No. 623,080. Patented Apr. 11, 1899.

F. L. ELLINGWOOD.

SAFETY APPLIANCE AND DEVICE FOR OPERATING SAME.

(Application filed Oct. 29, 1898.)

(No Model.) 3 Sheets—Sheet 1.

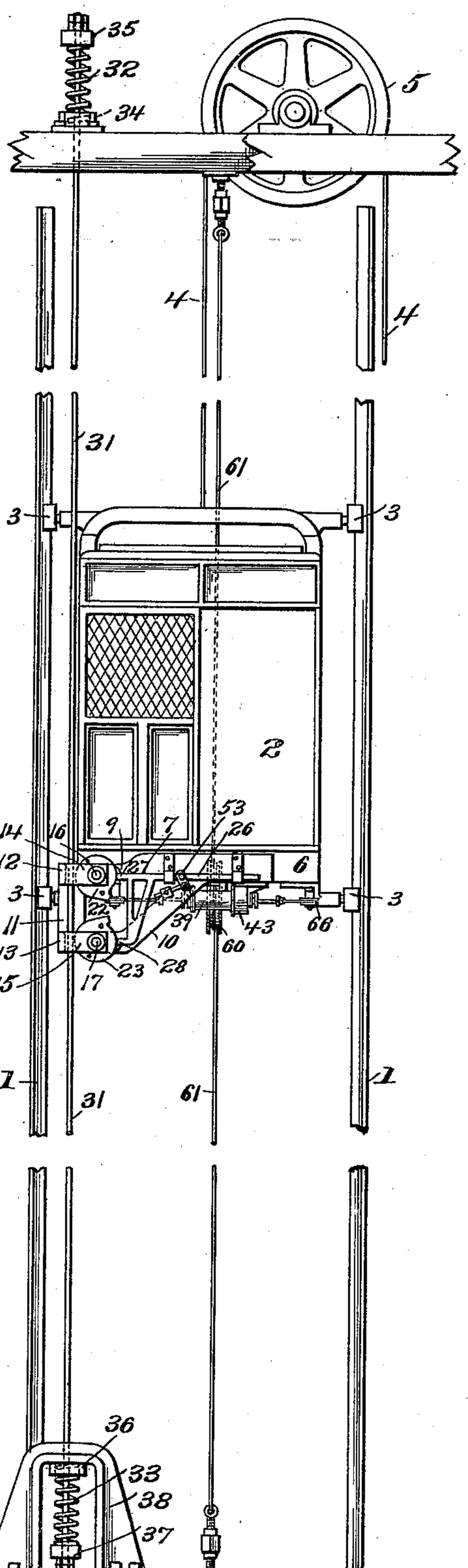

Fig. 1.

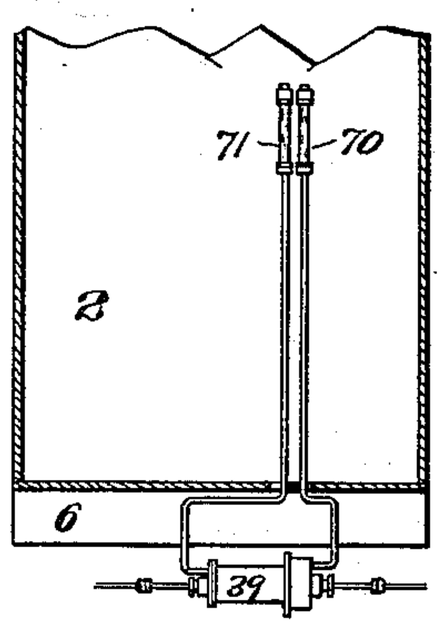

Fig. 7.

