

No. 828,983.

PATENTED AUG. 21, 1906.

A. SUNDH.
ELEVATOR BRAKE.

APPLICATION FILED JAN. 11, 1905.

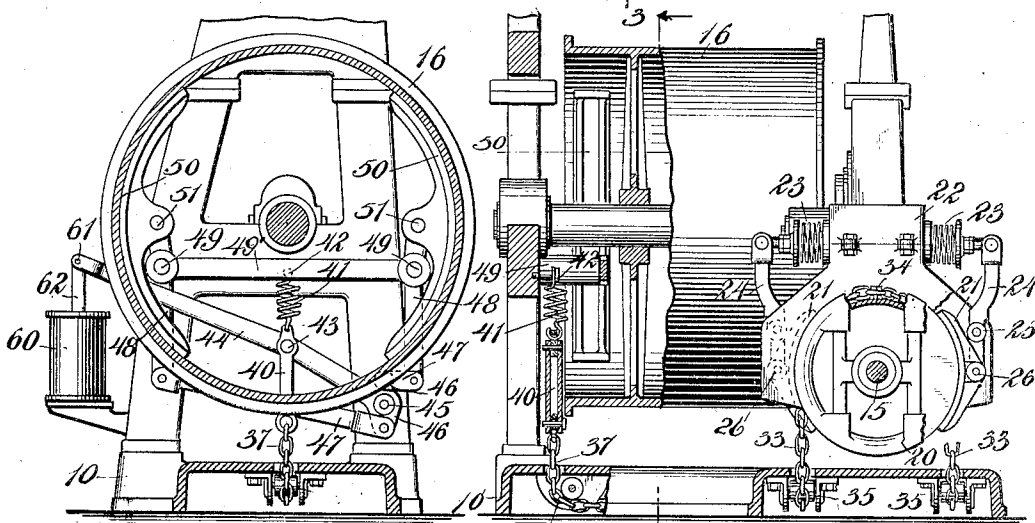


Fig. 1,

Fig. 2,

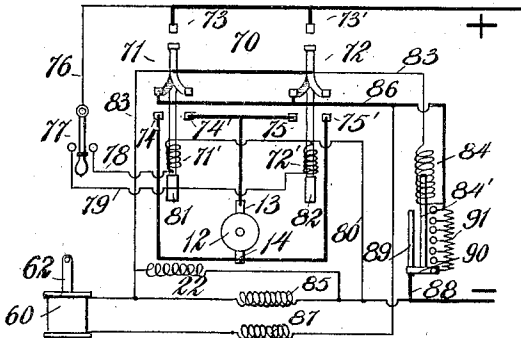


Fig. 3,

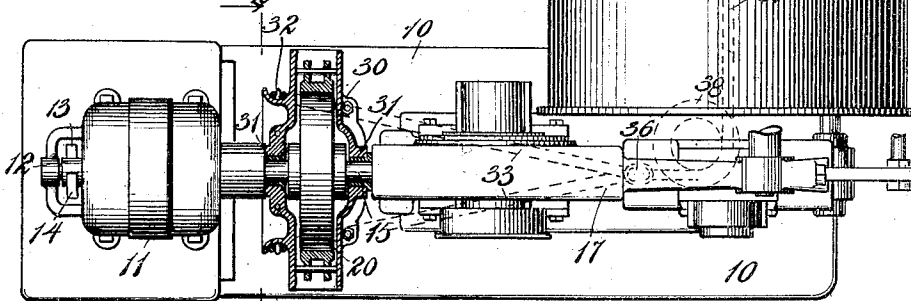
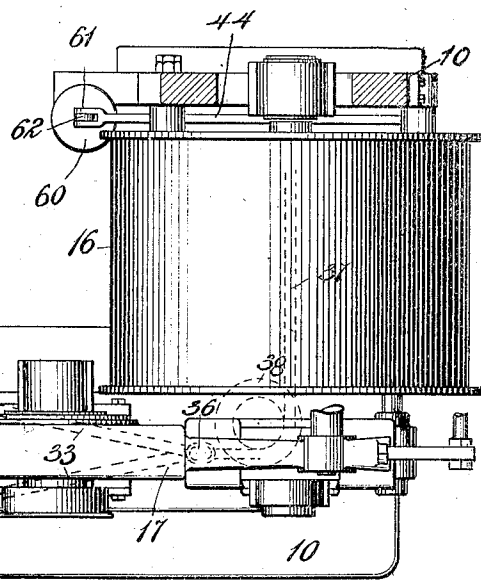


Fig. 4,

Fig. 5,

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ELEVATOR-BRAKE.

