No. 612,545. Patented Oct. 18, 1898.

N. HISS.

SAFETY APPLIANCE FOR ELEVATORS.

(Application filed Dec. 2, 1897.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1

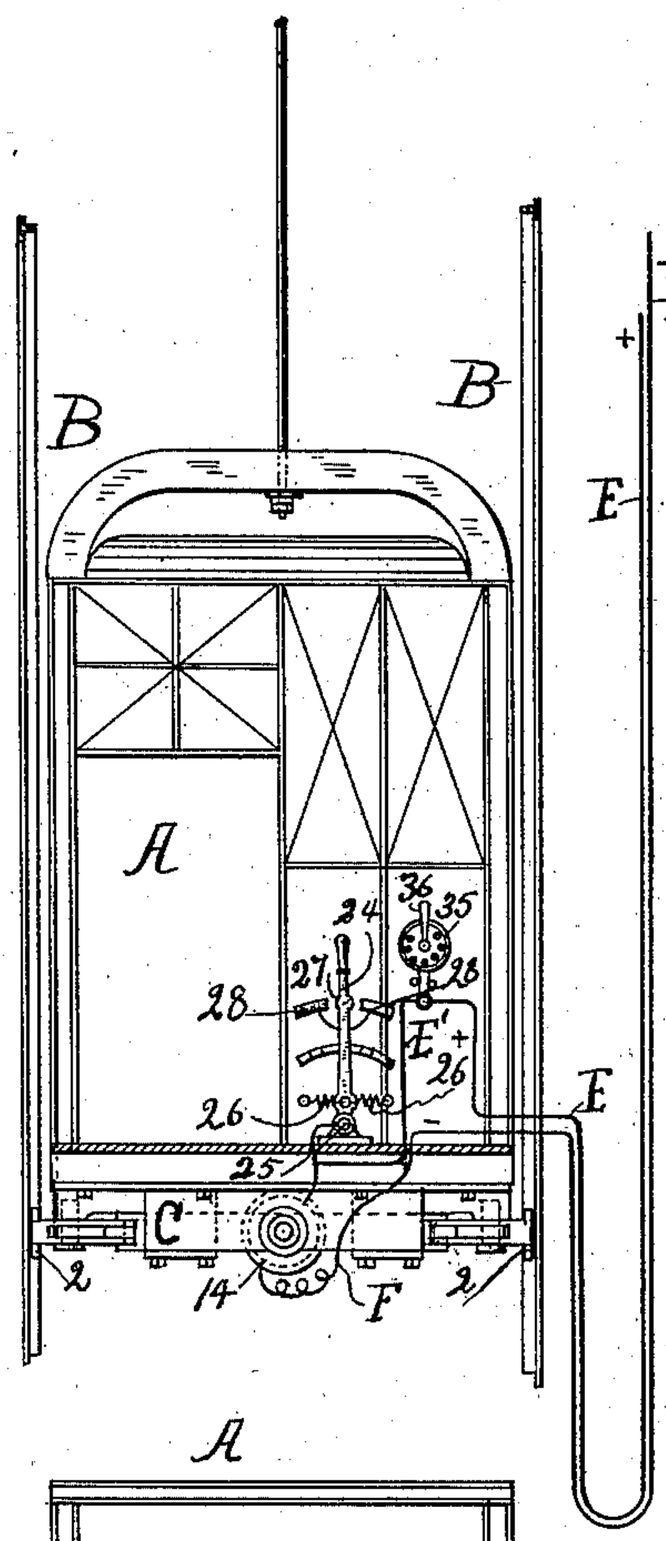
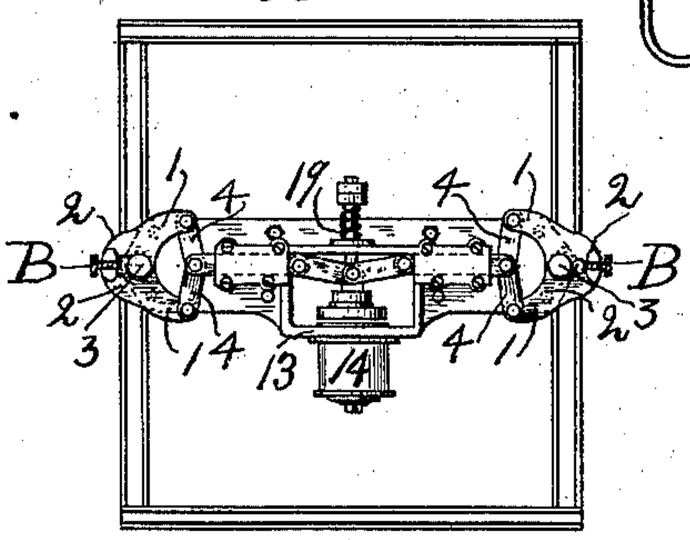


Fig. 2.



Witnesses
Charles Hannmann
Henry C. Brown.