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Fig. 2

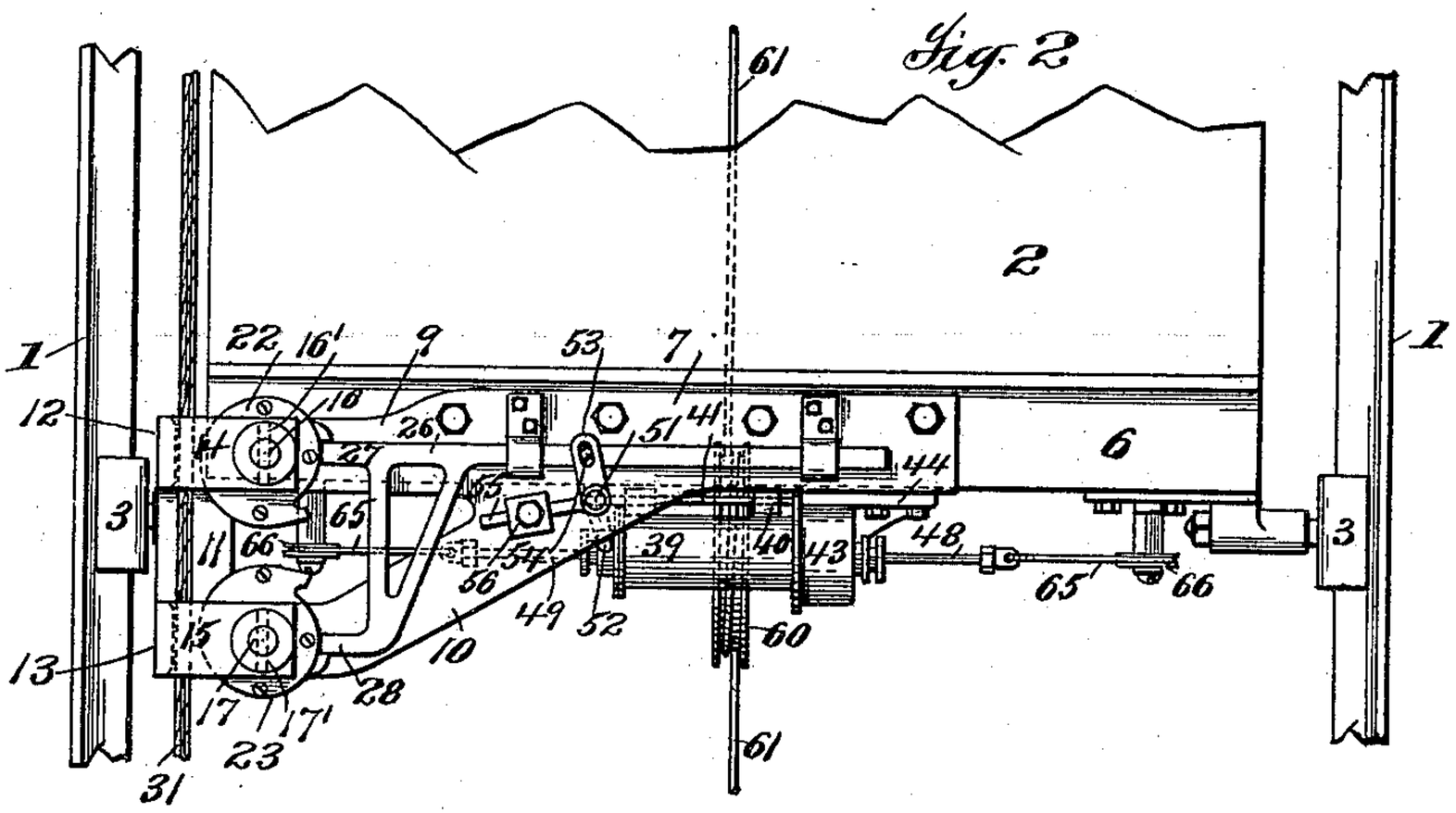
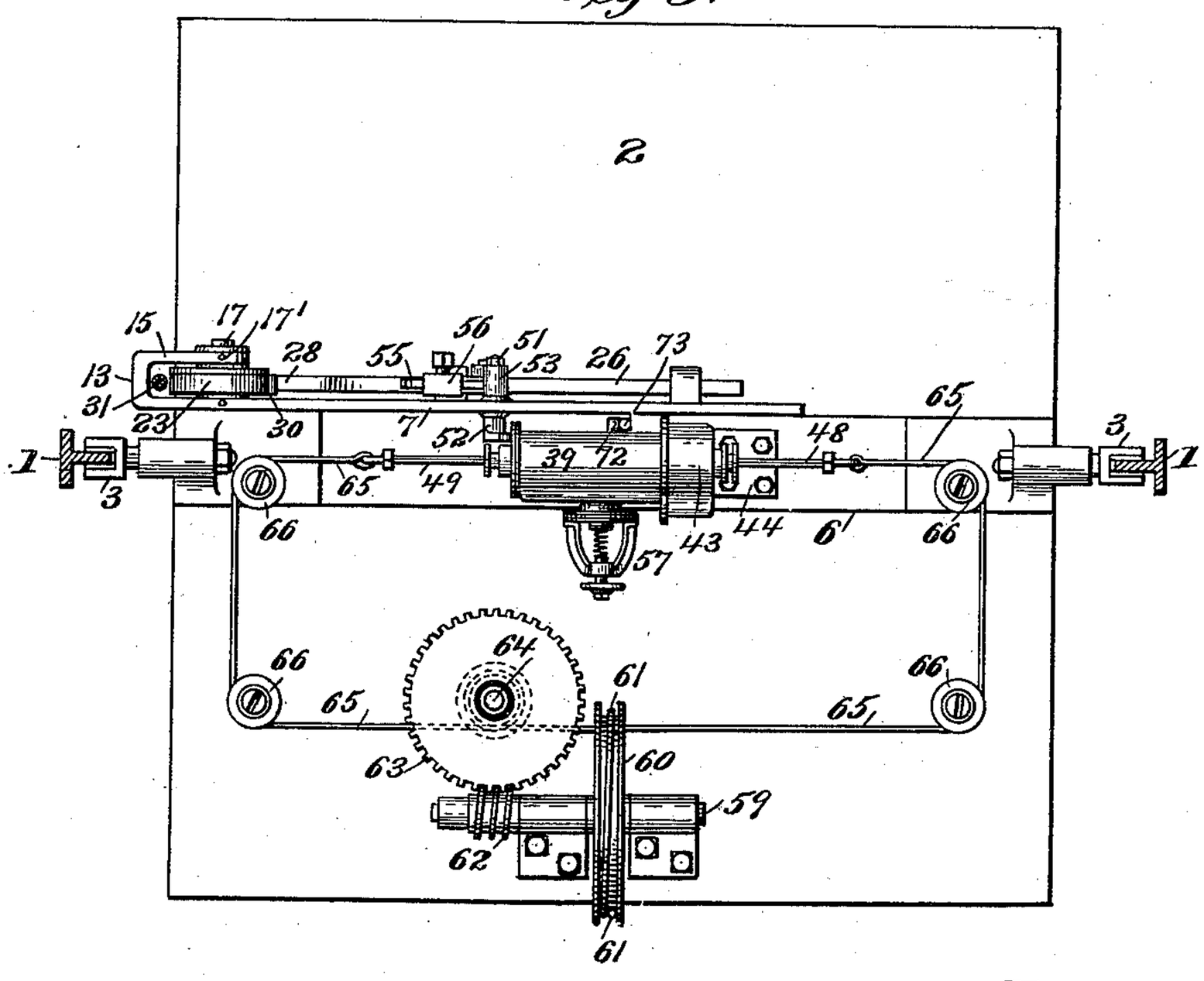


