This invention relates to elevators, and more particularly to brakes for automatically stopping elevators in case they start to fall or otherwise move too fast.

Elevators are often provided with brakes for stopping them automatically in emergencies, but such brakes generally operate only in case the cable that supports the elevator breaks, which would allow the elevator to fall. There are occasions, however, where it may be desirable to stop an elevator if it has started to move too fast, either up or down, and may get out of control. This is especially true of material handling elevators, which are operated by a man at a winch on the ground. If he misjudges the speed of the elevator or otherwise lets the elevator run away, it may strike the ground or the top of the tower before he can stop it. Off the few known emergency brakes for such occasions, the shoes are quite small and therefore have a very limited area of contact with the upright tower members they engage. That results in high concentration of pressure in small areas, which may distort or bend the tower members instead of stopping the elevator.

It is among the objects of this invention to provide an elevator brake, which will automatically stop the elevator if it starts to exceed a predetermined speed even if the supporting cable has not broken, and which applies braking pressure over a very long area.

In accordance with this invention, brake shoes are carried by opposite sides of an elevator cage that runs on guide rails. The shoes, preferably several feet long, are adapted to be applied to the rails to stop the cage. Springs urge the brake shoes toward the rails, but they are normally held in brake-released position. Rollers that are carried by the cage roll along the guide rails and operate a speed governor also carried by the cage. The governor controls means for releasing the springs if the governor reaches a predetermined maximum speed. Upon release of the springs, they will move the brakes to applied position against the guide rails and stop the cage. The side of the rails opposite the brake shoes are generally backed up by guide shoes carried by the cage, so there is no danger of bending the rails when the brakes are applied. The springs may also be provided with means for releasing them in case a cable supporting the elevator should break.

The preferred embodiment of the invention is illustrated in the accompanying drawings, in which—

Fig. 1 is a side view of an elevator suspended in the lower end of a tower.

Fig. 2 is a front view of the elevator and tower.

Fig. 3 is an enlarged fragmentary horizontal section taken on the line III—III of Fig. 2; and

Figs. 4, 5 and 6 are enlarged fragmentary vertical sections taken on the lines IV—IV, V—V and VI—VI, respectively, of Fig. 2.

Referring to the drawings, an elevator cage 1, such as used for building materials at a construction site, is suspended in a portable tower 2 by a pair of cables 3 connected to the opposite ends of a singletree 4 pivoted centrally to a bracket 5 at the center of the top of the cage. The two cables extend up over sheaves (not shown) at the top of the tower and then down to a winch on the ground beside the tower. An operator, standing beside the winch, controls the ascent and descent of the elevator cage in the tower. The cage is guided by vertical rails 7 rigidly secured to the inside of the tower centrally of two opposite sides. The adjacent sides of the cage have laterally spaced vertical angle bars 8 secured to them.

The bars extend from the top of the cage to below its floor. A long guide shoe 9 is secured to one of the angle bars at each side of the cage and extends toward the adjacent guide rail, around which it extends part way. A pair of parallel plates 10, as long as the guide shoes but narrower, are fastened to each of the other bars and have a long bifurcated brake shoe 11 located between them and the guide rail. Each brake shoe and adjacent pair of plates are connected by vertically spaced internal pivot links 12. The links are parallel and normally are inclined down from the plates to the brake shoe engaging the inner edges of the plates. The brake shoes also extend part way around the guide rails. The guide shoes and brake shoes normally are spaced from the guide rails to permit the cage to run up and down the two rails without binding.

Directly below the floor of the cage the vertical bars 8 at opposite sides of the cage are connected by horizontal cross bars 14, and their lower ends are similarly connected by cross bars 15. Projecting inwardly from the lower end of each guide shoe 9 beneath the cage is a pin 16, on which the upper ends of a pair of narrow plates 17 and 18 are pivotally mounted. The lower ends of these plates support bearings 19, in which the opposite ends of a pair of parallel shafts 20 and 21 are journalled. The shafts project out through the bearings and carry grooved rollers 22 on their outer ends. These rollers are held tightly against opposite sides of the guide rail by means of a coil spring 23 encircling a rod 24 slidable mounted in one end of a long L-shape bracket 25 pivoted at its opposite end to an extension 26 of plate 18. The spring is compressed between a collar 27 on the inner end of the rod and the opposite end of the bracket. The outer end of the rod is mounted in a small bracket 28 pivoted to an extension 29 of plate 17. Consequently, as the cage moves up and down, the rollers will roll along the guide rails.

