(No Model.)

E. S. MATTHEWS.

ELEVATOR.

No. 455,536. Patented July 7, 1891.

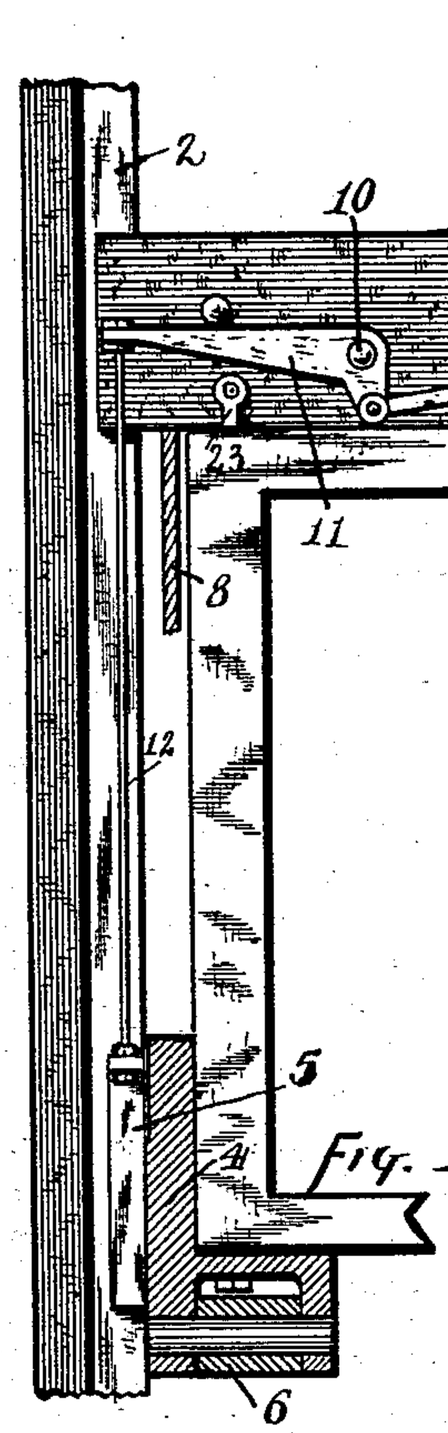

Fig. 1.

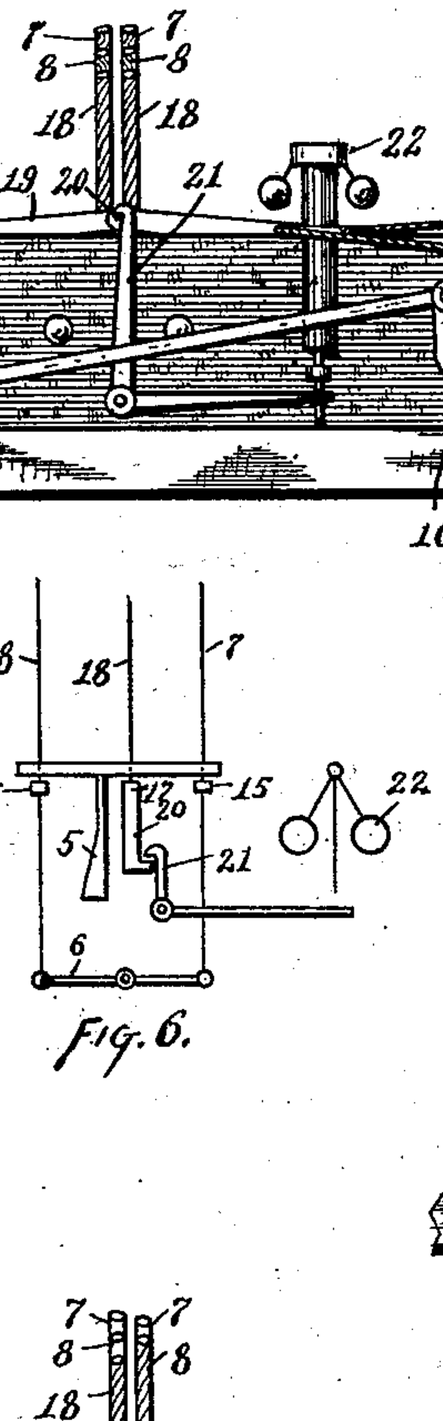

Fig. 6.