Fig. 3.



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(No Model.) 3 Sheets—Sheet 3.

Fig. 4.

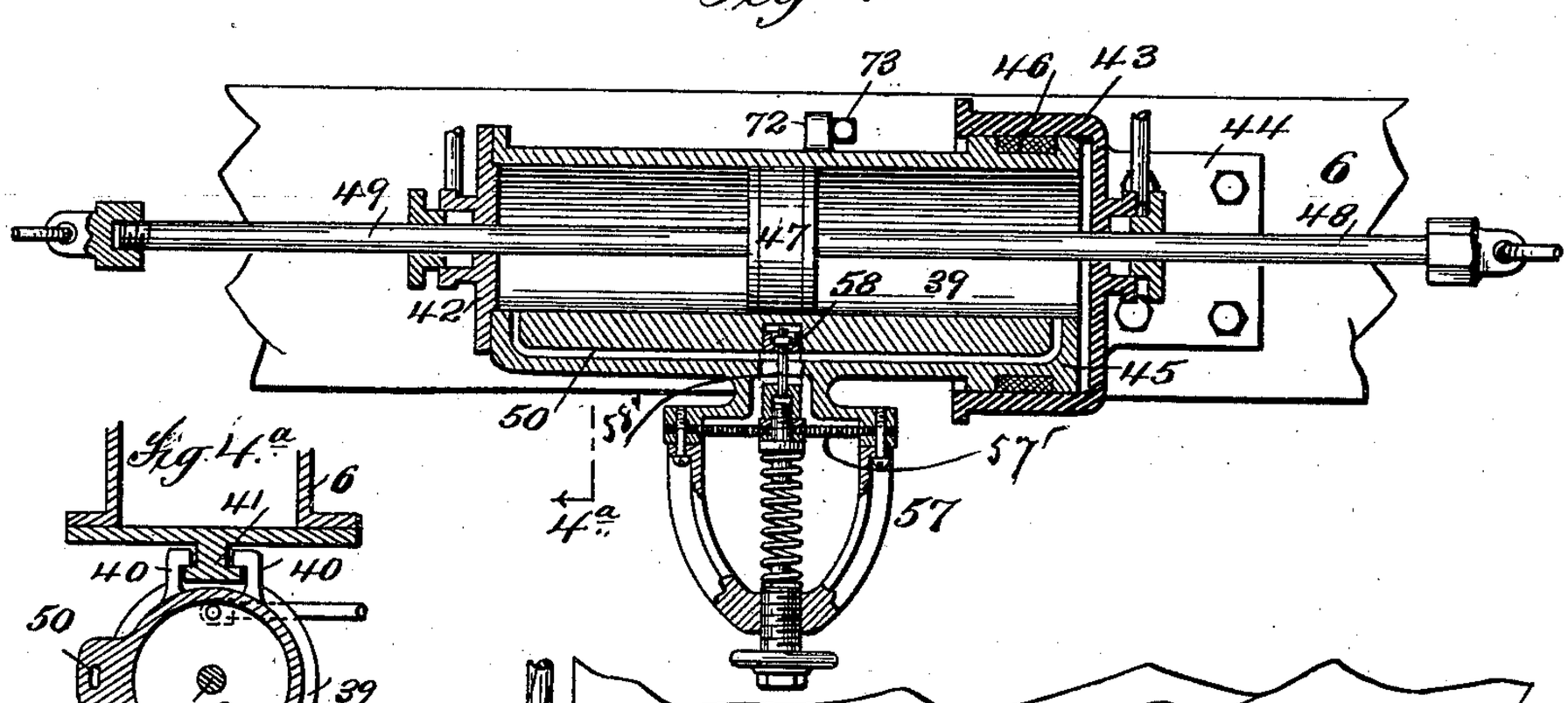


