No. 828,210. PATENTED AUG. 7, 1906.

H. C. E. JACOBY.

MEANS FOR CONTROLLING ELECTRIC LIFTS, ELEVATORS, CONVEYERS, &c.

APPLICATION FILED DEC. 15, 1905.

2 SHEETS—SHEET 1.

Fig 1.

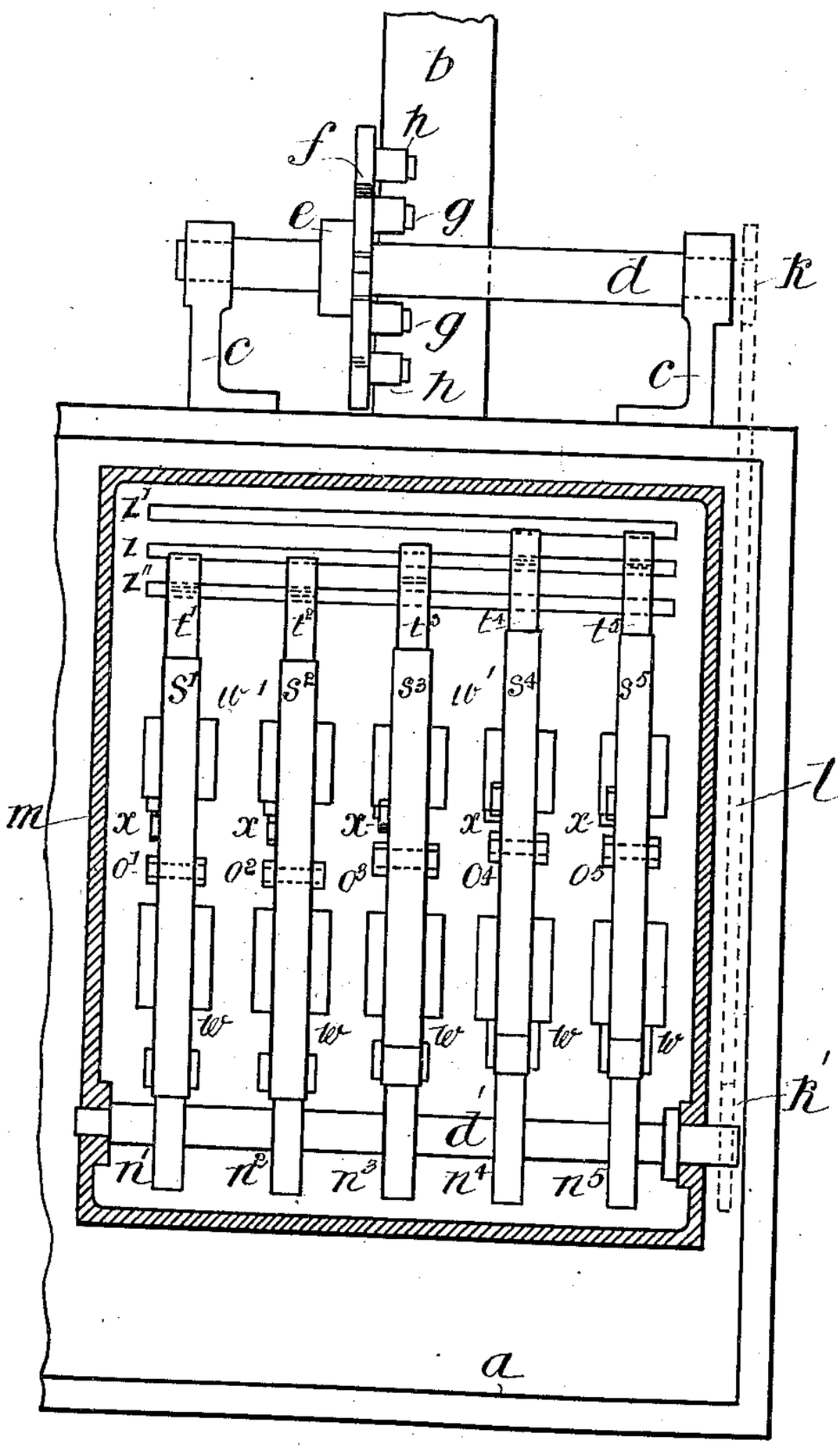
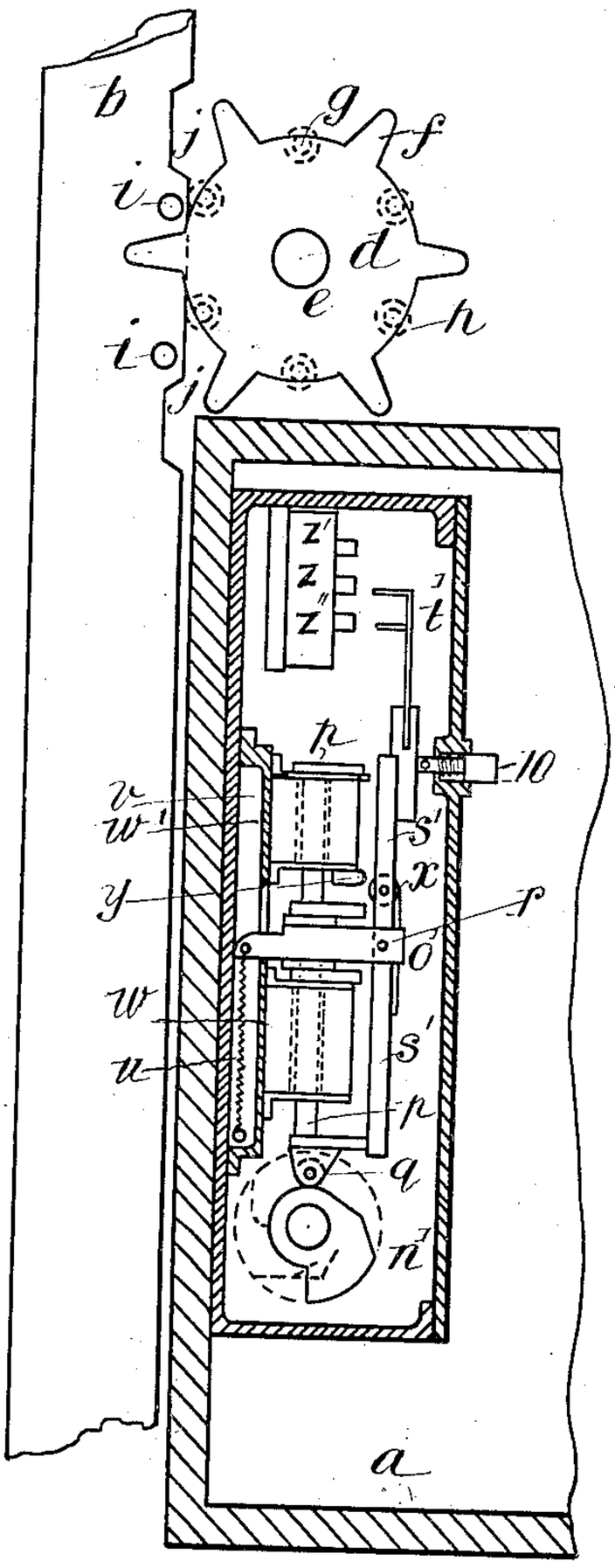


