(No Model.) 3 Sheets—Sheet 1.

H. H. DAY.

SAFETY DEVICE FOR ELEVATORS.

No. 515,661. Patented Feb. 27, 1894.

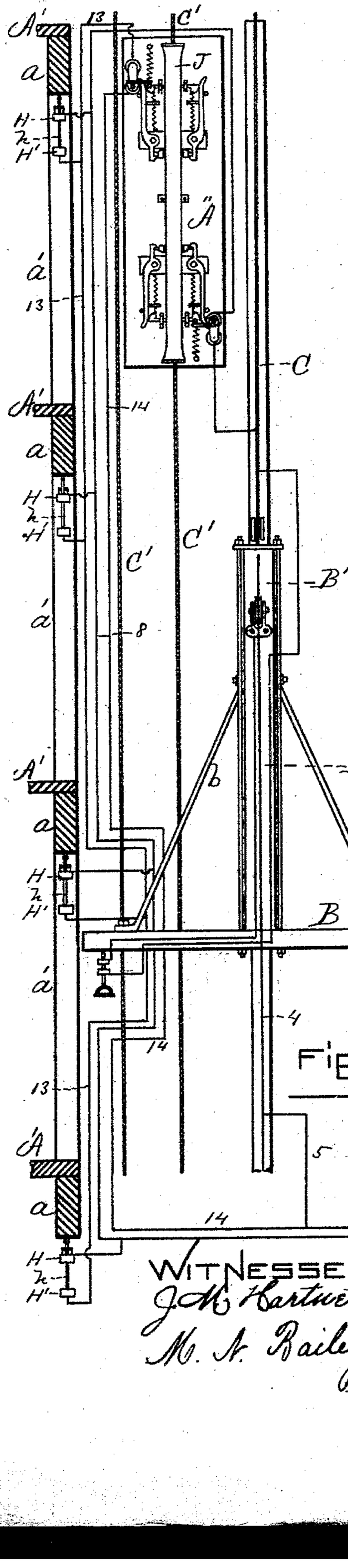

Fig. 1.

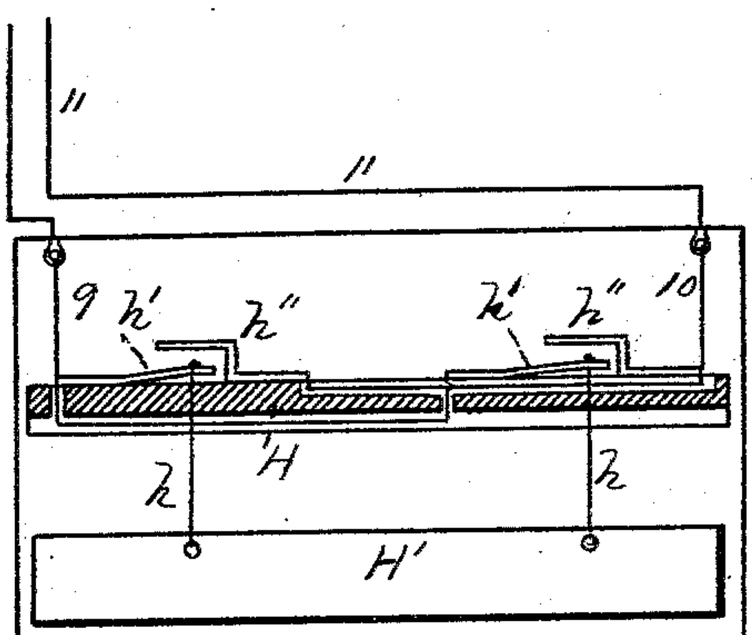

Fig. 3.