Fig. 4a.

Fig. 5.

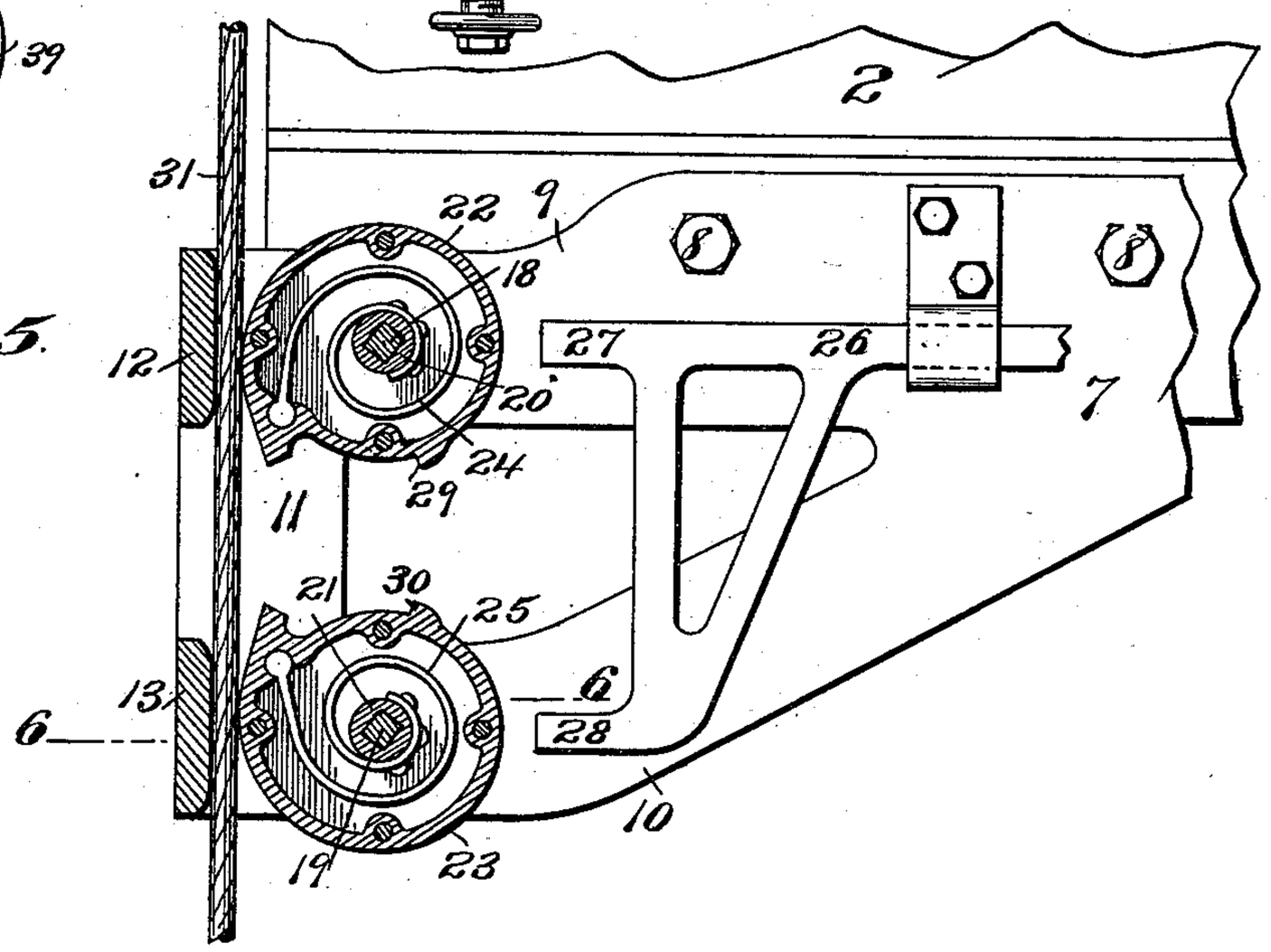
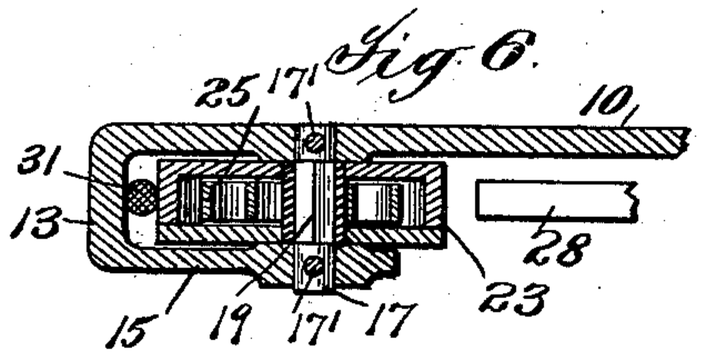