No. 828,983.

Specification of Letters Patent.

Patented Aug. 21, 1906.

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To all whom it may concern:

Be it known that I, AUGUST SUNDH, a citizen of the United States, residing at Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Elevator-Brakes, of which the following is a specification.

My invention relates to brakes for electric elevators; and its object is to provide a combination of certain elements by which the various forces which are generated by the rotation of the motor and the motion of an elevator may be used in bringing the elevator to rest.

In Patent No. 757,789, which was issued to me April 19, 1904, I have described an elevator-brake mechanism in which the rotary force of the motor is directly applied to the hoisting-drum of an elevator through the setting of brake-shoes upon a friction-pulley which is attached to the rotary motor-armature shaft.

The present invention is supplemental to that set forth in the above patent.

I will describe an elevator-brake made according to the present invention and point out the novel features thereof in claims.

Referring to the drawings, Figure 1 is a plan view of an electric elevator mechanism with my improved brake attached thereto. Fig. 2 is an elevation of a part of the apparatus shown in Fig. 1. In this case a part of the motor is cut away, and certain parts of the mechanism shown in section for the purpose of more clearly illustrating their construction and arrangements. Fig. 3 is an end elevation, partly in section, of a part of the mechanism shown in Fig. 2, in this case illustrating more particularly the winding-drum and a part of the improved mechanism which is applied thereto. Fig. 4 is a wiring diagram showing a method of connecting the various circuits used in an electric elevator in connection with the present invention.

Like characters of reference designate corresponding parts in all of the figures.

10 designates the bed-plate of an elevator apparatus.

11 designates an electric motor which is bolted to the bed-plate and which furnishes the motive power for the apparatus. 12 is the armature of this motor, and 13 14 are its brushes. The armature-shaft 15 is connect-

ed to a winding-drum 16 through intermediate mechanism, which in this particular case comprises worm-gearing which is inclosed in a casing 17. This part of the apparatus is not shown more fully, because it constitutes no part of the present invention. On the armature-shaft 15 is securely attached a friction-pulley 20, to which brake-shoes 21 21 may be applied by means of independently-mounted springs 23 23. These shoes may be arranged to be held away from the friction-pulley while the machine is running by means of an electromagnet 22, comprising two independent cores. The magnet 22 and the brake-shoes 21 21, with their connecting mechanism, which in this case comprises levers 24 24, pivoted at 25 25 and to the brake-shoes at 26 26, are all carried upon a yoke 30. It should be noted that the springs 23 23 and brake-shoes 21 21 are mounted and act independently, so that if one shoe becomes inoperative the other may still be effective in operating the second brake, and thus stop the hoisting-drum as desired. The yoke 30 has bearings 31 31 on the armature-shaft on both sides of the friction-pulley 20. The yoke 30 is grooved on one side, as shown at 32, to receive a chain 33, which is securely attached to the yoke at 34. The chain is led downward and under two pulleys 35 35 on the under side of the bed-plate 10, and its two ends are led from thence to a point 36, where they are joined to another chain 37. This chain passes around another pulley 38 and is led from thence to and under a fourth pulley 39 and thence upward to a link 40, to which it is connected. The other end of this link is supported by a spring 41, which is attached to a fixed point 42 on a swinging horizontal bar 49. This spring 41 serves the purpose of keeping the slack out of the chains 33 and 37 and of keeping the yoke 30 normally in the upright position in which it is shown in the drawings. (See Fig. 2.) The link 40 is pivoted at 43 to a lever 44, which is fulcrumed at 45 to the frame of the elevator apparatus. This lever 44 has two short arms 46 46, which by means of links 47 47 are connected to pivoted levers 48 48, which are fulcrumed at 49 49. The other ends of the pivoted levers 48 48 are connected to brake-shoes 50 50 at 51 51, which are adapted to engage with a surface on the inside of the winding-drum 16.

