No. 699,035. Patented Apr. 29, 1902.

H. P. SUMAN.

SAFETY APPLIANCE.

(Application filed Apr. 18, 1901.)

(No Model.) 3 Sheets—Sheet 1.

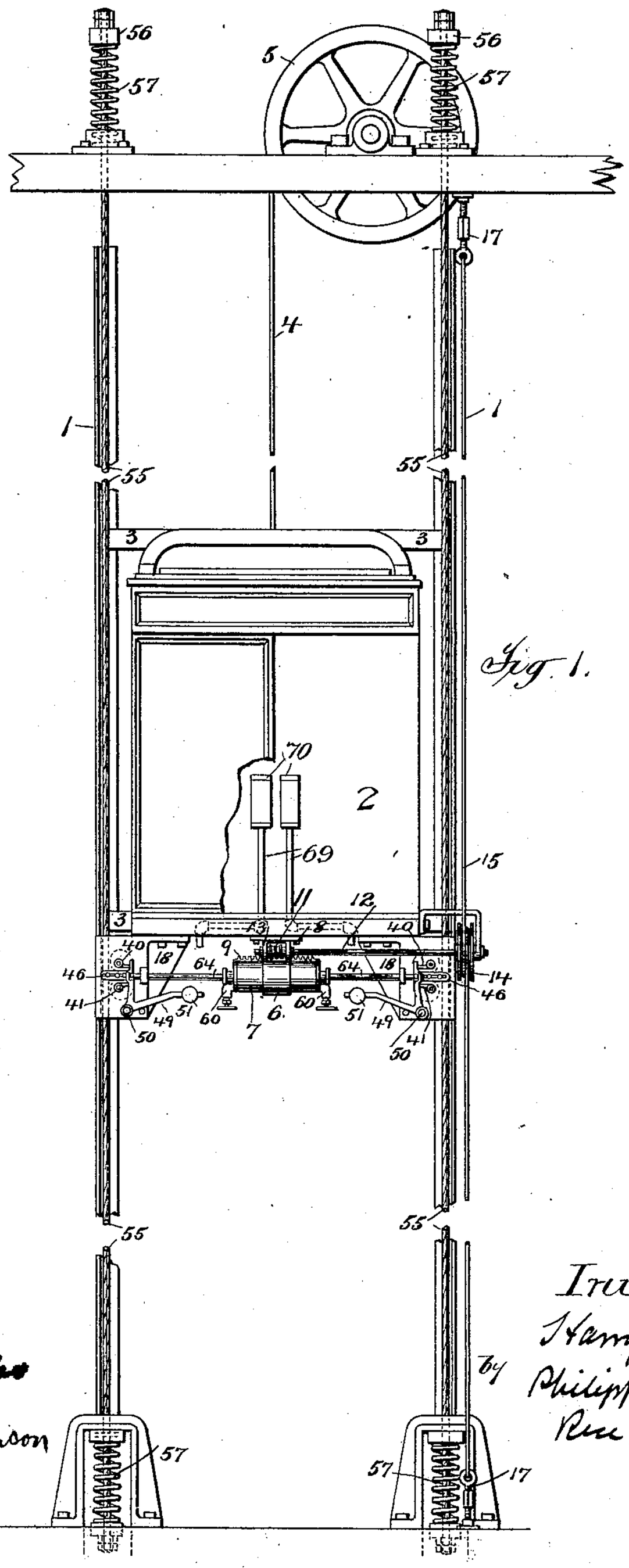

Fig. 1.

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(No Model.) 3 Sheets—Sheet 2.

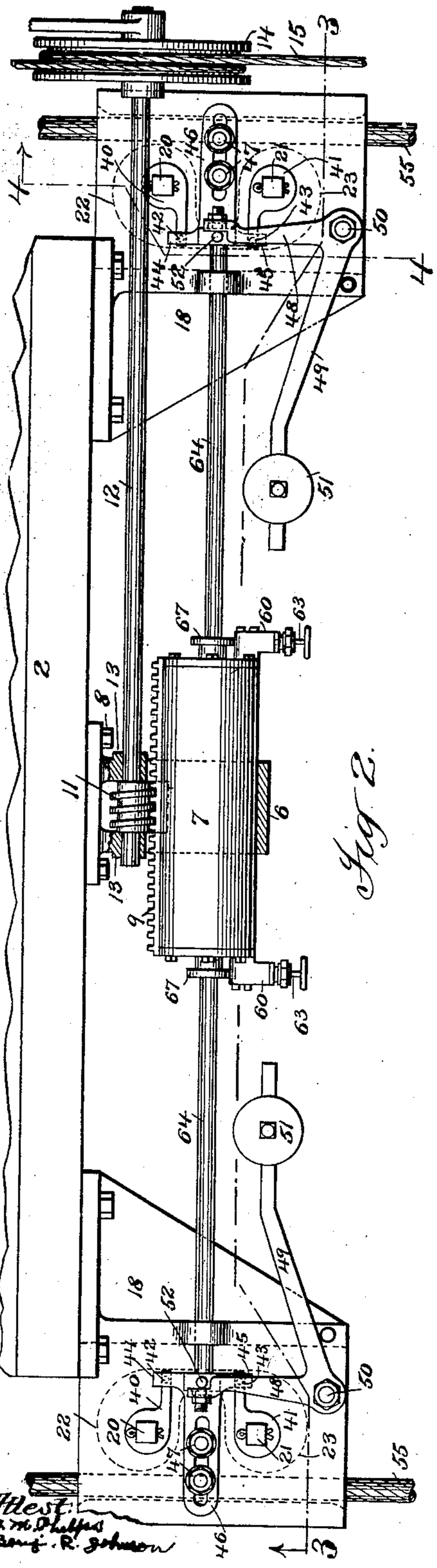

Fig. 2.