Fig. 6.



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UNITED STATES PATENT OFFICE.

FRANCIS L. ELLINGWOOD, OF NEW YORK, N. Y., ASSIGNOR OF THREE-FIFTHS TO CHARLES W. SCHUMANN, JR., OF ORANGE, NEW JERSEY.

SAFETY APPLIANCE AND DEVICE FOR OPERATING SAME.

SPECIFICATION forming part of Letters Patent No. 623,080, dated April 11, 1899.

Application filed October 29, 1898. Serial No. 694,895. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS L. ELLINGWOOD, a citizen of the United States, residing at New York city, county of New York, and State of New York, have invented certain new and useful Improvements in Safety Appliances and Devices for Operating the Same, 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.

There has been developed, more particularly in modern elevator construction, a demand for safety appliances which can be relied upon to absolutely stop the movement of an elevator-car when the necessity therefor arises, and to do so quickly and surely no matter in which direction the car is moving or what the peculiarities of the mechanism are by which the car is controlled or raised and lowered. Furthermore, some accidents occur where there is no breakage either of the operating mechanism of the car or of the controlling devices, but because control of the car is lost either by the elevator attendant or through failure on the part of the operating mechanism to properly perform its functions. The better classes of safety appliances have been constructed so as to be automatic in their action, being thrown into operation by any abnormal increase in speed of the car in either direction.

This invention relates generally to automatically-operated safety appliances, and has for its object to produce a device which will be cheap in construction and certain in its operation, which shall be applicable generally to all forms of elevators and in many other relations, which shall act to control or stop the movement of the car or other moving body to which it is applied while it is traveling in either direction, and in which any increase in speed above the maximum rate at which the elevator or other moving body is intended to be run shall act positively and quickly to throw the safety appliances into action.