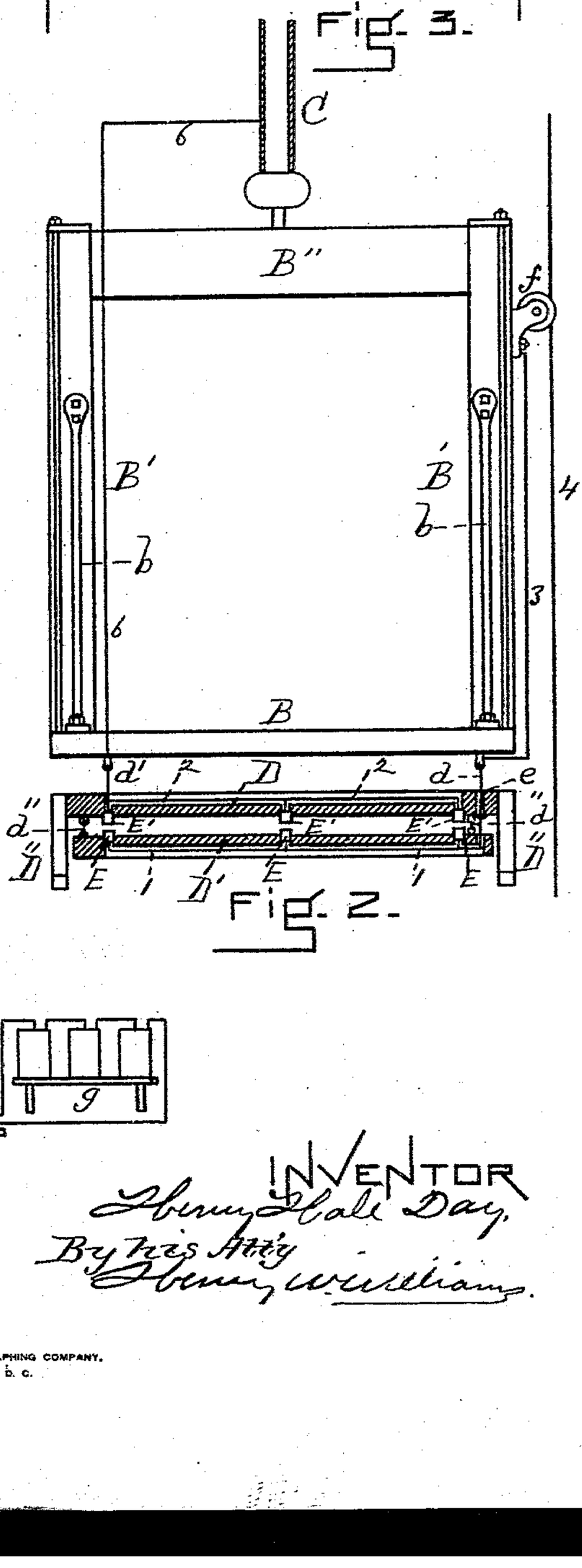

Fig. 2.

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(No Model.) 3 Sheets—Sheet 2.

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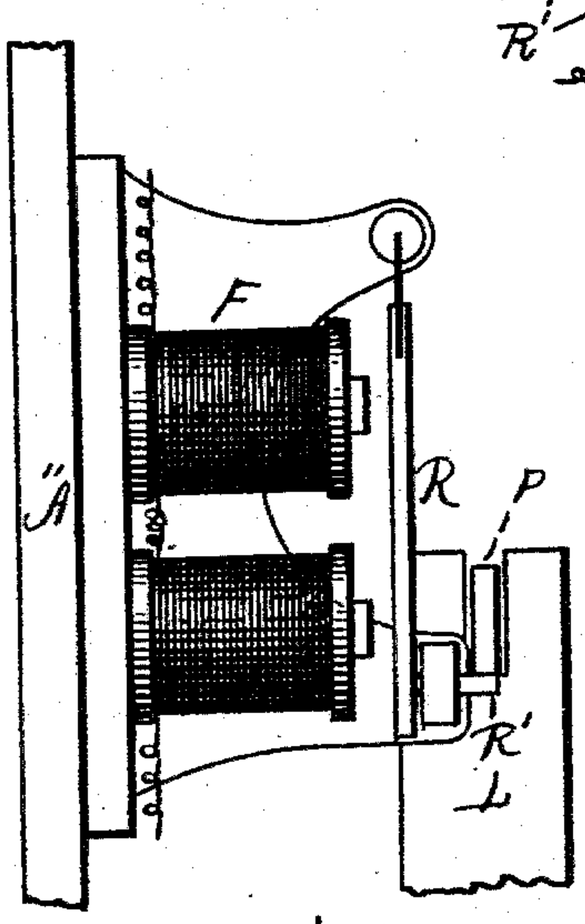

Fig. 5.

