Feb. 24, 1953

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2,629,461

ELEVATOR SAFETY DEVICE

Filed June 1, 1951

2 SHEETS—SHEET 1

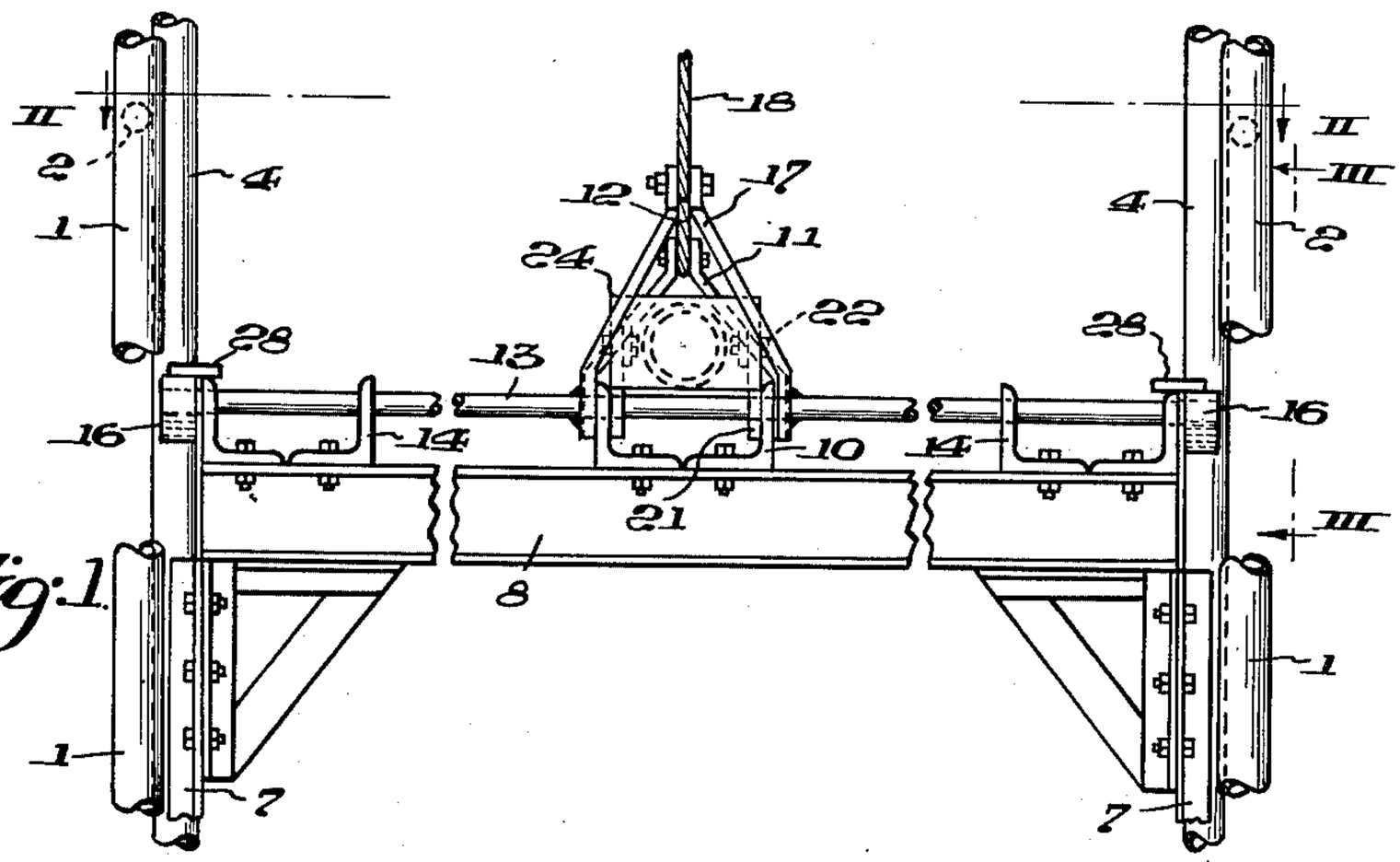

Fig. 1.