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

In the accompanying drawings, which form a part of this specification, and in which like numerals of reference indicate the same parts, Figure 1 is a diagrammatic view of an elevator and shaft fitted with my improved safety appliance. Fig. 2 is a detail side view, on an enlarged scale, of the improved safety appliance. Fig. 3 is an under side plan view of the construction shown in Fig. 2. Fig. 4 is a detail view showing a horizontal section of the fluid-containing cylinder, on an enlarged scale. Fig. 4ª is a horizontal section of the fluid-containing cylinder, showing the supporting devices, the section being taken on the line 4ª of Fig. 4. Fig. 5 is an enlarged detail view of the clutches or gripping devices and bolt for releasing it, the clutches being shown in section. Fig. 6 is a detail sectional view of one of the clutching devices, the section being taken on the line 6 6 of Fig. 5. Fig. 7 is a diagrammatic view showing the fluid-containing cylinder and the gages connected thereto.

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 any approved 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.

Various kinds of stopping or clutching mechanisms may be used to control the elevator. In the form which has been selected to illustrate the invention the car is provided, preferably, on its under side with a beam or brace 6, to which is secured a supporting-bracket 7 in any suitable manner, as by means of bolts 8. The bracket 7 is formed with two arms 9 and 10, the outer ends of these arms being preferably connected by a web 11. The outer ends of the arms are bent around, as at 12 13, to provide stationary jaws, which

coöperate with certain movable clutch members, to be hereinafter described. The ends of the arms 9 and 10 beyond the jaw-forming portions are preferably bent back, as at 14 15. Between the bent end 14 and the arm 9 is mounted a stationary shaft 16, and a similar shaft 17 is mounted between the arm 10 and end 15, the shafts being held from turning in any suitable manner, as by pins 16′ 17′. Each of these shafts is provided with a squared central portion 18 19, and on these squared central portions are mounted collars 20 21, the collars being kept from turning by the squared contour of the shaft. Eccentrically journaled on the collars 20 21 are two rotary clutch members consisting of rotary cams 22 23. These cams are thrown into action by springs 24 25, these springs having one end secured to the central collars and their other ends being connected to the rotary cams in the manner shown or in any other suitable way. The springs are so arranged that they tend to turn the rotary cams in opposite directions, but in each case to throw the eccentric portions toward the stationary jaws 12 13. The rotary cams are normally held out of action by means of a sliding locking-bolt 26, having two locking projections 27 28, which projections engage with projections 29 30 on the rotary cams 22 23, respectively.

The rotary cams and the stationary jaws before described form gripping devices by which the elevator may be stopped when it is moving in either direction, means being provided which may be seized by these gripping devices.

Various forms of devices may be located in the elevator-shaft to coöperate with the gripping mechanism heretofore described. In the present form of the invention there is shown a standing cable 31, which is held in the elevator-shaft between the two strong springs 32 33, the spring 32 being located at or near the top of the shaft and the spring 33 at or near the bottom of the shaft. The spring 32 finds its bearing at one end in a socket 34 on a beam above the elevator-shaft and at the other end bears against a nut 35, which is suitably secured to the cable 31. The spring 33 bears at one end against a socket 36 and at its other end against a nut 37, secured to the end of the cable, the socket being located in a U-shaped angle-bracket 38, which is or may be firmly secured to the bottom of the shaft. The cable lies between the stationary jaws 12 13 and the rotary cams 22 23 in position to be gripped by one or the other of these cams when released, according as the car ascends or descends.

Various forms of releasing devices may be used to withdraw the bolt 26 and permit the rotary cams to be thrown out by their springs into engagement with the cable 31. Preferably, however, there is employed a fluid-containing cylinder 39, which is movably mounted on the beam 6. This cylinder has upwardly-projecting inturned arms 40, forming guides which engage a T-shaped projection 41 on the beam 6. The cylinder is closed at one end by a head 42, which may be fastened to the cylinder in any desired way. The other end of the cylinder is inserted into and coacts with a stationary cylinder-head 43, which is firmly secured by means of a bracket 44 to the beam 6. The cylinder is somewhat smaller in diameter than the stationary head and has an outwardly-turned flange 45 on the end which is inserted into the head, the area of the said flange being equal to the area of the head 42 of the cylinder. This flange is formed so as to make a fluid-tight joint between it and the head 43, and there is further provided a suitable packing, as 46, between the outwardly-turned flange of the cylinder and the head 43, so as to prevent the escape of any fluid from the cylinder.

Working in the cylinder 39 is a piston 47, having two piston-rods 48 and 49, each of these piston-rods passing through packed joints in the cylinder-heads. The cylinder is further provided with a by-pass 50, leading from one end of the cylinder to the other, this by-pass being gaged so as to permit the passage of the fluid from one side to the other of the piston as the piston reciprocates in the cylinder.

