(No Model.) 3 Sheets—Sheet 1.

McCLELLAND C. FULLENLOVE.

SAFETY APPLIANCE FOR ELEVATORS.

No. 539,580. Patented May 21, 1895.

Fig. 1.

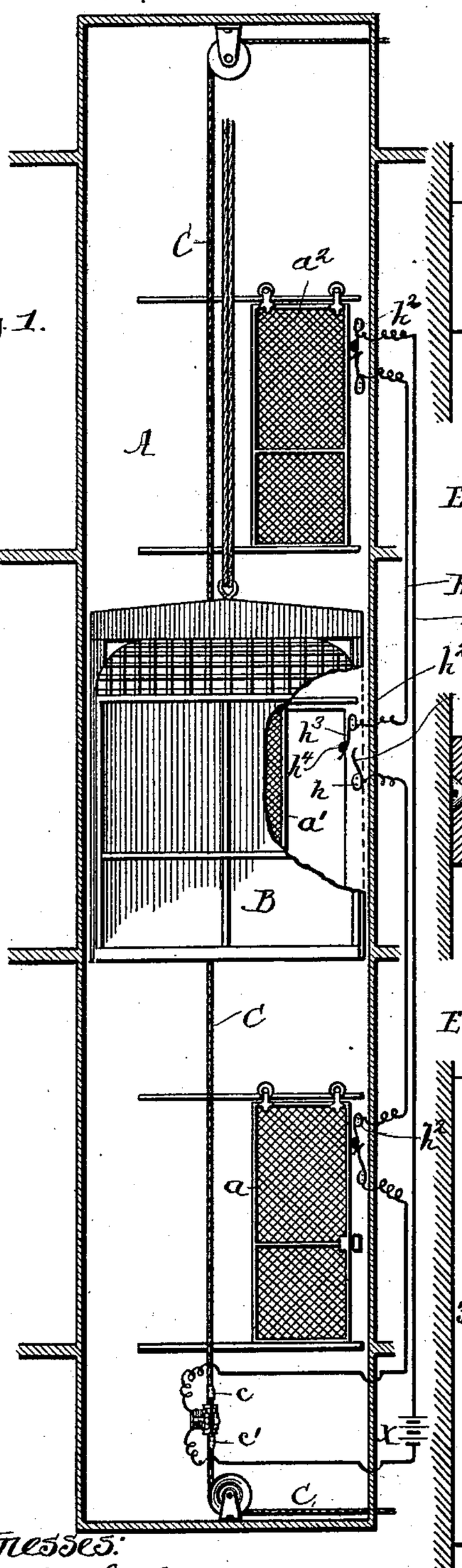


Fig. 2.

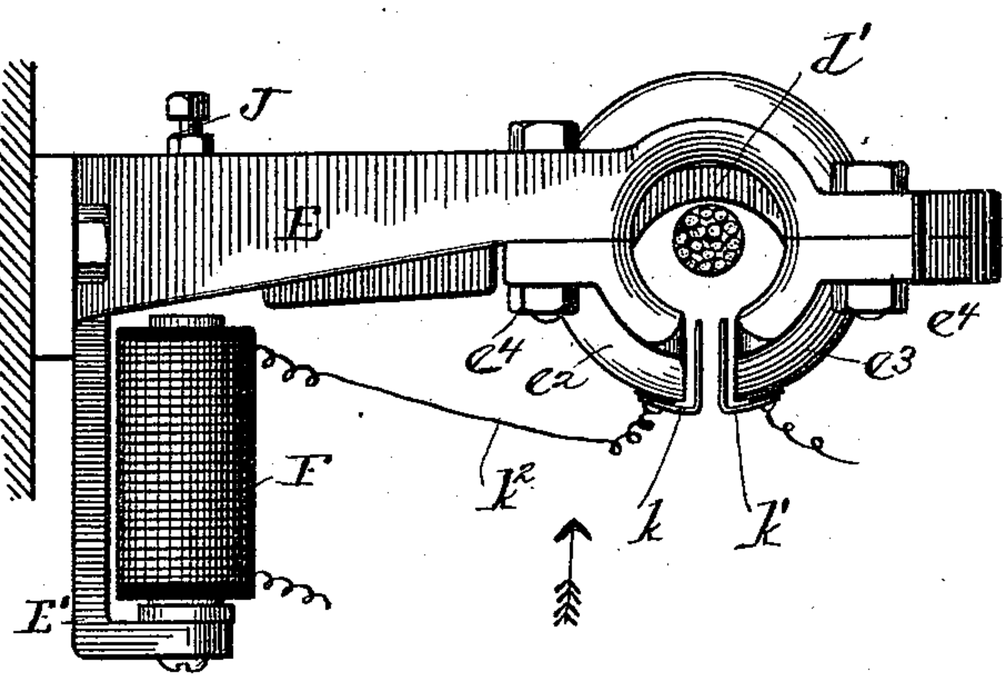


Fig. 3.

