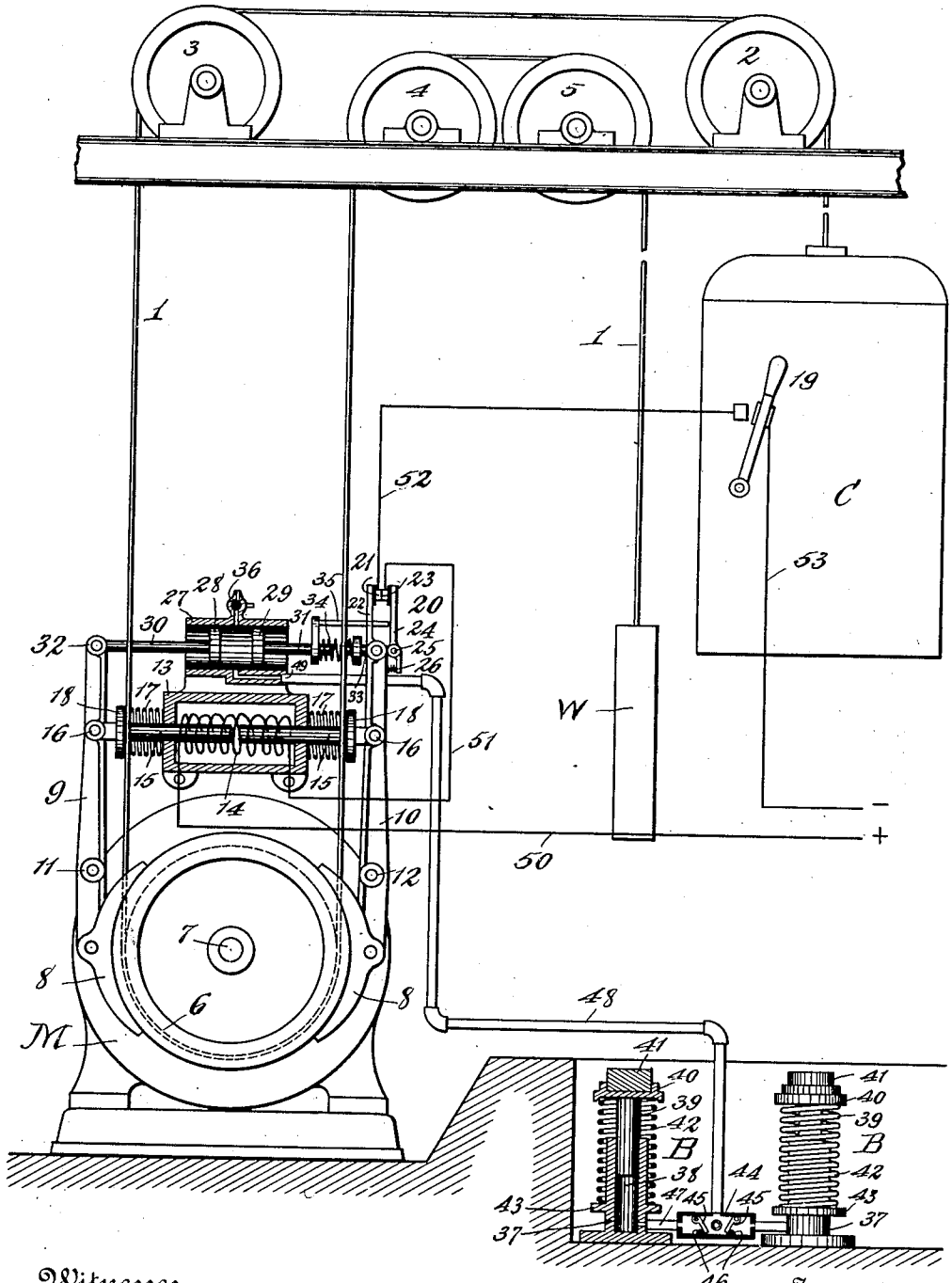
A. SUNDH.

LIMIT STOP BRAKE APPARATUS.

