J. KULP.

SAFETY DEVICE FOR ELEVATORS.

APPLICATION FILED DEC. 30, 1908.

973,518.

Patented Oct. 25, 1910.

2 SHEETS—SHEET 1.

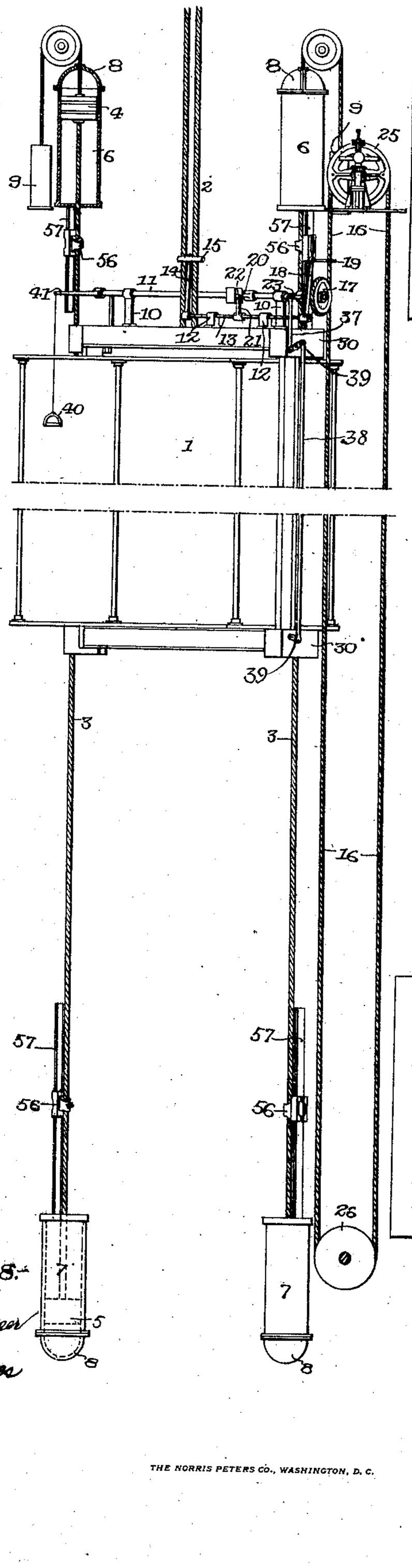

Fig. 1.

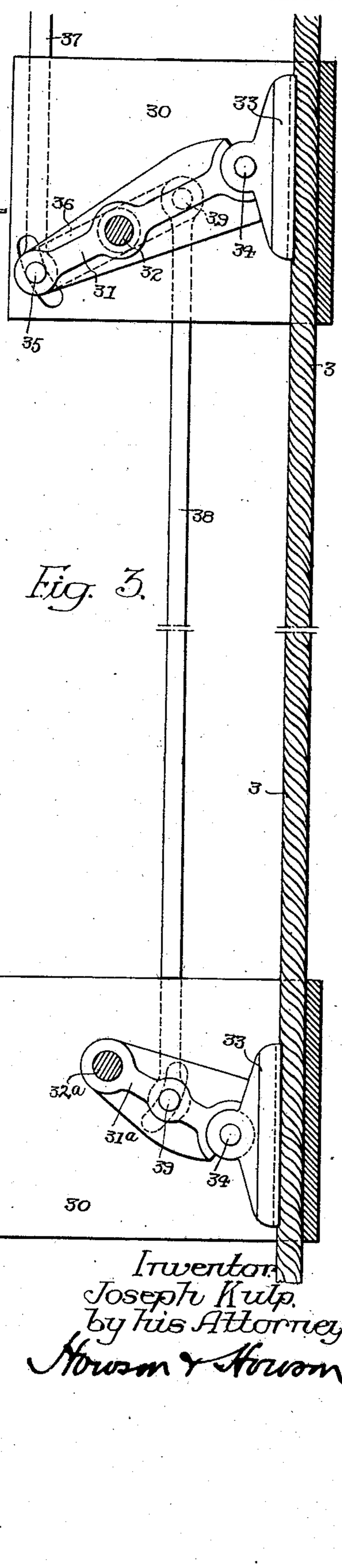

Fig. 3.

