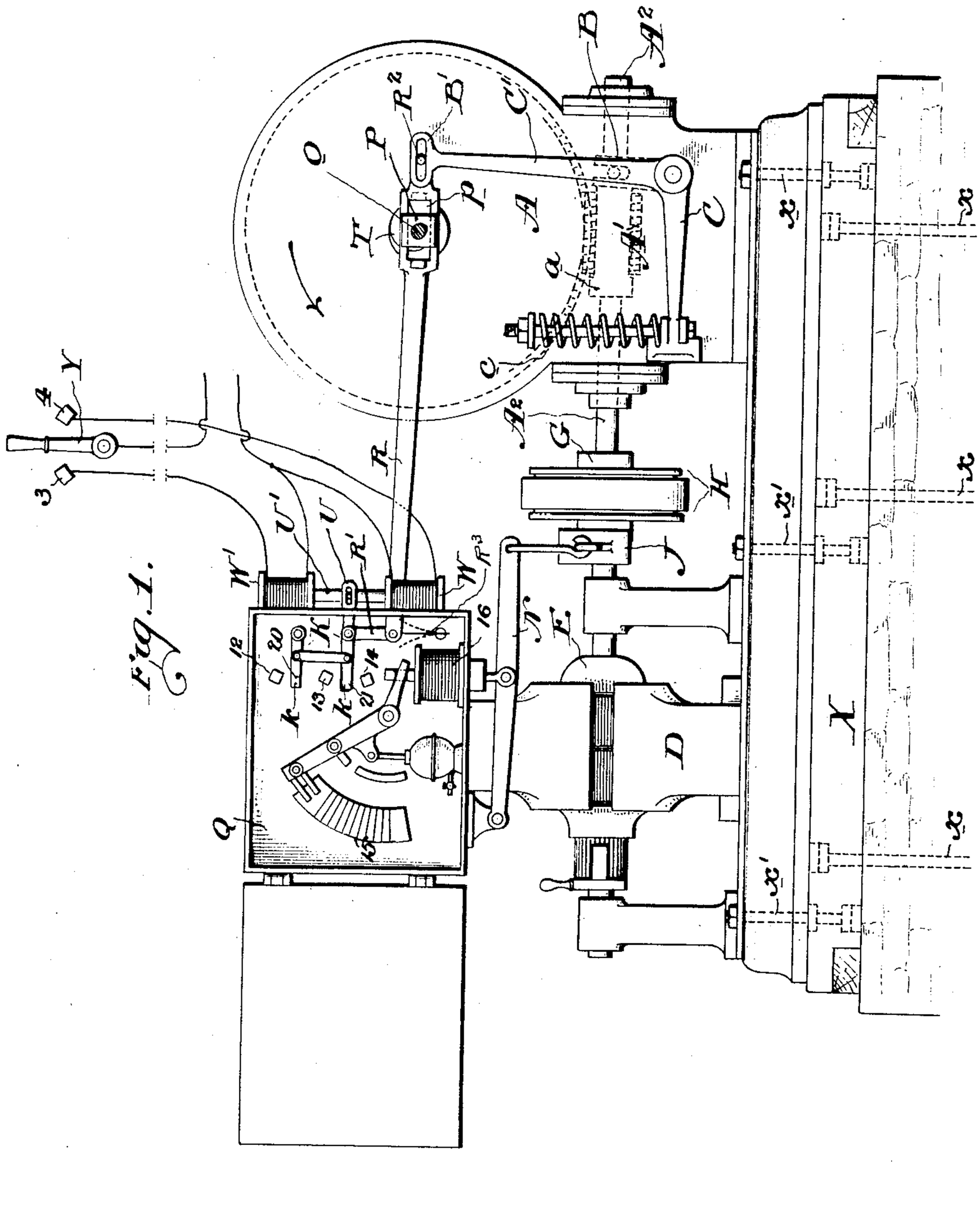
(No Model.)

5 Sheets—Sheet 1.

F. E. HERDMAN.

ELECTRIC ELEVATOR.

No. 480,846. Patented Aug. 16, 1892.



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(No Model.) 5 Sheets—Sheet 2.

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Fig. 2.