Fig 2.



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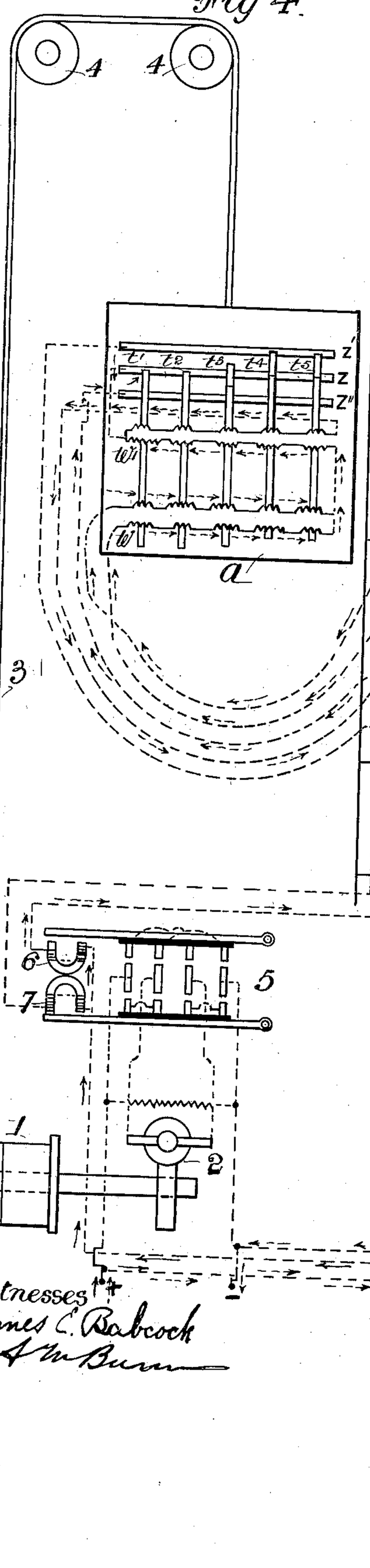
2 SHEETS—SHEET 2.

Fig 4.



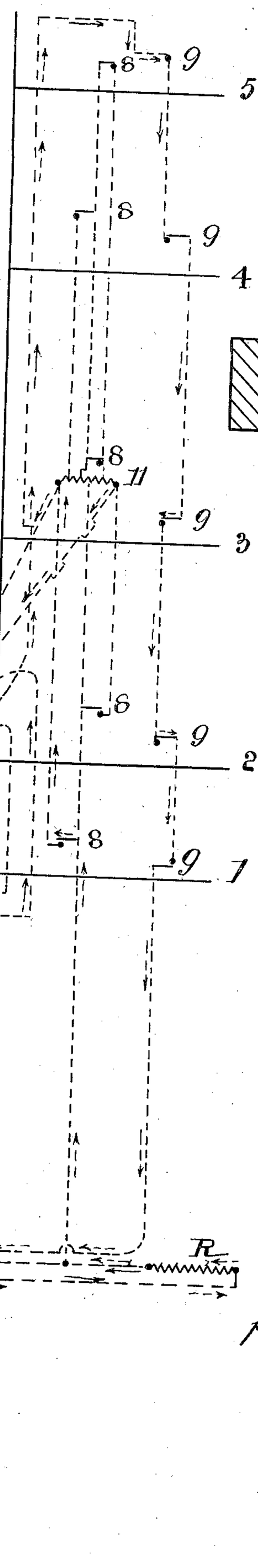


Fig 3.

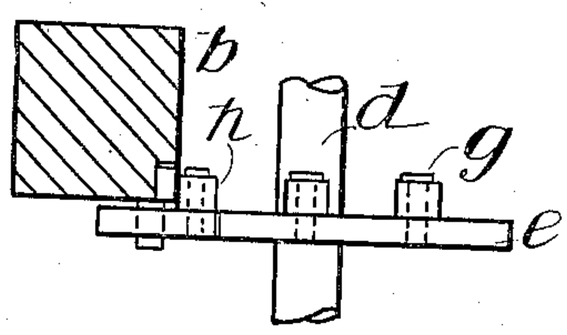
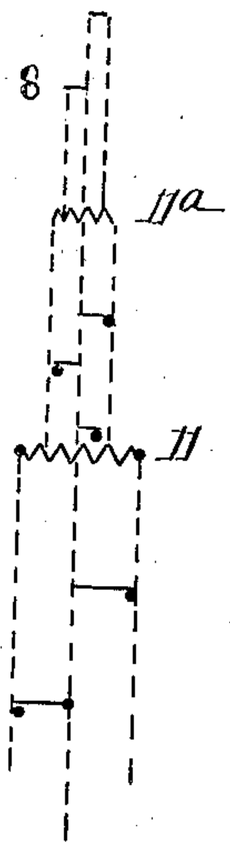