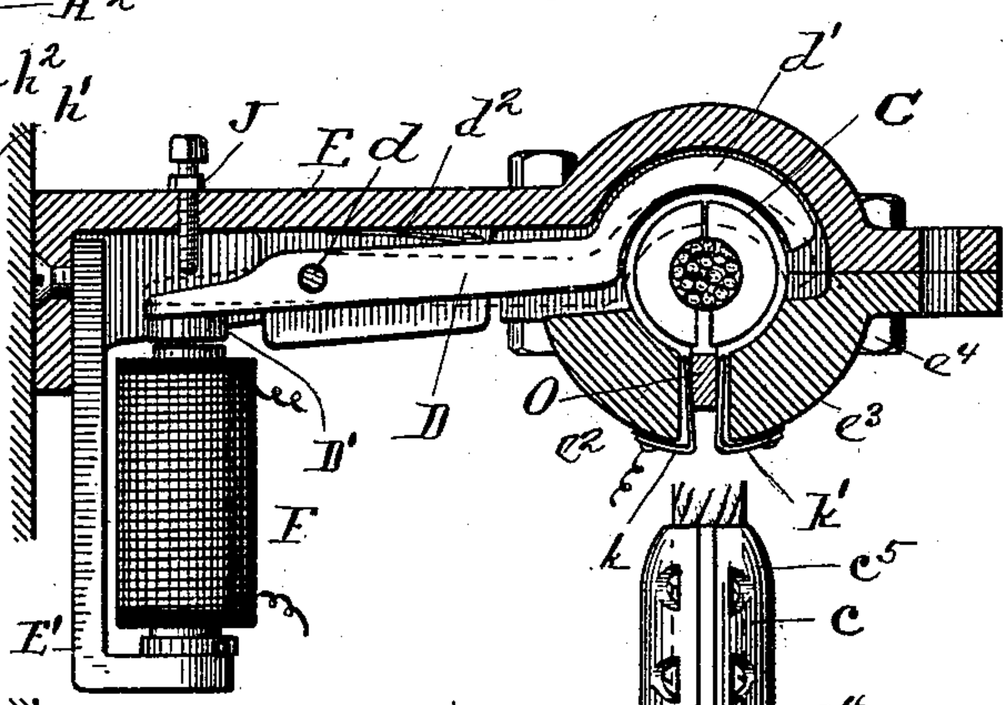
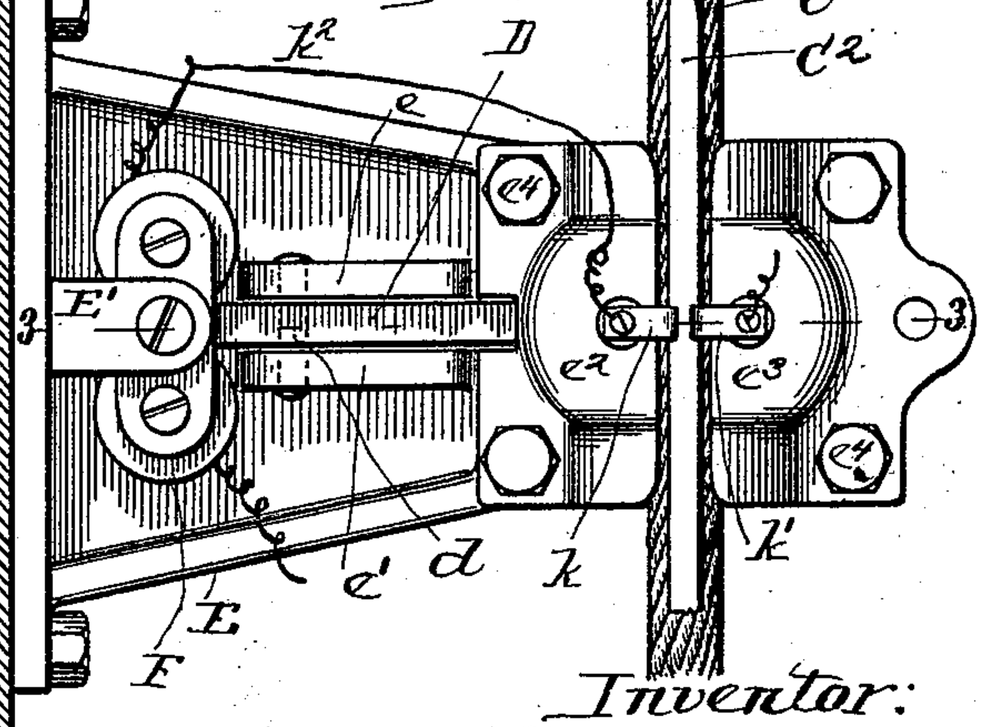


Fig. 4.



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(No Model.) 3 Sheets—Sheet 2.

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Fig. 5.

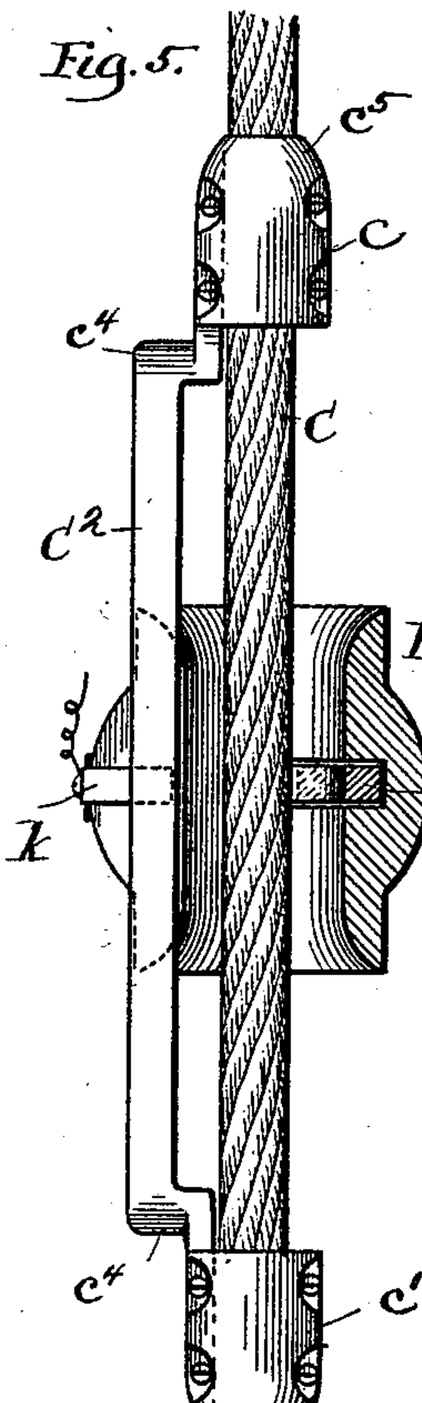

Fig. 11.