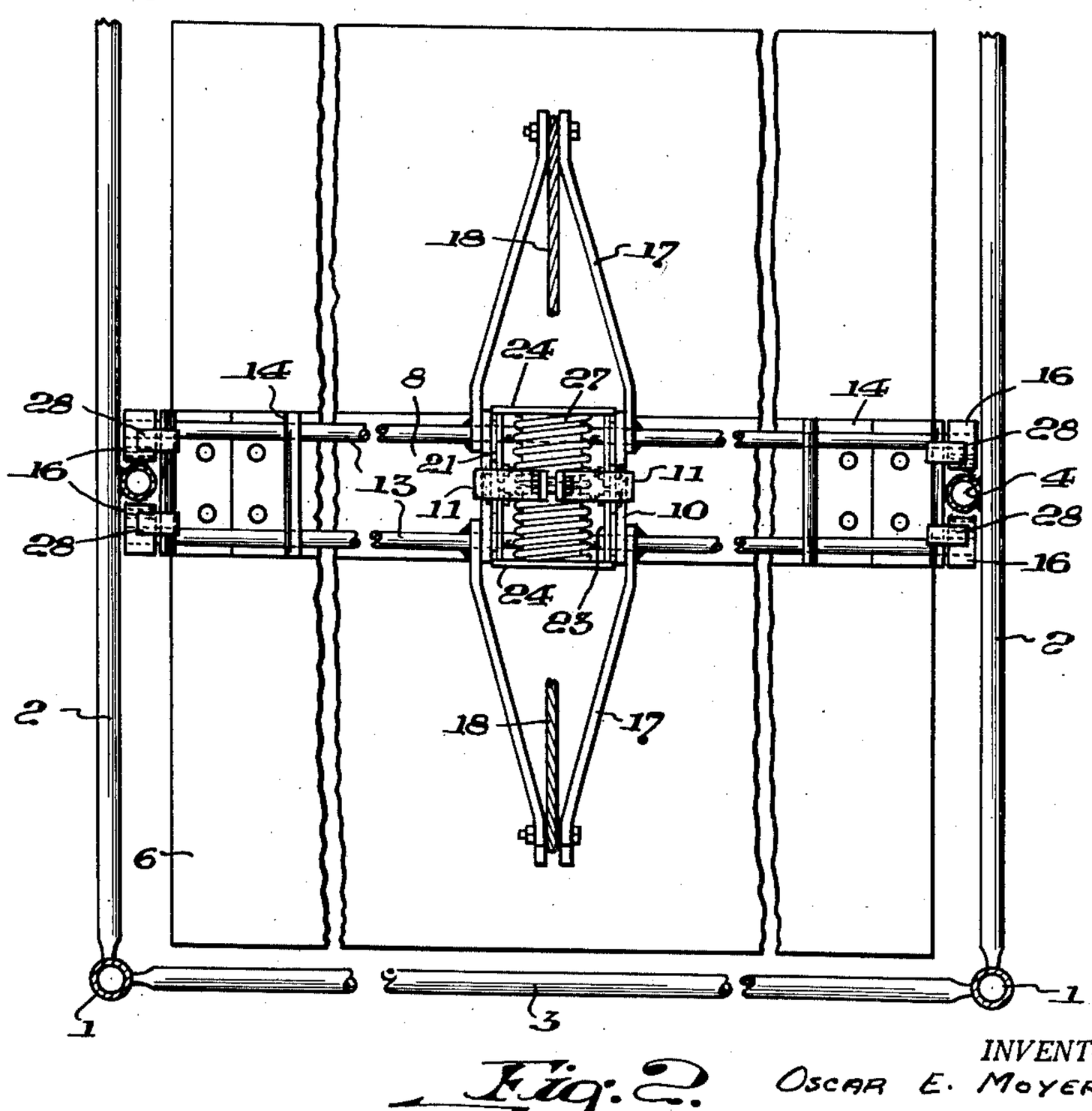

Fig. 2.