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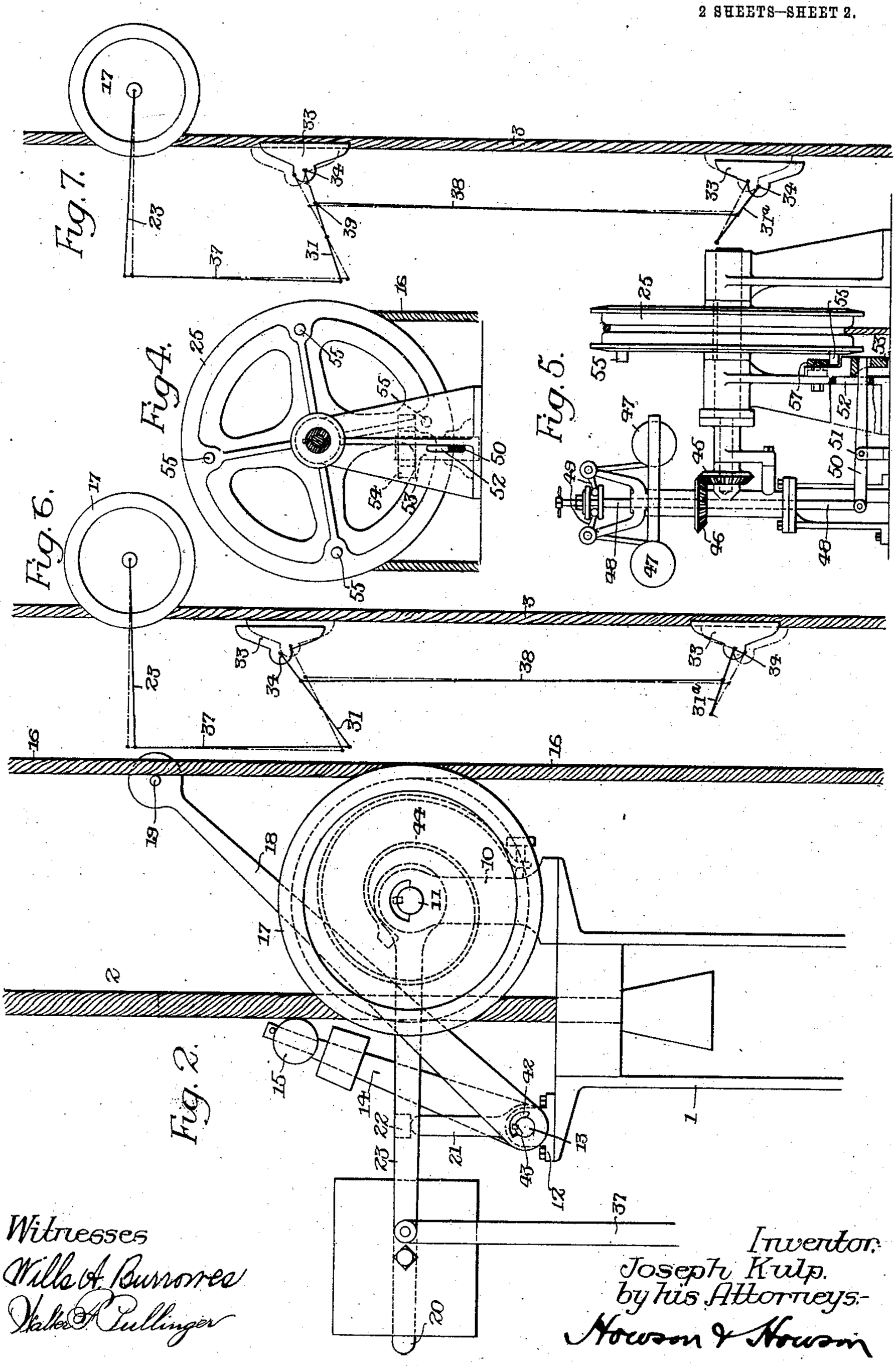

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UNITED STATES PATENT OFFICE.

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SAFETY DEVICE FOR ELEVATORS.