The amount or quantity of fluid flowing through the by-pass depends upon the rate of movement of the piston and the pressure exerted by it; but as the diameter of the by-pass is such that it will only permit, at the most, the passage of a given amount of fluid the rate of movement of the piston can only be increased up to the point where the by-pass will allow the fluid to escape from in front of it. So long, therefore, as the piston 47 reciprocates in the cylinder at or below the rate at which the by-pass will permit the fluid to escape from in front of it there will be no movement of the cylinder. When, however, the rate of movement of the piston is increased in either direction, since the by-pass will only permit the passage of a certain amount of fluid per unit of time, the pressure in the cylinder will be sufficient to cause the cylinder to move with relation to the stationary head 43.

The movement of the cylinder is utilized to operate the sliding bolt 26 in the following manner: Pivoted on the bracket 7 is a short rock-shaft 51, having an arm 52, which lies in the path of the moving cylinder-head. The rock-shaft is also provided with an arm 53, which loosely engages a pin 54 on the shank of the bolt 26. It is obvious that as the cylinder moves under the pressure of the fluid therein the rock-shaft will be operated to withdraw the bolts and permit the rotary cams 22 23 to be thrown out by their springs. The rock-shaft 51 is further provided with an arm 55, carrying an adjustable weight 56, which tends to keep the arm 52 in engage-

ment with the cylinder-head and the bolt 26 in its forward locking position.

Connected to the by-pass 50 of the cylinder 39 is a pressure-regulator 57. This regulator may be of any approved type. In the form shown it includes a flexible diaphragm 57′, to which is connected a valve-stem 58′, carrying a valve 58. The flexible diaphragm forms one side of a chamber which is preferably integral with the cylinder, this chamber being in connection with the by-pass 50. The valve 58 is normally inoperative, but so located as to be thrown into position to close the by-pass when the pressure on the pressure-regulator is abnormally increased, as it will be when there is any tendency on the part of the piston to reciprocate at more than its normal rate of speed.

Various devices may be used for causing a reciprocation of the piston, which shall be proportioned to the speed of the elevator-car. A convenient form of such device is, however, that shown in the drawings. The bottom of the car is provided with a short shaft 59, carrying a pulley 60, over which is passed a cable 61, which is secured to the top and bottom of the elevator-shaft. It is obvious that as the car moves up and down the pulley 60 will be turned by the cable 61. The shaft 59 is provided with a worm 62, which engages a gear-wheel 63, mounted on a short shaft 64, and provided with a drum, (best shown in dotted lines in Fig. 3,) around which passes a cable 65. This cable passes around suitable guides 66 and is connected by eyes to the piston-rods 48 49.

As the car rises and descends in its shaft the cable 61 will rotate the pulley or drum 60 and through the worm 62, the gear-wheel 63, and the cable 65 will cause the piston 47 to reciprocate in the cylinder 39. Inasmuch as the by-pass 50 is constructed to permit a flow per unit of time of the fluid from one end of the cylinder to the other equal to that which will be produced by the piston traveling at its maximum rate of speed there will be no operation of the safety devices until the maximum rate of speed is exceeded. As soon, however, as the elevator exceeds its maximum rate of speed the rate of movement per unit of time of the piston 47 will have to increase. As, however, the by-pass will not permit the fluid to escape from in front of the piston, the piston, acting through the non-compressible fluid directly against the head 42 when the piston is moving in one direction and against the flange 45 when the piston is moving in the opposite direction, will cause the cylinder itself in either case to move away from the stationary head. The pressure-regulator 51 also facilitates this action, since as soon as there is any increase in pressure on the fluid in the by-pass the regulator will be operated to entirely close the by-pass, thereby preventing any escape of fluid therethrough. As the cylinder moves away from its stationary head it operates the rock-lever 51, before described, and withdraws the bolt 26, thus allowing the springs 24 25 to throw the rotary cams. As has been before described, the springs tend to turn these cams in opposite directions, and the cams are so constructed that a movement of the car in one direction tends to tighten the grip of one of the cams on the cable 31 and loosen the grip of the other. If the car exceeds its normal speed when descending, the cam 23 will be thrown into operation and with its coöperating jaws 13 will grip the cable 31 and stop the car, the other gripping device running loose on the cable until the car is stopped. If, however, the car exceeds its normal speed in ascending, the rotary cam 22 will operate, in connection with its jaw 12 to grip the cable and stop the car, the other gripping devices running loose until the car is stopped.