I will now point out the operation of so much of the apparatus as has just been described. Whenever the current is cut off from the magnet 22, so that the brake-shoes 21 21 are applied to the friction-pulley 20 by the springs 23 23, they will, on account of their bearing upon the rotating friction-pulley, have a tendency to move with it. As the yoke 30, which holds them in position, is supported on the same shaft 15 as the friction-pulley 20, the whole yoke 30 can move around the shaft with the friction-pulley. Its motion, however, is limited by the chains 33 and 37 and their various connected parts. The motion which is imparted to the yoke 30 in the manner just described is transmitted through the chains 33 and 37 to the lever 44 and through this lever and its mechanical connections to the brake-shoes 50 50 in such direction as to force them against the inner surface of the winding-drum 16, so that not only will the brake-shoes 21 21 upon the friction-pulley 20 have a tendency to stop the rotation of the motor because the movement of the yoke 30 is limited, but also the brake-shoes 50 50, bearing on the inner surface of the winding-drum 16, will have a tendency to stop the rotation of the drum and at the same time hold the drum from any possible to-and-fro motion which it might have as the apparatus comes to rest, and thus stop any up-and-down vibration of the elevator-car which may be connected to the winding-drum in the usual manner by means of cables. It will be noticed that as the rate of rotation of the motor-armature decreases the tendency of the friction-pulley 20 to turn the yoke 30 will become less and the pull on the chains 33 and 37 will become weaker, so that the brake-shoes 50 50 will be eased off to some extent and the winding-drum 16 and the apparatus will come to an easy and gentle stop. This part of my invention has been already described in my Patent No. 757,789, already cited, as the apparatus which I have just described is but a simple modification of my former invention.

I will now describe the improvements which constitute the subject-matter of the present invention. The pivoted lever 44 in Fig. 3 is carried out to the left to a point 61, where it is attached to the plunger or core 62 of an electromagnet 60. I will now point out the various circuits which are used in an electric elevator embodying my invention to show the way in which this electromagnet 60 is used in connection with the apparatus already described. In doing this I will refer to Fig. 4. + and - designate wires leading from a source of electrical supply. The + wire is connected to the upper terminals 73 73' of an electromagnetically-operated reversing-switch 70. This reversing-switch comprises two swinging arms 71 72, each of which carries three contacts. Two of each

are in electrical connection with each other, and the third of each is insulated from the others. These three contacts on the swinging arms 71 72 are adapted to make connections with either of the two stationary contacts above them and to the + wire to which they are connected or with two other stationary contacts 74 74' underneath the swinging arm 71 or 75 75' underneath the swinging arm 72. One or the other of the swinging arms is always in contact with the lower contacts. The wire 76 is connected to the positive wire and by means of a manually-operated switch 77 may be connected with either wire 78 or wire 79 of the magnets 71' or 72', respectively. The other terminals of these two magnets are connected by a wire 80 to the negative main. The cores 81 and 82 of the magnets 71' and 72' are so arranged that when either of these magnets is energized it will draw its core upward and will cause the swinging arm to which it is attached to make electrical connections with the stationary contact above it. For example, if the manually-operated switch 77 be moved to the left, the wire 79 will be connected to the positive main, and so the magnet 72' will receive current and become energized, so that it will raise its core 82 and cause the swinging arm 72, to which it is connected, to be moved up until it touches the stationary contact 73', which is above it.

The motor-armature 12 is shown between and below the magnet-cores 81 and 82. One of its brushes 13 is connected by suitable electrical conductors to the stationary contacts 74' and 75, and its other brush 14 is similarly connected to the stationary contacts 74 and 75'. The two contacts which are connected together on each of the swinging arms of the reversing-switch are connected by a conductor 83 to the upper terminal of the solenoid 84 and to the upper terminal of the magnet 60 and to the left-hand terminal of the shunt-field 85 of the motor. The insulated contacts on the swinging arms are connected by a wire 86 to the lower terminal of the solenoid 84, the starting resistance 91, and to the lower terminal of the magnet 60 through a resistance 87. This resistance 87 is sometimes made in the form of an extra field in the motor. The negative or - wire is connected by a wire 88 to a plate 89. A brush 90 is connected to a core 84' of the solenoid 84. It is arranged to slide over the plate 89 and over contact-points to which the starting resistance 91 is connected. It will be seen that the negative wire is thus connected to one of the terminals of the motor-armature 12 through the starting resistance 91, and one of the insulated contacts or the other is always in contact with the stationary contact under it. It has already been pointed out that either the swinging arm 71 or the swinging arm 72 is always down against the stationary contacts

under it. Let us, for example, say that the swinging arm 71 is down against the stationary contacts 74 74'. In that case the brush 14 of the motor-armature 12 is the one which is in connection with the negative main. Now when the operator closes the circuit through the magnet 72' the swinging arm will be brought up against the stationary contact 73' above it, and through it the wire 83 and the contact 74' will connect the positive wire to the brush 13 of the motor-armature. The solenoid 84 will also be connected across the armature and will cause the starting resistance 91 to be cut out. The shunt-field 85 is also connected across the mains. The brake-magnet 22 is connected, as shown, to the mains by means of the swinging arms 71 or 72. This apparatus and these circuits have been described but briefly, as they are well known in the art. By means of this apparatus the motor may be started in either direction at the will of the operator, and if it is connected to an elevator in some such manner as that shown in Fig. 1 it will cause the elevator to travel up or down.