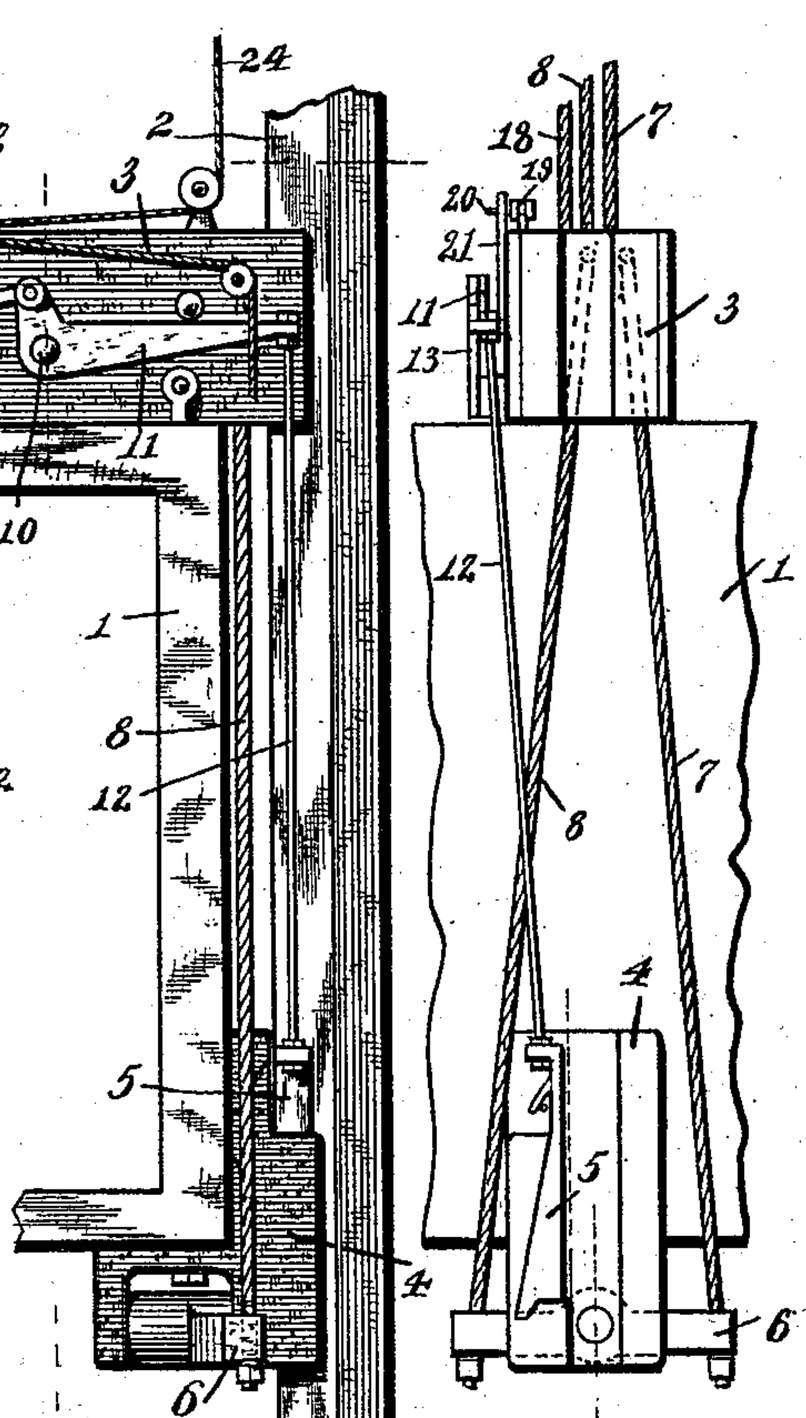

Fig. 2.