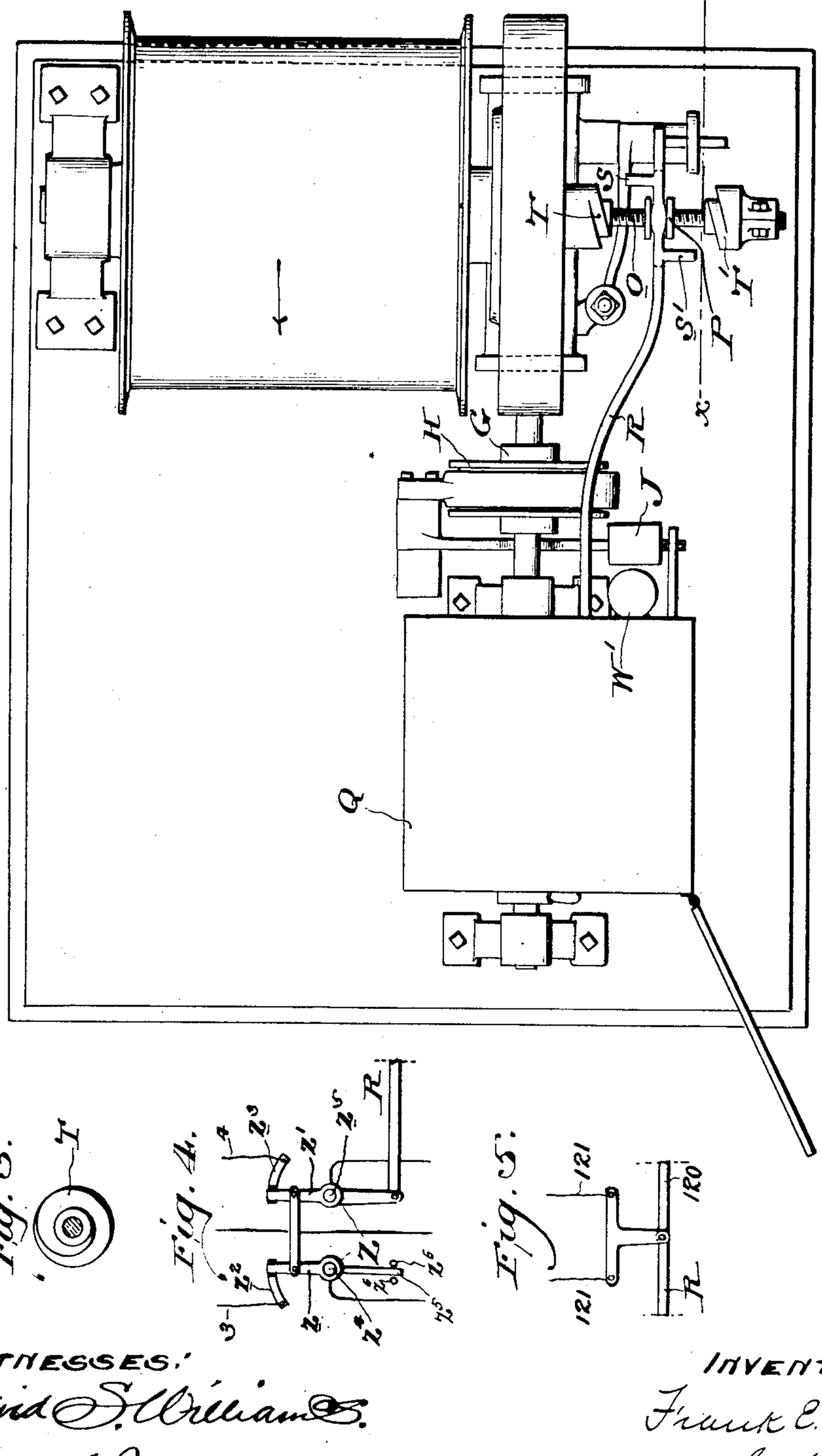

Fig. 3.

Fig. 4.

Fig. 5.

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ELECTRIC ELEVATOR.