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2 SHEETS—SHEET 2

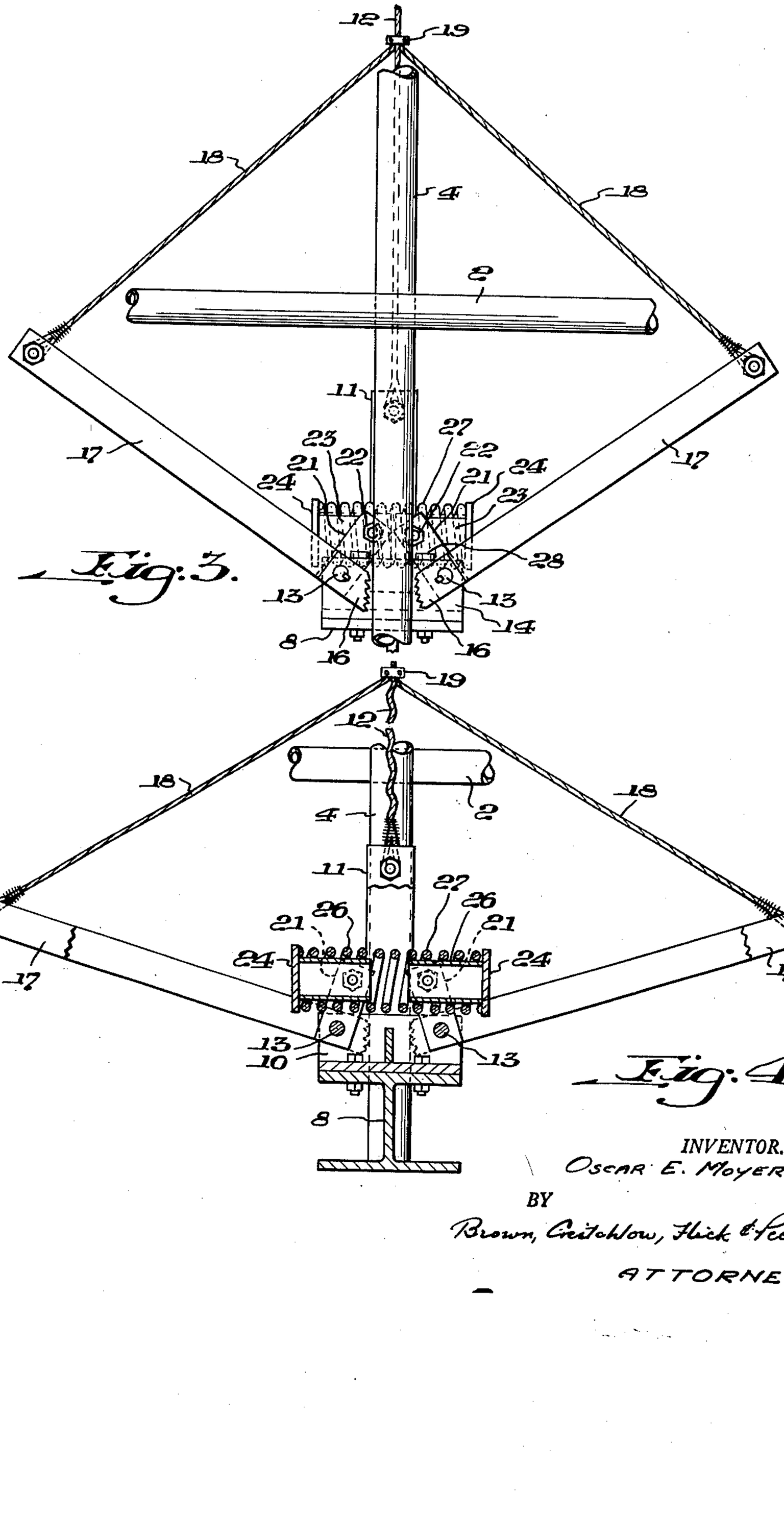

Fig. 3.

Fig. 4.

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ELEVATOR SAFETY DEVICE

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5 Claims. (Cl. 187—86)

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This invention relates to material handling elevator towers, and more particularly to safety apparatus to prevent the cages from falling in case the hoisting cables break.

It is among the objects of this invention to provide an elevator cage safety device which operates automatically the moment the cage hoisting cable breaks, which requires only one operating spring, which is simple in construction and positive in operation, and which does not deform the elevator tower when it operates.

In accordance with this invention, the safety device is mounted on a cage that is raised in an elevator tower by a cable and is guided by vertical rails at opposite sides of the tower. The safety device includes brackets that are rigidly mounted on the upper part of the cage beside the guide rails. Rotatable rod means extend across the cage and through the brackets and carry emergency brake elements that extend laterally downward from the rod means toward the adjacent guide rails. Preferably there are two rods, one on each side of the guide rails so that each rail is located between a pair of brake elements. An arm is fastened rigidly to each rod between the brake elements and projects laterally away from the rod. Tension means are connected to the ends of the arms and extend upward and inward to the cable, to which they are rigidly connected. A spring is provided for rotating the rods in case the cable breaks above the tension means and thereby allows the arms to swing downward. When this happens the rotation of the rods swings the brake elements upward against the sides of the guide rails to grip the rails between them in order to keep the cage from dropping in the tower. The spring is compressed between supports pivotally connected to lever arms that are secured to the rods.