APPLICATION FILED AUG. 16, 1907.

926,620. Patented June 29, 1909.



Witnesses

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LIMIT-STOP BRAKE APPARATUS.

No. 926,620. Specification of Letters Patent. Patented June 29, 1909.

Application filed August 16, 1907. Serial No. 388,813.

To all whom it may concern:

Be it known that I, AUGUST SUNDH, a citizen of the United States, residing in Yonkers, in the county of Westchester and State of New York, have invented a new and useful Improvement in Limit-Stop Brake Apparatus, of which the following is a specification.

My invention relates to safety appliances for elevators, and has for an object the provision of means for quickly and powerfully applying the brakes in an elevator system when the car is carried beyond its normal limit of travel in either direction.

A further object of the invention is to provide means for applying the brakes when the car is carried beyond its normal limits of travel, with a power varying with the momentum of the car, so that the faster the car is traveling when it reaches its normal limit and the greater the load, the more quickly and powerfully will the brakes be applied.

Other objects will appear more fully hereinafter, and the scope of the invention will appear from the appended claims in which the novel combinations of elements and their arrangements are specified.

The accompanying drawing is a diagrammatic view of a traction elevator system in combination with which my invention is used, and shows in detail the safety appliances.

The elevator car C and the counterweight W are connected by a rope or cable 1 passing over the overhead sheaves 2, 3, 4 and 5 and frictionally engaging the drive sheave 6 secured to the shaft 7 of a motor M. The brake shoes 8 are pivoted to the lower ends of the brake levers 9 and 10 which are fulcrumed on pivots 11 and 12, respectively, carried by the motor frame or other suitable support. When the upper ends of the brake levers 9 and 10 are moved outward, the brake shoes 8 are applied to the drive sheave 6, and when the upper ends of the levers are moved inwardly the brake shoes are released. The brakes are controlled by an electro-magnet which comprises an iron frame 13, a solenoid or winding 14, and two cores or armatures 15 which are connected by pivots 16 to the brake levers 9 and 10. When the magnet is deënergized the brakes are applied by coil springs 17 re-acting between the ends of the magnet frame 13 and shoulders 18 formed on the cores 15. When a current is passed through the winding 14 the cores 15 are drawn inward against the tension of the springs 17, moving the brake levers about their fulcrums 11 and 12, and releasing the brake shoes from the driving sheave.

Current is supplied to the brake magnet from any suitable source of current supply, the positive and negative leads of which are designated + and —, respectively. A manually operable controlling switch 19 in the brake magnet circuit may be located in the car or at any other position from which the elevator car is to be controlled. An automatic switch 20 is also placed in the brake magnet circuit. This switch comprises a fixed contact 21, carried by but insulated from an arm 22 secured to or forming an integral extension of the brake lever 10, and a movable contact 23 carried by and insulated from the switch lever 24, pivoted at 25 to a lug on the brake lever 10. A coil spring 26 between the lower end of the switch lever 24 and the brake lever 10 holds the switch normally closed with the contacts 21 and 23 in engagement.

Above the brake magnet is a dash-pot comprising a cylinder 27 which may be formed integral with the magnet frame 13 as shown. The dash-pot has two pistons 28 and 29 provided with piston rods 30 and 31, respectively. The piston rod 30 is pivoted at 32 to the upper end of the brake lever 9. Pivoted to the brake lever 10 in line with the piston rod 31 is a short arm 33. A coil spring 34 surrounds the adjacent ends of the piston rod 31 and the arm 33 and is secured to said parts, normally holding them a short distance apart. An arm 35 carried by the piston rod 31 normally extends within a short distance of the switch lever 24. Mounted on the dash-pot is a valve 36 which is adjustable to restrict to any desired degree an air passage leading into the cylinder between the pistons.