The central portions of the two shafts extend through a box 30 mounted on the lower cross bars 15 beneath the center of the cage. Inside the box there are spur gears 31 keyed on the shafts so that both shafts will turn even if the rollers on one of them happens to slide on the guide rails. A bevel gear 32 is also keyed on shaft 21 inside the box, where it meshes with a bevel pinion 33 projecting into the box from the bottom of a speed governor 34 mounted on top of the box. The construction of this governor does not in itself form part of the invention. It is merely a conventional speed governor that will turn a short shaft 35 that projects from opposite sides of it in case the governor speed starts to exceed a predetermined maximum.

Projecting laterally from one end of governor shaft 35 is an arm 36, the outer end of which is connected to the underlaying box by a coil spring 37 to urge the arm down. At the opposite end of the shaft there is a laterally projecting stop 38 that normally projects under the upper end of an inclined pivoted member. This member includes a lever 40 pivoted at its lower end in a bracket 41 supported by the box, and a bolt 42 slidably mounted in bearings 43 secured to the upper surface of the lever. The upper end of the bolt normally projects from the lever into engagement with the top of stop 38, and is held in that position by a coil spring 44 encircling the bolt between the lever and the box.
between the bearings. The lower end of the lever is formed by a notched member 45 that receives a rod 46 fastened to the top of the horizontal beam 47 of a U-shaped frame. The end members 48 of the frame are pivotally mounted on pins 49 projecting from plates 10, and the beam is urged upward by coil springs at its ends. Each coil spring 51 may encircle the upper portion of a rod 52, the lower end of which is pivoted to a cross piece 53 between the lower cross bars 18. The spring and upper end of the rod extend loosely up into a cylinder 54, the lower end of which is pivoted to the adjoining end member 48 of the frame about midway between its ends. As long as rod 46 is in notched member 45 of the lever, the frame will be held in its lower position against the pressure of the two springs 51. End members 48 are operatively connected to brake shoes 11 by means of pivot pins 55.

During ordinary use of the elevator, the rollers 22 run up and down the guide rails 7 without operating the governor 34 fast enough to cause it to release lever 42. However, if for any reason the speed of the elevator cage starts to exceed the safe speed for which the governor is set, the governor will swing stop 38 back away from bolt 42 and thereby allow lever 40 to drop and release beam 47 to apply the brakes. Assuming that the cage is descending at the time, the moment the brake shoes frictionally engage guide rails 7, the shoes will start to stop and then the tendency of the cage to continue down will cause inclined links 12 to force the shoes very tightly against the rails. No matter how much pressure is exerted by the brake shoes, the guide rails will not be bent because they are backed up by guide shoes 9 on the opposite side. Furthermore, the length of the shoes distributes the braking pressure over an area many feet long, so that the desired braking effect is obtained without concentrating the pressure in a small area. This produces more reliable braking with less unit pressure.

In order to release the brakes after they have been applied, a heavy jack screw 57 is provided. This screw is threaded in a large nut 58 pivotally mounted in a bracket 59 secured to the horizontal cross bar 14 above lever 40. Ordinarily, the screw extends horizontally across the cross bar towards the opposite cross bar 14, secured to its inner end is a cross rod 60 that serves as a handle for turning the screw. When necessary to release the brakes, the screw is turned upward until its lower end is in line with a socket member 61 secured to the top of beam 47, as shown in dotted lines in Fig. 6. The screw then is turned to move its lower end downward into the slot of the member and then to press that member and the beam upward to its full line position. As the beam moves downward, rod 47 will drop down on notched member 45 and swing the opposite end of the lever 40 upward until bolt 42 snaps over the top of stop 38. The beam will then be held in its lower position by the lever, and the screw jack can be returned to its former inoperative position.

This elevator may also be equipped with means for releasing lever 40 before the cage moves fast enough for that purpose. Such release is desirable in case one of the supporting cables 3 breaks. In such a case, the single-tree 4 is tilted by the other cable and that pulls a forked line 63 connected with a toggle. As will be seen in Fig. 2, the line will be pulled, whichever way the single-tree tilts. The toggle includes two links 66 and 67 pivoted to end and to a plate 68 rigidly mounted beside lever 40. The upper end of the upper link 67 is sladly mounted in a pivoted sleeve 69. The toggle normally is maintained in the broken position by a coil spring 71 on the upper link between its lower end and the sleeve. The lower end of line 65 is connected to the lower end of lower link 66. When the line is pulled by the tilting single-tree, the toggle is swung towards and through straightened position and then the coil spring snaps it into its opposite broken position, whereupon a lateral projec-

tion 72 on the lower link strikes a projection 73 on the lower end of bolt 42 and retracts the bolt from stop 38. The upward pressure of beam 47 against notched member 45 then swings the inner end of the lever down, which releases the beam to permit the brakes to be applied. In this way the cage is stopped without having to wait for it to fall far enough to gather sufficient speed to operate the governor.