973,518. Specification of Letters Patent. Patented Oct. 25, 1910.

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To all whom it may concern:

Be it known that I, JOSEPH KULP, a citizen of the United States, and a resident of Jersey City, New Jersey, have invented certain Improvements in Safety Devices for Elevators, of which the following is a specification.

My invention relates to elevators; and the object of my invention is to provide improved automatically operating safety devices that will serve to arrest the movement of the elevators should the cables or other part of the supporting means give way, or when its speed in either direction is accelerated beyond a predetermined limit.

My invention consists of certain improvements in the structures illustrated in the Hanford Patents, Nos. 397,912, and 703,127, dated February 19, 1889, and June 24, 1902, respectively, and the details of the same are fully shown in the accompanying drawings, in which:

Figure 1, is an elevation of an elevator, partly in perspective, showing the same suspended in a shaft, and illustrating the safety mechanism carried by the car and arresting means for coöperation therewith mounted in the upper and lower portions of the elevator shaft; Fig. 2, is an enlarged view, showing a side elevation of a part of such mechanism; Fig. 3, is an enlarged view of clutches employed in connection with my improved safety device; Fig. 4, is a view of the brake wheel over which the rope for actuating the clutches travels; the governor, and the means actuated by the governor for stopping said brake wheel; Fig. 5, is a side elevation, partly in section of the structure shown in Fig. 4, and Figs. 6 and 7, are diagrammatic views illustrating the operation of the brake shoes or clutches forming part of my invention.

In the drawings herewith, 1 represents a car adapted to travel in a suitable shaft; such car being supported by the usual cables 2 which are raised and lowered in any suitable or approved manner. Disposed in the shaft and arranged to pass through the car are what may be termed "standing cables" 3; such cables being connected to pistons 4 at the top and 5 at the bottom, which pistons are disposed in suitable cylinders 6 and 7, respectively. The cylinders are provided with covers 8, which may be termed vacuum caps. The pistons 5 in the lower cylinders 7 are normally disposed in the bottom of the same, while the pistons 4 in the upper cylinders 6 are normally disposed toward the top of the same, and the latter pistons are maintained in their position by weights 9.

The car is provided with suitable clutches mounted adjacent the roof and floor of the same, which clutches are for engagement with said standing cables and are more fully described hereinafter, and these clutches may be brought into action to arrest the movement of the car under certain conditions through the aid of the following described mechanism: Suitably journaled in bearings 10 on top of the car is a shaft 11, disposed to one side of the cables 2 supporting the car. On the opposite side of said cables and mounted in bearings 12 a little lower than the shaft 11, is a rock shaft 13 carrying an upwardly projecting arm 14, which may be weighted; such arm being provided with a movable cross piece 15, which lies against the supporting cables 2.

The elevator is equipped with the usual governor mechanism, the cable of which, indicated at 16, passes around a wheel or pulley 17 mounted on the shaft 11, and the rock shaft 13 carries at its outer end another arm 18 having a finger 19 in contact with said governor cable.

The shaft 11 is provided with a weighted lever 20, and is maintained in a normal position by means of an arm 21 on the shaft 13 which normally engages a projection 22 on the weighted lever 20, but may be tripped to allow said weighted lever to drop.

The shaft 11 carries an arm 23 to operate the clutch mechanism, and this arm is rendered active under the following conditions: Should one of the supporting cables 2 break, the movable cross-piece 15 engaging the same, which is pivotally mounted on the end of the arm 14, would turn on said arm; releasing it from its normal position and allowing it to throw over, which action would turn the rock shaft 13 in its bearings and cause the trip arm 21 to release the weighted lever 20 on the shaft 11 and allow the same to drop. This movement of the weight will cause said shaft 11 to turn in its

bearings, and will actuate one of the clutches to engage the standing cables through the medium of the arm 23. If the car is descending when such accident occurs, the standing cables will tend to buckle at the bottom and to pull down on the pistons 4 in the cylinders 6 at the top of the well, and as such pistons will tend to compress the air in the cylinders ahead of them besides being held back by a partial vacuum in said cylinders, due to the closed caps 8, the progress of the car will be arrested.

