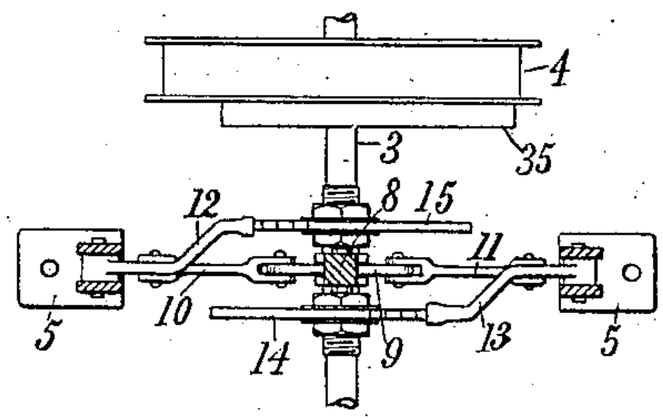


Fig. 4

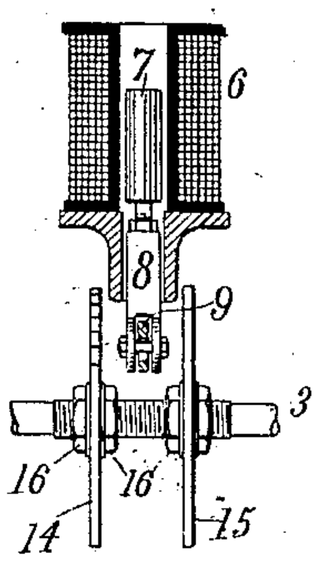
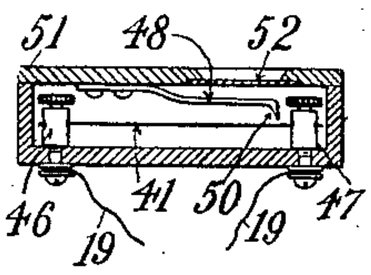


Fig. 6



Witnesses:
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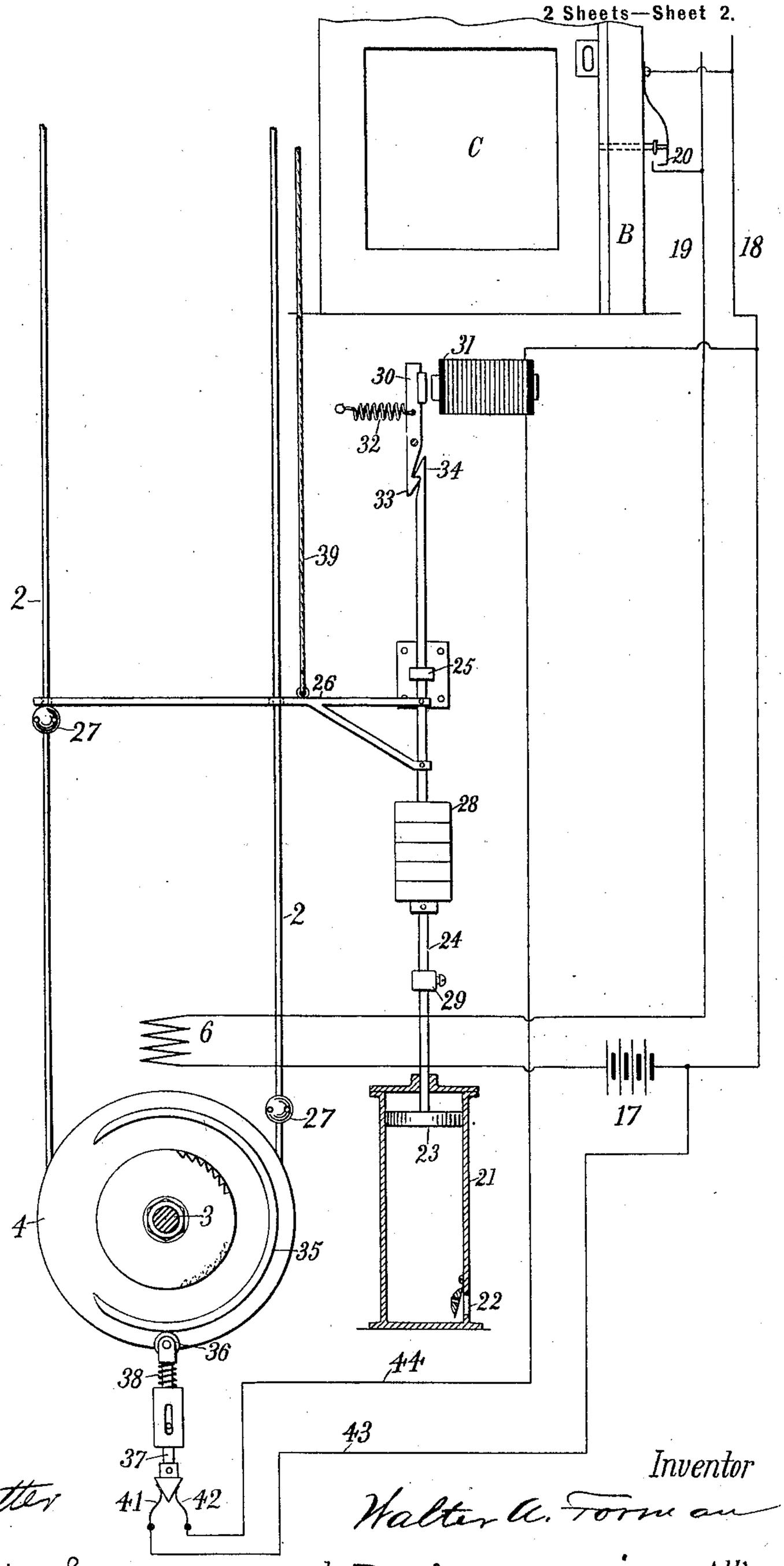
Fig. 5