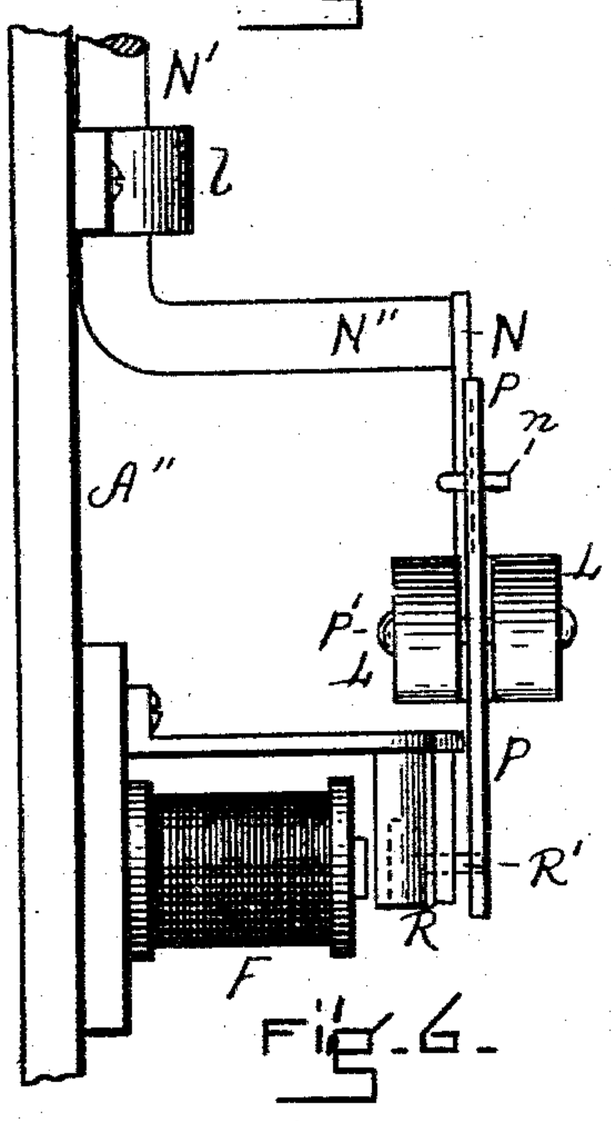

Fig. 6.