At the bottom of the elevator well and in the path of the car and counterweight, respectively, are two spring buffers or cushions B. These buffers are identical in construction, one of them being shown in section on the drawing. Each comprises a base 37 in the form of a hollow cylinder provided with an air chamber 38. A cylindrical rod or piston 39 fits closely in the chamber 38 and is movable up and down therein. Each rod 39 has a head 40 carrying a block 41 of rubber or other suitable material in the path of

the car or counterweight. A coil spring 42 surrounds the rod 39 and base 37 with its ends abutting against the head 40 and a flange 43 formed on the base 37. The spring normally holds the rod 39 in its upper position in which the rod only extends part way into the base. Located between the two bases 37 is a valve chamber 44 in which are two valves 45 which in their closed positions abut against stops 46, but are freely movable in the opposite direction. Between each end of the valve chamber 45 and its adjacent cylinder 37 is an air duct 47 communicating with the valve chamber and the air chamber 38. An air pipe 48 leads from the center of the valve chamber 44 to an air duct 49 communicating with the center of the dash-pot cylinder 27.

The operation of the device is as follows. When the elevator car is brought to rest the parts assume the positions shown by the drawing. The brake magnet circuit is open at the switch 19, the magnet is deënergized and the brakes are held to the drive sheave by the springs 17 acting through the brake levers. If now it is desired to start the car, the switch 19 is closed. This closes a circuit through the brake magnet coil as follows,—from the positive main, through the wire 50, magnet coil 14, wire 51, contacts 23, 21, wire 52, switch 19, and wire 53 to the negative main. The coil 14 being thus energized, the cores 15 are pulled inward against the pressure of the springs 15 and release the brakes. The switch 19 of the brake magnet circuit may be connected to and operated by the controller for the motor M in a manner well known in the art, so that the brake is released and the motor started by a single operation of the controller lever.

When it is desired to stop the car the current is cut off from the motor and the switch 19 is opened. This deënergizes the brake magnet and allows the springs 17 to force the brake levers 9 and 10 outward and powerfully apply the brakes. The dash-pot at this time acts to retard the application of the brakes, as the outward movement of the brake levers carrying with them the pistons 28 will produce a partial vacuum between the pistons, and the atmospheric pressure on the outside of the pistons will oppose the movement of the brake levers. The restricted air passage controlled by the valve 36 will now admit air slowly into the cylinder, allowing the pistons to move outward gradually and apply the brakes gradually and smoothly. The dash-pot may be made of a size to completely control the speed with which the brakes are applied, and by its use the sudden or jerky application of the brakes, with the consequent slipping and wearing of the cables, annoyance to passengers, and other objectionable features, is avoided. I do not claim, however, as my invention the idea broadly of using a dash-pot as a retarding device for the brakes.

If the operator has failed to apply the brakes, or for any other reason the car is moving rapidly as it approaches its limit of travel in either direction, the brakes will automatically be set quickly and powerfully. If the car is moving downward, for example, it will strike the block 41, moving it downward, compressing the spring 42 and compressing the air in the chamber 38. Both the spring 42 and the compressed air in the chamber 38 will react as a cushion to prevent a sudden stopping of the car. At the same time the compressed air in the chamber 38 will expand through the air passage 47, valve 45, pipe 48 and air duct 49 into the dash-pot cylinder 27. This air in the cylinder 29 will force the pistons outward to apply the brakes.

When the piston 29 begins to move outward, the coil spring 34 is compressed until the end of the piston rod 31 engages the end of the rod 33. As soon as this compression of the spring commences, the arm 35 carried by the piston rod strikes the switch lever 24, moving it about its pivot 25 and separating the switch contacts 21, 23. This opens the brake magnet circuit and allows the brake to be applied under the combined action of the brake springs 17 and the compressed air in the dash-pot. It will thus be seen that when this automatic device operates the brakes are applied much more quickly and held on with more power than when they are operated in the usual way, for not only is the retarding action of the dash-pot entirely removed, but it is replaced by the compressed air which augments the speed with which the brakes are applied and the power with which they are held. It will also be observed that the speed and power with which the brakes are applied will vary with the speed of the car or counterweight when the buffer B is struck. If the car is moving rapidly more air will be forced into the dash-pot and under greater pressure than if the car is moving slowly, which will result in a corresponding action of the brakes. The valves 45 prevent any air escaping from the dash-pot cylinder 27 back through the pipe 48 and into either of the chambers 37. They also prevent the air escaping from one chamber 37 into the other through the valve chamber 44.