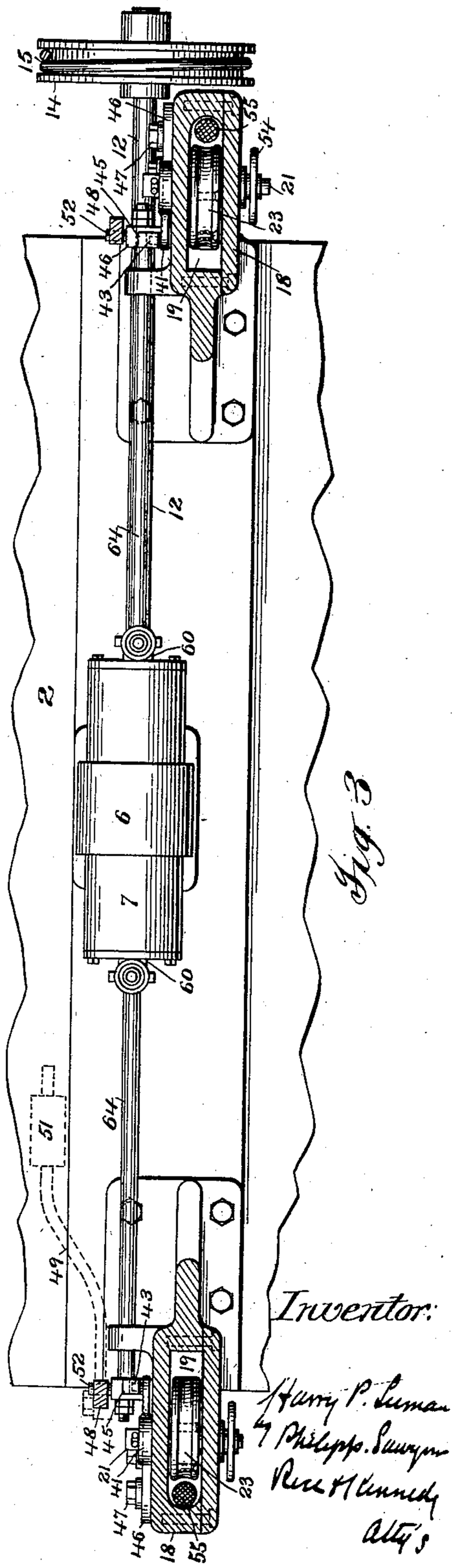

Fig. 3.

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(No Model.) 3 Sheets—Sheet 3.

Fig. 4.

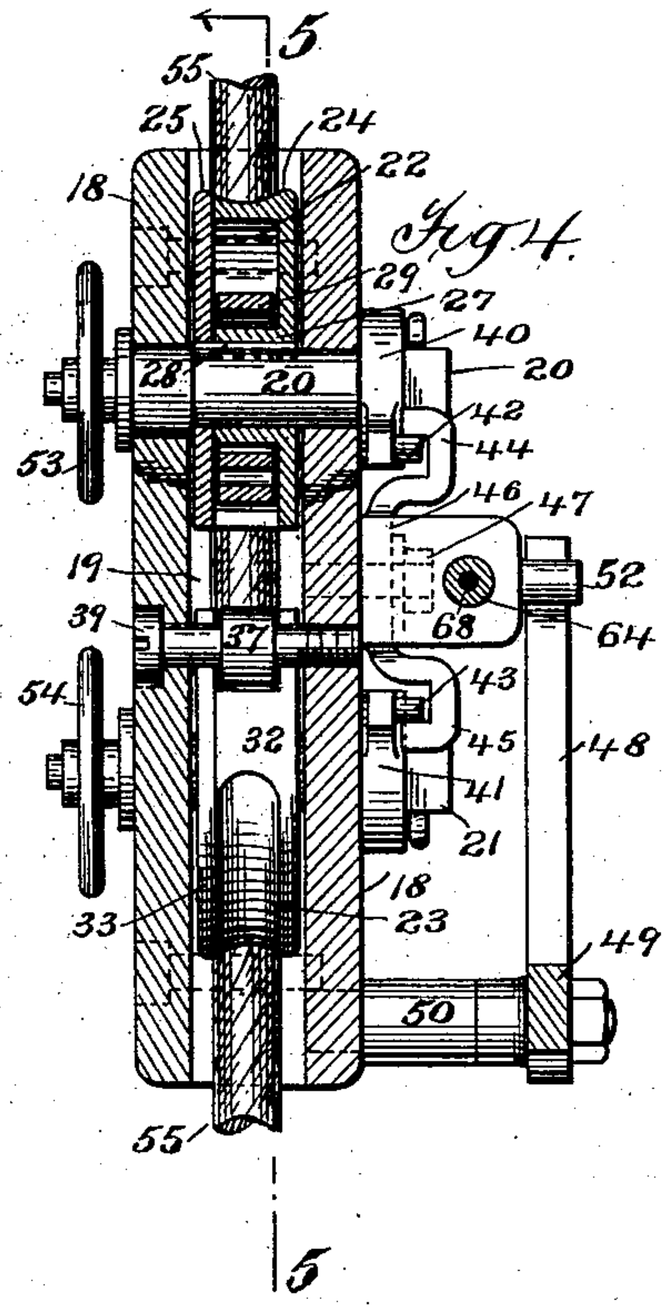


Fig. 5.