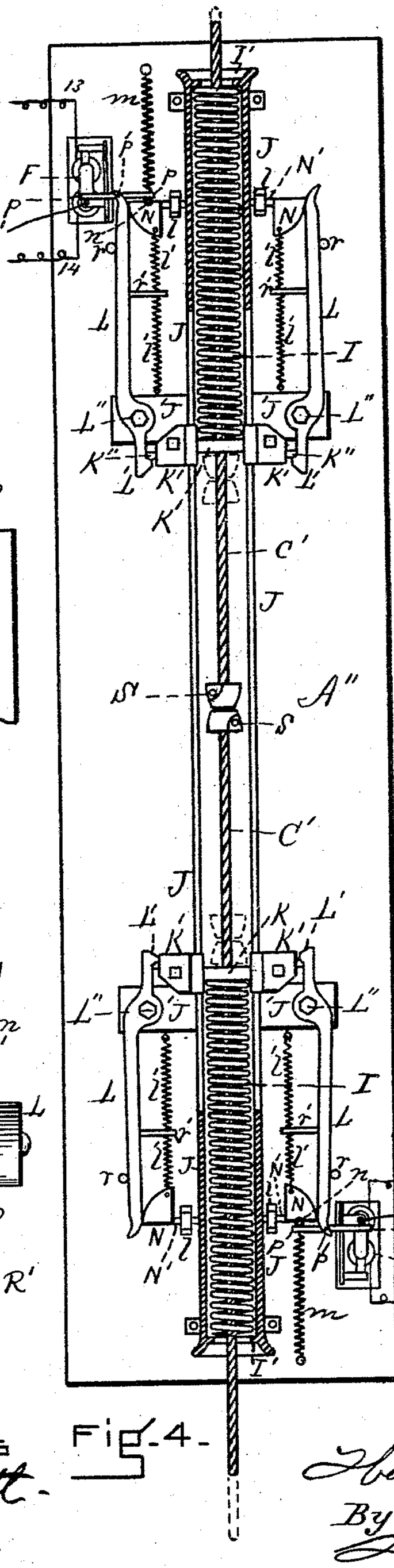

Fig. 4.

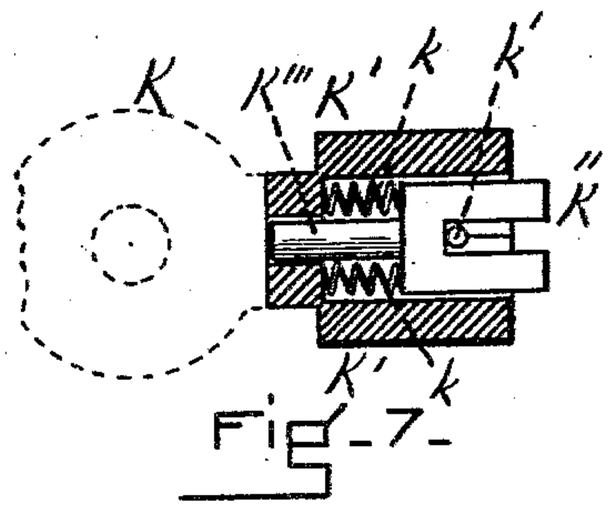

Fig. 7.

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SAFETY DEVICE FOR ELEVATORS.

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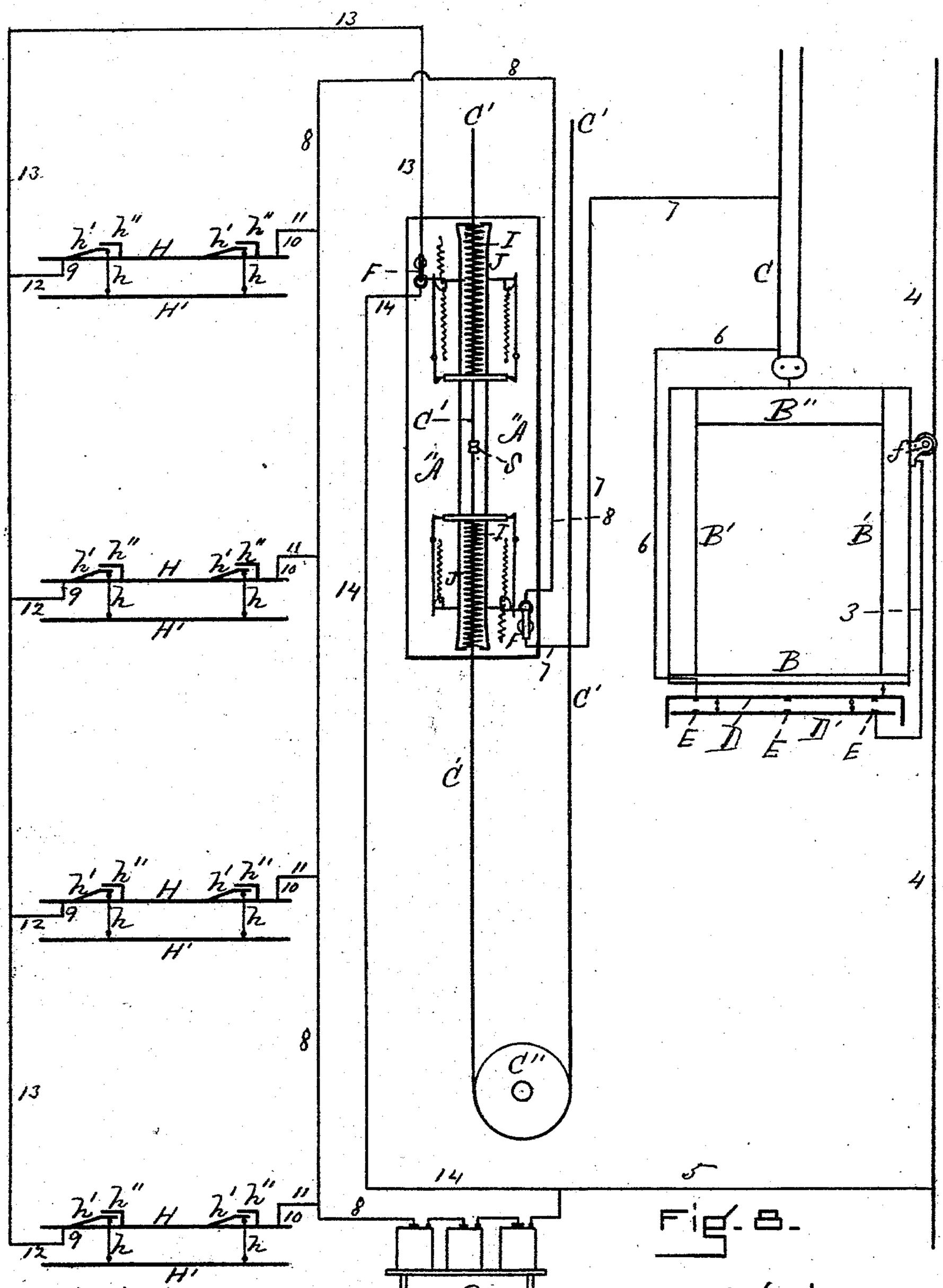