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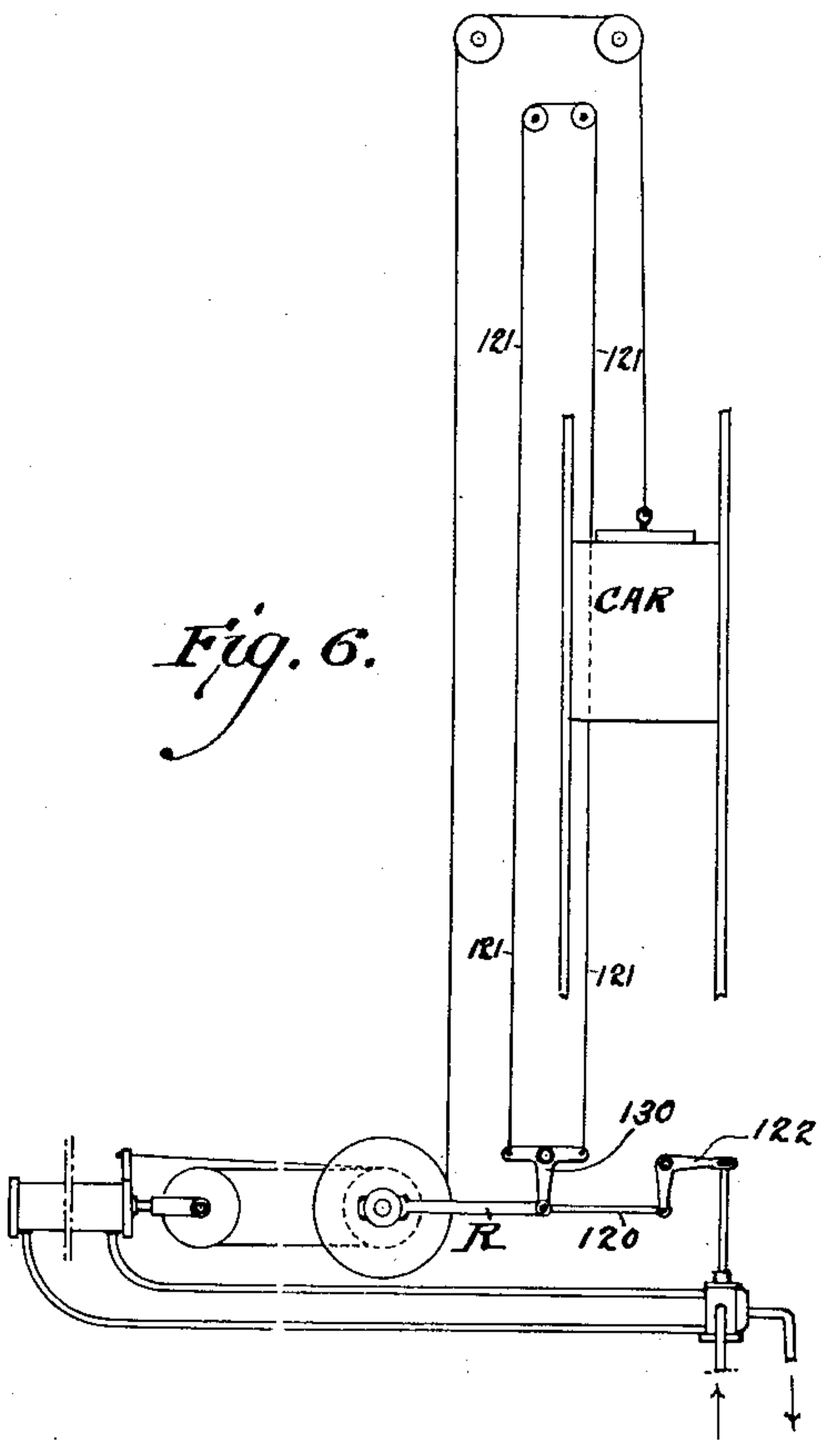

Fig. 6.

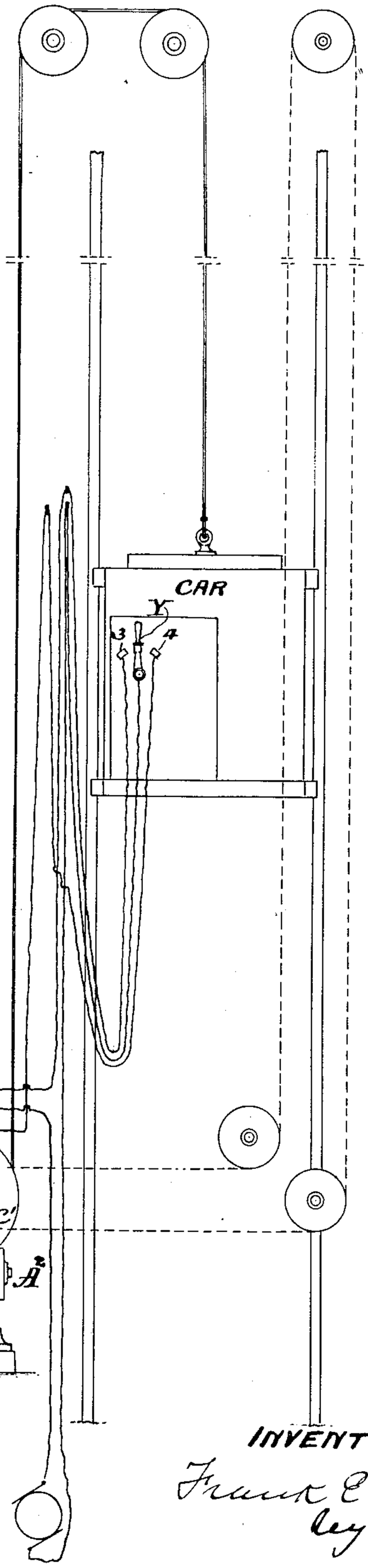

Fig. 7.

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5 Sheets—Sheet 4.