Inventor
Nelson Hiss
By his Attorney
Wolter Brown

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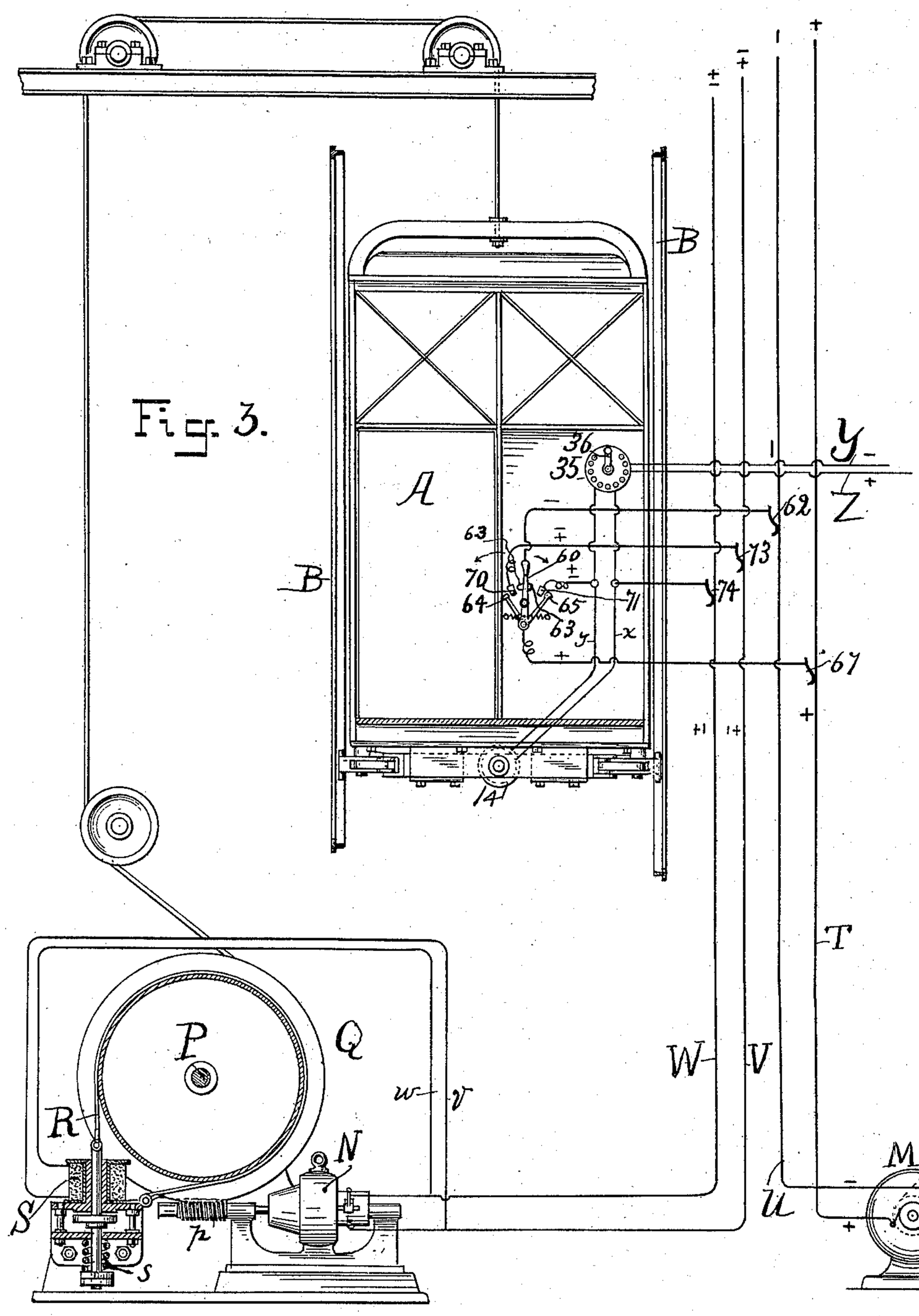
(No Model.) 4 Sheets—Sheet 2.

Fig. 3.



Witnesses.
Charles Hanimann
Henry V. Brown.

Inventor
Nelson Hiss
By his Attorney
Walter Brown

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(No Model.) 4 Sheets—Sheet 3.