As before explained, the governor cable 16 passes over a pulley 17 on the end of the shaft 11, said pulley being normally non-rotative, and the cable runs freely over the pulleys 25 and 26 at top and bottom of the shaft; the former pulley being controlled by governor mechanism. Should accident to the operating machinery cause the car to accelerate its movement in either direction, such movement will cause the governor cable to increase the speed of the pulley 25 and this communicating to the governor will cause the latter to actuate means (more fully described hereinafter) to arrest the movement of said pulley 25 and the cable traveling over it. This stopping of the cable will cause the wheel or pulley 17 on the end of the shaft 11 to turn and actuate the mechanism before referred to, thereby producing the same conditions with regard to throwing the clutches into engagement with the standing cables, as is effected by the breaking of the hoisting cables. If such accelerated movement takes place when the car is ascending, the upper clutches will be thrown into contact with the standing cables, and the latter will be raised, lifting the pistons in the lower cylinders; the pistons compressing the air within the same besides being held back by a partial vacuum in said cylinders, due to the caps 8, and gradually stopping the car. When the accelerated movement takes place on the downward movement of the car, the lower clutches will be thrown into action and the standing cable will be lowered against the pressure exerted by the pistons in the upper cylinders. Should the governor cable break, the same result will be accomplished, as owing to the engagement of the finger 19 of the arm 18 carried by the rock shaft 13 with said governor cable, the release of the arm by the breaking of such cable will remove the trip arm 21 and permit the shaft 11 to turn, thereby throwing one set of the clutches into engagement with the standing cable.

The clutches are mounted at top and bottom of the car on both sides of the same; one set of the same being fully shown in the normally inactive position in Fig. 3, and in the operative positions in the diagrammatic views, Figs. 6 and 7; and these clutches are disposed in suitable housings 30, carried by the frame of the elevator at top and bottom of the same. The upper clutches comprise, in each instance, a lever 31 pivotally mounted at 32 and carrying a shoe 33 with a grooved face for engagement with the standing cable; such shoe being pivotally connected to the lever 31 at 34. Connected at 35 to a lever 36 disposed outside the housing and paralleling said lever 31, is a link 37, the other end of which is connected to the arm 23 carried by the shaft 11 on top of the car, and when this arm 23 is operated in the manner described, owing to any accident occurring in the operation of the car, one clutch of each set will be operated.

The lower clutches comprise, in each instance, a lever 31^a pivoted at 32^a and having a shoe 33 pivoted to said lever at 34 with a grooved face for engagement with the standing cable. This clutch is operated from the lever 36 by means of a link 38 connected at 39 to said levers.

In the diagram views, Figs. 6 and 7, the dotted lines represent the inactive positions of the clutches when the car is running under normal conditions; the full lines, Fig. 6, showing the position of the parts when the lower clutches are thrown into action; the upper clutches being out, and the full lines, Fig. 7, showing the position of the parts when the upper clutches are thrown into action; the lower clutches being out. When the arm 23 carried by the shaft 11 is raised, due to accelerated upward movement of the car, the upper clutches will be thrown into action and the lower clutches will be thrown out, as shown in Fig. 7, and when said arm is operated due to accelerated downward movement of the car, the lower clutches will be operated in the manner described and the upper clutches will be thrown out, as shown in Fig. 6.

In order that the clutches may be under the control of the elevator attendant and operable by hand, I provide a hand pull 40 extending through the roof of the car, the upper end of which is connected to a lever 41 attached to the rock shaft 11.

Lost motion is provided for between the shaft 13 and the finger 19 of the arm 18 lying against the governor cable 16, so that the mechanism may operate should one of the hoisting cables break, without affecting the governor or its cable. This is accomplished by slotting the hub of the arm 18 at 42, and providing the shaft 13 with a lug 43 for engagement with the end walls of said slot. Similar provision for lost motion is made between the hub of the weighted lever 14 and the shaft 13; the hub of the weighted lever 20 and the shaft 11; the hub of the lever 41 and said shaft 11, and the hub of the pulley 17 and said shaft 11. The pulley 17

is also provided with a coiled spring 44 designed to return it to normal position after it has been operated for any purpose.