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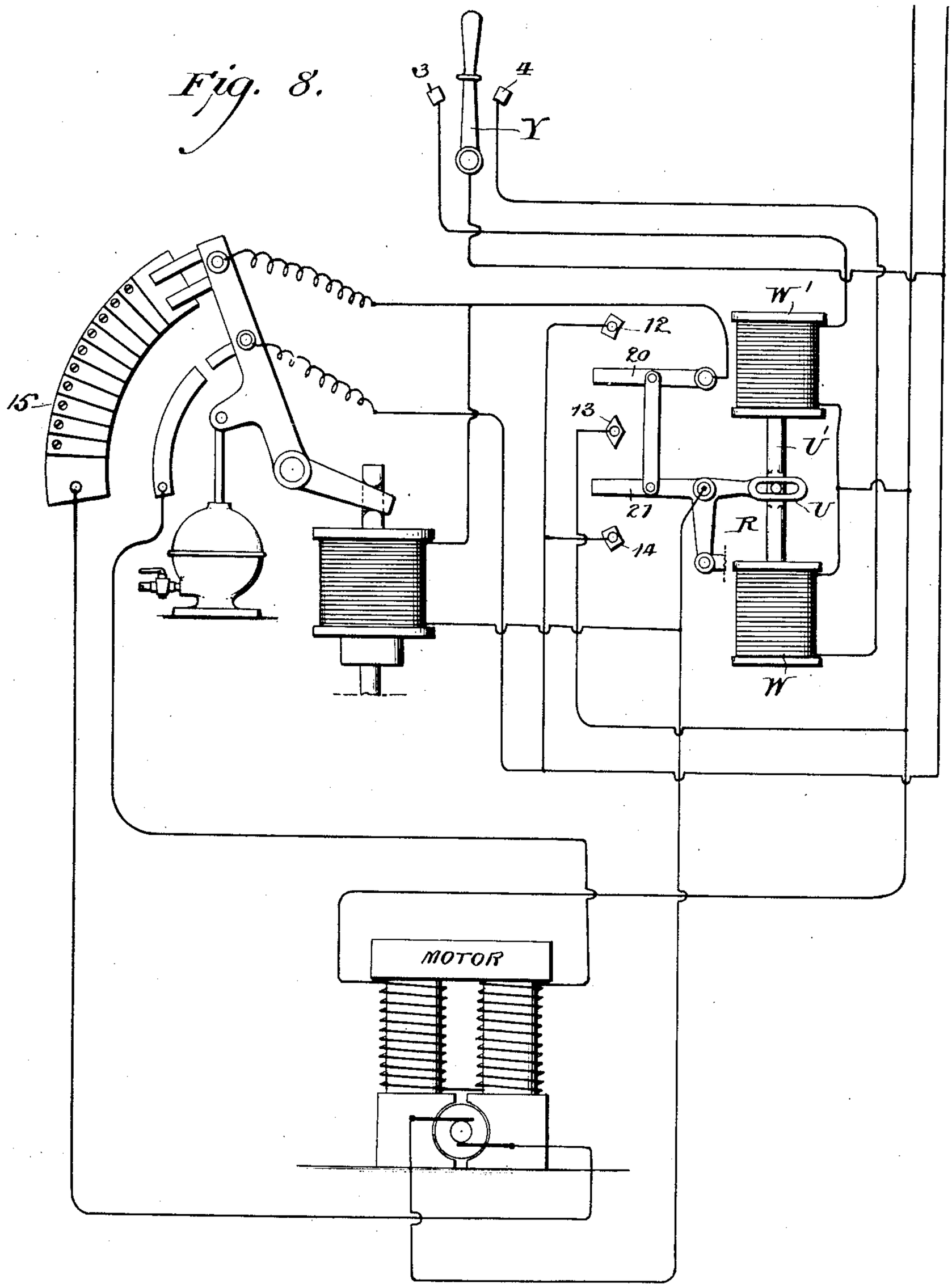
No. 480,846. Patented Aug. 16, 1892.

Fig. 8.



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ELECTRIC ELEVATOR.

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Fig. 9.