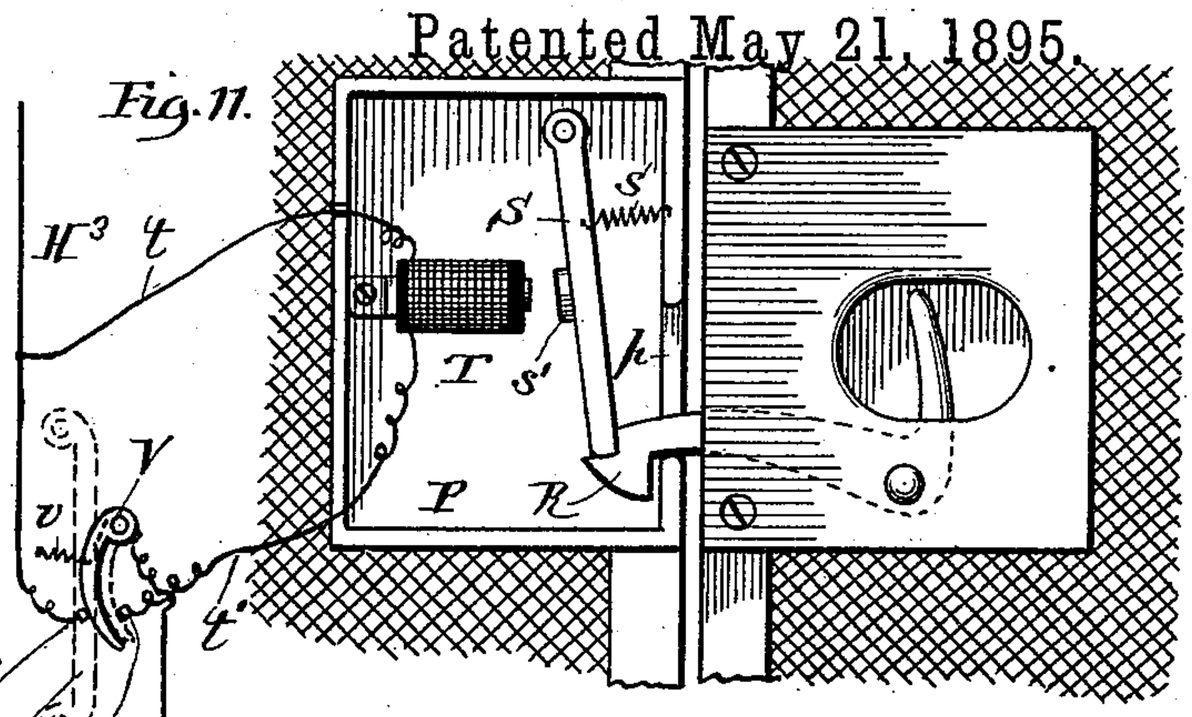

Fig. 12.

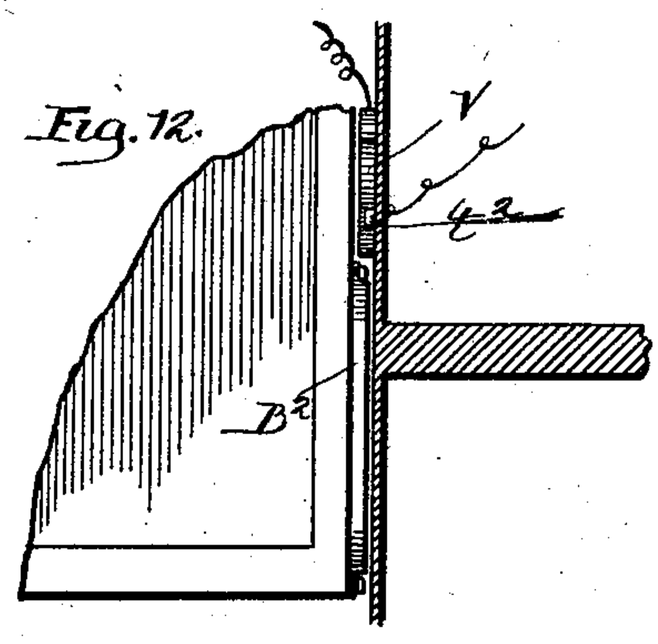

Fig. 7.

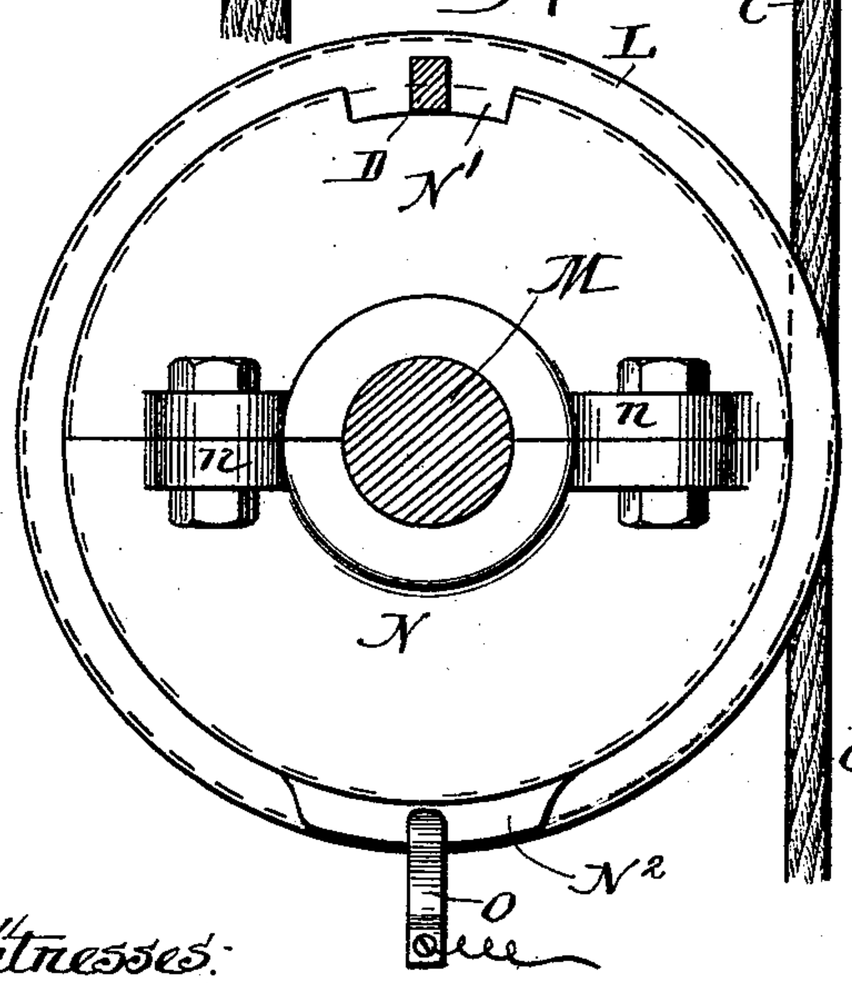

Fig. 6.