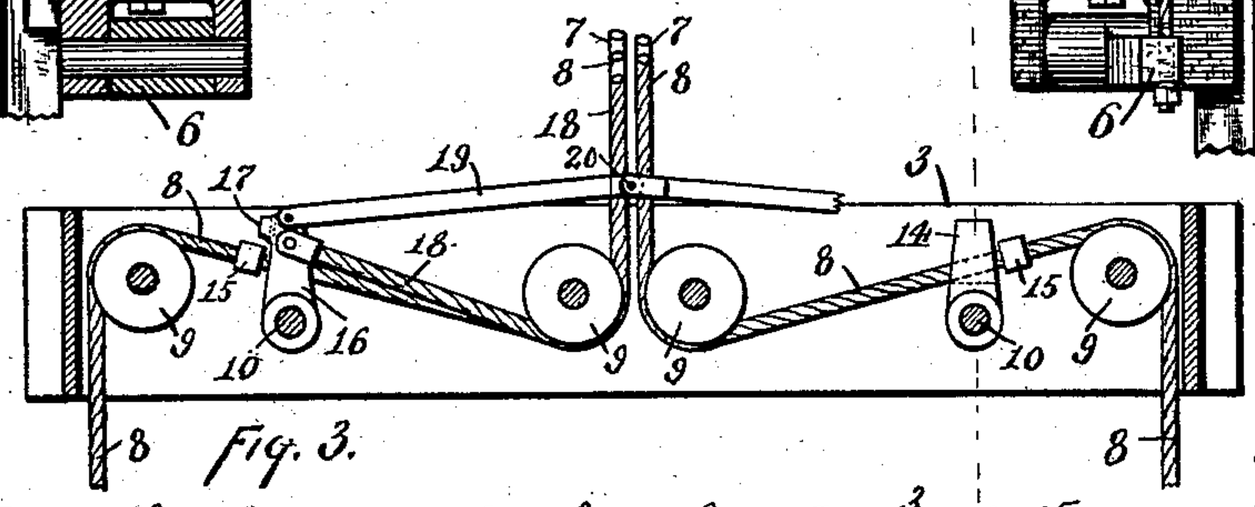

Fig. 3.

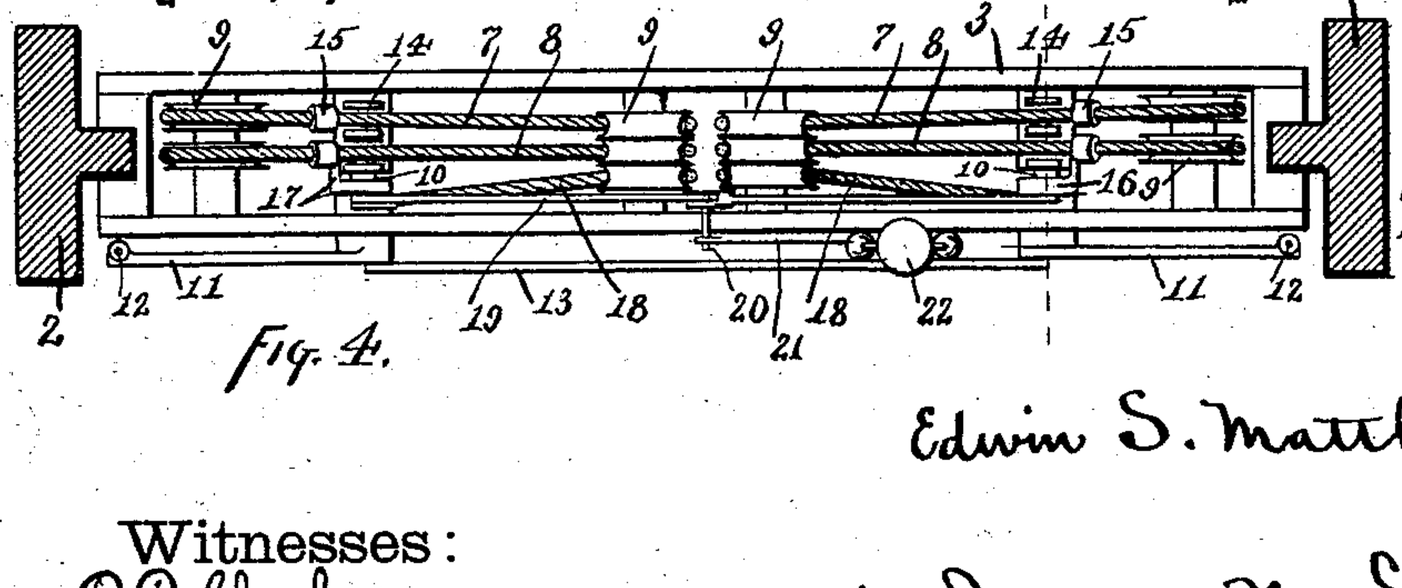

Fig. 4.