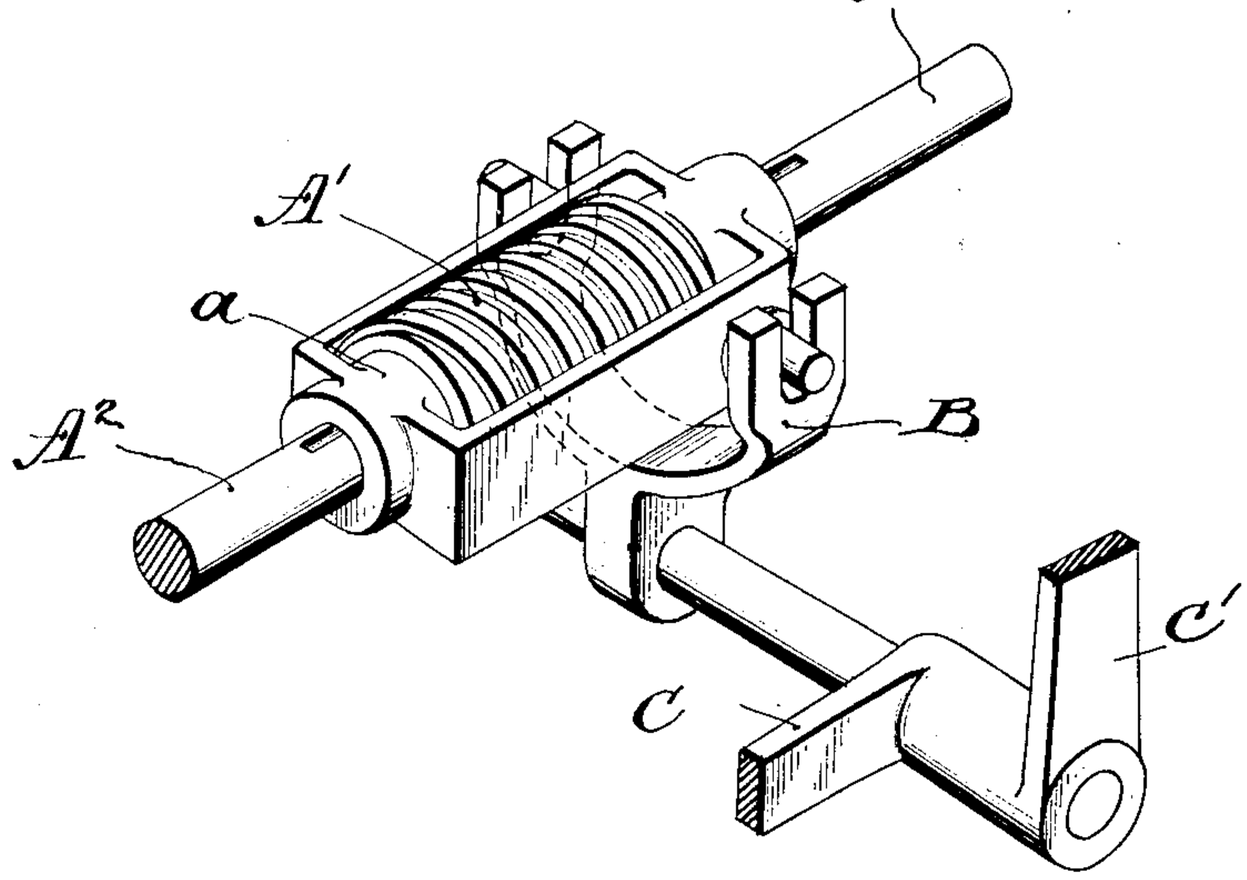
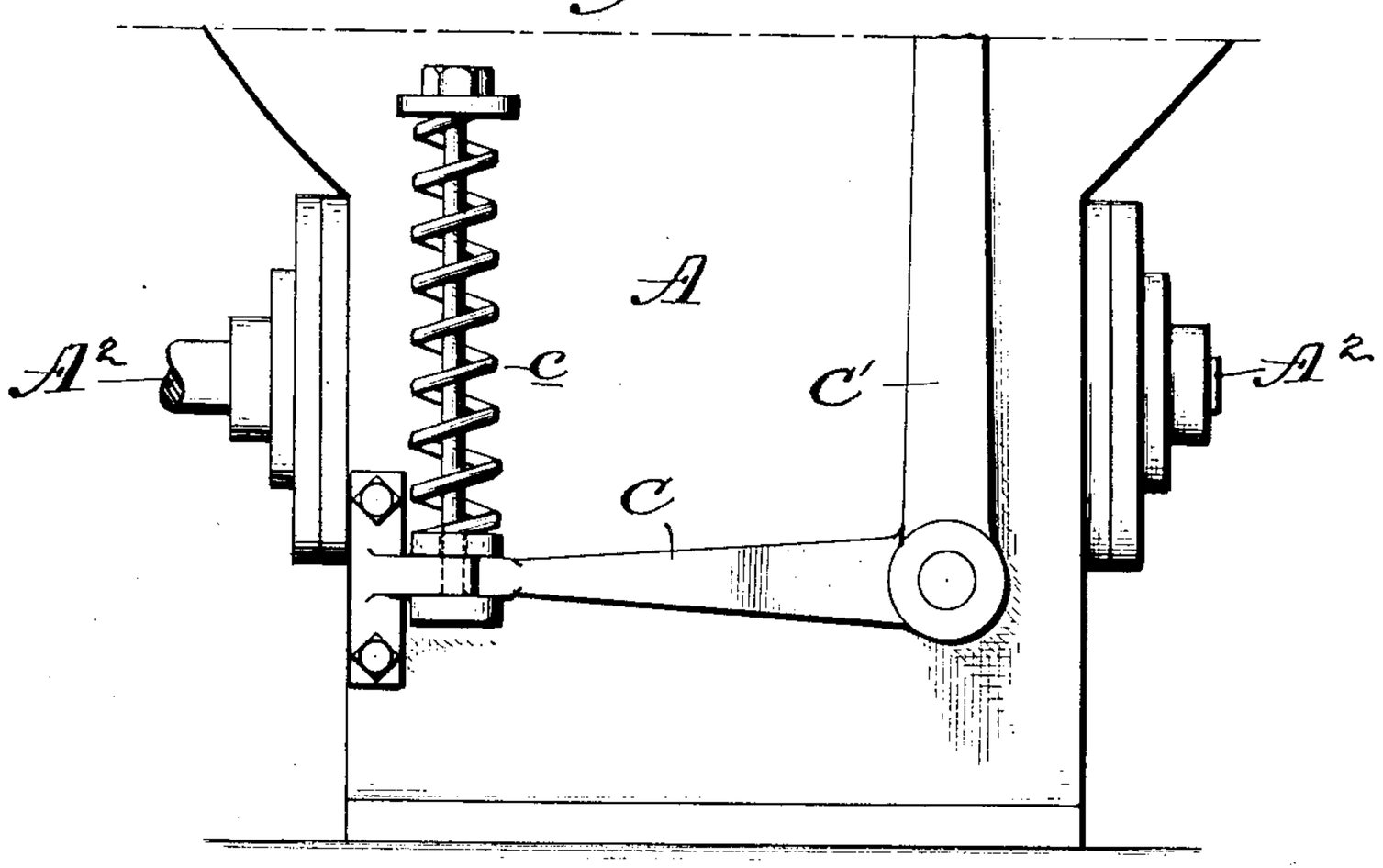