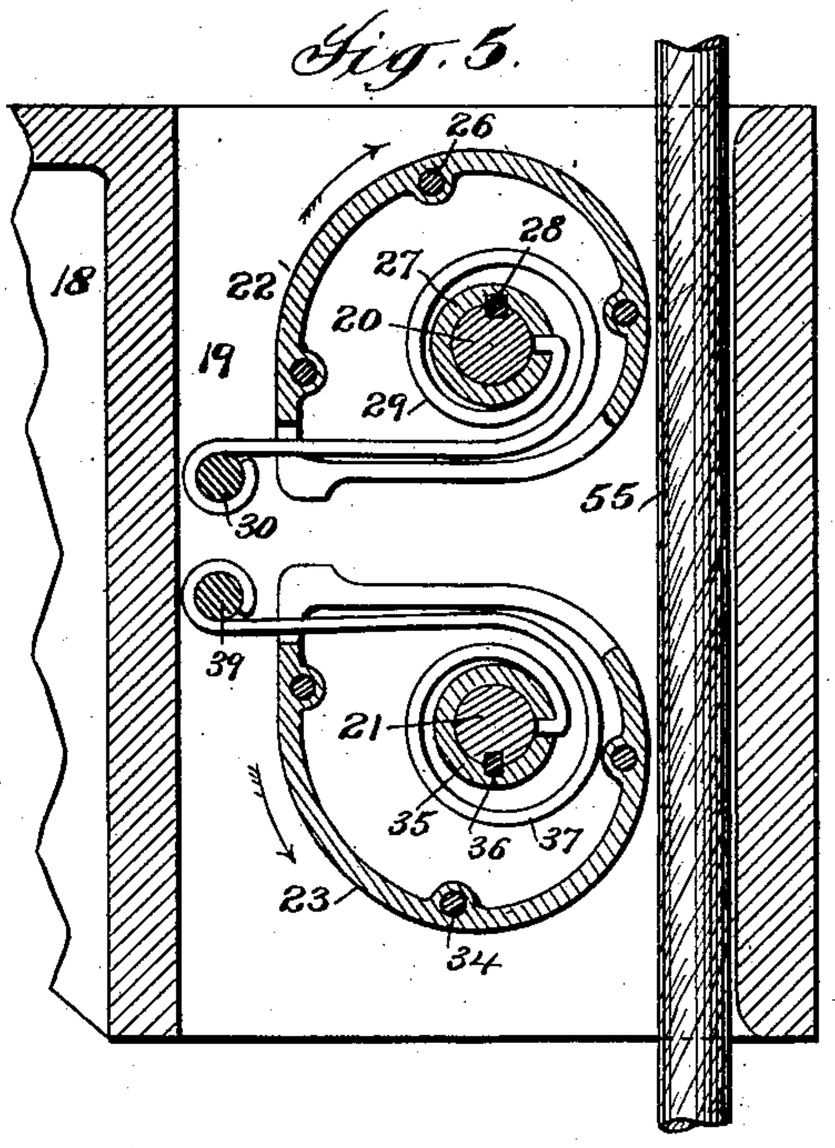


Fig. 7.

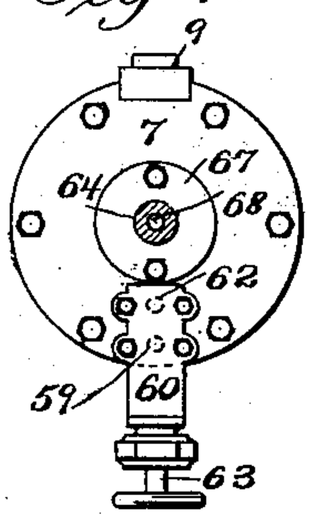


Fig. 6.