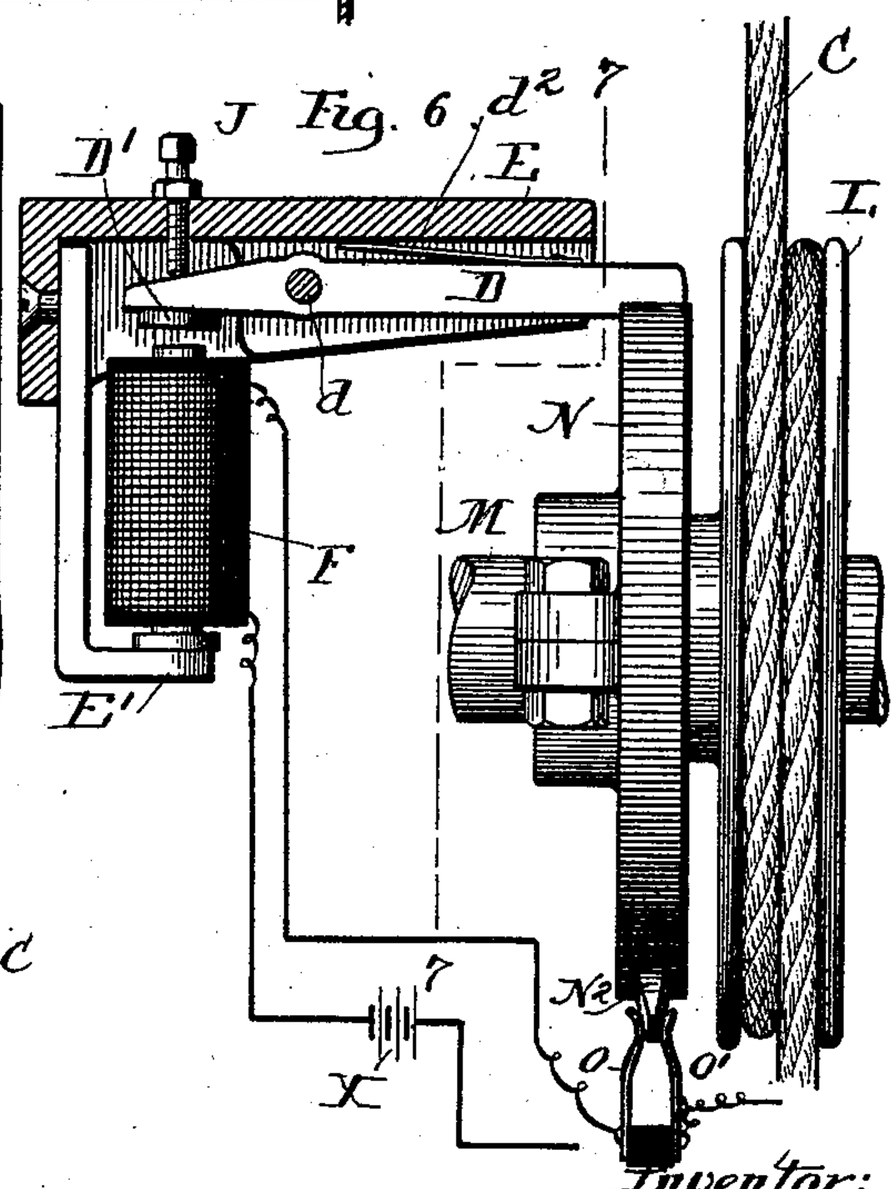

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Fig. 8.

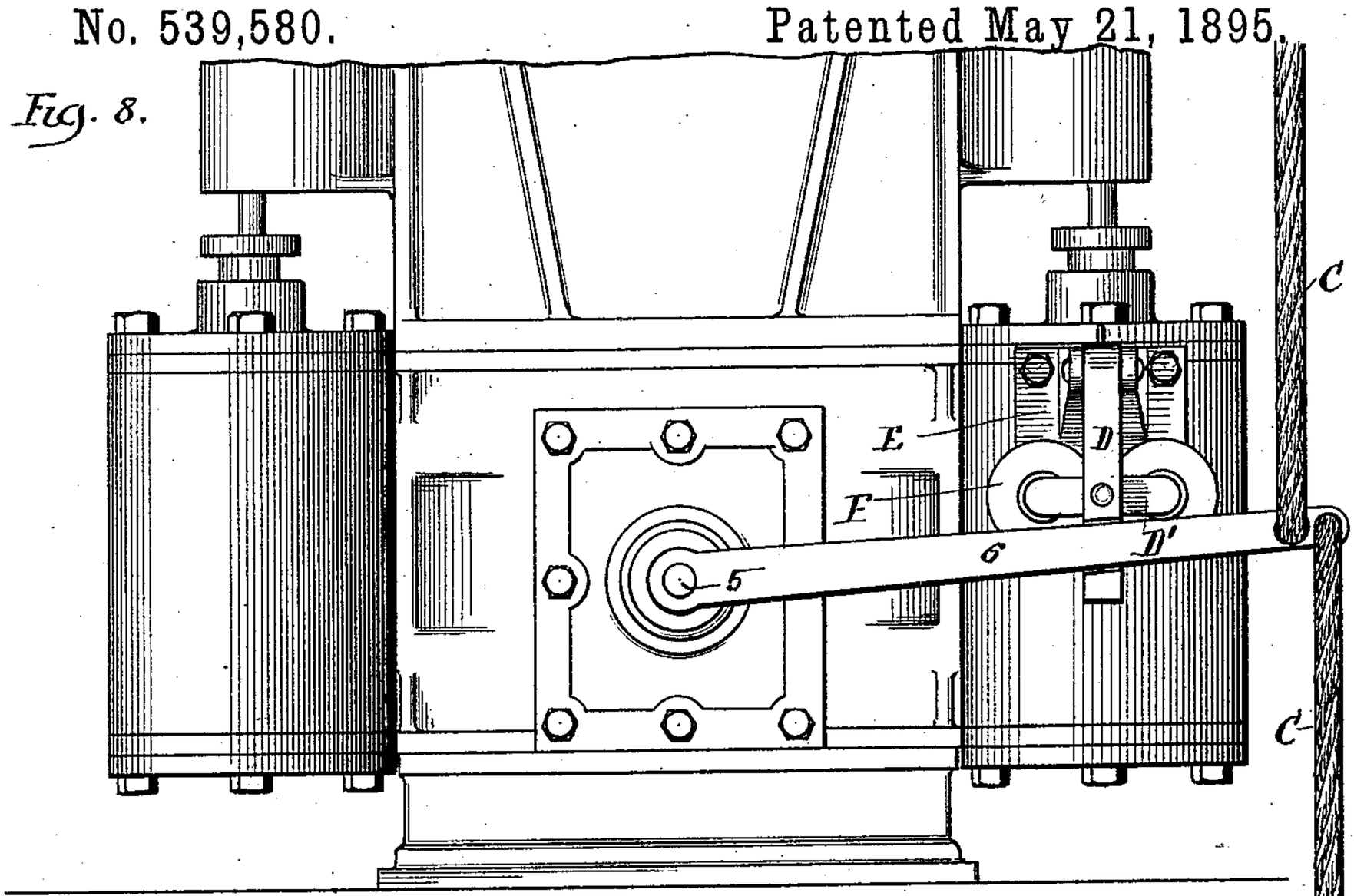


Fig. 10.