Fig. 10.



WITNESSES:

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UNITED STATES PATENT OFFICE.

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ELECTRIC ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 480,846, dated August 16, 1892.

Application filed December 22, 1891. Serial No. 415,881. (No model.)

To all whom it may concern:

Be it known that I, FRANK E. HERDMAN, a citizen of the United States, residing at Indianapolis, county of Marion, and State of Indiana, have invented a new and useful Improvement in Elevators, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

I will now describe an embodiment of my improvement as illustrated in the drawings, in which—

Figure 1 is a front elevation, partially in section. Fig. 2 is a plan view. Fig. 3 is a section on the line *x x*, Fig. 2. Fig. 4 is a modified method of connecting the connecting-rod R. Fig. 5 is a view showing the connection of connecting-rod R as used with a hydraulic elevator. Figs. 6 and 7 are diagrammatic views showing the devices connected with the car of an elevator. Fig. 8 is a diagrammatic view showing paths of the current. Fig. 9 is a detached perspective view of the worm-rocker, &c. Fig. 10 is a detached elevation enlarged, showing the relations between the levers C and C′ and the spring *c*.

A is the worm-casing, containing the worm and worm-gear. A′ is the worm, A^2 the worm-shaft, and *a* the yoke.

B is a rocker on the inside of the worm-casing, connected to the yoke *a*, said yoke taking up the end-thrust of the worm.

C is a lever connected to the rocker B, and this lever has at its end the tension-spring *c*.

D is the motor; E, the armature, whose shaft is coupled directly with the worm-shaft A^2 by the coupling G, which has its rim extended into the form of a brake-wheel H, on whose surface acts an ordinary friction-brake held down by the weight J. On the top of the motor is placed the resistance-box Q.

K is a snap-switch the brushes 20 21 of which are adapted to be connected with the contact-points 12 and 13 or 13 and 14 in electrical connection with the source of current-supply. The connection between brushes 20 and 21 and from the source of current-supply is shown in Fig. 8. The solenoid-core is connected to the lever N, which acts upon the brake J in the manner described in said application.

O is the drum-shaft, and on the end of this drum-shaft is a long screw *o*. (Shown in plan.) On this screw is placed the nut P, which is connected in a slot *p* in the connecting-rod R, so that said nut cannot revolve, but so that the connecting-rod R is adapted to have a motion to and fro on the same. On each side of the nut and fastened to the connecting-rod R are the fingers *s s′*, one on one side and one on the other. The shoulder where the screw connects with the drum-shaft is made in a spiral T of the same longitudinal pitch as the pitch of the screw, but so that anything riding on it will be carried to the outer surface of this shoulder, as shown in Figs. 2 and 3. To the other end of the screw *o* is clamped a nut with a similar spiral shoulder T′, so that it can be placed at any desired distance from the shoulder T.

The connecting-rod R, as shown in Fig. 1, is connected by the lever R′ to the switch K. If the switch is thrown upward, the connecting-rod R would necessarily be thrown to the left, which would carry the finger *s* on the inside to the left. With the switch thrown in this direction the drum would move in the direction of the arrow, as shown in Fig. 1, which would necessarily cause the revolving of the screw *o* and the throwing of the nut P in the direction of the drum-shaft when the nut carries the connecting-rod in that direction, so that the finger *s* rides on the spiral T and it is pushed back, moving the connecting-rod to the right and throwing the switch to the center and cutting the current off of the elevator, thereby stopping it. If the switch K is thrown in the opposite direction or downward, the drum moves in the direction opposite to the arrow and the nut P travels in the direction opposite to that before described on the screw and comes in contact with the spiral nut T′, clamped on the outer end of the screw *o*. When the finger *s′* reaches the spiral, it causes the connecting-rod to move in the direction opposite to that before described, again bringing the switch to the center and cutting the current off. This described arrangement forms an automatic stop, so that the elevator is automatically stopped independently of the operator at the end of its travel. By the movement of the nut T,

clamped on the end of the screw *o* either inwardly or outwardly, the travel of the elevator is decreased or increased.