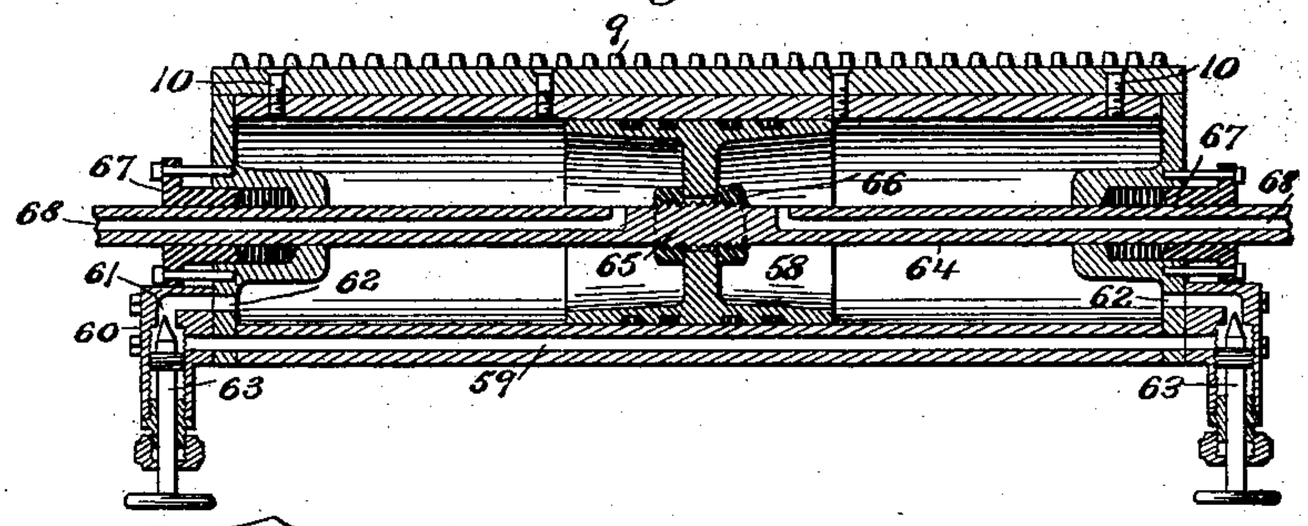
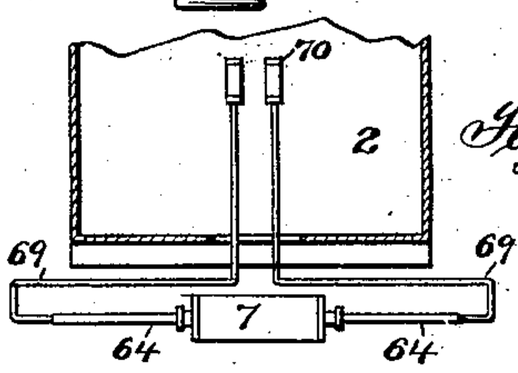


Fig. 8.



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UNITED STATES PATENT OFFICE.

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SAFETY APPLIANCE.

SPECIFICATION forming part of Letters Patent No. 699,035, dated April 29, 1902.

Application filed April 18, 1901. Serial No. 56,457. (No model.)

To all whom it may concern:

Be it known that I, HARRY P. SUMAN, a citizen of the United States, residing at Baltimore, State of Maryland, have invented certain new and useful Improvements in Safety Appliances, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to certain improvements in safety appliances.

In Patent No. 623,080, granted April 11, 1899, to F. L. Ellingwood and C. W. Schumann, Jr., as assignee of said Ellingwood, there is disclosed a safety appliance more particularly intended for use with elevators, though capable of use in other relations, in which the stopping mechanism, which is normally held out of action, is released through connections operated from a cylinder arranged to contain a fluid, and preferably a liquid. This fluid-containing cylinder is normally stationary, and in it reciprocates a piston, a by-pass being provided, which allows the liquid or fluid to circulate from one side of the piston to the other. This by-pass is so arranged as to allow a definite quantity of the fluid per unit of time to pass from one side of the piston to the other, and the movement of the piston is produced by the movement of the car and corresponds to that movement. If the movement of the car is increased so as to exceed a fixed or normal rate, the by-pass will not permit the escape of the additional fluid necessary to allow the piston to increase its rate of movement. Under these circumstances the cylinder is moved by the pressure of the piston on the fluid contained in the cylinder, and this movement of the cylinder releases the locking mechanism.

The present invention has for its object to improve and simplify the construction of the safety appliance described in the said patent.

With this and other objects in view the invention consists in certain parts, improvements, and combinations, which will be hereinafter described, and more fully pointed out in the claims hereunto appended.

Referring to the drawings, which form a part of this specification, and in which like characters of reference indicate similar parts, Figure 1 is a diagrammatic view of an elevator-shaft fitted with the improved appliance. Fig. 2 is a side elevation, on an enlarged scale, of the bottom of the elevator-car and the safety appliance. Fig. 3 is an under side sectional plan view taken on the line 3 3 of Fig. 2. Fig. 4 is a sectional view on the line 4 4 of Fig. 2 looking in the direction of the arrow in said figure. Fig. 5 is a sectional view on the line 5 5 of Fig. 4. Fig. 6 is a central sectional elevation of the cylinder which forms part of the apparatus. Fig. 7 is an end view of the construction shown in Fig. 6. Fig. 8 is a detail view on a smaller scale.

In the embodiment of the invention selected for illustration 1 indicates the ordinary guides or ways of an elevator-shaft, 2 indicates the car, and 3 the guides carried by the car and engaging the ways 1, all of which parts may be of usual or any construction.

The car may be raised and lowered by any of the well-known mechanisms. It is herein shown as raised and lowered by means of a cable 4, passing over a pulley 5, the end of the cable being connected to any suitable source of power.