Fig. 4

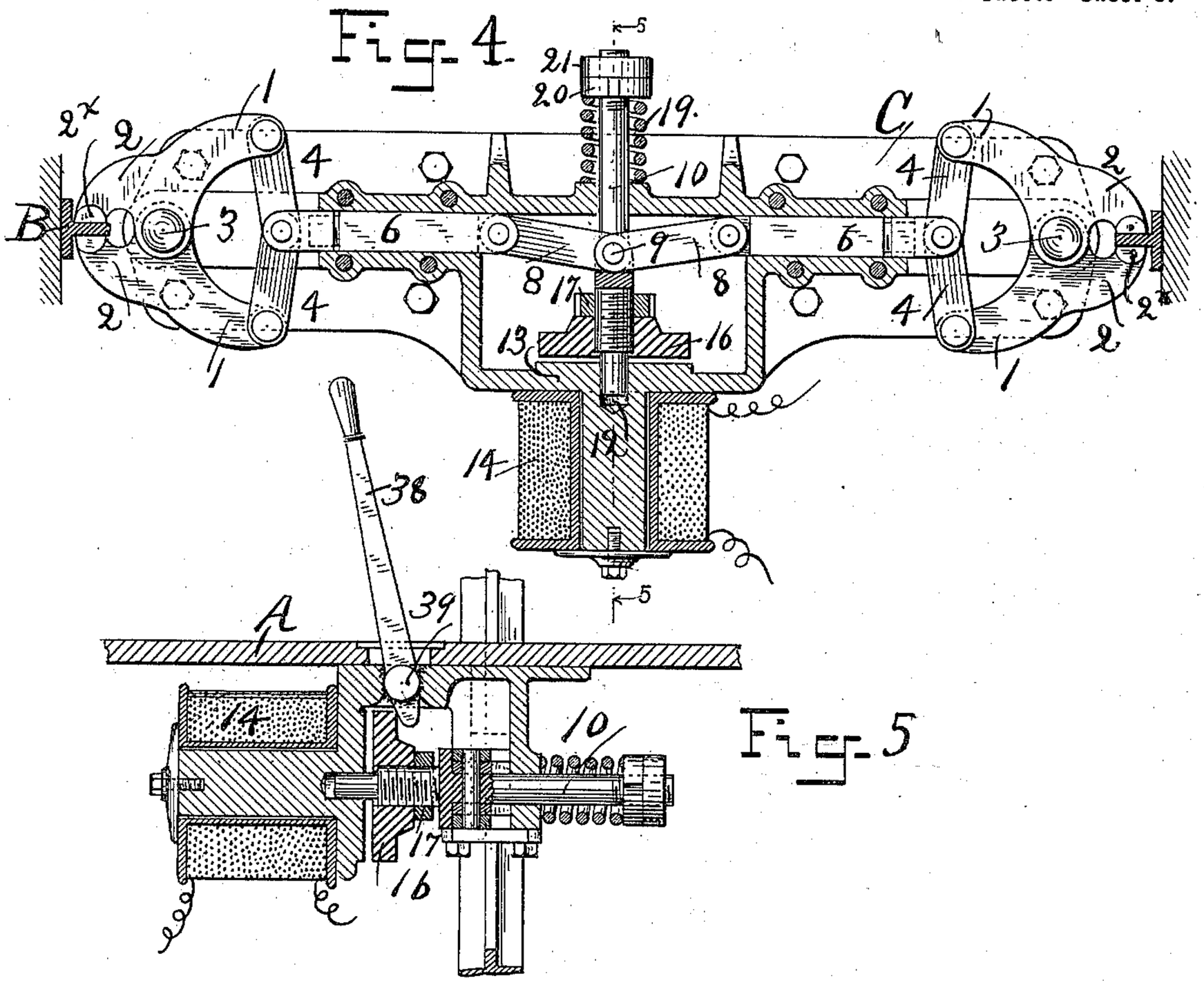


Fig. 5

Fig. 6.

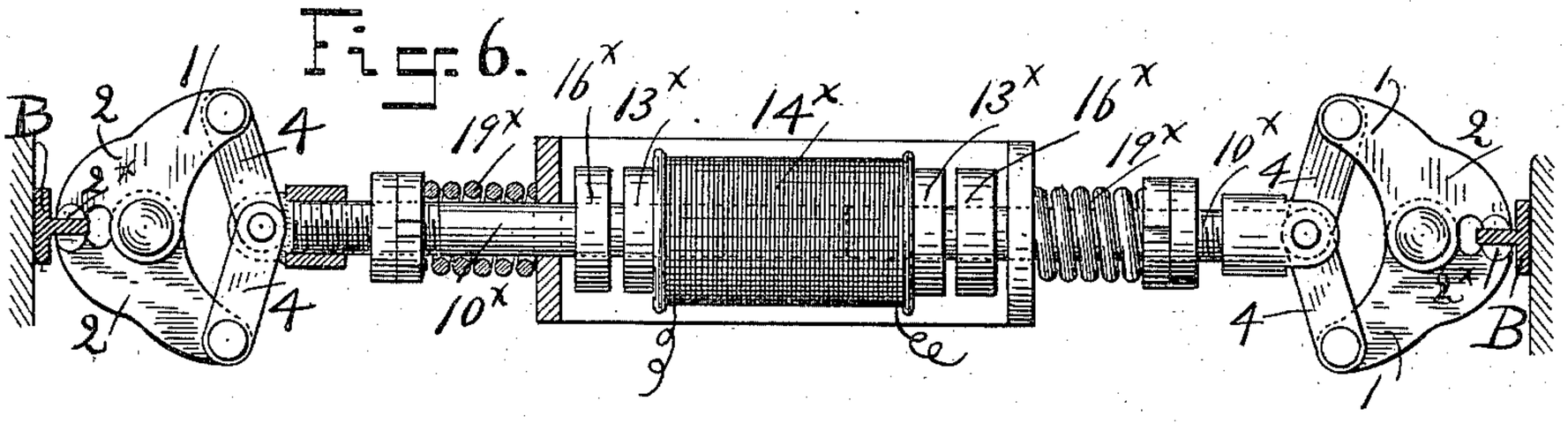
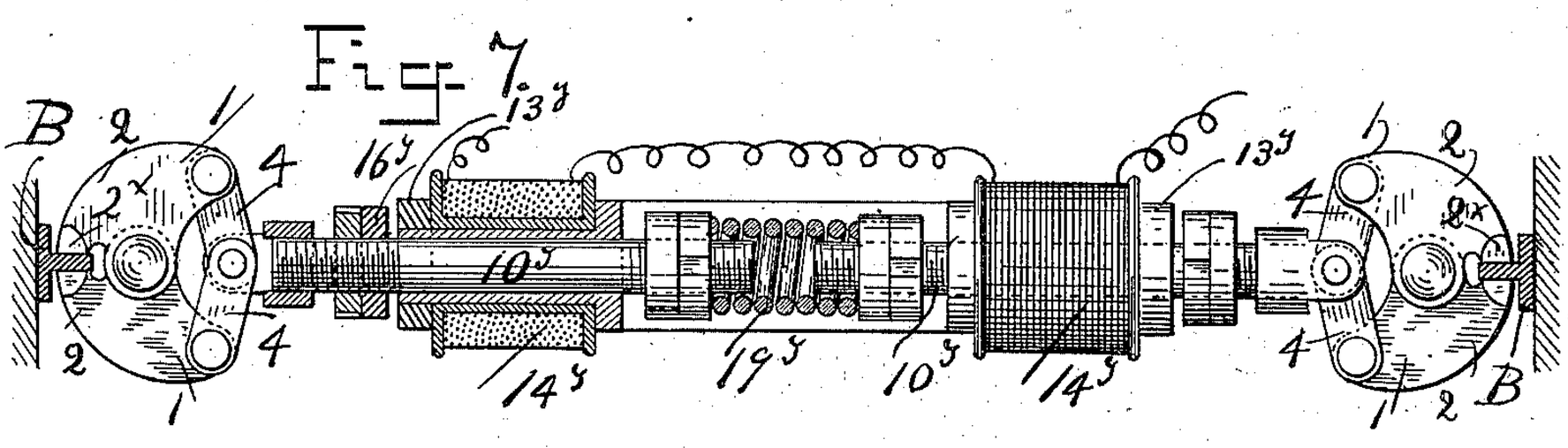


Fig. 7.