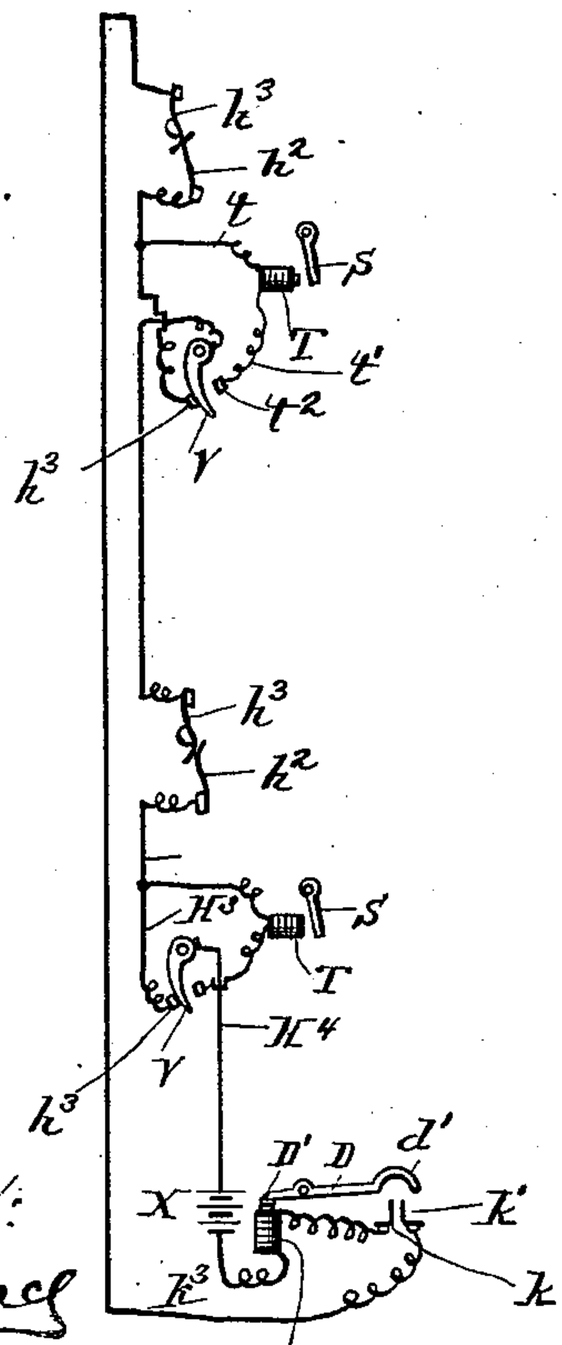
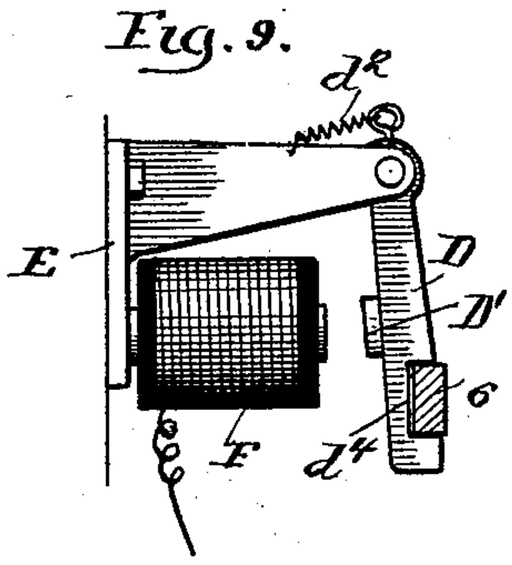


Fig. 9.



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UNITED STATES PATENT OFFICE.

McCLELLAND C. FULLENLOVE, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO JOHN C. COSGROVE, OF SAME PLACE.

SAFETY APPLIANCE FOR ELEVATORS.

SPECIFICATION forming part of Letters Patent No. 539,580, dated May 21, 1895.

Application filed January 17, 1894. Serial No. 497,185. (No model.)

To all whom it may concern:

Be it known that I, McCLELLAND C. FULLENLOVE, a citizen of the United States, residing at Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Safety Appliances for Elevators, of which I do declare the following to be a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My present invention has for its object to provide improved means whereby when the car of an elevator has been stopped opposite a door way of the elevator shaft and the door-way has been opened it will be impossible for an operator of the car to start the car either in upward or downward direction until the door-way of the elevator shaft has been closed.

A further object of my invention is to provide means whereby the latches of the doors of the elevator shaft shall be dogged and guarded against operation except at such times as the elevator car is opposite a door-way of the shaft.

My invention consists in the novel features hereinafter described, illustrated in the accompanying drawings and particularly pointed out in the claims at the end of this specification.

Figure 1 is a view in vertical section through an elevator-hatchway having my invention applied thereto, the elevator-car being shown in side elevation with a portion broken away. Fig. 2 is a detail plan view of the mechanism for engaging the cable in order to guard the same against movement. Fig. 3 is a view in horizontal section on line 3 3 of Fig. 4. Fig. Fig. 4 is a side view looking in the direction of the arrow, Fig. 2. Fig. 5 is a detail view of a part of the operating-cable with the stops and circuit-closer thereon. Fig. 6 is a view in elevation, a part being shown in section, showing my invention as applied to another form of apparatus, whereby the starting and stopping of the elevator-car are effected. Fig. 7 is a view in vertical section on line 7 7 of Fig. 6. Fig. 8 is a view in elevation showing another manner of applying my invention. Fig. 9 is a detail side view of part of the construction shown in Fig. 8. Fig. 10 is a diagrammatic view illustrating the arrangement of the electric circuits. Fig. 11 is a view in side elevation, taken from the inside of the hatchway, showing the mechanism for dogging the latch of the doors of the elevator-shaft. Fig. 12 is a view of a portion of the elevator-car in readiness to engage the circuit-changer shown in Fig. 8, the adjacent portion of the elevator-shaft being shown in vertical section.