Fig. 8.

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UNITED STATES PATENT OFFICE.

HENRY HALE DAY, OF NEWTON, MASSACHUSETTS.

SAFETY DEVICE FOR ELEVATORS.

SPECIFICATION forming part of Letters Patent No. 515,661, dated February 27, 1894.

Application filed November 20, 1893. Serial No. 491,379. (No model.)

To all whom it may concern:

Be it known that I, HENRY HALE DAY, a citizen of the United States, residing at Newton, in the county of Middlesex and State of Massachusetts, have invented new and useful Improvements in Safety Devices for Elevators, of which the following is a specification.

This invention relates to safety attachments for elevators and elevator shafts, whereby the ascent of the elevator car is stopped as it approaches a floor through which the elevator shaft extends, whenever any portion of a passenger, or article in the car, projects therefrom into the doorway; and the descent of the car is stopped as it approaches a floor from which any portion of a person or article extends into the shaft. The device therefore renders it impossible for a person to become caught between the elevator car and doorway, in case the car has not stopped or has suddenly started to ascend before the person has gotten entirely on or off the car.

The nature of the invention consists in the novel construction and arrangement of parts fully described below, and illustrated in the accompanying drawings, in which—

Figure 1 is a view partly in elevation, and partly in vertical section, illustrating my invention. Fig. 2 is an elevation of a car with the attachment beneath the car in section. Fig. 3 is a section and elevation in detail showing the device as applied to a floor through which the shaft extends. Fig. 4 is an enlarged elevation, and vertical section showing the connection of the device with the stopping and starting rope. Fig. 5 is a detail in elevation of the let-off mechanism. Fig. 6 is a detail in plan of the same. Fig. 7 is a detail in plan and horizontal section showing one of the latches. Fig. 8 is a diagram showing the wiring and electrical connection with the car and different floors.

Similar letters and figures of reference indicate corresponding parts.

A represents the side walls of the elevator well.

A′ represents the different floors in the building, and *a* beams under the floors.

B, B′, B″, *b*, represent respectively the floor, uprights, cross-piece and brace-rods of an ordinary elevator car.

The car shown in the drawings is intended for a freight elevator, but the device is equally applicable to a passenger elevator.

a′ represents the different doorways.

C is the lifting rope made of wire.

C′ is the hand rope whereby the elevator is started and stopped, and C″ (Fig. 8) is the lower pulley over which it passes.