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UNITED STATES PATENT OFFICE.

WALTER A. FORMAN, OF BROOKLYN, NEW YORK.

SAFETY ATTACHMENT FOR ELEVATORS.

SPECIFICATION forming part of Letters Patent No. 699,511, dated May 6, 1902.

Application filed March 23, 1900. Serial No. 9,889. (No model.)

To all whom it may concern:

Be it known that I, WALTER A. FORMAN, of Brooklyn, county of Kings, State of New York, have invented a new and useful Safety Attachment for Elevators, of which the following is a specification.

My invention relates to improvements in safety attachments for elevators, its object being to provide automatic means to stop and also to prevent the starting of the elevator while any door of the elevator-shaft is open.

To this end my invention consists in the features of construction hereinafter particularly described and claimed.

In the drawings forming part of this specification, Figure 1 represents, conventionally, an elevator-shaft, its car, the car-operating attachment, and my improved valve-locking device in connection therewith. Fig. 2 is a sectional detail of my device as applied to the valve-shaft of the elevator. Fig. 3 is a detail plan view of the same. Fig. 4 is a vertical sectional detail taken in a plane at right angles to that of Fig. 2. Fig. 5 is a conventional drawing showing my improved automatic stop device, and Fig. 6 shows the emergency circuit-breaker.

Specifically, A represents the elevator-shaft, B the car, and C a door into the elevator-shaft.

2 is the hand cable or rope for operating the valve-shaft 3, passing around a drum 4 upon the shaft.

D is my improved safety locking attachment. This comprises the yoke-shaped frame 5, having suitable support, through which passes the valve-shaft 3. Mounted upon the frame is an electromagnet 6, preferably a solenoid. Its core 7 has an arm 8 extending downward and loosely pivoted or otherwise connected centrally to the horizontal cross-bar 9, to the ends of which bar are loosely pivoted the links 10 and 11, these links in turn being pivoted to the pawls 12 and 13, respectively, which have pivotal support on the side standards of the frame.

Adjustably mounted upon the shaft 3 on opposite sides of the bar 9 are the ratchet-disks 14 and 15. These are adjustable upon the shaft, preferably by being threaded thereon, and are secured in adjusted positions by set-nuts 16. These disks are toothed only upon a small arc of their peripheries, the teeth of one being oppositely inclined to those of the other. The disks are so adjusted that when the shaft 3 is in normal position—*i. e.*, to close the valve or otherwise shut off the power from the elevator—the ratchet-teeth will be in position to be engaged by the respective pawls 12 and 13, the connection between the cross-bar, links, and pawls being sufficiently loose to permit either pawl to drop into engagement with a notch in its ratchet, while the other pawl rests upon the point of a tooth. My object in making the ratchets adjustable is to adapt them to any variation in the normal position of the valve and its shaft. I find that in taking out and placing new cups or packing in the hydraulic valves the racks and pinions are not always replaced in exactly their original position. This serves to vary the normal position of the valve and its shaft. Hence, the pawls being non-adjustable, it is necessary that the ratchets be adjusted to the variable position of the shaft to insure engagement at proper points with the pawls. These pawls can engage the ratchets only when the solenoid is energized, so as to lift its core and permit the pawls to drop upon the disks, the loose connections between parts giving sufficient play for each pawl to drop independently into engagement with its ratchet. When the solenoid is deënergized or out of circuit, the weight of the core and its attached parts thrusts the pawls away from and out of engagement with the disks. The solenoid is arranged in an open circuit comprising the battery 17, the indicator 40 in the car, the wires 18 and 19, and the spring circuit-closers 20, connected in multiple with said wires, which circuit-closers are respectively held open by the doors C when the latter are in closed position, but are released by the slightest opening movement of a door, whereupon that particular closer makes contact and closes the circuit. The particular form of circuit-closer is immaterial, so long as it is operative in the manner described. The normal position of the various parts, the elevator-doors being all closed, is with all the circuit-closers 20 open, the magnet 6 deënergized, and the pawls 12 and 13 out of engagement with the ratchet-disks.