Witnesses
Charles Haninann
Henry V. Brown

Inventor
Nelson Hiss
By his Attorney
D. Walter Brown

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(No Model.) 4 Sheets—Sheet 4.

Fig. 8

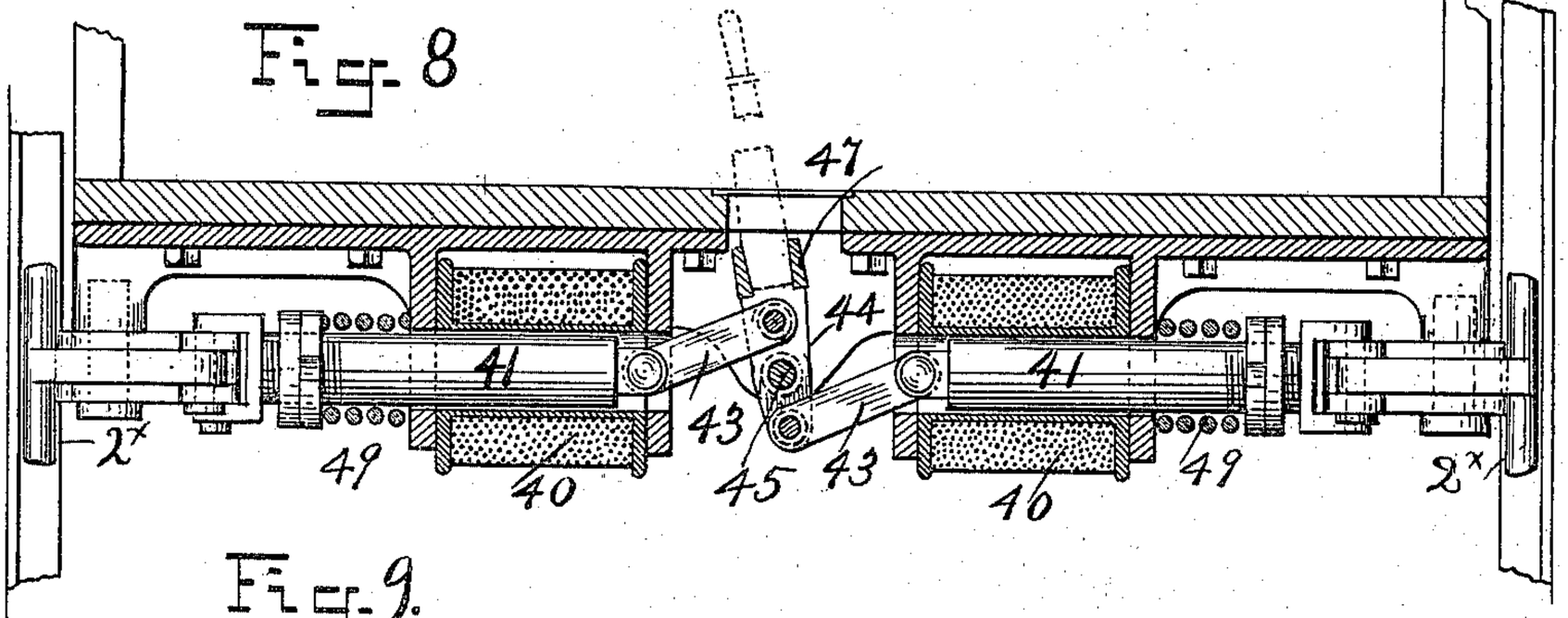


Fig. 9.

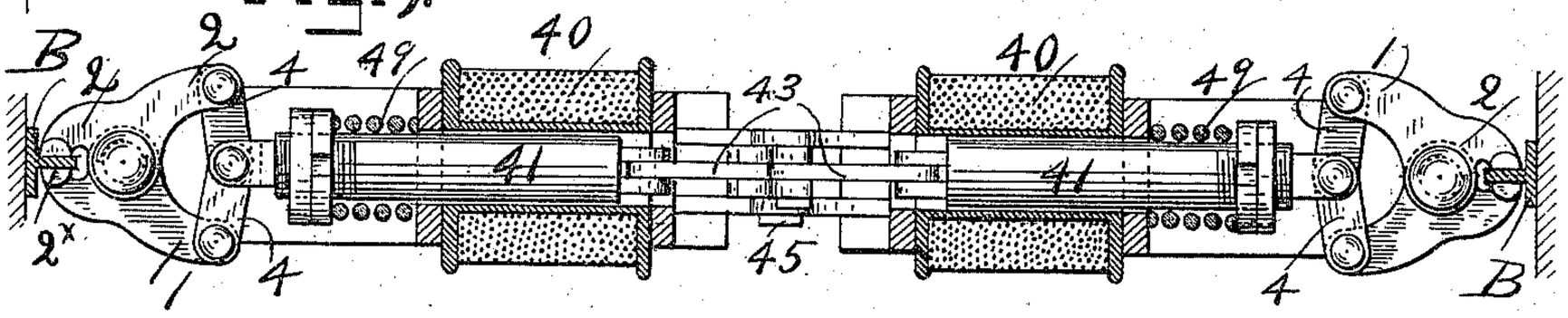
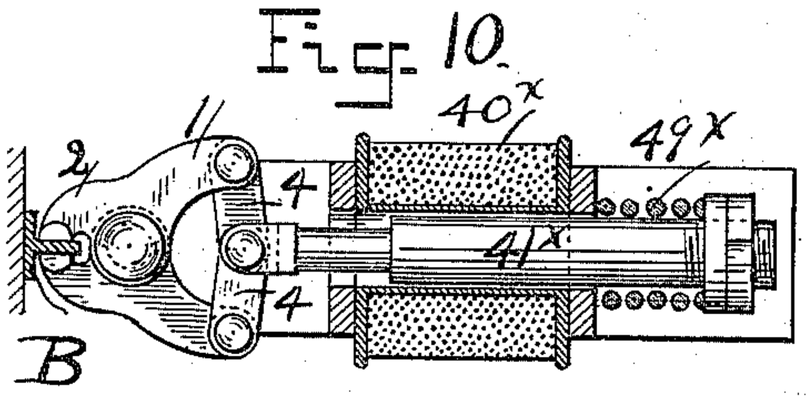


Fig. 10.