According to the present invention a movable cylinder is substituted for the normally stationary cylinder, which forms a part of the construction illustrated in the patent referred to. This movable cylinder may be variously located and arranged. In the preferred form of the construction, however, it is mounted on the car, any suitable supporting means being employed. As shown, the supporting means consist of a bracket 6, having a wide supporting-surface in the form of a band which passes around the cylinder, the cylinder in the present construction being marked 7. This bracket 6 is secured to the under side of the car in any suitable manner, as by bolts 8.

The means for moving the cylinder may be varied within wide limits. In the construction shown the cylinder is provided with a rack 9, which may be secured to it in any suitable manner, as by screws 10. This rack is engaged by a worm 11, which is mounted on a worm-shaft 12, said shaft being support-

ed at one end in bearings 13, which are formed in the bracket 6. This shaft 12 is given a movement which corresponds to the rate of movement given to the car, so that the cylinder may have a similar movement. The means by which this movement is imparted to the shaft may be varied within wide limits; but they are preferably operated by the movement of the car itself. In the construction shown the shaft carries a pulley 14, around which passes a standing cable 15, said cable being supported in any suitable manner, as by loops and turnbuckles 17 at the top and bottom of the elevator-shaft. As the car moves up and down, therefore, the shaft will be rotated at a rate of speed corresponding to the movement of the car and will in turn impart a similar movement to the cylinder 7.

The stopping devices employed may be of any suitable or desired description. Preferably, however, they will be generally similar to those disclosed in the patent referred to. In the construction of the patent, however, a single set of stopping devices is shown, located on one side of the car only, whereas in the present construction two sets of said devices are employed, a set being mounted on each side of the car. In the present construction the under side of the car is provided with brackets 18, one bracket being located on each side of the car. Each of these brackets is recessed, as shown at 19, and serves to support shafts 20 and 21, said shafts being mounted in suitable bearings. The shafts 20 and 21 support rotary cams 22 and 23. The cam 22 is formed of two parts 24 and 25, said parts being secured together in any suitable manner, as by pins or screws 26, and the part 24 has formed integral therewith a hub 27, said hub being secured to the shaft in any suitable manner, as by means of a key 28. In the construction shown this cam is normally held out of operative position by means to be hereinafter described and is thrown into operative position by means of a spring 29, said spring being secured to the hub 27, being coiled around said hub, and passing out through a recess in the part 26, its outer end being secured to a pin 30, located in the recess 19. The rotary cam 23, supported on the shaft 21, is also composed of two parts 32 and 33, secured together by means of pins or bolts 34, the part 32 having a hub 35 formed integral therewith, said hub being secured to the shaft 21 by means of a key 36. This cam is also normally held in inoperative position and is thrown into action by means of a spring 37, which is secured to the hub 35, passes out through a recess in the cam, and is secured to a pin 39 in the recess 19. These rotary cams are arranged so that their springs throw them in opposite directions. The cams may be held in inoperative position by any suitable means. As shown, however, the shaft 20 is provided with an arm 40 and the shaft 21 with a similar arm 41. These arms carry pins 42 and 43, which are engaged under bent arms 44 and 45, which extend from a slide 46, said slide being mounted on the brackets 18, before referred to. Bolts 47, which pass through a slot in the slide, hold it in position and permit its movement. Means are preferably provided for holding the slides in the position in which their bent arms engage the pins on the levers 40 and 41 and for returning them to their locking position after they have been operated. These means may be of any suitable character; but, as shown, each bracket 18 supports a bell-crank lever 48 49, said levers being pivoted on studs 50, which extend outward from the brackets. The arm 49 of the bell-crank carries a weight 51, and the arm 48 takes behind a pin 52, which extends from the slide before referred to.

It will be apparent that when the slides are moved the bent arms 44 and 45 will release the pins 42 and 43 and permit the springs 29 and 37 to throw the cams, and it will be further seen that the bell-crank levers referred to will, when they are permitted to act, return the slides to their normal position and hold them there. Each of the shafts 20 and 21 may be provided with suitable means—as, for instance, hand-wheels 53 and 54—to return their cams to inoperative position against the stress of the spring.

Any suitable means may be provided to cooperate with the cams to enable them to perform their stopping function. As shown, two standing cables 55 are provided, the ends of said cables carrying nuts 56, which bear against springs 57, located at the top and bottom of the elevator-shaft, so that the cables are spring-supported and will yield when drawn in either direction. These cables pass through the recesses 19, before referred to, and the cams when operated by their springs grip the cables, the outer walls of the recesses serving as gripping-jaws, which coöperate with the cams. It will be noted that since the cams are thrown in opposite directions the cables will be gripped by one cam of each pair when the elevator-car is moving upward and by the other cam of each pair when the elevator-car is moving downward.

The cams are thrown into operation through means actuated by the movable cylinder 7, which has already been described. The means by which the movable cylinder effects the operation of the cams may be varied within wide limits. Preferably, however, and as shown, the cylinder is provided with a piston 58, which is normally stationary in the cylinder. To permit the piston to remain stationary while the cylinder moves, a suitable by-pass is provided, which permits the liquid or fluid in the cylinder to circulate from one side of the piston to the other. As shown, this by-pass is formed integral with the cylinder, though it might be separate therefrom, and consists of a passage 59, which communicates with valve-casing 60, secured to the ends of the cylinder in any suitable manner. These valve-casings 60 are provided with passages

61, which register with openings 62, formed in the ends of the cylinder. The size of these passages 61, and consequently the amount of liquid or fluid which is allowed to pass therethrough, is controlled by means of valves 63, which may be of any ordinary description. It will be seen that by regulating the openings by means of the valves the amount of liquid which is allowed to circulate through the by-pass may be controlled so that the piston will remain stationary for any given rate of movement of the cylinder. When, however, the rate of movement of the cylinder is increased beyond the given or normal rate, the by-pass will not permit the escape of the liquid or fluid with sufficient rapidity to permit the piston to remain stationary, and the piston will therefore be compelled to partake of the movement of the cylinder.