The preferred embodiment of the invention is illustrated in the accompanying drawings, in which Fig. 1 is a fragmentary side view of an elevator tower containing a cage provided with my safety device; Fig. 2 is a plan view of the safety device; Fig. 3 is an enlarged side view of the safety device taken on the line III—III of Fig. 1; and Fig. 4 is a central vertical section through the safety device after the hoisting cable has broken.

Referring to Figs. 1 and 2 of the drawings, an elevator tower has four legs 1 connected together by cross braces 2 and 3. Midway between the legs on each of two opposite sides of the tower there is a vertical guide member or rail 4 attached to the inner sides of braces 2. A cage is

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slidable up and down these guide rails. The cage may be of any suitable construction, the one shown being formed from a platform 6 (Fig. 2) supported by the lower ends of upright members 7 that are connected at their upper ends by a cross beam 8. The uprights straddle the guide rails to hold the cage in position.

Bolted to the top of the central portion of the cross beam is a U-shape bracket 10, from the opposite sides of which a stirrup 11 extends upward. This stirrup is connected to the lower end of the hoisting cable 12 that extends up to the top of the tower and over sheaves and down to the hoisting engine (not shown) located beside the tower. Extending through the vertical sides of the bracket are two parallel rods 13 which are journaled in the bracket. The outer end portions of both rods are journaled in similar brackets 14 mounted on the ends of the cage cross beam. The rods project beyond these latter brackets on opposite sides of vertical guide rails 4. Rigidly mounted on each end of each rod is a brake element 16 that extends downward on an incline toward the adjacent guide rail. The ends of these elements next to the rails preferably are provided with teeth and are shaped so that if the brake elements are swung upward their teeth will frictionally engage the guide rails. The brake elements normally are held in their lower position, in which they are spaced a slight distance from the guide rails, by means of arms 17 rigidly connected to the two rods. The inner ends of the arms straddle the center bracket 10, and their outer ends are connected by short tension lines 18 to a clamp 19 on the hoisting cable a few feet above the cage. In normal use of the elevator the arms are inclined at such an angle as to swing the brake elements down away from the guide rails, as shown in Fig. 3.

Rigidly mounted on each rod between the sides of the center bracket are a pair of upwardly extending short levers 21. These levers preferably are disposed at about a right angle to the adjacent arm 17. Pivotally connected to the upper ends of each pair of levers by means of bolts 22 is a U-shape spring support formed from a pair of parallel legs 23 connected at their outer ends by a vertical plate 24. The plates 24 of the two spring supports support tubular bosses 26 which extend substantially horizontally toward each other, and a coil spring 27 encircles the bosses and is supported by them. The spring is compressed between the two plates so that it constantly exerts pressure to force them away from each other.

Until the hoisting cable 12 accidentally breaks above the safety device, the brake elements 16 are held out of engagement with guide rails 4 and serve no purpose. In the event, however, that the hoisting cable breaks, it will no longer hold tension lines 18 taut, and therefore the outer ends of the two arms 17 can swing downward. In such an event they are swung downward very quickly and forcefully by the expanding coil spring 27 pushing the two spring supports away from each other. The outwardly moving spring supports swing the upper ends of the adjoining levers 21 outward and thereby rotate the two rods 13 in opposite directions. The directions of rotation are such that the toothed brake elements 16 are swung upward into engagement with the adjoining guide rails. The force of the spring, the weight of the arms, the leverage exerted on the brake elements, and the weight of the cage all combine to rotate the brake elements upward against the guide rails so that they tightly grip it and their teeth dig into it to prevent the cage from falling in the tower.

Due to the fact that the brake elements engage opposite sides of each guide rail, neither the rails nor the sides of the tower are sprung outward when the emergency brakes are applied. If the weight of the loaded cage is so great that brake elements collapse the tubular guide rails, the rails still will be gripped between the brake elements. Upward movement of the brake elements is limited by stops 28 welded to the outer ends of the outer brackets 14. However, it would be an unusual case where the brake elements would ever swing up against the stops, except when the safety device is not mounted on the cage. In such a case the safety stops limit the rotation of the rods by the spring.