I do not intend to limit myself to the specific devices heretofore described. This controlling-switch K of the elevator may be operated by a shunt or secondary circuit, in which case the switch is connected by the slotted arm U with a core U′ common to two electro-solenoids W and W′, the switch being held in its central position by the spring R^3.

Y is a lever in the car. This lever is in electrical connection with one of the poles of the current-supply, (the negative pole,) and the positive pole of the battery is connected by a loop-circuit with both of the solenoids W and W′.

3 and 4 are two contact-points, having electrical connection, respectively, with the solenoids W and W′. When the lever is moved in contact with contact-point 3, so that the current passes from the source of current-supply through the contact-point 3 to the solenoid W′, said solenoid is energized and the core is drawn upward, drawing with it the connecting-arm U and bringing the switch in contact with the contact-points 13 and 14. When the lever is moved in the reverse direction, so that it will be in contact with contact-point 4, the solenoid W is energized, the core of which draws down the connecting-arm U and bringing the switch in contact with contact-points 12 and 13.

In place of connecting the connecting-rod R directly with the switch K it can be connected with the shunt-circuit, which operates the electro-solenoids W and W′ in the following manner: Z is a switch having the brushes *z z′*, and z^2 z^3 are contacts extending in opposite directions from the brushes *z* and *z′*, so that when the switch is thrown to the right or left it will break only one of the contacts. When the switch is in its central position, the brushes *z* and *z′* are both in contact with their contacts z^2 and z^3. The switch when free is brought to its central position by the spring z^5, fastened to it and passing between the two pins z^6. To the contacts z^2 and z^3 are connected one end of the wires 3 and 4 from contact-points 3 and 4, the other end of the wires coming from the solenoid being connected to the posts z^4 z^5. The connecting-rod R is connected to this switch Z, and by the movement of the connecting-rod the contact is broken with either the contact-point z^2 or the contact-point z^3, according to the movement of the connecting-rod R. If the elevator is moving in the direction of the arrow and the switch K is in connection with the contact-points 13 and 12, the lever in the car having been thrown in contact with contact 4 so as to electrify solenoid W, the switch Z is in connection with both of the contacts z^2 and z^3. Then when the nut P has carried the connecting-rod R far enough inward for the finger S to ride on the spiral shoulder T, the connecting-rod R is drawn to the right and breaks the contact between brush *z′* and contact z^3, thus breaking the circuit through the solenoids W and allowing the switch K to be brought to the center by the spring R^3, and consequently automatically stopping the elevator. As the contact between the brush *z* and contact z^2 is still maintained, the operator is free to operate the elevator in the opposite direction, and as soon as the elevator has run far enough in that direction to free the finger S from the spiral shoulder T the spring z^6 brings the switch *z* back to its central position and closing both contacts, so that the operator is then free to operate the elevator in either direction. Thus by this means the elevator is automatically stopped at the end of its travel, and any further movement in that direction prevented.

If a hydraulic elevator is used, instead of connecting the connecting-rod R with the switch, as in an electric elevator, it is connected with the lever 130, which carries the shipper-rope 121, which passes through the car and over a pulley at the top of the well. This lever 120 is connected by the bell-crank 122 with the valve-operating mechanism, so that the movement of this connecting-rod shuts off the valve of the hydraulic elevator.

My invention also consists in a novel method of setting up the motor of an electric elevator so as to insulate it from any ground-circuit. As electric elevators are ordinarily constructed the foundation-bolts are generally placed in rubber tubing and otherwise thoroughly insulated from the foundation before connecting them with the base plate.

My improvement is clearly shown in Fig. 1 and is as follows: I place on top of the foundation a heavy wooden frame X and pass the foundation-bolts *x* through the same, the ends of the foundation-bolts being sunk in this wood so as to be below the surface of the same; also, in this same wood frame are placed the bolts *x′* at the desired points for the holes in the base-plate of the machine. The lower ends of these bolts *x′* are sunk in the wood, so that they are clear and free from the foundation. The base-plate of the machine is thoroughly bolted to the framework X by these bolts, and as they are connected with the framework independently of the foundation-bolts and in no way directly touching the foundation or these foundation-bolts, and as the foundation-bolts in no way directly touch the base-plate, the machine is in a simple and inexpensive manner thoroughly insulated from ground-circuits.

Attached to the lever C is the arm C′, which has a slot in its upper end, and a pin attached to the connecting-rod R passes through this slot, the slot being of sufficient length to allow the connecting-rod to be thrown in either direction sufficient to operate the elevator; but if the elevator is overloaded and the spring *c* is overcome, and thereby throwing the arm C′ to the right or left, it moves the pin, and thereby moves the connecting-rod so as to

limit the movement of the connecting-rod or to move the connecting-rod so that the elevator will be stopped.

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

1. In combination, a drum-shaft, a threaded screw connected to said drum-shaft, a shoulder threaded as described upon said drum-shaft, a nut adapted to travel on said threaded screw, a connecting-rod slotted as described to receive said nut, mechanism, substantially as described, connected to said rod adapted to travel on the threaded end of said drum-shaft, and intermediate connection, substantially as described, between said connecting-rod and the source of power.