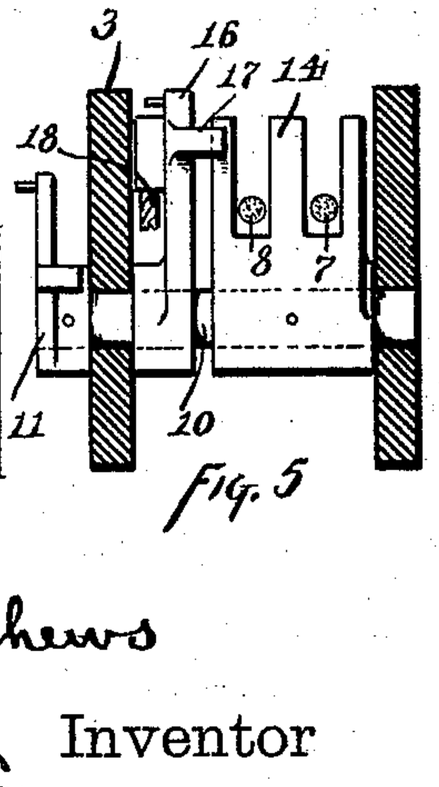

Fig. 5

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UNITED STATES PATENT OFFICE.

EDWIN S. MATTHEWS, OF CINCINNATI, OHIO, ASSIGNOR OF ONE-HALF TO JAMES L. HAVEN, OF SAME PLACE.

ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 455,536, dated July 7, 1891.

Application filed January 26, 1891. Serial No. 379,196. (No model.)

To all whom it may concern:

Be it known that I, EDWIN S. MATTHEWS, of Cincinnati, Hamilton county, Ohio, have invented certain new and useful Improvements in Elevators, of which the following is a specification.

This invention pertains to elevators employed for freight and passenger purposes, and relates to improvements in the safety devices intended to prevent the dropping of the car or cage in case of accident to the hoisting-ropes or apparatus.

My improvements will be readily understood from the following description, taken in connection with the accompanying drawings, in which—

Figure 1 is a front elevation of an elevator-car exemplifying my improvements, the left-hand jaw-block appearing in vertical section; Fig. 2, a side elevation of the same, a portion of the car only appearing; Fig. 3, a view of the head-beam in vertical longitudinal section, or with the front plate removed, this view having also the right-hand counterbalance-rope and its lever omitted; Fig. 4, a plan of the head-beam; Fig. 5, a vertical transverse section of the head-beam on an enlarged scale, and Fig. 6, a diagram illustrating what might be called the "prime factors" of the invention.

In the drawings, omitting for the present all consideration of Fig. 6, 1 indicates the usual car or cage of the elevator; 2, the usual vertical guide-timbers therefor; 3, the usual head-beam secured across the top of the car and having at each end jaws to engage the guides 2; 4, the usual jaw-blocks secured below the car, one at each side, and engaging the guides; 5, safety-wedges, one seated in each jaw-block, these wedges being normally out of contact with the guides but so disposed that if they shift upwardly in the jaw-blocks they will cause the jaw-blocks to pinch the guides with sufficient force to lock the car to the guide and prevent its descent, or at least furnish sufficient brake-power to prevent descent at dangerous velocity; 6, a lever pivoted in each jaw-block; 7, a hoisting-rope attached at its lower end to the rear end of lever 6 and extending upward to the head-beam, and thence over and under idle-sheaves in the head-beam, thence upward from the car at about the center of the car, as is usual, and thence to go to the hoisting-motor, whatever it may be, passing generally over a sheave at the top of the elevator-way, there being one of these hoisting-ropes 7 for each side of the car; 8, a hoisting-rope having the same course as hoisting-rope 7, but attached to the front end of lever 6, this hoisting-rope being also in duplicate, one for each side of the car, there thus being four hoisting-ropes, two of 7 and two of 8, bearing the hoisting strain between them; 9, the usual idle-sheaves in the head-beam over and under which the various ropes turn in changing their courses; 10, a pair of spindles journaled across the head-beam, one toward each end of the beam, these spindles crossing under the horizontal portions of the ropes, these spindles being hereinafter denominated the "safety-spindles;" 11, levers fast upon one end of each safety-spindle, these levers having a bell-crank form with an arm projecting sidewise to the neighborhood of the guides; 12, rods connecting these sidewise-projecting arms with the wedges, whereby when the arms are raised the wedges will be lifted into clamping position; 13, a connecting-rod pivoted to the two levers 11 in such manner as to unify their motions and insure a simultaneous lifting of both wedges; 14, a slotted lever fast on each safety-spindle and projecting upwardly, the slots of these levers straddling the hoisting-ropes 7 and 8; 15, knobs or enlargements on the hoisting-ropes 7 and 8 outside of and near to or in contact with the levers 14, so that any inward movement of these knobs will cause an inward movement of the levers and an upward movement of the wedges; 16, a second lever loose on each safety-spindle and projecting up alongside the slotted levers 14; 17, lugs projecting from the levers 16 to behind the levers 14, so that any inward movement of levers 16 will produce an inward movement of levers 14; 18, the usual counterbalancing-rope coming down, as usual, from attachment to the counterbalance-weight and turning under the central sheaves and then fastened to levers 16, as clearly seen at the left in Fig. 3, this rope and its lever 16 being omitted from the right-hand part of this figure, this counterbalanc-