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. The combination with an elevator tower in which a cage that is raised by a cable is guided by vertical rails at opposite sides of the tower, of brackets rigidly mounted on the upper part of the cage beside said guide rails, rotatable rod means extending across the cage and through said brackets, emergency brake elements rigidly mounted on the outer ends of said rod means and extending laterally downward therefrom toward the adjacent guide rails, an arm fastened rigidly to said rod means between the brake elements and projecting laterally away from said means, tension means connected to the outer end of the arm and extending upward and inward toward said cable, means rigidly connecting the upper end of said tension means to the cable, lever means rigidly fastened to said rod means and projecting therefrom, and a normally compressed spring for swinging said lever means to rotate said rod means in case the cable breaks above said tension means and thereby allows the arm to swing downward, said rotation of said rod means swinging said brake elements upward against the sides of the guide rails to keep the cage from dropping in the tower.

2. The combination with an elevator tower in which a cage that is raised by a cable is guided by vertical rails at opposite sides of the tower,

of brackets rigidly mounted on the upper part of the cage beside said guide rails, rotatable rod means extending across the cage and through said brackets, emergency brake elements rigidly mounted on the outer ends of said rod means and extending laterally downward therefrom toward the adjacent guide rails, an arm fastened rigidly to said rod means between the brake elements and projecting laterally away from said means, tension means connected to the outer end of the arm and extending upward and inward toward said cable, means rigidly connecting the upper end of said tension means to the cable, lever means rigidly fastened to said rod means and projecting therefrom, a spring support pivotally connected to said lever means, and a normally compressed spring engaging the spring support and urging it in a direction to cause said lever means to rotate said rod means in case the cable breaks above said tension means, said rotation of said rod means being in a direction to cause said brake elements to swing upward against the sides of the guide rails to keep the cage from dropping in the tower.

3. The combination with an elevator tower in which a cage that is raised by a cable is guided by vertical rails at opposite sides of the tower, of brackets rigidly mounted on the upper part of the cage beside said guide rails, a rotatable rod extending across the cage and through said brackets, emergency brake elements rigidly mounted on the outer ends of said rod and extending laterally downward therefrom toward the adjacent guide rails, an arm fastened rigidly to the central portion of said rod and projecting laterally away from the rod, tension means connected to the outer end of the arm and extending upward and inward toward said cable, means rigidly connecting the upper end of said tension means to the cable, lever means secured to the central portion of said rod and projecting therefrom, a spring support pivotally connected to said lever means, a coil spring having one end bearing against said support, and means pressing against the opposite end of the spring to compress it so that in case the cable breaks above said tension means the spring will rotate said rod and swing said brake elements upward against the sides of the guide rails to keep the cage from dropping in the tower.

4. The combination with an elevator tower in which a cage that is raised by a cable is guided by vertical rails at opposite sides of the tower, of brackets rigidly mounted on the upper part of the cage beside said guide rails, a pair of parallel rotatable rods extending across the cage and through said brackets, emergency brake elements rigidly mounted on the outer ends of said rods and extending laterally downward therefrom toward the adjacent guide rails, a pair of arms each fastened rigidly to the central portion of one of the rods with the two arms projecting away from the rods in opposite directions, tension members connected to the outer ends of the arms and extending upward and inward toward said cable, means rigidly connecting the upper ends of said tension members to the cable, lever means secured to the central portion of each rod and projecting upward therefrom, a spring support pivotally connected to the upper end of each lever means, and a coil spring compressed between said spring supports for pushing them away from each other to rotate the rods in case the cable breaks above said tension members and thereby

allows the arms to swing downward, said rotation of the rods swinging said brake elements upward against the sides of the guide rails to keep the cage from dropping in the tower.

5. The combination with an elevator tower in which a cage that is raised by a cable is guided by vertical rails at opposite sides of the tower, of brackets rigidly mounted on the upper part of the cage beside said guide rails, a pair of parallel rotatable rods extending across the cage and through said brackets, emergency brake elements rigidly mounted on the outer ends of said rods and extending laterally downward therefrom toward the adjacent guide rails, a pair of arms each fastened rigidly to the central portion of one of the rods with the two arms projecting away from the rods in opposite directions, tension members connected to the outer ends of the arms and extending upward and inward toward said cable, means rigidly connecting the upper ends of said tension members to the cable, a pair of spaced parallel levers rigidly mounted on each rod and projecting upward therefrom, a U-shape member pivotally connected to the upper ends

of each pair of levers, the U-shape members including plates parallel to each other, bosses mounted on the opposed surfaces of said plates, and a coil spring mounted on said bosses and compressed between said plates for pushing said U-shape members away from each other to rotate the rods in case the cable breaks above said tension members and thereby allows the arms to swing downward, said rotation of the rods swinging said brake elements upward against the sides of the guide rails to keep the cage from dropping in the tower.

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