According to the provisions of the patent statutes, I have explained the principle of my invention and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. An elevator overspeed brake, comprising an elevator cage running on guide rails, brake shoes carried by opposite sides of the cage for application to the rails, brake actuating means pivotally carried by the cage, springs urging said means toward brake-applying position, a member pivoted to the cage and normally holding said actuating means in brake-released position but urged away from said means, rollers carried by the cage adapted to roll along the guide rails, a speed governor carried by the cage, means operated by the rollers for driving the governor, and a movable stop in the cage separated from said brake actuating means and normally holding said pivoted member and controlled by the governor for releasing said member if the governor reaches a predetermined maximum speed, whereby the springs will move said actuating means to brake-applying position.

2. An elevator overspeed brake, comprising an elevator cage running on guide rails, brake shoes carried by opposite sides of the cage for application to the rails, a frame pivotally connected to opposite sides of the cage and extending across it, means operatively connecting the frame with said shoes to actuate them when the frame is swung vertically, springs urging the frame toward brake-applying position, means normally holding said frame in brake-released position, rollers carried by the cage adapted to roll along the guide rails, a speed governor carried by the cage, means operated by the rollers for driving the governor, and means controlling the governor for releasing said holding means if the governor is swung to a predetermined maximum speed, whereby the springs will swing the released frame to brake-applying position.

3. An elevator overspeed brake, comprising an elevator cage running on guide rails, brake shoes carried by opposite sides of the cage for application to the rails, brake actuating means carried by the cage, springs urging said means toward brake-applying position, a pivoted member normally holding said actuating means in brake-released position but urged away from said means, rollers carried by the cage adapted to roll along the guide rails, a speed governor carried by the cage, means operated by the rollers for driving the governor, a movable stop normally holding said pivoted member and controlled by the governor for releasing said member, said member including a sliding bolt, means for retracting said bolt, a line for actuating said retracting means, and means connecting the line with a cage-supporting cable to pull the line in case the cable breaks.

4. An elevator brake as defined in claim 3, in which said retracting means includes a toggle, a spring holding the toggle off center, means connecting said line to the toggle to pull it over center, and means on the toggle for striking said bolt when the toggle is pulled by said line.

5. An elevator overspeed brake, comprising an elevator cage running on guide rails, brake shoes carried by opposite sides of the cage for application to the rails, springs urging said brakes toward applied position, means normally holding said springs in brake-released
position, rollers carried by the cage adapted to roll along the guide rails, a speed governor carried by the cage, means operated by said rollers for driving the governor, and means controlled by the governor for releasing said springs if the governor reaches a predetermined maximum speed, whereby the springs will move the brakes to applied position, a singletree pivotally connected to the top of the cage, cage-supporting cables connected to the opposite ends of the singletree, a line having a forked end secured to the singletree above and below its pivoted axis, and means connected to the opposite end of the line for releasing the springs when the line is pulled by the singletree if either of said cables breaks.

6. An elevator overspeed brake, comprising an elevator cage running on guide rails, brake shoes carried by opposite sides of the cage for application to the rails, a frame pivotally connected to the cage, means operatively connecting the frame with said shoes to actuate them when the frame is moved, springs urging the frame toward brake-applying position, means normally holding said frame in brake-released position, rollers carried by the cage adapted to roll along the guide rails, a speed governor carried by the cage, means operated by the rollers for driving the governor, means controlled by the governor for releasing said holding means if the governor reaches a predetermined maximum speed, whereby the springs will move the released frame to brake-applying position, and a screw jack pivotally mounted on a transverse axis in the cage and normally disposed horizontally, the jack being adapted to be swung upright to position its lower end against the top of the released frame, whereby the frame can be forced down manually to brake-released position again.

7. An elevator overspeed brake, comprising an elevator cage running on guide rails, brake shoes several feet long at opposite sides of the cage for application to the rails, links pivotally connected to the cage and inclined vertically down toward the shoes, means pivotally connecting the links to the shoes, a U-shaped frame extending across the cage and having its opposite ends pivotally connected to said shoes and the cage beside them, springs at opposite sides of the cage urging said frame upward to apply the brake shoes to the rails, means normally holding said frame in its lower position with the brakes released, rollers carried by the cage adapted to roll along the guide rails, a speed governor carried by the cage, means operated by the rollers for driving the governor, and means controlled by the governor for releasing said frame-holding means when the governor reaches a predetermined maximum speed, whereby the springs will swing said frame upward to apply the brake shoes to said rails.

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