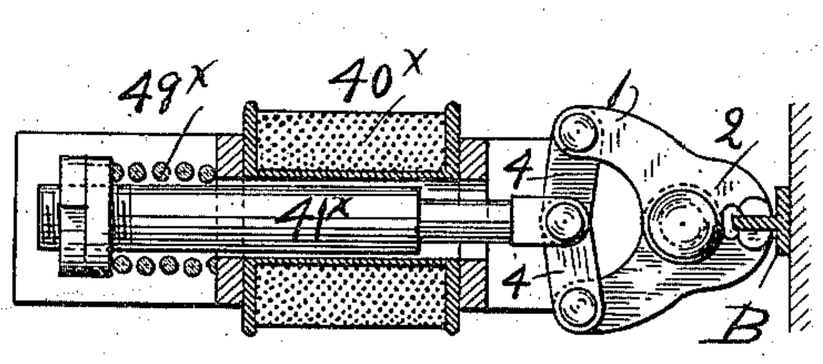
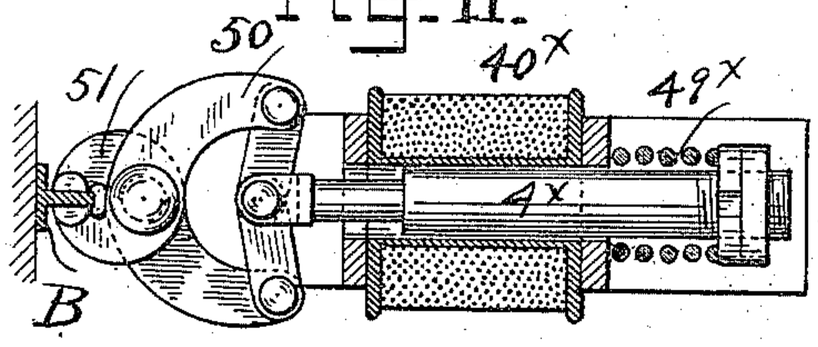


Fig. 11.



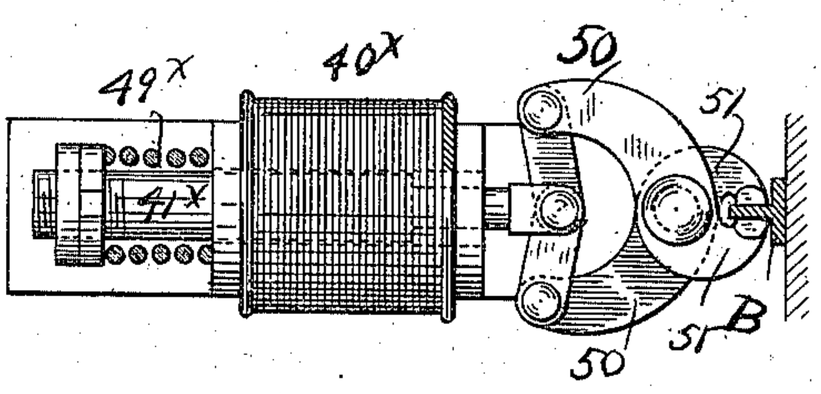
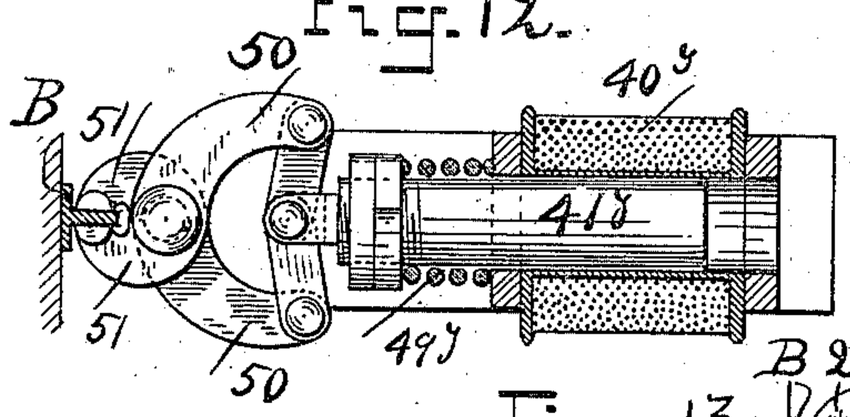


Fig. 12.



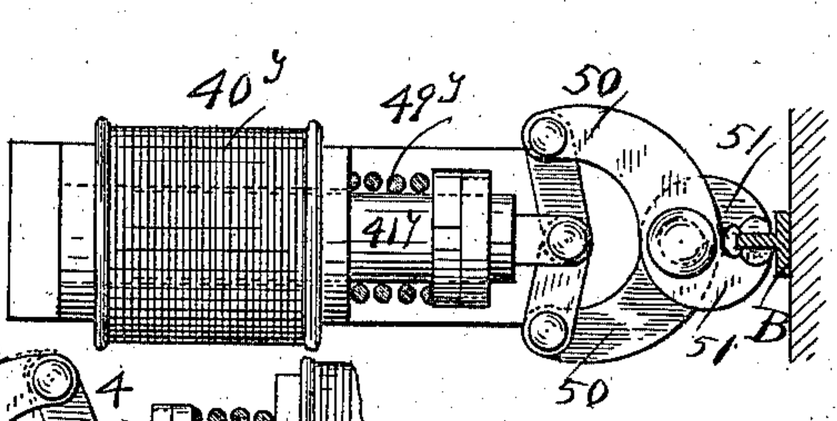
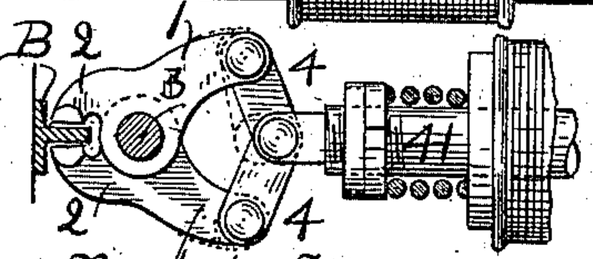


Fig. 13.