A designates the elevator shaft within which moves the car B, this car being raised and lowered by any suitable mechanism adapted for such purpose.

The elevator shaft A is shown as having three door-ways that will close by the doors a, a' and a^2.

Through the elevator car B passes the operator's cable C in usual manner, this cable being trained over suitable pulleys and being suitably connected to the valve mechanism of the engine whereby the raising and lowering of the elevator car are effected.

Inasmuch as there exist many types of engines for the operation of elevators and inasmuch as my invention is applicable to any of the different types of such engines I have not deemed it necessary to illustrate any particular type of engine for operating the elevator nor to describe the same in this specification.

When the operator's cable C is employed it is well understood that the starting and the stopping of the car are effected by the operator within the car drawing upward or downward upon the cable so as to shift the valve mechanism of the engine with which the cable is connected.

My invention can be applied at various points between the elevator car and the engine whereby the car is operated and in Figs. 1 to 5 of the drawings I have shown my invention as applied for checking the operator's cable by means of stops fixed thereto. In this embodiment of my invention the cable C (see Figs. 4 and 5) has fixed thereto the stops c and c', and with these stops will engage a suitable dog in order to prevent a movement of the cable sufficient to effect the starting of the car after it has been brought to rest opposite any door-way of the elevator shaft. The dog whereby the checking of the operator's cable C will be effected consists pref-

erably of a lever D that is connected to a bracket E, being by preference pivoted as at d between the brace-plates e and e' of the bracket. (See Fig. 4.) The dog or lever D is shown as provided with the bent end d' that extends to a point adjacent the cable C and the opposite end of the dog or lever D is provided with an armature D' adapted to be attracted by the electro-magnet F. This magnet F is mounted upon an arm E' attached to the bracket E, the bracket E being fixed to some stationary part of the structure adjacent the bottom of the elevator shaft.

By reference to Fig. 1 of the drawings it will be seen that when the elevator car B stops opposite any one of the door-ways, as for example the door-way a' of the elevator shaft, the stops or buttons c and c' of the cable C will be respectively above and below the bent end d' of the dog or lever D, and if it be assumed that at such time current is passing through the electro-magnet F to energize the same, the magnet F will attract the armature D' and draw the bent end of the dog or lever D away from the cable C so as to permit the stops c and c' of the cable to freely pass the bent end d' of the dog D and consequently permit the cable C to be moved upward or downward in order to start the elevator car B. If however, when the elevator car B is opposite a door-way of the elevator shaft and the circuit through the electro-magnet F is broken the dog D will be forced by the spring d^2 (see Fig. 3) to a point adjacent the cable C and consequently will engage the stops c and c' in case attempt is made to shift the cable C for the purpose of starting the elevator car. Hence it will be seen that when the elevator car B is opposite any of the door-ways of the elevator shaft and the current through the magnet F is broken it will be impossible for the operator of the car to so shift the cable C as to again start the car in motion.

Adjacent each of the door-ways of the elevator shaft I have placed suitable mechanism whereby when the various door-ways of the elevator shaft are closed, circuit may be completed through the electro-magnet F and whereby when either of the doors of the elevator shaft is opened the circuit through the magnet F will be broken.

One simple form of mechanism for making and breaking the circuit at the various door-ways of the elevator shaft is illustrated in Fig. 1 of the drawings and consists in providing adjacent each of the door-ways of the shaft an electrical contact or terminal h, having preferably a spring arm h' and a similar contact or terminal h^2 having preferably a spring arm h^3 that is provided with a bearing block h^4 of insulating material. The arms h' and h^3 will be out of contact so as to break the circuit in which they are interposed when the adjacent door of the elevator shaft is open, as seen at a' Fig. 1 of the drawings; but when the door of the elevator shaft is closed as seen at a and a^2 of Fig. 1, the edge of the door will strike against the block h^4 of the spring arm h^3 and force this arm into contact with the terminal arm h' thereby completing the circuit through such arms. Hence it will be seen that if the electro-magnet F is placed in circuit with the several terminal spring plates h' and h^3 and with the battery X, then when all of the terminal plates h' and h^3 are in contact so as to complete the circuit through these plates, through the wires H' and H², through the battery X and through the electro-magnet, the electro-magnet will attract the armature D' and thus hold the dog or lever D in such position that it will not engage with the stops or buttons c and c' above the cable C, and consequently the operator within the car B can freely shift the cable so as to start the car. If however, the operator, having stopped the car B opposite a door-way of an elevator shaft, for example the door-way a', should open the door, the circuit through the electro-magnet F will be at once broken by the separation of the terminal plates h' and h^3 and consequently the electro-magnet F will be de-energized and the dog or lever D will be forced by the spring d^2 to a point adjacent the cable C where it will engage with the stops or buttons c and c' and thus prevent the operator within the elevator car from shifting the cable C in order to start the car, and it is manifest that until the operator closes the door a' and thus again completes the circuit through the terminal plates h' and h^3 the passage of current through the magnet F will be interrupted and consequently it will be impossible for the operator to start the car.

In order to enable the dog or lever D to more firmly engage the stops or buttons c and c' of the cable C, I prefer to mount upon the outer end of the bracket E the guard plates e^2 and e^3 that are bolted as at e^4 to the outer end of the bracket E and with the end of this bracket form a guide and guard for the cable. Thus it will be seen that when the dog or lever D is forced to a position adjacent the cable C in order to engage the stops c and c' the guard plates e^2 and e^3 will prevent the cable C, and the stops c and c' from slipping away from the end of the dog or lever D.