When the operator desires to stop the elevator, he will bring the manually-operated switch 77 back to its central position, thereby cutting off the current in the magnet 72' and so allowing the swinging arm 72 to drop away from contact 73'. This will cut off the current to the motor and to the brake-magnet 22, so that the motor will tend to stop rotating and the brake-shoes 21 21 will be applied to the friction-pulley 20, and the brake-shoes 50 50 will be applied to the winding-drum 16. At the same time an armature short circuit will be established through the resistance or extra field 87 and the magnet 60. I will now trace this circuit. Starting with the brush 13, the circuit passes to the contact 74', thence through a part of the swinging arm 71 to the wire 83, which leads to the upper terminal of magnet 60. The other terminal of magnet 60 is connected to the resistance or extra field 87, and this is connected by wire 86 to the insulated contact of the swinging arm 71, which is now in electrical connection with the stationary contact 74, and this contact 74 is connected to the other brush 14 of the motor. Thus it will be seen that as long as the motor continues its rotation the current which is generated thereby will pass through the magnet 60 and the resistance or extra field 87. The resistance of this short circuit is so proportioned as to make the current which the armature is generating a suitable load upon the motor, so that it in itself has a tendency to retard its rotation. When the resistance 87 is made in the form of an extra field, the current which passes through it has a tendency to strengthen the magnetic field of the motor, and that also has a tendency to retard the rotation of its armature. The current which passes through the magnet 60 will

cause it to be energized, and as its core 62 is attached to the lever 44 at 61 the magnetic attraction of this magnet for its core will put an additional pressure upon the brake-shoes 50 50. By the combination of the primary brake on the friction-pulley 60, the brake-shoes 50 50 on the winding-drum 16, the electrodynamic effect of the armature short circuit, the strengthening of the fields by the current passing through the armature short circuit, and the extra pressure of the brake-shoes 50 50 due to the pull of the magnet 60 I have effected a brake for electric elevators in which the various forces which are generated by the rotation of the armature and the movement of its connected parts are utilized for overcoming the momentum of the moving parts in bringing them to rest.

When the brake mechanism which is set forth in Patent 757,789 has been applied to an electric elevator in which the armature is short-circuited when being brought to rest, it has been found that the retarding effect of this armature short circuit has minimized the effect which the primary brake on the friction-pulley 20 has on the brake-shoes 50 50 on the winding-drum. This is especially true when the elevator is carrying an extra load, and the result is that the machine is not brought to rest quickly enough. When, however, the armature short circuit is made to assist in putting a pressure on the winding-drum brake-shoes, as in this present invention, this difficulty is overcome. Moreover, the extra pressure which the armature short circuit puts upon the winding-drum is proportioned to the speed of the motor, so that when the elevator is carrying an extra heavy load at high speed the braking effect will be greater, so that its effect will be to stop the mechanism and the car in substantially the same space of travel, regardless of the load or the speed of the elevator. This arrangement also brings the car to an easy and gentle stop, because as the motor slows down the current which it generates and which is passing through the magnet 60 will become less until the apparatus comes to rest.

Having described my invention, what I claim is—

1. The combination of a rotary member, a brake associated therewith and movable in the direction of rotation of said member, a second rotary member, a brake associated therewith, means for moving said second brake into operative relation with said second member by the impressed movement of the first brake due to its frictional engagement with the first member, and electromagnetic means for increasing the braking effect of the second brake.

2. The combination of a rotary member, a brake associated therewith and movable in the direction of rotation of said member, a second rotary member, a brake associated

therewith, means for moving said second brake into operative relation with said second member by the impressed movement of the first brake due to its frictional engagement with the first member, and electromagnetic means for increasing the braking effect of the second brake in proportion to the rate of rotation of said rotary members.