Although I have shown and described a practical embodiment of my invention, I do not wish to be limited to the exact construction disclosed, as various changes in details of construction and arrangement of parts might be made without departing from the spirit of the invention.

What I claim as new and desire to secure by Letters Patent of the United States is:—

1. In an elevator, the combination with a motor, a car, driving connections between

the motor and car, and a brake, of means for applying the brake, means to normally retard the application of the brake, and means to overcome such retardation and add to the power with which the brake is applied.

2. In an elevator, the combination with a motor, a car, driving connections between the motor and car, and a brake, of means for applying the brake, means to normally retard the application of the brake, and means to automatically operate the brake-applying means, overcome the retardation, and add to the power with which the brake is applied.

3. In an elevator, the combination with a car, a motor, driving connections between the car and motor, and a brake, of a dash-pot connected to the brake and normally retarding its application, and means to overcome such retardation and add to the power with which the brake is applied.

4. In a traction elevator, the combination with a car, a driving sheave, a cable connecting the car and driving sheave, a brake, and means to apply the brake, of a dash-pot connected to the brake and normally retarding its application, a manually operable device for controlling the brake-applying means, and means automatically operable at predetermined points in the travel of the car for applying the brake, overcoming its retardation and adding to the power with which it is applied.

5. In an elevator, the combination with a motor, a car, driving connections between the motor and car, an electro-magnetic brake, and a manually operable device for controlling the brake magnet circuit, of a dash-pot connected to the brake and normally operative to retard the application of the brake, and means automatically operative at predetermined points in the travel of the car to control the brake magnet circuit and operate the dash-pot as an accelerating device in applying the brake.

6. The combination with a brake and means for applying the brake, of a device connected to the brake and normally retarding its application, and means for converting said retarding device into an accelerating device.

7. The combination with a brake and means for applying the brake, of a dash-pot connected to the brake and normally operative to retard its application, and means for operating the dash-pot as a motor to accelerate the application of the brake.

8. The combination with a brake lever, a brake shoe carried thereby, and means for moving the lever in a direction to apply the brake shoe, of an air cylinder, a piston connected to the brake lever and movable in the cylinder against an unbalanced air pressure to normally retard the application of the brake, and means to produce a preponderance of air pressure on the piston in a direction to accelerate the application of the brake.

9. The combination with a brake lever, a brake shoe carried thereby, and means for moving the lever in a direction to apply the brake shoe, of an air cylinder, a piston in the cylinder, a connection between the piston and brake lever for moving the piston in a direction to reduce the air pressure in the cylinder and retard the application of the brake, and means for introducing air into the cylinder above atmospheric pressure to accelerate the application of the brake.

10. In an elevator, the combination with a motor, a car, driving connections between the motor and the car, a brake, and means for applying the brake, of an air cylinder, a piston in the cylinder, connections between the piston and brake for moving the piston outwardly against atmospheric pressure and producing a partial vacuum in the cylinder in the normal application of the brake, and means for introducing compressed air into the cylinder to accelerate the application of the brake.

11. In an elevator, the combination with a motor, a car, driving connections between the motor and the car, a brake, and means for applying the brake, of an air cylinder, a piston therein, connections between the piston and brake for moving the piston outwardly as the brake is being applied, manually operable means for controlling the application of the brake, an air chamber beneath the car, means engaged by said car as it approaches its limit of travel for compressing the air in said chamber, an air passage from said chamber to the interior of the cylinder, and means operated by the compression of the air for automatically controlling the application of the brake.

12. In an elevator, the combination with a motor, a car, driving connections between the motor and car, an electro-magnetic brake, and a manually operable device for controlling the brake magnet circuit, of a dash-pot connected to the brake and operable to normally retard its application by producing a partial vacuum in the dash-pot, a spring buffer in the path of travel of the car, means operated by said buffer for introducing compressed air into the dash-pot, and means operated by the compressed air for automatically controlling the brake magnet circuit.