Suspended from the floor B of the elevator car by wires *d d′* and hanging below and parallel with it, next its front edge, is a frame consisting of two parallel horizontal bars D D′, the lower bar D′ being suspended from the upper bar D by a cord *d″* of non conductive material. The wire *d* extends through an opening *e* in the bar D and through the bar D′ and is connected by the electric wire 1 with the contact points E on the upper surface of the bar D′. The wire *d′* is connected by the wire 2 with the contact points E′ on the under side of the upper bar D opposite the contact points E. The wire *d* is connected by the wire 3 with the trolley *f* supported by the elevator car. This trolley runs on the vertical wire 4 placed in the well, said wire being connected by the wire 5 with the negative end of the battery *g*, see Figs. 1, 2, and 8. The wire *d′* is connected by the wire 6 with the metallic ropes C from which the wire 7 extends to the magnet F (Figs. 4, 5, 6, and 8), from which a wire 8 extends to the positive end of the battery *g*. The magnet F is supported by the upright board A″ secured to the elevator well, Figs. 1 and 4. It is evident that if there is anything projecting into the well below the descending car, it will be struck by the bar D′, causing the contact points E′ on the bar D to meet the contact points E on the bar D′. This will establish an electrical circuit through the wires *d* and 3, the trolley *f*, the wires 4 and 5, the battery *g*, wire 8, magnet F and wires 7, 6, and *d′*. The effect of the establishment of this circuit is below described. The opposite ends of the upper bar D are provided with legs D″ long enough to extend below the lower bar in order that when the elevator reaches the bottom of the well, the bar D will be held up out of contact.

Suspended from each floor, or from the beam under the floor, within the doorway, is a device substantially similar to the bars D D′ above described. The lower bar H′ is sus-

pended from the upper bar H by means of flexible cords h, and the upper bar is suspended from the floor or beam by the wires 9, 10. These wires are connected through suitable openings in the bar H with the metallic springs h', the metallic brackets h'' projecting over said springs see Fig. 3. The wire 10 extending from each floor is connected by a wire 11 (Figs. 1, 3, and 8), with the wire 8, which leads to the battery g, and the wire 9 from each floor is connected by a wire 12 with the wire 13 which leads to the upper magnet F, which is exactly similar to the magnet F above described, which is the one situated at the lower portion of the board A''. From this magnet F, a wire 14 extends to the other end of the battery g, completing the circuit. If during the ascent of the elevator car, a person or article should project therefrom, it will hence strike the lower bar H' and allow the metallic springs h' (to which the cords h are directly fastened) to fly up into contact with the portions h'', said springs being relieved from the weight of the bar H', with the effect described below.

The effect produced by striking either of the lower bars D' and H' is to stop the elevator car in its descent or ascent. This is accomplished by the following means. The operating cord C' passes through springs I located at the upper and lower ends of a tube J secured vertically to the board A''. Figs. 1, 4, and 8. Each of these springs is connected with a mechanism and through the mechanism with a magnet, said mechanisms and magnets being exactly similar. Hence a description of one spring mechanism and magnet will serve as a description of both. Each spring is held contracted within the tube J between an internal flange or lip I' and a disk K perforated to allow the passage of the rope C'. This disk is provided at opposite edges with latches, each consisting of the frame K', and horizontally bifurcated sliding bolt K'' on the guide rod K''', said bolt being held normally out, as shown in Fig. 7, by the springs k, and prevented from flying out entirely by the pin k'. The disk holds the spring I compressed by reason of the engagement of the latches with the projections L' of the levers or catches L pivoted at L'' to suitable brackets or supports J' extending on the opposite sides of the tube J and secured to the board A''. The long arms or outer ends of the levers L are held normally out (and hence the short arms in engagement with the latches) by the cams N fast on the ends of the horizontal arms N'' (Fig. 6), extending from the rock shaft N' having bearings in the boxes l supported by the board A''. A light spring l' connects each cam N with the bracket J'. One of the cams is connected by a strong spring m with the board A'', such spring tending to pull the cams outward, *i. e.*, toward the end of the board. The cam N, which is connected with the spring m, is provided with a horizontally set pin n which is normally in engagement with the horizontal lever P pivoted at P' to the outer end of the catch L, (Figs. 4, 5, and 6.) The opposite end of the lever P rests on a pin R' extending horizontally from the armature R of the magnet F. The outward movement of the long arms of the levers or catches L is limited by the stops r, and the inward movement by the stops r'.