Witnesses
Charles Hanimann.
Henry V. Brown.

Inventor
Nelan Hiss
By his Attorney
D. Walter Brown

UNITED STATES PATENT OFFICE.

NELSON HISS, OF NEW YORK, N. Y.

SAFETY APPLIANCE FOR ELEVATORS.

SPECIFICATION forming part of Letters Patent No. 612,545, dated October 18, 1898.

Application filed December 2, 1897. Serial No. 660,561. (No model.)

To all whom it may concern:

Be it known that I, NELSON HISS, a citizen of the United States, and a resident of the city of New York, in the county and State of New York, have invented certain new and useful Improvements in Safety Appliances for Elevators, of which the following is a specification.

My invention relates to improvements in safety devices for elevators and hoisting apparatus, and particularly to improvements in the means for operating the safety-clutches.

It is essentially the object of the invention to put the clutches in the control of the attendant of the car and to overcome the serious failure which experience shows attends upon every safety appliance whose operation depends on the motion of the car—as, for example, on its speed. Repeated accidents in the last few years have shown that no purely automatic safety appliance is reliable, and injury and loss of life have followed upon their failure. This failure, among other causes, is particularly due to two—viz., first, that, as the appliances are only operated at long intervals, when an accident happens they are usually out of order when the time arrives when they ought to work, and then they won't work, and, second, that the speed which is sufficient to cause the safety appliances to operate is great enough to cause injury to persons in the car.

My invention places the safety appliances in the control of any person in the car, so that when he has any reason to anticipate danger he can immediately bring the appliance into operation and stop the car before its speed has increased.

The invention also includes means controlled by the person in the car for slowly and safely lowering the car to a landing after it has been stopped. The clutch devices are also so connected with the lever, hand-rope, or other device for stopping and starting the elevator-car that the clutches are thrown on every time the car is stopped and slacked off every time it is started, so that the clutch devices are kept in good working condition.

In my invention the elevator-car carries safety-clutches which are adapted to grip on and slack off standards arranged in an elevator-shaft parallel to the travel of the car. These clutches are operated by a suitable device, such as a solenoid or magnet, which device is electrically connected with the means for starting and stopping the car—as, for example, the starting and stopping lever—in such a manner that every time the attendant throws the lever to stop the car the safety-clutches are gripped on, and every time he throws the lever to start the car the safety-clutches are slacked off, the standards. In this manner the safety-clutches are operated with such frequency that they are kept in good condition, or if they get out of order the defect will be at once discovered. As the necessary combination of parts can be effected in various ways I show in the drawings and describe in the specification several constructions applicable to any elevator system.

Referring to the drawings which accompany the specification to aid the description, Figure 1 is a vertical section of an elevator-car and showing, diagrammatically, the safety-clutches and electric connections arranged for any motive power other than electric—as, for example, a hydraulic motor. Fig. 2 is a view of the clutches from below. Fig. 3 is a vertical section of an elevator-car and showing, diagrammatically, the safety-clutches and electric connections arranged for an electric elevator. Fig. 4 is a horizontal section, on a large scale, of the preferred arrangement of the safety-clutches, which arrangement is that indicated on Figs. 1 and 3. Fig. 5 is a vertical section on the line 5 5 of Fig. 4 and showing a removable hand-lever for slacking off the clutches in case of derangement of the electric circuits. Fig. 6 is a plan, partly sectioned, of a modification wherein two springs are used to throw on the clutches. Fig. 7 is a plan, partly sectioned, of a modification wherein the spring which throws on the clutches is arranged between the electric magnets which slack off the clutches. Fig. 8 is a sectional elevation, and Fig. 9 a view from below of a modification with two springs for throwing on the clutches and two solenoids for slacking them off and the cores of the solenoids being so connected by links as to mutually coact. In this figure is also indicated by dotted lines a removable hand-lever for slacking off the clutches in case of derangement of the electric connections. Fig.

10 is a sectional plan view of the clutch equipped with two solenoids for throwing on and two springs for slacking off the clutches. Fig. 11 is a sectional plan view of another modification, wherein two solenoids are arranged to throw on and two springs to slack off the clutches. Fig. 12 is a sectional plan view of a modification wherein two springs throw on and two solenoids slack off the clutches. Fig. 13 is a plan view of one of the clutches, corresponding to Fig. 9, slacked off the standard.