The operation of the device can be readily

understood from the drawings and from the foregoing description, as follows: The elevator-car being at rest and all the doors to the elevator-shaft closed, the cable 2 is pulled so as to rotate the valve-shaft to open the valve and start the car, as desired, either upward or downward. While the valve remains thus open the ratchet-disks 14 and 15 are so turned that the untoothed segment of the periphery of each is presented to its respective pawl, as illustrated in Fig. 1, whereby it is impossible for the pawls to engage the disks. When the car has reached its destination and is stopped by the turning of the valve-shaft, the toothed segments or portions of the disks are presented to their respective pawls, as shown in Fig. 2. The opening of a door when the parts are in the last-named position releases its circuit-closer and allows it to make the circuit through the solenoid, thereby energizing the same and causing the core 7 to be drawn upward and permit the pawls to drop into engagement with the teeth of the ratchets. So long as the circuit remains closed the pawls are in engagement with the ratchets, and it is impossible to rotate the valve-shaft in either direction to move the car. Upon the closing of the door the circuit is broken and the pawls are disengaged from the ratchets, after which the car can be operated in either direction. While the car is in transit should a door be opened the circuit is closed in the manner described, and the pawls drop upon the untoothed edges of their respective ratchet-disks, but cannot engage with the same. Consequently the car continues to move until stopped by the operator. When so stopped, however, the pawls immediately engage the ratchet-teeth and prevent the car being started again until the door is closed. The purpose of this arrangement is to prevent the possibility of the valve being locked open while the car is in motion by the opening of a door, whereby it would be impossible for the operator to stop the car.

In some cases it may be desired to have automatic means by which the car will be stopped in transit—if, for example, the operator carelessly attempts to open a door before he has reached a landing position, as well as to prevent accidents in case another party should open any door while the car is in motion. For this purpose I have provided an additional attachment. (Shown conventionally in Fig. 5.) This consists of a dash-pot cylinder 21, provided with a suitable valve 22 and a piston 23, carried by the rod 24, which runs in guides 25. This rod has an arm or bracket 26, through openings in which the cable 2 runs, the cable being provided with stops 27, against which the arm 26 will strike, as hereinafter described. The rod 24 carries weights 28, which tend to move it downward until the stop 29 strikes upon the head of the cylinder 21. The rod 24 and its weights are normally supported in raised position by means of the armature 30 of the magnet 31, the armature being withdrawn from the magnet by the spring 32 and being provided with a catch 33, engaging a corresponding catch 34 upon the rod. The magnet is in circuit with the circuit-closers of the doors above described, but in multiple with the stop attachment, so that the opening of a door will close its circuit, energize it, and cause the weighted rod 24 to drop, the impact of falling being cushioned by the air in the cylinder 21, against which the piston impinges, the arm 26 upon the rod engaging the uppermost stop 27 and carrying the cable downward to rotate the valve-shaft, throwing it around to valve-closing position, as determined by the position of the stop 29 on the rod 24. In order to prevent the operation of this attachment when a car is at a landing and the door is opened, I provide means for breaking the circuit through its magnet. This may be done as follows: The drum 4 is provided with a segmental flange 35, upon which runs an antifriction-roll 36, carried by the plunger 37. The plunger is provided with an actuating-spring 38, and the flange 35 serves to thrust the plunger against the tension of its spring into engagement with the spring-contacts 41 and 42 of the branch wires 43 and 44, respectively connected to the wires 18 and 19, as shown in Fig. 1. Thus the circuit through the magnet 31 is in position to be closed by the closer 20 upon the opening of any door. Thereupon, the magnet 31 being energized, the rod 24 is allowed to drop with the impulse of its weight 28, engaging, by means of its arm, with the weight 27 upon the cable 2, and thereby throwing around the shaft 3 till the motive power is cut off and the car stopped. The opening of a door while the car is running, as will be seen, causes both devices to operate the pawls, taking effect to lock the valve-shaft after the weighted rod 24 has served to turn the shaft to close the valve. After the open door has been closed the operator of the car can by means of the cable or rope 39 lift the weighted rod 24 back to normal position, where it is engaged and held by the armature of the magnet 31. After this the cable 2 may be operated to throw the valve-shaft and apply the power to start the car. It will be seen that the automatic stopping attachment, however, is not operative when the car is stopped by the operator in the ordinary way, because when the valve is closed the cable-drum is turned to carry the flange 35 out of engagement with the roll 36. The spring 38 then lifts the plunger out of engagement with the contacts 41 and 42, leaving the circuit of the attachment open.