Fig 5.



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UNITED STATES PATENT OFFICE.

HENRY C. E. JACOBY, OF HARROW, ENGLAND.

MEANS FOR CONTROLLING ELECTRIC LIFTS, ELEVATORS, CONVEYERS, &c.

No. 828,210. Specification of Letters Patent. Patented Aug. 7, 1906.

Application filed December 15, 1905. Serial No. 291,868.

To all whom it may concern:

Be it known that I, HENRY CHARLES EDWARD JACOBY, residing at 3 Gresham Terrace, Butler Road, Harrow, in the county of Middlesex, England, have invented certain new and useful improvements in an improved means for controlling electric lifts, elevators, conveyers, or any similar contrivance having a moving car and stations; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improved means of controlling electric lifts, elevators, conveyers, and the like whereby the cage or car is caused to travel to any desired station or floor by pressing one of the row of push-buttons in said cage or car. Similarly by pressing a push-button in any station or floor the cage or car is caused to travel thereto, all interference being prevented when once the cage or car is started.

The construction and operation of my invention will be understood by reference to the drawings, which show its application to an electric lift.

Figure 1 is a front view. Fig. 2 is a side part-sectional elevation. Fig. 3 is a plan of star-wheel and guide-post. Fig. 4 is a diagrammatic view of connections. Fig. 5 is a diagram of auxiliary resistance.

In the drawings, *a* is the cage, and *b* one of the guide-posts. Upon the cage, journaled in suitable brackets *c*, is a shaft *d*, and fixed to this shaft by a key or the like is a star-wheel *e*, fitted with teeth or spurs *f*. Between the teeth are pins *g*, preferably fitted with rollers *h*. The teeth *f* engage with projections or pins *i*, two of which are employed for each floor as the lift moves. The object of the rollers is to lock the wheel *e* except when the teeth *f* are in engagement with the pins *i*, the guide-post being suitably recessed, as at *j*, to allow the rollers to clear and complete the required motion of the star-wheel as the roller engages with the full surface of the guide-post.

In a suitable position on shaft *d* is keyed a chain sprocket-wheel *k*, which, by means of the chain *l*, communicates motion to a corresponding sprocket-wheel *k'*, keyed to the shaft *d'*, journaled in the sides of the case *m*. Fixed to the shaft *d'* are as many cams n' n^2 n^3 n^4 n^5 as there are floors, these cams being keyed onto the shaft in different positions, the cams being so shaped as to raise the moving pieces o' to o^5, which in the drawings are shown built up in one piece with the magnet-cores and pole-pieces *p*, a small roller *q* being employed to reduce the friction. Hinged at *r* or pivoted to the moving pieces *o* are armatures s' s^2 s^3 s^4 s^5, carrying contacts t' t^2 t^3 t^4 t^5 in the form of a bridge-piece, the springs *u* being employed to keep the face of the rollers *q* in contact with the cams n' n^2 n^3 n^4 n^5. Mounted upon each of the brackets *v* are two electromagnets *w* *w'*, *w* being the holding-magnet in each case and *w'* the attracting-magnet.