The connections by which the movement of the piston effects the movement of the stopping mechanism may be varied within wide limits. As shown, however, a rod 64 passes through said piston, a suitable perforation being provided in the head of the piston for this purpose. This rod 64 is shown as provided with an intermediate threaded portion 65, and nuts 66 serve to hold the rod stationary with respect to the piston. This rod passes through suitable stuffing-boxes 67 of any ordinary description in the heads of the cylinder, and the ends of the rod are directly connected, as shown, to the slides 46, before described. Any movement of the piston, therefore, will operate to move the slides, disengage the bent arms from the pins, and permit the springs to throw the cams into operation. It may be here remarked that the cams are so shaped that any movement of the car after the cams come into operation tends to increase their gripping action.

Suitable indicating-gages are preferably provided, so that any loss of fluid from the cylinder may be detected. While these gages may be arranged in any desired manner, in the construction shown the rod 64 is provided with longitudinal perforations 68, which open into the interior of the cylinder. Suitable pipes 69 communicate with said perforations at any suitable point. As shown, the perforations extend through the rod, and the pipes 69 are connected to the ends thereof. These pipes terminate in cups 70, located inside the elevator-car.

The operation of the construction, briefly stated, is as follows: When a car or carrier—as, for instance, an elevator-car—is moving at a normal rate of speed or below the same, the movement of the cylinder 7, produced by the shaft 12, will cause the fluid in the cylinder to circulate through the by-pass 59 from one side of the piston 58 to the other. So long as the car or carrier, therefore, is moving at the normal rate of speed or below it there will be no movement of the piston. Whenever, however, the speed of the car or carrier in either direction exceeds the normal rate of speed, the by-pass will not allow the increased circulation of the fluid which is necessary to permit it to circulate in the manner described. The movement of the cylinder, therefore, under these circumstances produces a movement of the piston 58, which in turn through its connecting-rod operates the locking-slides and releases the gripping-cams. These cams are immediately thrown into operation by their springs, force the standing cables against the outer walls of the recesses through which the cables pass, and bring the elevator to a stop.

While any suitable fluid might be used in the cylinder to produce the best results, a non-compressible liquid—like oil, water, or alcohol—should be used in the cylinder, though air or gas which is capable of a certain amount of compression might be used. The use of a compressible fluid is not, however, deemed to be desirable.

While the construction described is an effective one for carrying out the invention, it is to be understood that many changes and variations may be made therein. The invention is not, therefore, to be limited to the specific details of construction hereinbefore described.

What is claimed is—

1. In a safety appliance, the combination with a car or carrier, of a cylinder, means for giving the cylinder a movement corresponding to the rate of movement of the car or carrier, stopping devices, and means actuated by the cylinder when its movement exceeds the normal rate for throwing the stopping devices into action, substantially as described.

2. In a safety appliance, the combination with a car or carrier, of a cylinder, means operated by the movement of the car for giving the cylinder a movement corresponding to the rate of movement of the car or carrier, stopping devices, and means actuated by the cylinder when its movement exceeds the normal rate for throwing the stopping devices into action, substantially as described.

3. In a safety appliance, the combination with a car or carrier, of a cylinder mounted thereon, means operated by the movement of the car or carrier for giving the cylinder a movement corresponding to the rate of movement of the car or carrier, stopping devices, and means actuated by the cylinder when its movement exceeds the normal rate for throwing the stopping devices into action, substantially as described.

4. In a safety appliance, the combination with a car or carrier, of a cylinder, means for giving the cylinder a movement corresponding to the rate of movement of the car or carrier, a normally stationary piston in the cylinder, stopping devices, means whereby the cylinder causes a movement of the piston when the movement of the cylinder exceeds the normal rate, and means whereby the piston throws the stopping devices into action, substantially as described.

5. In a safety appliance, the combination with a car or carrier, of a cylinder, means operated by the movement of the car or carrier for giving the cylinder a movement corresponding to the rate of movement of the car or carrier, stopping devices, a normally stationary piston in the cylinder, means whereby the cylinder causes a movement of the piston when the movement of the cylinder exceeds the normal rate, and means whereby the piston throws the stopping devices into action, substantially as described.

6. In a safety appliance, the combination with a car or carrier, of a cylinder mounted thereon, means operated by the movement of the car or carrier for giving the cylinder a movement corresponding to the rate of movement of the car or carrier, stopping devices, a normally stationary piston in the cylinder, means whereby the cylinder causes a movement of the piston when the movement of the cylinder exceeds the normal rate, and means whereby the piston throws the stopping devices into action, substantially as described.