ing-rope being, like the hoisting-rope 7 or 8, also in duplicate; 19, a pair of toggle-bars connecting the two levers 16 and pivoted together at about the center of the head-beam and capable at that central pivot of rising and falling as the levers 16 move inward or outward, these toggle-bars occupying normally a position almost horizontal, so that the inward strain upon the levers 16 produces but little rising tendency on the part of the center of the toggle; 20, the pivot-pin which unites these toggle-bars; 21, a trigger-lever pivoted to the head-beam and hooking over pin 20 and holding the toggle down in normal position; 22, an ordinary centrifugal governor to be mounted and rotated in the manner usual with elevators, the spindle of this governor being so disposed with reference to the trigger-lever that if the governor revolves at abnormal speed the trigger-lever will be tripped and unhooked from the pin 20; 23, the usual tension-bolts tying the head-beam to the guide-blocks, and 24 the usual standing cable for rotating the governor.

It will of course be understood that six ropes centrally grouped pass up from the car, four of these ropes 7 and 8 being the hoisting-ropes, while two of them 18 are the counterbalance-ropes. The hoisting-ropes and counterbalance-ropes are duplicated at each side for the usual purpose—namely, to increase the factor of safety. I may therefore for the present consider one set only of these ropes, namely, one each of 7, 8, and 18. The two ropes 7 and 8, it will be understood, act virtually as two independent strands of one rope. The lever 6, to which these two ropes are attached, divides the strain between them. The lever is not essential, as it is evident that if ropes 7 and 8 were united below and were bent under a pulley or bent under any substitute on which the unified rope might slip the effect of dividing the load between the two ropes would be the same as when the lever 6 is employed. Therefore we must look upon ropes 7 and 8 as a single hoisting medium formed of two elements with their share of the load properly apportioned between them. It will therefore be obvious that under normal operations knobs 15 will never change their position. But now assume that we cut or break rope 7 above the car. The strain previously on the pair will now come entirely on rope 8, and the foot of the ropes at lever 6 or whatever may unite the ropes at this point will shift, rope 7 shifting downwardly and rope 8 shifting upwardly. The knob on rope 8 will therefore be drawn inwardly with a force represented by the strain previously borne by ropes 7 and 8. This knob will therefore come in contact with lever 14 and will lift its arm 11 and pull the appropriate wedge upward and clamp the car to the guide, and simultaneously the wedge on the other side of the car will have been similarly operated, connecting-rod 13 insuring that both wedges act together. Very little study will make it obvious that the wedges will be thus operated upon the breaking of either of ropes 7 or either of ropes 8. In other words, the breaking or excessive stretching of any one of the hoisting-ropes above the car will cause a setting of both wedges.

It will be observed that the pulling of the wedges into action is done by a knob on a hoisting-rope not broken. In other words, upon the breaking of a hoisting-rope the intact-rope of the broken pair becomes the straining element to pull the wedges into action; but the intact hoisting-rope to do the work of pulling the wedges must really be intact—that is, it must reach upward from the car and be under strain. Assume now that the four hoisting-ropes 7 7 8 8 were all broken at once, it will at once be seen that no intact hoisting-rope remains to pull the wedges into action.

I carry the "safety" scheme further than usual and provide for the setting of the wedges if all the hoisting-ropes break at once, and even if there is no breakage of any rope or any part of the apparatus, I arrange that excessive downward speed of the car shall cause the counterbalance rope or ropes to set the wedges. The strain of the counterbalance-ropes 18 tends to pull lever 16 inwardly, and if these levers could be pulled inwardly their lugs 17 would move levers 14 and set the wedges precisely as if the knobs on the hoisting-rope shifted inwardly; but toggle-bars 19 when in normal position will not permit levers 16 to swing inwardly, those levers thus forming normally-fixed points of attachment for the counterbalance-ropes. The inward strain on lever 16 by the counterbalance-ropes is met by toggle-bars 19 in a nearly straight position, the toggle having a slight tendency to rise and permit the levers to swing inwardly. Trigger 21, engaging the central toggle-pivot with its hook, keeps the toggle down, and the entire system connected with the counterbalance-ropes therefore forms a trap normally set. Governor 22, operated as usual, has no effect on the trigger at normal car speeds; but if the car moved at abnormal speed, giving to the governor an abnormally high rotation, then the governor-balls rise higher than usual and the governor-spindle unhooks the trigger-lever. Thereupon the toggle is free to rise and lever 16 to be pulled inwardly by the full power of counterbalance-ropes, the wedges becoming thereby set. Thus it will be seen that, independent of any breakage, abnormally high speed of car will set the wedges. It will be further seen that if all the hoisting-ropes break and the car moves at excessive speed up or down the counterbalance ropes will set the wedges.