Upon each armature s' s^2 s^3 s^4 s^5 is mounted a roller or wheel *x*, which engages with the corresponding projection *y* wher the moving piece is raised or lowered by the action of the cam, its function being to impart an outward motion to the armature and contacts *t*. The contact-pieces t' to t^5 bridge the contacts *z* to z'' when the moving piece carrying the armature and contact is in the position shown in the drawings; but when the action of the cam raises the moving piece it bridges *z* to z', the effect being that when *z* is coupled to z'' the lift descends, and when *z* is coupled to z' the lift ascends.

The actuating mechanism, arrangement of circuits, and operation of my invention will be readily understood by reference to the diagram shown in Fig. 4, in which 1 shows a drum or equivalent device actuated by a motor 2, a rope 3, made fast or wound upon said drum, wheel, or the like being conducted over guide-pulleys 4 and fastened to the cage *a* in the manner shown or by any other well-known method.

I have shown the attracting-magnets *w'* so wound as that the current can pass through the whole or a portion of the wire thereon; but this is not absolutely necessary, the lower or holding magnets *w* having two windings on each, which I distinguish as "first" and "second" windings, the ratio of the number of turns in the first winding to the number of turns in the second winding varying in each magnet.

5 shows diagrammatically the reversing-switch, which is actuated by two electromagnets or solenoids 6 7. When the electromagnet 6 is energized by the current, the reversing-switch gives current to the armature of the motor in such direction as to cause the lift to descend. If 7 is energized, the lift will ascend. A series of push-buttons 8, depend-

ing upon the number of floors—in the case shown there are five—are placed one on each floor. 9 represents gate-switches for cutting off the current from the switch 5 when the gate on any floor is open. Push-buttons 10 (see Fig. 2) are also fixed within the cage and act by pressure on each armature *s* and contact *t*.

Usually it would be necessary to employ as many wires as there are push-buttons or floors and a common return, and where there are only a few floors I may do this, in which case the holding-magnets *w* are dispensed with; but where there are a large number of floors I prefer to arrange the circuits as shown, in which case I only require two wires for any number of push-buttons and a common return which also serves as a return for the motor-switch. I accomplish this as follows: A resistance 11 is fixed on the third floor and is usually arranged in the base of the push-button. The outer ends of this resistance are connected, respectively, to the first and second windings of the holding-magnets. One end of the resistance is also connected to one contact of the push-button on the first floor. The other end is also connected to one contact of the push-button on the second floor, one contact of each push-button on the third, fourth, and fifth floors being connected to intermediate points in such resistance. These points are so chosen that the sections of resistance 11 are in definite proportion to each magnet-winding *w*.

In Fig. 4 I have shown a diagrammatic view which will enable the circuit to be traced from the positive main through the push-button and resistance to the negative main. Suppose that a push-button 8 on lower floor is depressed. Starting from the positive pole, the current will follow the course of the dotted arrows through resistance R, push-button depressed, (lower one on the drawings,) to a resistance 11. There the current divides in the manner described, part flowing through the resistance to and part flowing directly to the coils *w*. The two currents unite again at the farther end of the coils *w*, and, following the course of the dotted arrows, circulate in the coils *w'*, which are each wound to the same resistance, and thence through the gate-switches 9 back to the negative main. This divided current actuates in the manner described the contact *t'*. Another circuit is now set up. Starting from the positive main, current flows in the direction of the full arrows through resistance R, magnet 6, which actuates the motor-reversing switch, following full arrows to the contact *t'*, reaches contact-bar *z*, and there joins the coils *w'*, from which point the course of the current is the same as the dotted arrows through gate-switches to negative main. This last circuit, as indicated by the full arrows, shunts the first circuit (indicated by dotted arrows) and reduces the current therein. When the push-button is released, the current follows the circuit indicated by the full arrows only.