7. In a safety appliance, the combination with a car or carrier, of a liquid-containing cylinder mounted thereon, means for giving the cylinder a movement corresponding to the rate of movement of the car or carrier, a piston located in the cylinder, means for permitting the circulation of the liquid from one side of the piston to the other, said means being constructed to allow the passage of a definite amount of liquid, whereby the piston remains stationary when the cylinder is moving at a normal rate but is caused to move when the movement of the cylinder exceeds the normal rate, stopping devices, and means whereby the movement of the piston throws the stopping devices into action, substantially as described.

8. In a safety appliance, the combination with a car or carrier, of a liquid-containing cylinder mounted thereon, means operated by the movement of the car or carrier for giving the cylinder a movement corresponding to the rate of movement of the car or carrier, a piston located in the cylinder, means for permitting the circulation of the liquid from one side of the piston to the other, said means being constructed to allow the passage of a definite amount of liquid, whereby the piston remains stationary when the cylinder is moving at a normal rate but is caused to move when the movement of the cylinder exceeds the normal rate, stopping devices, and means whereby the movement of the piston throws the stopping devices into action, substantially as described.

9. In a safety appliance, the combination with a car or carrier, of a liquid-containing cylinder mounted thereon, means operated by the movement of the car or carrier for giving the cylinder a movement corresponding to the rate of movement of the car or carrier, a normally stationary piston located in the cylinder, a valve-controlled by-pass leading from one side of the piston to the other, said by-pass being constructed to allow the circulation of a definite amount of liquid, whereby the piston remains stationary when the cylinder is moving at a normal rate but is caused to move when the movement of the cylinder exceeds the normal rate, stopping devices, and means whereby the movement of the piston throws the stopping devices into action, substantially as described.

10. In a safety appliance, the combination with a car or carrier, of a liquid-containing cylinder mounted thereon, means operated by the movement of the car or carrier for giving the cylinder a movement corresponding to the rate of movement of the car or carrier, stopping devices, a locking mechanism for rendering the stopping devices normally inoperative, and means actuated by the cylinder when its movement exceeds the normal rate for releasing the locking mechanism, substantially as described.

11. In a safety appliance, the combination with a car or carrier, of a liquid-containing cylinder mounted thereon, means operated by the movement of the car or carrier for giving the cylinder a movement corresponding to the rate of movement of the car or carrier, a normally stationary piston located in the cylinder, means whereby when the movement of the cylinder exceeds its normal rate the piston is moved, stopping devices, a locking mechanism for rendering said stopping devices normally inoperative, and connections between the piston and the locking devices, whereby the movement of the piston releases the locking mechanism and throws the stopping devices into operation, substantially as described.

12. In a safety appliance, the combination with a car or carrier, of a liquid-containing cylinder mounted thereon, means operated by the movement of the car or carrier for giving the cylinder a movement corresponding to the rate of movement of the car or carrier, a piston, a valve-controlled by-pass leading from one side of the piston to the other, said by-pass being constructed to allow the circulation of a definite amount of liquid, whereby the piston remains stationary when the cylinder is moving at a normal rate but is caused to move when the movement of the cylinder exceeds the normal rate, stopping devices, locking mechanism therefor for rendering the stopping devices normally inoperative, and connections between the piston and the locking mechanism whereby the movement of the piston releases the locking mechanism, substantially as described.

13. In a safety appliance, the combination with a car or carrier, of a liquid-containing cylinder supported thereon, a shaft also supported thereon, means whereby the movement of the car or carrier causes the rotation of the shaft, connections between the shaft and the cylinder, whereby the rotation of the

shaft causes a movement of the cylinder, a piston located in the cylinder, a valve-controlled by-pass leading from one side of the piston to the other, said by-pass being constructed to allow the circulation of a definite amount of liquid, whereby the piston remains stationary when the cylinder is moving at a normal rate but is caused to move when the movement of the cylinder exceeds the normal rate, stopping devices, locking mechanism therefor for rendering the stopping devices normally inoperative, and connections between the piston and the locking mechanism whereby the movement of the piston releases the locking mechanism, substantially as described.

14. In a safety appliance, the combination with a car or carrier, of a liquid-containing cylinder mounted thereon, a cable located alongside the path of movement of the car or carrier, a shaft mounted on the car or carrier, a pulley on the shaft around which the cable passes, gearing between the shaft and the cylinder, a piston located in the cylinder, a valved by-pass leading from one side of the piston to the other, said by-pass being constructed to allow the circulation of a definite amount of liquid, whereby the piston remains stationary when the cylinder is moving at a normal rate but is caused to move when the movement of the cylinder exceeds the normal rate, stopping devices, locking mechanism therefor for rendering the stopping devices normally inoperative, and connections between the piston and the locking mechanism whereby the movement of the piston releases the locking mechanism, substantially as described.

15. In a safety appliance, the combination with a car or carrier, of a cylinder mounted thereon, means operated by the movement of the car or carrier for giving the cylinder a movement corresponding to the rate of movement of the car or carrier, stopping devices, locking mechanism including a slide for rendering the stopping devices normally inoperative, and means actuated by the movement of the cylinder for moving the slide and releasing the stopping devices, substantially as described.