Referring to Figs. 1, 2, and 4, A is an elevator-car, and B B the standards on which the safety-clutches grip. Said clutches, preferably two in number, are each composed of two parts pivoted at 3 to the frame C on the bottom of car A and which are so shaped and arranged that the in motion of the arms 1 1, Fig. 4, slacks off the jaws 2 2, and the out motion of said arms throws on said jaws. The shoes $2^{\times}$ may be pivotally secured to said jaws 2 in the usual manner. Toggle-links 4 4 connect said arms 1 1 with reciprocating rods 6, guided in said frame C, the inner ends of the rods 6 being connected together by the toggle-links 8 8, which are pivoted at 9 to a transverse reciprocating rod 10, guided in a hole of said frame C and a socket-hole 12 of the pole-piece 13 of the electromagnet 14, which is carried on said frame. Said pole-piece 13 is shown in Fig. 4 as one with the frame C; but it may be insulated therefrom in any usual manner. On said rod 10 threads an armature 16, 17 being a lock-nut and 19 a powerful spring to force rod 10 outward when the electromagnet 14 is not acting and throw on the clutches. To facilitate adjustment and taking up for wear, the aforesaid rods 6 6 are made in two parts, threading together, as shown. The force and throw of spring 19 can also be adjusted by the nut 20 and locknut 21. Said magnet 14, which is of any known construction and of power sufficient to move the rod 10 against the spring 19, (or the solenoid which may be used in place of said magnet, as is well understood in the art,) is in a circuit E F from any source of electric energy, the wires or cables of the circuit being insulated in the usual manner. Said circuit is closed or broken by the man in charge of the elevator-car by the aid of any suitable means of control, as the lever 24, pivoted at 25 and normally held in the middle position, Fig. 1, wherein the circuit is broken by springs 26 26. Said lever 24 is an electric conductor. The handle being insulated carries contact 27 and vibrates between contacts 28 28, which are electrically connected with wire E. Thus when the attendant throws lever 24 to either side he closes the circuit and the electromagnet 14 slacks the clutches off the standards B. Said lever 24 is also connected in any usual manner with the motor of the elevator, so that when it is thrown to the one side or the other the motor causes the car to rise or descend, and the connections of said lever 24 or equivalent device with hydraulic valve or equivalent part of said motor are such as to shut off the valve or equivalent part of the motor just before the clutches throw on and to slack off the clutches just before the motor starts. When, therefore, the lever is brought to the center, the elevator-motor first stops, the car comes to rest, and immediately the electric current is cut off magnet 14 and spring 19 throws the clutches on the standards, holding the elevator-car in the desired position until the attendant moves lever 24 again to one side or the other, thereby closing the circuit through magnet 14 and again slacking the clutches off the standards and then immediately starting the elevator-motor to cause the car to ascend or descend.

In the circuit with the magnet 14 may be a rheostat 35, Fig. 1, so arranged as to permit the attendant to throw any desired current through said magnet independently of lever 24, so as to very gradually ease off the clutches and allow the car to slowly slip down, should it ever be necessary. For instance, suppose in case of some accident the attendant has stopped the car between floors and then desires to lower the car slowly to a landing below to let off passengers. By throwing switch 36 of the rheostat the proper distance from the neutral position of Fig. 1 he would pass sufficient current through magnet 14 to ease off the clutches a little, so as to let the car slip safely down to the landing, where by restoring switch 36 to the neutral position he would again throw on the clutches and hold the car fast at the landing.

Should the electric connections be broken, spring 19 would of course throw the clutches on and stop the car. To let it slip safely down to a landing in such case, a lever 38, provided with pivot-bosses 39, Fig. 5, is put through a hole in the bottom of the car and the clutches pried a little to just ease them off enough to let the car slip down to a landing.

In Fig. 6 the clutch device is shown equipped with one electromagnet 14^{x}, provided with two pole-pieces 13^{x} 13^{x}, arranged to attract the two armatures 16^{x} of rods 10^{x} 10^{x}. Said rods 10^{x} are each connected at the outer ends with the toggle-arms 4 of one of the clutches. When the magnet 14^{x} is energized, both clutches are slacked off. When the magnet is dead, the springs 19^{x} 19^{x} throw both clutches on and stop the car.

In the arrangement of Fig. 7 two electromagnets 14^{y} 14^{y}, with pole-pieces 13^{y} 13^{y}, two rods 10^{y} 10^{y}, with armatures 16^{y} 16^{y} and one spring 19^{y}, are employed. When the magnets are energized, the clutches are slacked off. When the magnets are dead, the spring throws both clutches on.

The arrangement of Figs. 8 and 9 has two solenoids 40 40 and two cores 41 41. Said cores are operatively connected by links 43 43 and lever 44, pivoted at 45. Said lever 44 is provided with a socket 47 for the insertion

of a hand-lever (indicated by dotted lines) to ease off the clutches when desired. Springs 49 49 throw the clutches on when the current through the solenoids is interrupted. The arrangement of the circuits, operating-lever, and rheostat is the same as shown in Fig. 1.

The clutch arrangement shown in Fig. 10 is equipped with two solenoids 40^x 40^x, two cores 41^x 41^x, and two springs 49^x 49^x. In this case when the solenoids are energized they throw the clutches on. When the circuit is broken, the springs 49^x 49^x slack off the clutches.

The arrangement shown in Fig. 11 is the same as that shown in Fig. 10, except that the clutches are now of the shear type, so that the closing of the arms 50 closes the jaws 51. The effect of the whole is that when the solenoids are energized they throw the clutches on, and when the solenoids are dead the springs slack off the clutches. Of course the shear type of clutches can be used, if desired, with the electromagnets 14.

The arrangement of Fig. 12 is equipped with two solenoids 40^y 40^y, two cores 41^y 41^y, two springs 49^y 49^y, and clutches of the shear type. In this case when the solenoids are energized they slack off the clutches. When the circuit is broken, the springs 49^y 49^y throw the clutches on.