In order to economize current from battery X or other source, I prefer to provide means whereby the electric circuit wherein the magnet F is interposed shall be broken except at the time when the elevator car is at rest, and the stops c and c' of the cable are in position to be engaged by the dog or lever D. For this reason I prefer to provide the cable C with a circuit closer consisting preferably of a bar C² that is attached to the stops or buttons c and c' and extends between the same, and is adapted to pass between the spring terminal arms k and k' that are located between the edges of the guard plates e^2 and e^3. (See Figs. 2 and 3.) The ends of the circuit closing bar C² are preferably pointed as at c^4 to permit the ready passage of the bar between the

terminal plates k and k'. The terminal arm k is connected by wire k^2 with one pole of the electro-magnet F and the terminal plate k' is connected by the wire k^3 to battery X. From the foregoing description it will be seen that when the cable C has been shifted, in order to start the elevator car, the circuit closing bar C^2 will be above or below the contact plates k and k' and consequently the circuit will be broken at such points, since, as shown by Fig. 2 of the drawings, these contact plates do not bear against each other. When however, the cable C is shifted by the elevator operator so as to stop the car, the circuit closing bar C^2 will be brought to rest between the contact plates k and k' and inasmuch as this circuit closing bar C^2 is formed of conducting material it will serve to close the circuit between the contact plates k and k' and thus complete the circuit in which the electro-magnet F and battery X are interposed, thereby enabling the electro-magnet F to attract the armature D' and hold the dog or lever D out of action.

It will be observed that the upper end of the stop or button c and the lower end of the stop or button c' are beveled as at c^5 to permit these stops or buttons to pass freely into and through the flaring ends of the guide formed by the outer end of the bracket E and the guard plates e^2 and e^3. (See Fig. 5.) The beveled ends c^5 of the stops c and c' will also serve to force backward the end d' of the dog or lever D when the cable C is shifted upward or downward to stop the car. In order to determine with exactness the extent of movement of the dog or lever D I prefer to provide a set-screw J that passes through a threaded hole in the bracket E and has its end extending into position adjacent the inner end of the dog or lever D.

In Figs. 6 and 7 of the drawings I have shown my invention as applied at another point of the mechanism whereby the starting and stopping of the elevator car are effected. In this embodiment of the invention the elevator cable C passes in usual manner around the wheel or drum L that is mounted upon the usual shaft M, whereby movement is transmitted from the cable to the valve mechanism of the engine. Upon this shaft M I mount a wheel N that is preferably formed of sections bolted together at n, in order to permit the wheel to be readily attached to the shaft. In the rim of the wheel N is formed a notch N' with which will engage the outer end of the dog or lever D. This dog or lever D is pivoted at d to the bracket E, as in the construction hereinbefore described and carries at its end an armature D' adapted to be attracted by the electro-magnet F that is sustained by the bracket E as in the construction hereinbefore set forth. A spring d^2 serves to force the dog D toward the wheel N and a set-screw J determines the extent of movement of the dog D. The electro-magnet F is connected with battery X by suitable conductors and this magnet will also be placed in the circuit in which is interposed the various circuit changers adjacent the door-ways of the elevator shaft as illustrated in Fig. 1 of the drawings. Hence it will be seen that when the electro-magnet F is energized the dog D will be lifted from engagement with the wheel N and as this energization of the magnet will occur when the doors of the elevator shaft are all closed, the operator can at such time freely shift the cable C in order to start the elevator car. The notch N' is formed at such point in the wheel N that this notch will be brought beneath the dog D when the cable C has been so shifted as to stop the elevator car. In order to economize current I prefer, in this form of my invention as in that hereinbefore described, to provide means whereby the electric circuit shall be broken except at such time as the elevator car is stopped opposite a door-way of the elevator shaft and to accomplish this I provide the wheel N with a circuit closing bar or lug N^2 adapted to pass between the contact plates O and O' that are interposed in the electric circuit, being connected to the sections of the wire as shown in Fig. 6 of the drawings.

From the foregoing description it will be seen that when the elevator car B is brought opposite a door-way of the shaft, as shown for example, in Fig. 1 of the drawings and the door a' has been opened, the electric circuit will be broken by the separation of the terminal plates h' and h^3 adjacent such door-way and consequently current will not pass through the electro-magnent F, (it being understood of course that the bar N^2 is insulated from the wheel N.) As soon however, as the operator closes the door a' and completes the circuit through the contact plates h' and h^3, current will pass through electro-magnet F and will cause this magnet to attract the armature D' and thus withdraw the end of the dog D from engagement with the notch N' of the wheel N, thereby permitting the cable C to be freely shifted in order to start the elevator car. As soon however, as the circuit closing bar or lug N^2 is moved from between the plates O and O', which will occur when the cable C is shifted to start the car, the circuit will be broken at such point and consequently the electro-magnet F will be de-energized thereby permitting the spring d^2 to force the end of the dog D into position to again engage the notch N' of the wheel when the car is again stopped and a door is opened.

In Figs. 8 and 9 of the drawings I have shown my invention as applied to a modified form of apparatus for starting and stopping the elevator car, although this mechanism forms no part of my invention and I have simply shown it for the purpose of illustrating how my invention can be used in connection therewith. From the stem 5 of the engine valve extends a lever 6 to the free end of which is connected the operator's cable C, by means of which the operator within the car will shift the lever 6 in order to control the

engine for starting or stopping the car. Upon the bracket E is pivotally mounted the dog D that carries the armature D′ of the electro-magnet F, the dog D being preferably provided with a notch d^4 to engage the lever 6. A spring d^2 serves to throw the dog outward in position to engage the lever 6, one end of this spring being attached to the bracket E and the other end to the end of the dog D. From this construction it will be seen that when the magnet F is energized by passage of current therethrough it will serve to attract the armature D′ and hold the dog D in such position that it will not check the movement of the lever 6, and consequently when the magnet F is thus energized the operator upon the elevator car can freely change the lever 6 in order to stop or start the car. When however, the magnet F is de-energized by breaking the passage of current therethrough the spring d^2 will throw the dog D outward so that the notch d^4 of this dog will engage the lever 6 and will prevent the movement of this lever until the electric circuit has been again completed through the magnet F. The dog D is arranged opposite that point which the lever 6 will occupy when the elevator car is at rest and if at such time the passage of current through the magnet F be broken it is obvious that the dog will prevent the movement of the lever 6 in order to again start the car until the magnet F is again energized. The magnet F will be connected with battery and with the various circuit changes located adjacent the door-ways of the elevator shaft substantially as illustrated in connection with the constructions hereinbefore set forth and it follows therefore that if the circuit, in which the magnet F is interposed, is broken or interrupted at either of the door-ways of the elevator shaft, by the opening of the doors the dog D will guard the lever 6 against movement until the circuit has been completed at such points as by the closing of the doors.