16. In a safety appliance, the combination with a car or carrier, of a liquid-containing cylinder mounted thereon, means operated by the movement of the car or carrier for giving the cylinder a movement corresponding to the rate of movement of the car or carrier, a piston located in the cylinder, a valved by-pass leading from one side of the piston to the other, said by-pass being constructed to allow the circulation of a definite amount of liquid whereby the piston remains stationary when the cylinder is moving at a normal rate but is caused to move when the movement of the cylinder exceeds the normal rate, stopping devices, locking mechanism including a slide for rendering the stopping devices normally inoperative, and means actuated by the movement of the piston for moving the slide and releasing the stopping devices, substantially as described.

17. In a safety appliance, the combination with a car or carrier, of a cylinder mounted thereon, means for giving the cylinder a movement corresponding to the rate of movement of the car or carrier, stopping devices located on each side of the car or carrier, a normally stationary piston located in the cylinder, means actuated by the cylinder when its movement exceeds the normal rate for operating the piston, and connections between the piston and the stopping devices whereby the movement of the piston throws the stopping devices into operation, substantially as described.

18. In a safety appliance, the combination with a car or carrier, of a cylinder mounted thereon, means for giving the cylinder a movement corresponding to the rate of movement of the car or carrier, stopping devices located on each side of the car or carrier, locking mechanisms for rendering said stopping devices normally inoperative, a normally stationary piston located in the cylinder, means actuated by the cylinder when its movement exceeds the normal rate for operating the piston, and connections between the piston and the locking mechanisms whereby the movement of the piston releases the locking mechanisms, substantially as described.

19. In a safety appliance, the combination with a car or carrier, of a liquid-containing cylinder mounted thereon, means for giving the cylinder a movement corresponding to the rate of movement of the car or carrier, a piston located in the cylinder, a valved by-pass leading from one side of the piston to the other, said by-pass being constructed to allow the circulation of a definite amount of liquid whereby the piston remains stationary when the cylinder is moving at a normal rate but is caused to move when the movement of the cylinder exceeds the normal rate, stopping devices located on each side of the car or carrier, locking mechanisms for rendering said stopping devices normally inoperative, and connections between the piston and the locking mechanisms whereby the movement of the piston releases the locking mechanisms, substantially as described.

20. In a safety appliance, the combination with a car or carrier, of a liquid-containing cylinder mounted thereon, means for giving the cylinder a movement corresponding to the rate of movement of the car or carrier, a normally stationary piston located in the cylinder, a valved by-pass, two sets of stopping devices, one located on each side of the car or carrier, a locking mechanism for each set of stopping devices, said locking mechanism including a slide, and a connecting-rod extending from each side of the piston to the slides whereby a movement of the piston operates the slides and releases the stopping devices, substantially as described.

21. In a safety appliance, the combination with a car or carrier, of a stopping device, locking mechanism including a slide for holding said device inoperative, means for holding the slide in operative position, and means including a fluid-containing cylinder for operating the slide to release the locking device, substantially as described.

22. In a safety appliance, the combination with a car or carrier, of a stopping device, locking mechanism including a slide for holding said device inoperative, means for holding the slide in operative position, a liquid-containing cylinder mounted on the car or carrier, means for giving the cylinder a movement corresponding to the rate of movement of the car or carrier, a normally inoperative piston located in said cylinder, connections between the piston and the slide, and means actuated by the cylinder when its movement exceeds the normal rate for moving the piston, substantially as described.

23. In a safety appliance, the combination with a car or carrier, of a stopping device, locking mechanism including a slide for holding said device inoperative, means for holding the slide in operative position, a liquid-containing cylinder mounted on the car or carrier, means for giving the cylinder a movement corresponding to the rate of movement of the car or carrier, a normally inoperative piston located in said cylinder, a valved by-pass, connections between the piston and the slide, and means actuated by the cylinder when its movement exceeds the normal rate for moving the piston, substantially as described.

24. In a safety appliance, the combination with a car or carrier, of a liquid-containing cylinder mounted thereon, a shaft also mounted thereon, gearing between the shaft and the cylinder, a cable located alongside the path of movement of the cylinder, a pulley on the shaft around which said cable passes, a normally stationary piston located in said cylinder, a valved by-pass, a set of stopping devices on each side of the car or carrier, said sets including normally inoperative clutches, a locking mechanism for each set of stopping devices, each of said locking mechanisms including a slide, counterweighted levers for holding the slides in operative positions, a rod connected to the piston and the slides whereby the movement of the piston moves the slides and releases the locking mechanisms, substantially as described.

25. In a safety appliance, the combination with a car or carrier, of a liquid-containing cylinder, means for giving the cylinder a movement, a normally stationary piston located in the cylinder, a perforated rod extending through the cylinder-head, stopping devices, an indicator-cup, and a pipe connecting the cup with the perforation in the rod, substantially as described.

26. In a safety appliance, the combination with a car or carrier, of a liquid-containing cylinder mounted thereon, means for giving the cylinder a movement corresponding to the rate of movement of the car or carrier, a normally stationary piston located in the cylinder, a perforated rod extending from opposite sides of the piston and passing through the cylinder-heads, stopping devices, connections between the rod and the stopping devices, indicator-cups, and pipes connecting the cups with the perforation in the rod, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

HARRY P. SUMAN.

Witnesses:
A. WHITE,
A. A. V. BOURKE.