In case the elevator car is ascending, and a person or article projects therefrom into a doorway and lifts the bar H' so as to bring the parts h', h'' into contact, an electrical circuit is established through wires 9, 12, and 13, the upper magnet F, wire 14, the battery g and wires 8, 11, and 10. The effect is to draw the armature R to the magnet, thus withdrawing the pin R' from under the outer end of the lever P, allowing the spring m to roll up the cams N, which have been held down by the pin n under the inner end of the lever P. This releases the long arms of the levers or catches L, and allows the bolts K'' in the latches K' to push out the inner ends of said levers L, this being accomplished by the downward pressure of the bolts on the hook portions or projections L' of the levers L, which portions are very slightly inclined downwardly toward the edges, thus releasing the spring I and allowing it to force the rings or blocks S from the position shown in the upper broken lines in Fig. 4 to the position shown in full lines in said figure, stopping the elevator car automatically. In case the elevator car in its descent, strikes an object or person projecting from a floor, the bar D' is raised into contact with the bar D, with the effect of producing an electrical circuit through wires d, 3, 4 and 5, battery g, wire 8, lower magnet F, and wires 7, 6, and d'. The lower of the mechanisms on the board A'' is operated in exactly the same manner as the upper mechanism above described, moving the blocks S from the position shown in lower broken lines in Fig. 4, to the position shown in full lines in said figure, stopping the elevator. The disks and latches K K' may be easily returned into their original position by the blocks S, in which case the springs l' will draw the cams N into their original position, and the device will be ready to be operated automatically, as above described, in case of an obstruction appearing in a doorway. The springs m, however, whose inner ends have slipped off the pins n during the above described process, must be returned into engagement with said pins, in order to render the device ready for automatic action. By reason of the flexible nature of the connection between the bars and the car or floor, said bars while hanging in the position shown, are adapted to yield and move not only vertically but horizontally (or nearly so) as well, and thus binding or wedging is prevented.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a safety device for elevators, the combination of a bar suspended in the doorway, a flexible connection sustaining said bar whereby it may be lifted vertically or at an angle by coming into contact with an obstruction, and an electrical circuit adapted to be closed by the said bar being lifted into electrical contact with the part from which it is suspended, substantially as set forth.

2. In a safety device for elevators, the combination of a bar suspended in the doorway, a flexible connection sustaining said bar whereby it may be lifted vertically or at an angle by coming into contact with an obstruction, an electrical circuit adapted to be closed by the lifting of said bar into electrical contact with the part from which it is suspended, a magnet in said circuit, and mechanism intermediate the magnet and the operating rope of the elevator, whereby the approach of the armature toward the magnet automatically stops the ascent or descent of the car, substantially as described.

3. In a safety device for elevators, the combination of the operating rope, the spring I within the tube J surrounding said rope, a disk supporting said spring normally in a contracted position, hooks normally in engagement with and supporting said disk, levers pivoted to the outer ends of said hooks, cams holding the hooks into engagement with the disk and held in such position by the inner arms of the levers, and an electro magnet whose armature is held in engagement with the outer arm of one of said levers while the electric circuit is open and withdrawn from said engagement when the circuit is closed, substantially as set forth.

4. In a safety device for elevators, the combination of the operating rope provided with the ring or block S, the tube J and spring I within said tube and inclosing said rope, the disk K provided with the latches K′, K″, K‴, *k*, the hooks or levers L L′ normally in engagement with said latches, the cams N on the rock shaft N′ bearing against the inner sides of said levers L, the lever P pivoted to the outer end of one of said levers L and having one end in engagement with one of the cams, an electro magnet whose armature is normally in engagement with the other end of the lever P, and a spring *m* adapted to draw up the cams when the armature is withdrawn from the lever P and the said lever P releases the cams, substantially as described.

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Witnesses:
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