Referring to Fig. 3, which is a diagrammatical representation of an electric elevator, M is any source of electric energy; N, an electric motor; P, the shaft of a hoisting apparatus; Q, the worm-wheel thereof, driven by worm *p* of said motor N; R, the strap-brake on the disk of shaft P, and S a solenoid or electromagnet with spring *s* for throwing brake R on when the car is stopping. The spring *s* throws on, and the energized solenoid or magnet S slacks off, the brake. T U are conductors from said source of electric energy M and adjacent to the car A, and V W are separate conductors, also adjacent to the car and ultimately leading into the motor N, *v w* being a shunt-circuit to the aforesaid solenoid or electromagnet S, and *x y* being an auxiliary circuit in which are the solenoid or magnet 14 and the rheostat 35 and capable of being put in connection with said conductors V W, as will be hereinafter described. The upper part of operating-lever 60 is electrically connected with brush 62, which rubs along on conductor U and is provided with contacts 63 63. The lower part of said lever 60 is insulated from its said upper part, is equipped with contacts 64 65, and electrically connected with brush 67, which rubs along on conductor T. Contacts 70 71 are respectively electrically connected with brushes 73 74, which rub, respectively, on conductors V and W. Y Z are independent wires to rheostat 35 from a source of electric energy, as M. Solenoids or magnets 14 and S are so wound and adjusted that when the operation of the former throws on the clutches the operation of the latter shall throw on brake R just before the clutches close. When lever 60 is in the middle position of Fig. 3, the current through motor N and also through magnets 14 and S is interrupted, so that motor N stops, clutches 14 throw on the standards B, and brake R throws on the disk of shaft P, the brake R coming on slightly in advance of the clutches, and the car stops. To start the car, the attendant moves lever 60 to one or the other side as he wishes to ascend or descend. Suppose he throws lever 60 to the right. Then the current flows from conductor T by brush 67, to contact 64, to contact 70, to brush 73, to conductor V, through motor N and solenoid or magnet S, starting the motor in the desired direction (say for raising the car) and slacking off brake R, thence back by conductor W and brush 74, to wire *x*, to magnet 14, slacking off the clutches, thence by wire *y* to contact 71, to contact 63 and lever 60, to brush 62, to conductor U, and back to the source of energy. The clutches slack off in starting the car just before the motor N starts up. When lever 60 is again brought to the middle position, the various circuits are broken, the brake and clutches thrown on, and the car stopped. When lever 60 is thrown to the left, the motor will be driven in the opposite direction, the clutches and brake, however, being again slacked off. When switch 36 of rheostat 35 is in the middle position shown, the electric connection from wires Y Z to the magnet 14 is broken; but suppose that, owing to some accident, the car has been stopped between floors and the attendant wishes to lower it safely to a landing. He turns switch 36 the proper distance, and thus allows a suitable current to flow through magnet 14 to just ease off the clutches to permit the car to descend slowly to the landing, where the attendant returns switch 36 to the middle position and the clutches hold the car fast. The circuit through lever 60 being broken, the current through the rheostat cannot reach motor N, so that said motor will remain at rest. Of course instead of the conductors T U V W and the sliding brushes flexible cables can be led into the car and to various parts of the device in the manner well known in present practice.

Now, having described my improvements, I claim as my invention—

1. The combination in safety appliances for elevators, of the car and motor therefor, means for starting and stopping the car operated by the car-attendant, a standard parallel to the travel of the car, a safety-clutch carried by the car and adapted to grip on and slack off said standard as desired, and a device for operating said clutch electrically connected with the aforesaid means for starting and stopping the car, whereby said safety-clutch is operated whenever the car starts or stops, substantially as described.

2. The combination in safety appliances for elevators, of a safety-clutch, electrically-operated devices for actuating the safety-clutch

controllable at the will of a person, and auxiliary electrical means for operating the safety-clutch consisting of a controllable auxiliary circuit, substantially as described.

3. The combination in safety appliances for elevators, of a safety-clutch, electrically-operated devices for actuating the safety-clutch controllable at the will of a person, and hand-operated auxiliary means for slacking off said safety-clutch, substantially as described.

4. The combination in safety appliances for elevators, of a safety-clutch, electrically-operated devices for actuating the safety-clutch controllable at the will of a person, auxiliary electrical means for operating the safety-clutch consisting of a controllable auxiliary circuit, and auxiliary mechanical hand-operated means for slacking off the safety-clutch in case of injury to the electrical circuits, substantially as described.

5. The combination in safety appliances for elevators of the car and its motor, means for starting and stopping said motor, a safety-clutch carried by the car, a device for operating said clutch electrically connected with the aforesaid means for starting and stopping the car, and a toggle connecting said device and safety-clutch, substantially as described.

6. The combination in safety appliances for elevators, of safety-clutches, an electromagnet or solenoid for actuating said safety-clutches in one direction, an electric circuit controllable at the will of a person for energizing said magnet or solenoid, and a spring for actuating said safety-clutches in the opposite direction, substantially as described.

7. The combination in safety appliances for elevators, of safety-clutches, an electromagnet or solenoid for actuating said safety-clutches in one direction, an electric circuit controllable at the will of a person for energizing said magnets or solenoid, and an auxiliary circuit controllable at the will of a person for independently slacking off said safety-clutches, substantially as described.

8. The combination in safety appliances for elevators, of safety-clutches, an electromagnet or solenoid for actuating said safety-clutches in one direction, an electric circuit controllable at the will of a person for energizing said magnet or solenoid, a spring for actuating the safety-clutches in the opposite direction, and hand-controlled mechanical means for slacking off said safety-clutches, substantially as described.

9. The combination in safety appliances for elevators, of safety-clutches, an electromagnet or solenoid for actuating said safety-clutches in one direction, an electric circuit controllable at the will of a person for energizing said magnet or solenoid, a spring for actuating the safety-clutches in the opposite direction, an auxiliary circuit controllable at the will of a person for slacking off said safety-clutches, and auxiliary hand-controlled mechanical means for slacking off said safety-clutches in case of injury to the electric circuits, substantially as described.

10. The combination in safety appliances for elevators, of clutches, a spring for throwing said safety-clutches in one direction and an electrically-actuated device for throwing said safety-clutches in the opposite direction, and means for starting and stopping the elevator-car provided with an electric make and break, whereby the throwing of said means to stop the car throws on the safety-clutches and the throwing of said device to start the car slacks off said safety-clutches, substantially as described.

11. The combination in safety appliances for hydraulic elevators, of safety-clutches, an electrically-controlled device for operating said safety-clutches, and means for starting and stopping the elevator adapted to make and break the circuit of said electrically-controlled device, whereby said safety-clutches throw on when the hydraulic motor stops and slack off just before it starts, substantially as described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 19th day of November, 1897.

NELSON HISS.

Witnesses:
GRACE E. MCILWAINE,
HENRY V. BROWN.