2. In combination, a drum-shaft, a threaded screw connected to said drum-shaft, a shoulder threaded as described upon said drum-shaft, a nut adapted to travel on said threaded screw, a connecting-rod slotted as described and surrounding said nut, projections from said rod, said projections being adapted to travel on the threaded shoulders, and connection, substantially as described, between said connecting-rod and the source of power.

3. In combination, a drum-shaft, a threaded screw connected to said drum-shaft, a shoulder threaded as described upon said drum-shaft, a nut threaded on the exterior, adapted to be placed at varying distances upon said threaded screw, a nut adapted to travel on said threaded screw, a connecting-rod slotted as described and surrounding said nut, projections from said rod, said projections being adapted to travel on the threaded shoulders, and connection, substantially as described, between said connecting-rod and the source of power.

4. In combination, a drum-shaft, a threaded screw connected to said drum-shaft, a shoulder threaded as described upon said drum-shaft, a nut adapted to travel on said threaded screw, a connecting-rod slotted as described to receive said nut, said rod being adapted to be moved on the threaded end of said drum-shaft, a switch connected with the source of current-supply, and electrical connection between said switch and the motor and connection between said switch and connecting-rod.

5. In combination, a drum-shaft, a threaded screw connected to said drum-shaft, a shoulder threaded as described upon said drum-shaft, a nut adapted to travel on said threaded screw, a connecting-rod slotted as described and surrounding said nut, projections from said rod, said projections being adapted to travel on the threaded shoulders, and connection, substantially as described, between said connecting-rod and the source of power, a switch connected with the source of current-supply, electrical connection between said switch and the motor, and connection between said switch and connecting-rod.

6. In combination, a drum-shaft, a threaded screw connected to said drum-shaft, a shoulder threaded as described upon said drum-shaft, a nut threaded on the exterior, adapted to be placed at varying distances upon said threaded screw, a nut adapted to travel on said threaded screw, a connecting-rod slotted as described and surrounding said nut, projections from said rod, said projections being adapted to travel on the threaded shoulders, connection, substantially as described, between said connecting-rod and the source of power, a switch connected with the source of current-supply, and electrical connection between said switch and the motor and connection between said switch and connecting-rod.

7. In combination, a worm-shaft, a worm upon said shaft, a lever adapted to be operated by said worm, a tension device on said lever, a connecting-rod, connection, substantially as described, between said lever and said connecting-rod, and connection between said rod and the source of power, whereby when the movement of the worm exceeds the tension on the lever the connecting-rod is moved.

8. In combination, a worm-shaft, a worm upon said shaft, a lever connected to said worm, a tension device connected to said lever, a slotted arm connected to said lever, a connecting-rod provided with a pin, and connection between said rod and the source of power, the said pin resting in the slot in the arm, whereby when the lateral movement of the worm exceeds the tension on the lever the lever operates.

9. In an electric elevator, in combination, an electric switch, solenoids, a core common to both magnets, connection between said switch and the core, electric connection between one pole of the source of current-supply and each of the electro-magnets, a lever carried by the car, electric connection between the other pole of the electric-current supply and the lever, contact-points carried by said car, said lever being adapted to be brought in contact with either contact-point, and electric connection between said contact-points and the electro-magnets, respectively.

10. In combination, an electric switch, solenoids, a core common to both solenoids, connection between said switch and the core, electric connection between one pole of the source of current-supply and each of the electro-magnets, a lever carried by the car, electric connection between the other pole of the electric-current supply and said lever, contact-points carried by said car, said lever being adapted to be brought in contact with each contact-point, a secondary switch, contact-points, electrical connection between said contact-points and the contact-points carried by the car, contacts in electrical connection with each of the electro-magnets, a connecting-rod, connection between said switch and connecting-rod, and means, substantially as described, to move said rod laterally, whereby connection

can be broken between either contact-point carried by the car and its corresponding electro-magnet.

11. The hereinbefore-described method of securing an electric motor to its supporting-foundation, which consists in interposing a wooden frame between the motor and foundation, securing said frame to foundation by bolts passing through said frame and into said foundation, and securing the base-plate of the motor to the frame by bolts passing through said plate and frame, but not projecting into said foundation.

12. In an elevating apparatus, in combination, a connecting-rod slotted as described, a nut in said slot, a drum-shaft, a threaded end connected to said drum-shaft, passing through said nut, devices attached to said connecting-rod, and devices attached to said threaded end of the drum-shaft in line of travel of devices attached to said rod and adapted to give said rod a movement, as described.

13. In an elevating apparatus, in combination, a connecting-rod, intermediate connection between said rod and the source of power, a drum-shaft provided with an extension adapted to travel through said rod, devices attached to said rod, and adjustable devices attached to said extension of drum-shaft in line of travel of devices attached to said rod and adapted to give said rod a movement, as described.

In testimony of which invention I have hereunto set my hand.

FRANK E. HERDMAN.

Witnesses:
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