It will be understood that the clutches 33 and the mechanism shown at one side of the car for automatically operating said clutches should accidents occur owing to breakage of the cables, or if the speed of the car acquire undue acceleration, are duplicated on the other side of the elevator illustrated in Fig. 1, but it has been thought unnecessary to indicate such duplication on said view of the drawing. The governor cable being on one side of the car only, there is but a single operating means controlled thereby.

In Fig. 5, the governor mechanism is shown on a larger scale. The shaft carrying the sheave or pulley 25 has at its outer end a bevel gear 45, meshing with a bevel gear 46 through which the speed governor receives its motion. When the downward speed of the car becomes too great for safety, the balls 47 of the governor are thrown outward by centrifugal force and acting upon a vertical rod 48, through their arms 49, depress said rod which is connected at its lower end to one end of a lever 50, pivoted at 51. The opposite end of this lever extends through a slot 52 in the support for the bearings of the shaft carrying said sheave or pulley 25 and into engagement with a vertically movable member 53 free to slide in guides 54. The sheave or pulley 25 is provided on its face with pins 55, which serve as stops when the member 53 is raised by the lever 50 into their path. Such stoppage of the sheave or pulley 25 will cause the cable passing over the same to move the pulley 17, and such movement of the pulley will actuate the shaft 11 and the coacting mechanism for arresting the movement of the car in the manner described. A further means of arresting downward movement of the car consists of stops 56 carried by the standing cables 3 near the top and bottom of the elevator shaft or well. These stops are guided by suitable rods 57 extending upwardly from the lower cylinders and downwardly from the upper cylinders, and should the car fall into the well, it will engage these stops and exert a pull on the standing cables against the force exerted by the pistons in the upper cylinders and the weights, thereby stopping the car; the lower portions of the standing cables buckling.

While I have shown certain devices for accomplishing the results sought to be attained, I do not wish to be limited to the precise construction and arrangement of the parts of the mechanism forming the subject of my invention.

I claim:

1. The combination, in an elevator safety device, of a car, a pair of standing cables suitably connected at top and bottom of the well in which said car operates, clutch mechanism at top and bottom of the car normally inactive but disposed for engagement with said standing cables, means on top of the car for controlling said clutches, one of said clutches being arranged for engagement with said standing cables when an accident occurs with the car moving in one direction and the other of said clutches being arranged for engagement with said standing cables when an accident occurs with the car moving in the opposite direction, said means being normally in the inactive position, and means for throwing said controlling means into action under varying conditions.

2. In an elevator safety device, the combination of an elevator car, a pair of standing cables suitably connected at top and bottom of the well in which said car operates, clutch mechanism carried at top and bottom of the car normally inactive but disposed for engagement with said standing cables, a shaft on top of the car controlling said clutches, one of said clutches being arranged for engagement with said standing cables when an accident occurs under certain conditions with the car moving in one direction and the other of said clutches being arranged for engagement with said standing cables when an accident occurs under certain conditions with the car moving in the opposite direction, said shaft being normally in an inactive position, and means controlled by said shaft for throwing said clutches into action under varying conditions.

3. The combination, in a safety device for elevators, of a car, a pair of standing cables passing through said car, a shaft mounted on top of said car, a governor, a cable for operating said governor, a wheel mounted on said shaft around which the governor operating cable passes and by which it is moved vertically, clutching mechanism arranged to coöperate with the standing cables, and means for operating said clutching mechanism by the turning of said wheel.

4. The combination, in an elevator safety device, of a car, a hoisting cable therefor, a pair of standing cables, housings carried by said car through which said cables pass, pivoted arms at top and bottom of said car having clutch shoes for engagement with said cables within said housings, means for operating said clutch carrying arms including a weighted lever, and means carried by the car and operable by the breaking of the hoisting cable for throwing said mechanism into action.

5. In an elevator safety device, the combination of a car, having the usual operating mechanism including a governor and a governor cable, a pair of standing cables mounted in the elevator shaft, housings car-

ried by said car through which the cables pass, pivoted arms at top and bottom of said car having clutch shoes for engagement with said cables in the housings, and means carried by the car including a weighted lever for throwing said clutch carrying arms into action by the breaking of the governor cable.