It is obvious that my invention may be applied in connection with other forms of apparatus for starting and stopping elevator cars and at any other suitable points thereof, but I have not deemed it necessary to illustrate such other methods of applying my invention as these will readily suggest themselves to the skilled mechanic.

While I have described what I regard as the preferred form of the invention I do not wish the invention to be understood as restricted to the details above set out since these may obviously be varied within wide limits. For example it is manifestly not essential to the broad feature of my invention that means should be provided for holding the circuit normally open, although as a matter of economy this is plainly desirable. So also any suitable form of circuit changer may be employed adjacent the door ways of the elevator shaft and where levers or like mechanism are used for enabling the operator to close the doors, the shifting of the circuit changers may obviously be effected by such mechanism instead of by the doors.

In order to prevent the opening of any door of the elevator shaft until the elevator is opposite thereto, I have provided the mechanism next to be described.

Within a suitable casing P mounted upon the frame-work adjacent the door way, and into the opening p of which casing the latch R of the door will enter, as seen in Fig. 11, is mounted a dogging bar S that is held normally in position to engage the free end of the latch R by means of the coil spring s. This dogging bar S has connected thereto the armature s' of an electro-magnet T that is mounted within the casing P and from this magnet lead the wires t and t'; the wire t leading to the main circuit wire H^3, and the wire t' leading to a contact pin t^2 as shown. The wire H^3 leads to a contact pin h^3 and the section H^4 of the main circuit wire is connected to one end of the pivoted switch or circuit changer V as shown in Fig. 11. This circuit changer V is held normally against the contact pin h^3 by means of the coil spring v, so that when the parts are in the position seen in Fig. 11 of the drawings, current will pass between the sections H^3 and H^4 of the main circuit wire through the switch or circuit changer V and at such time the electro-magnet T will be de-energized and the latch bar R will be dogged by the bar S. Upon the elevator car B is mounted a shifting bar B^2 in position to contact with the edge of the switch V and when this bar B^2 contacts with the switch V it will force said switch from the position shown by full lines, Fig. 11 to the position shown by dotted lines, Fig. 11. This shifting of the switch V will force the switch from its contact with the pin h^3 and cause it to bear against the contact pin t^2. When the switch V is thus shifted it will be seen that current will pass from the main wire H^3 by branch wire t to electro-magnet T and thence by branch wire t' to contact pin t^2, and through switch V to the section H^4 of the main wire. When current is thus passed through magnet T this magnet will be energized and will attract the armature s' thereby withdrawing the bar S from engagement with the latch R and permitting this latch to be lifted by the operator in order to enable him to open the door. As soon however, as the door has been closed and the elevator car has been moved either in upward or downward direction until the shifting bar B^2 passes from engagement with the switch V, the spring v will restore the switch V to the position seen in Fig. 11, thereby throwing the magnet T out of circuit and permitting the spring s to retract the dogging bar S into position shown in Fig. 11 so as to prevent the operation of the latch R until the magnet T has been again energized. It is my purpose to employ this mechanism for dogging the latch of the doors of the elevator shaft in connection with my mechanism for prevent-

ing the operation of the car when the door-ways of the shaft are open, although manifestly these features of invention may be separately employed.

I have not shown the mechanism for dogging the latches of the door-ways in Fig. 1 of the drawings simply to avoid confusing the circuit as there shown, but in Fig. 10 I have illustrated in diagrammatic manner the arrangement of the circuit with the dogging mechanism included therein.

It is manifest that the details of construction above set out may be varied within wide limits and that features of the invention may be used without its adoption as an entirety.

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

1. The combination with an elevator car and with mechanism for starting and stopping the car, of suitable means for arresting said starting and stopping mechanism, comprising an electro-magnet, means connected with the armature of said electro-magnet for checking said starting and stopping mechanism, a normally open electric circuit wherein said magnet is interposed, a suitable circuit closer connected with the starting and stopping mechanism for closing said normally open circuit and suitable circuit changers interposed in said electric circuit along the elevator shaft, substantially as described.

2. The combination with an elevator car and with mechanism for starting and stopping the car, of suitable means for arresting said starting and stopping mechanism comprising an electro-magnet, means connected with said electro-magnet for checking said starting and stopping mechanism, a normally open electric circuit wherein said magnet is interposed, a circuit closer for closing said normally open circuit, said circuit closer being connected with the mechanism whereby the starting and stopping of the car is effected, a series of circuit changers interposed in said circuit adjacent the door-ways of the elevator-shaft and arranged to automatically break said circuit when the doors are open but to close said circuit when the doors are closed, substantially as described.

3. The combination with an elevator car and with mechanism for starting and stopping the car, of suitable means for arresting said starting and stopping mechanism comprising an electro-magnet, means connected with the armature of said electro magnet for checking said starting and stopping mechanism, a normally open electric circuit wherein said magnet is interposed, a circuit closer for closing said normally open circuit, said circuit closer being connected with the mechanism whereby the starting and stopping of the car is effected, a series of circuit changers interposed in said circuit adjacent the door-ways of the elevator-shaft and arranged to automatically break said circuit when the doors are open but to close said circuit when the doors are closed, substantially as described.

4. The combination with an elevator car, of mechanism for starting and stopping the car, comprising an operator's cable provided with stops thereon and with a circuit closer intermediate said stops, an electro-magnet, a dog connected to the armature of said electro-magnet and adapted to engage said stops, a normally open electric circuit wherein said magnet is interposed and suitable insulated contacts adapted to be bridged by said circuit closer and suitable circuit changers in said electric circuit, substantially as described.

5. The combination with an elevator car and with mechanism for starting and stopping the car and with the doors for closing the hatch-ways of the elevator shaft, of suitable means for arresting said starting and stopping mechanism and for locking said doors temporarily, comprising an electro-magnet, means connected with the armature of said electro-magnet for checking said starting and stopping mechanism, a second electro-magnet, suitable means connected with the armature of said second electro-magnet for controlling the movement of the door, an electric circuit wherein said magnets are interposed, said electric circuit having a branch circuit wherein said second magnet is interposed, and a shifting switch for controlling the flow of current through said branch circuit and through the main circuit, said shifting switch being connected to said main circuit and serving to normally close the same at such point and suitable means upon the elevator car for throwing said switch to cause the passage of current through the branch circuit and through said second electro-magnet, substantially as described.

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