40 is an indicator—such as, for example, an incandescent lamp or other suitable electrical device—arranged in circuit and which shows at all times to the operator whether or not current is passing, and consequently whether the safety device is in operation. This device is normally absolutely out of his control. In emergencies, however, such as a fire, it may be important to have it possible

for the operator to break the circuit of the safety device, so as to throw it wholly out of service for the time, and thus enable him to operate the car meanwhile in the ordinary manner. While any suitable provision may be made for this, I prefer to employ the emergency circuit-breaker, which is shown in Fig. 6. In this one of the circuit-wires 18 or 19 has a fuse 41, inserted between binding-posts 46 and 47. A spring-arm 48 carries a knife 50, so positioned as to sever the fuse adjacent one of the binding-posts when the arm is struck a sharp blow. For the purpose of protection the whole is preferably covered by a box 51, having a glazed opening 52 above the arm. When the emergency arises to make it necessary to have recourse to this attachment, the operator can by one blow break the glass and strike the arm, causing it to cut the fuse, thus effectually opening the circuit and cutting the attachment out of service. When the emergency has passed, the fuse can be replaced to bring the attachment into service and the glass restored to the case. It is evident that a circuit-closer can also be applied to the door of the elevator-car, and thereby cause the position of that door to control the operation of the car in the same manner as the position of a door of the elevator-shaft.

I claim—

1. In an elevator, the combination with its valve-shaft, of an electromagnet and its circuit, a closer for said circuit operated by the opening of an elevator-door, and a lock or clutch mechanism controlled by said magnet adapted to restrain the shaft from movement in either direction when the motive power is cut off, and adjustable for different normal positions of such shaft or part.

2. The combination with an elevator valve-shaft, of a pair of oppositely-toothed segmental ratchets thereon, their pawls, means for adjusting said ratchets to different normal positions of said shaft, the electric circuit, the electromagnet in said circuit controlling said pawls, and the closer for said circuit actuated by the opening of an elevator-door, substantially as and for the purposes set forth.

3. In an automatic stop device for elevators, in combination with its valve-shaft, the disks adjustable on said shaft, each having a small arc only ratchet-toothed, the teeth of one being oppositely inclined to those of the other, the pawls, the toothed segments of the disks being so positioned as to be presented to the pawls only when the shaft is in normal or valve-closing position, and means operative by the opening of an elevator-door for automatically bringing such pawls into engagement with said teeth.

4. The combination with an elevator valve-shaft, of the segmentally-toothed ratchet-disks independently adjustable thereon, the oppositely-disposed pawls, the electromagnet and its circuit, the loose operative connection between its armature and said pawls, and the circuit-closer actuated by the opening of an elevator-door, all substantially as and for the purposes specified.

5. The combination with the valve-shaft, the ratchet-disks thereon, the pawls, the magnet and its armature, of the cross-bar and links connecting said armature and pawls, said connections being sufficiently free or loose to permit either pawl to drop into engagement with a notch upon its ratchet while the other pawl may be resting upon the apex of a tooth.

6. The combination with the valve-shaft, the segmental ratchet-disks thereon, their pawls, the magnet and its armature, of the loose connection between said armature and pawls, permitting, when the magnet is energized, either pawl to drop into engagement with its ratchet irrespective of the position of the other pawl, and whereby both pawls are thrust equally away from their ratchets when the magnet is deënergized.

7. In combination with the electric circuit in a safety device of the character described, a secondary circuit in multiple with the main circuit and having an independent switch automatically closed while the car is running, a mechanical trip for the valve-shaft-operating means, and a magnet in the secondary circuit controlling said trip, substantially as and for the purpose specified.

8. In combination with an electrically-operated locking device for an elevator valve-shaft controlled by circuit-closers operative by the opening or closing of elevator-shaft doors, a secondary circuit in multiple with the main circuit, normally closed while the car is running and opened when the car is at rest, a mechanical trip adapted to engage the valve-shaft cable and to operate the same to turn the shaft into valve-closing position, and a magnet in the secondary circuit controlling said trip.

Signed at New York city this 21st day of March, 1900.

WALTER A. FORMAN.

Witnesses:

CHARLES LA RUE KINGSLEY,

T. D. MERWIN.