6. The combination, in an elevator safety device, of a car, a pair of standing cables, clutches for engagement therewith, means for operating said clutches, cables supporting the car, a lever carried by the clutch operating mechanism, and a pivoted arm mounted on said lever and in engagement with said supporting cables, the release of said arm by the breaking of one of the supporting cables serving to throw the clutch operating mechanism into action.

7. In an elevator safety device, the combination of a car, a pair of standing cables mounted in the shaft or well in which said car travels, clutches carried at top and bottom of the car for engagement with said standing cables, means for operating said clutches, one of said clutches being arranged for engagement with said standing cables when an accident occurs with the car moving in one direction and the other of said clutches being arranged for engagement with said standing cables when an accident occurs with the car moving in the opposite direction, a governor, a cable operating the same, and means carried by the clutch operating mechanism for moving said cable, said means serving to throw the clutching mechanism into action should the movement of the governor cable be arrested.

8. The combination, in safety devices for elevators, of cylinders mounted at top and bottom of the shaft in which the elevator travels, pistons in said cylinders, standing cables in the shaft to which said pistons are connected, the pistons in the upper cylinders being disposed near the upper part of the same while the pistons in the lower cylinders are adjacent the bottom of the same, clutches mounted on the car for engagement with said standing cables, the movement of the car after such engagement tending to compress the air within the cylinders and arrest such movement while the pistons are also retarded by the vacuum created by their movement, and means for operating said clutches.

9. In an elevator safety device, the combination of a car, standing cables mounted in the shaft, stops fixed to said cables to arrest the downward movement of the car, and guides for said stops.

10. In an elevator safety device, the combination of a car having the usual operating mechanism including hoisting cables, a governor and a governor cable, cylinders mounted at the top and bottom of an elevator shaft, pistons in said cylinders, standing cables connected to said pistons, and clutching mechanism on the car for engagement with said standing cables under conditions caused by accident to the hoisting cables, the governor cable, or accelerated movement of the car in either direction, such movement affecting the governor cable.

11. In an elevator safety device, cylinders mounted at top and bottom of an elevator well, standing cables extending between said cylinders, pistons in said cylinders connected to said cables, and caps carried by said cylinders through which the cables pass, said caps being substantially air-tight and serving to create a partial vacuum and thereby assist in retarding the movement of the cables in connection with the pressure exerted by the pistons within said cylinders to which said cables are connected.

12. In an elevator safety device, the combination of a car, a series of standing cables mounted in the shaft or well in which said car travels, clutches for engagement with said standing cables, a governor, a cable for operating the same, a wheel around which said cable passes and by which it is moved, a pulley moved by said cable, said pulley having a series of pins on its face, a lever, and a sliding member operated by said lever and brought into position to engage one of said pins and arrest the movement of the pulley and the governor cable, the wheel for operating said cable being moved by such action and actuating the clutches.

13. In an elevator safety device, the combination of a car, standing cables mounted in the shaft, stops fixed to said cables to arrest the movement of the car, and guides for said stops.

14. In an elevator safety device, cylinders mounted at top and bottom of an elevator well, standing cables extending between said cylinders, clutches for engaging the car with said cables, pistons in said cylinders connected to said cables, means for maintaining said cables in a taut condition, and caps carried by said cylinders, said caps being substantially air-tight and serving to create a partial vacuum and thereby assist in retarding the movement of the cables when the car is clutched to the same.

15. The combination, in a safety device for elevators, of an elevator car, a pair of standing cables disposed in the well for said car and passing through the same, a shaft mounted on top of said car, a governor, a cable for operating said governor, a pulley mounted on said shaft around which the governor operating cable passes and by which said cable is moved vertically, said pulley being normally non-rotative, clutching mechanism carried by the car and ar-

ranged to coöperate with the standing cables, means for operating said clutching mechanism upon turning of said pulley, other means for operating said clutches independently of said governor cable and pulley, and provision for lost motion between the operating parts to avoid the actuation of all when any one is operated.

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

JOSEPH KULP.

Witnesses:
MURRAY C. BOYER,
JOS. H. KLEIN.