To make the matter clearer, I will point out that whatever outside push-button is depressed the current reaches the resistance 11, only at a different point, and thus divides in a certain fixed ratio, which differs according to the push-button depressed, and hence the circuit is practically the same for all outside push-buttons, and the selection of the contacts *t'* to *t⁵* depends not upon a separate circuit being set up, but upon the current dividing in a particular ratio. The ratio of these two currents will be the same as the ratio of the number of turns in the first and second windings on magnet and contact pieces corresponding to this floor. Since the two windings magnetize in opposite directions, the two currents will neutralize each other in the holding-magnet corresponding to the first floor, all the other holding-magnets being magnetized.

It will be seen that if any other push-button be depressed the current will divide at the resistance 11 in the different ratios accorded to each push-button, and hence will magnetize all the holding-magnets except the one in which neutrality exists, which corresponds to the push-button pressed. The current after circulating round the holding-magnets passes through the coils of the attracting-magnets and magnetizes them, thereby attracting their armatures, but only the armature corresponding to the push-button pressed is free to move, as all the others are tightly held by the holding-magnets. Hence when any push-button is pressed the armature corresponding thereto will move toward the attracting-magnet and bridge the bar *z* to bar *z'* or *z''*, as the case may be. Thus in the case under consideration when the push-button on the first floor is pressed the armature and contact corresponding thereto will bridge bar *z* to bar *z''*. Current is then given to magnet 6 on reversing-switch which causes the lift to descend. As the lift passes the floors the star-wheels and cams are turned in the manner described, and when the lift reaches the first floor the cam *n'* will cause the moving piece *o'* to rise and the wheel *x* will engage with the projecting piece *y*, and throw the contact *z'* into the open, thereby cutting off current from magnet 6 and stopping the lift. When there are more than five floors or stations, it is sometimes convenient to arrange an auxiliary resistance 11^a (see Fig. 5) to avoid multiplicity of wires.

Resistance R, Fig. 4, is connected in the manner shown or may be inserted in the return-wire for the purpose of preventing interference from outside when once any push-button has been operated.

The action is as follows: When the lift is at rest, the full potential is on the push-button

circuit in series with the resistance R and has a value $E-(r\times c)$. When the lift is working, the push-button circuit is shunted across the magnet 6 or 7, as the case may be, and the potential on the push-button circuit will be $E-r(c+c')$, which is not sufficient to fully energize the attracting-magnets. Where E equals electromotive force of supply, r equals resistance of R, c equals current in push-button circuit, c' equals current in magnet 6 or 7.

The star-wheel *e* may, if preferred, be attached directly to or geared in any suitable manner to the shaft *d'*.

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

1. A star-wheel and a locking device arranged and adapted to engage the same and also to complete its motion, one of these elements rising and falling with the elevator cage or platform, in combination with means for controlling the lifting and lowering of the cage operated by said star-wheel substantially as set forth.

2. In means for governing electrically-operated elevators, a series of differentially-wound holding-magnets, operating-magnets and their armatures, and a resistance and conductors arranged and adapted to divide an electric current in different ratios for the purpose of operating at will any particular armature while leaving the others unaffected substantially as set forth.

3. In means for governing electrically-operated elevators, a series of differentially-wound holding-magnets, operating-magnets and their armatures, a resistance and conductors arranged and adapted to divide the current in different ratios for the purpose of operating at will any particular armature while leaving the others unaffected and two circuit-wires and their necessary connections for actuating the aforesaid electrical devices substantially as set forth.

4. In electrically-operated elevator mechanism, an armature provided with means for electromagnetically operating the said armature, a device carried by said armature and a projection arranged and adapted to come in contact with said device for insuring throw-off substantially as set forth.

5. In elevator mechanism, the combination of a star-wheel rising and falling with the elevator-cage, means for engaging and locking said wheel, cams operated by said wheel, electromagnets having cores movable individually by said cams, armatures hinged to said cores, contacts carried by said armatures and circuits closed by said contacts which thereby control the rising or falling movement of the cage substantially as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

HENRY C. E. JACOBY.

Witnesses:
H. D. JAMESON,
F. L. RAND.