3. The combination of a rotary shaft, a friction-pulley thereon, a brake acting on the friction-pulley, a support for said brake constructed to move around the shaft, and a second brake actuated by the impressed movement of said support due to frictional engagement of the first brake with the friction-pulley and electrical means for increasing the effect of said second brake.

4. The combination of an electric motor having an armature, two rotary members driven thereby, a device on each of said members for retarding the motion thereof, the second of said devices being brought into operation by the first through the frictional engagement of the latter with one of the rotary members, and an electromagnet for increasing the effect of the second retarding device, said magnet arranged to be connected across the motor-armature.

5. In an elevator, the combination of an electric motor having an armature, a hoisting-drum driven thereby, a friction-pulley connected to rotate with the motor-armature, a brake constructed to retard the motion of said pulley and movable around the axis thereof, and a second brake constructed to act upon the drum and operated by the impressed movement of the first brake and by an electromagnet arranged to be connected across the motor-armature.

6. In an elevator mechanism, the combination of a motor, a hoisting-drum driven thereby, a friction-pulley connected to rotate with the motor, a brake constructed to retard the motion of the pulley and movable around the axis thereof, a second brake constructed to act upon the drum and operated by the impressed movement of the first brake, electromagnetic means for holding the first brake out of operative position during the normal running of the mechanism and electromagnetic means for increasing the effect of the second brake while the mechanism is being brought to rest.

7. In an elevator mechanism, the combination of an electric motor, a hoisting-drum driven by the motor, a retarding device on the drum actuated by the motion of the motor and by the current generated thereby.

8. In an elevator, the combination of an electric motor having an armature, an electrically-governed brake acting on the motor-shaft, a hoisting-drum actuated by said shaft, a brake acting on said hoisting-drum and mechanically actuated by said first brake, an electromagnet for increasing the effect of the

drum-brake, and means for conjointly cutting off current from the motor, applying said first brake and connecting said magnet across the motor-armature.

9. In an elevator, the combination of an electric motor having an armature and a magnetic field, a brake acting on the motor-shaft, a hoisting-drum actuated by said shaft, a brake acting on the drum and mechanically operated by the shaft-brake, an electromagnet for increasing the effect of the drum-brake, an extra field-coil on the motor, means for cutting off current from the motor and connecting the said electromagnet and the extra field-coil across the motor-armature.

10. In an electric elevator, the combination of an electric motor having an armature and a magnetic field, a mechanically-acting brake gripping a movable part of such elevator, and an electroresponsive device in the short circuit of the armature and connected to the mechanical brake whereby additional gripping effect is secured.

11. In an electric elevator, the combination of an electric motor having an armature and magnetic field, a mechanical brake acting upon a movable part of the elevator, and an electroresponsive device in the armature short circuit connected to the mechanical brake so as to give an additional braking effect proportionate to the speed of the armature.

12. The combination with a brake-pulley, of brake mechanism therefor, movable supporting means for said brake mechanism, and separate devices for effecting the application of said brake mechanism.

13. The combination with a movable member, of brake mechanism therefor and movable relatively thereto, and independent springs for effecting the application of said brake mechanism.

14. The combination with a single member, of brake mechanism therefor, movable supporting means for said brake mechanism, and independent devices for applying respective portions of said brake mechanism.

15. The combination with a rotating member, of brake mechanism therefor, separate devices for operating said brake mechanism, and a movable support for said brake mechanism and said operating devices.

16. The combination with a brake-pulley, of a double brake therefor, independent devices for applying the respective portions of said brake, a single mechanism for releasing said brake, and a support for said brake and brake-applying devices and the releasing mechanism, said support being movable relatively to said brake-pulley.

17. The combination with a rotary member, of a brake associated therewith and movable in the direction of rotation of said member, separate devices for effecting the application of said brake, a second rotary mem-

ber, a brake associated therewith, and means
coacting with said first-named brake for ap-
plying said second brake.

5 18. The combination with a moving mem-
ber, of a brake associated therewith and mov-
able in the direction of motion of said mem-
ber, independent springs for applying the re-
spective portions of said brake, an electro-
magnet for releasing said brake against the
10 action of said springs, and a second brake ac-

tuated by the impressed motion of said first
brake due to its frictional contact with said
member.

In testimony whereof I have signed my
name in the presence of two subscribing wit- 15
nesses.

AUGUST SUNDH.

Witnesses:

W. H. BRADY,
ERNEST W. MARSHALL.