13. In an elevator, the combination with a motor, a car, driving connections between the motor and car, a brake, and means for applying the brake, of a dash-pot connected to the brake and normally operable to retard its application, spring buffer mechanism in the path of travel of the car and comprising an air chamber, means for compressing the air in said chamber, an air passage leading from said chamber to the dash-pot cylinder,

to admit compressed air to the cylinder, and means operated by the compressed air for automatically controlling the application of the brake.

14. In an elevator, the combination with a motor, a car, operative connections between the motor and car, a brake, and means for applying the brake, of a dash-pot connected to and normally retarding the application of the brake by the production of a partial vacuum in the dash-pot, a spring buffer in the path of travel of the car and comprising an air cylinder, a piston operated by the car for compressing air in the cylinder, an air passage leading from the cylinder to the dash-pot, a valve in the air passage and means for automatically controlling the application of the brake.

15. In a traction elevator, the combination with a drive sheave, a car, a counterweight, a cable connecting the car and counterweight and frictionally engaging the drive sheave, a brake and means for applying the brake, of a dash-pot operatively connected to the brake, spring buffers in the path of movement of the car and counterweight respectively and comprising air cylinders, means for compressing the air in the respective cylinders as the car or counterweight exceeds its normal limit of travel, a valve chamber, air passages communicating with the valve chamber and the respective cylinders, an air passage extending from the valve chamber to the dash-pot, and valves in said chamber between said last-named air passage and the air passages communicating with the cylinders.

16. In an elevator, the combination with a motor, a car, driving connections between the motor and car, an electro-magnetic brake operative to release the brake when the brake magnet circuit is closed, means for applying the brake when the circuit is open, and a manual switch in the circuit, of an air cylinder, a piston in the cylinder, connections between the piston and the brake for moving the piston in a direction to reduce the air pressure in the cylinder when the brake is being controlled manually, means for automatically forcing air into the cylinder at predetermined periods in the travel of the car, an automatic switch in the brake magnet circuit, and means for opening said switch when air is forced into said cylinder.

17. In a brake mechanism, the combination with a brake shoe, a brake lever and an electro-magnet operatively connected to the lever, of an air cylinder, a piston in the cylinder, a coil spring between the piston and brake lever, a switch in the circuit of the electro-magnet, means for forcing air into the cylinder and operating the piston to compress the coil spring, and means for operating said switch when the spring is compressed.

18. In a traction elevator, the combination with a car, a counterweight, a drive sheave, a cable connected to the car and counterweight and engaging the drive sheave, brake levers, brake shoes carried by the levers in position to engage the drive sheave, brake springs, an electro-magnet connected to said levers and operative to release the brakes when the magnet is energized, and a manually operable switch in the magnet circuit, of an air cylinder located between the brake levers, pistons in the cylinder, piston rods on the pistons, one of said rods being pivoted to a brake lever and movable outwardly therewith when the brake is applied, a coil spring connection between the other piston rod and the other brake lever, electrical contacts in the brake magnet circuit, one of said contacts being carried by said last-named lever, a switch lever pivoted to the brake lever and carrying the other contact, means for normally holding the contacts in engagement, an arm carried by said last-named piston rod and extending into position to engage the switch lever and separate the contacts when the coil spring is compressed, and means for forcing air into the cylinder between the pistons to move the pistons outwardly, open the brake magnet circuit and apply the brakes.

19. In brake apparatus, the combination with a brake, of mechanism for applying the same, a fluid motor for assisting said applying-mechanism, a fluid actuator for operating said motor, an electro-magnet for releasing the brake, an electric switch in the brake-magnet circuit, connections for operating said switch to cut off current from said brake-magnet when said motor is operated, and means for restoring said switch to normal position.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

AUGUST SUNDH.

Witnesses:
CHAS. M. NISSEN,
ALFRED C. BECHET.