As the principle of my invention is not at all dependent on many peculiarities of detail which have necessarily been described in connection with its illustrated exemplification, it has been thought well to illustrate the prime factor of the system by means of the ele-

mentary diagram seen in Fig. 6. Here it will be seen the wedge will be lifted by the upward movement of either hoisting-rope knob 15 or by the upward movement of piece 17, to which the counterbalance-rope is attached; also that piece 17 is held in normal position by a trigger; also that the hoisting strain is divided between ropes 7 and 8. If rope 7 breaks, then the knob on rope 8 lifts the wedge. If rope 8 breaks, then the knob on rope 7 lifts the wedge. If the governor moves at excessive speed, it trips the trigger and the counterbalance-rope lifts the wedge. If both hoisting-ropes 7 and 8 break, then high speed of governor ensues most likely, and if such be the case then the counterbalance-rope lifts the wedge. An analysis of this diagram will also show that the action of the hoisting-rope in setting the wedges is due to the fact that the strain is divided between two ropes occupying a normal relationship to each other, the changing of which relationship causes the intact-rope of the pair to do the work of setting the wedges.

I claim as my invention—

1. In an elevator, the combination, substantially as set forth, with a car, guides therefor, and a safety-clamp to arrest the car, of two hoisting-ropes held in normal relationship to the car by the mutual strain on the ropes, projections connected with said ropes to pull the safety-clamp into action in case the ropes change their relationship to the car, a counterbalance-rope in connection with the clamp and tending to pull it into action, a trigger resisting such tendency, and a governor to trip the trigger in case the car moves at excessive speed.

2. In an elevator, the combination, substantially as set forth, with a car, guides therefor, and a safety-clamp to arrest the motion of the car, of a rope under strain by the weight of the car and in connection with the safety-clamp and tending by its strain to pull the clamp into action, a trigger resisting such strain and preventing the rope from pulling the clamp into action, and a governor to trip the trigger when the car moves at excessive speed.

3. In an elevator, the combination, substantially as set forth, with a car, guides therefor, and a safety-clamp to arrest the motion of the car, of a counterbalance-rope in connection with said safety-clamp and tending by its strain to pull it into action, a trigger resisting such strain and preventing the rope from pulling the clamp into action, and a governor to trip the trigger when the car moves at excessive speed.

4. In an elevator, the combination, substantially as set forth, with a car, guides therefor, and a safety-clamp to arrest the motion of the car, of two hoisting-ropes in connection with each other at the car and movably attached to the car and held in a normal relationship to the car by the mutual strains on the two ropes, projections connected with the ropes to pull the safety-clamp into action when the relationship between car and ropes becomes abnormal, and connections to transmit the pulling strain from said projections to the safety-clamp.

5. In an elevator, the combination, substantially as set forth, with a car, guides therefor, a safety-clamp to arrest the car, and a double rope engaging the car, of a spindle, a lever thereon to be moved to abnormal position by the strain of said rope as it shifts on the car, and a lever on the spindle communicating with the safety-clamp, whereby the strain of the shifting-rope pulls the safety-clamp into action.

6. In an elevator, the combination, substantially as set forth, with a car, guides therefor, a safety-clamp at each side of the car, and a double rope engaging the car, of a pair of safety-spindles, levers thereon communicating with the safety-clamps, a lever on one of said spindles to be moved to abnormal position by the strain of said rope as it shifts on the car, and a rod and levers connecting the two spindles to cause them to move in unison.

7. In an elevator, the combination, substantially as set forth, with a car, guides therefor, a safety-clamp to arrest the car, a hoisting-rope, and a counterbalance-rope, of a safety-spindle, a lever thereon communicating with the safety-clamp, a lever on the spindle to be moved by the shifting of the hoisting-rope, and a lever on the spindle to be moved by the shifting of the counterbalance-rope.

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