The cylinder 39 is preferably provided with a pair of gages 70 71, one being connected to each end of the cylinder, so that any loss of fluid from the cylinder may be immediately detected.

To produce the best results, a non-compressible fluid like water, oil, or alcohol should be used in the cylinder, though air or gas which is capable of a certain amount of compression may be used. The use of a compressible fluid is not, however, recommended.

In order to avoid too close adjustment of the cylinder 39 to the cylinder-head 43, and thus prevent the fluid operating against the surface presented by the outwardly-turned flange 45, the cylinder is provided with a stop-lug 72, which engages with a stop-lug 73, depending from the beam 6 or connected to any other suitable part.

Many changes may be made in the details of the various constructions employed for carrying out this invention. It will be understood, therefore, that the invention is not to be limited to the specific details of construction, but embraces such changes therein as fall within its spirit and scope.

What is claimed is—

1. In a safety appliance, the combination with a moving body such as a car or carrier, of stopping devices, a locking mechanism holding the stopping devices normally out of action, a movable liquid-containing cylinder, and means whereby the movement of the cylinder is caused to operate the locking devices to release the stopping mechanism, substantially as described.

2. In a safety appliance, the combination with a car or carrier, of stopping devices, a movable liquid-containing cylinder, means whereby the cylinder is caused to move when the car or carrier exceeds its normal rate of speed, and means whereby the movement of the cylinder causes the stopping devices to act, substantially as described.

3. In a safety appliance, the combination with a car or carrier, of stopping devices, a

locking mechanism holding the stopping devices normally out of action, a movable fluid-containing cylinder carried by the car, and means whereby the movement of the cylinder is caused to operate the locking devices to release the stopping mechanism, substantially as described.

4. In a safety appliance, the combination with a car, of stopping devices, a movable cylinder carried by the car, means whereby the cylinder is caused to move when the car exceeds its normal rate of speed, and means whereby the movement of the cylinder causes the movement of the stopping devices, substantially as described.

5. In a safety appliance, the combination with a car or carrier moving in two directions, of a pair of automatic clutch devices normally out of action, one operating to stop the movement of the car or carrier in one direction and the other operating to stop the movement of the car in the opposite direction, means lying along the path of travel of the car or carrier with which the clutch devices coöperate, a locking mechanism operating on the clutch devices to hold them out of action, and means for operating the locking mechanism to release the clutch devices when the car exceeds its normal rate of speed, substantially as described.

6. In a safety appliance, the combination with a car or carrier, of a pair of normally inactive cams, one operating to control the movement of the car or carrier in one direction, and the other operating to control the movement of the car or carrier in the opposite direction jaws with which the cams cooperate, springs for rotating these cams in opposite directions, a locking device for holding the cams in their inactive position, and means for operating the locking device, substantially as described.

7. In a safety appliance, the combination with a pair of stationary jaws, of a pair of normally inactive cams coöperating with the jaws, springs for rotating these cams in opposite directions, projections on the cams, a single locking-bolt having projections engaging locking projections on the cams, and means for sliding the bolt, substantially as described.

8. In a safety appliance, the combination with a pair of stationary jaws, of a pair of normally inactive cams coöperating with the jaws, springs for rotating these cams in opposite directions, locking projections on the cams, a single locking-bolt having projections engaging the locking projections on the cams, and means for sliding the bolt, said means being brought into operation when the car moves at an excessive rate of speed, substantially as described.

9. In a safety appliance, the combination with a movable cylinder, of a piston reciprocating therein, means whereby the rate of reciprocation of the piston is governed by the movement of the car, means for permitting the circulation of the fluid from one side of the piston to the other, said means being constructed to permit the passage of an amount of fluid which will allow the piston to operate at a rate corresponding to the normal or maximum speed of the car without moving the cylinder and which will cause the piston to move the cylinder when said rate of speed is exceeded, car-stopping devices, and means whereby the movement of the cylinder will throw the car-stopping devices into operation, substantially as described.

10. In a safety appliance, the combination with a car or carrier, of a stationary head, a fluid-containing cylinder movable therein, a piston working in the cylinder, a by-pass which permits sufficient fluid to escape from one side to the other to allow the piston to move at a given rate of speed whereby when the piston is moved at such speed or less the cylinder is stationary, but when the piston moves at a greater rate of speed the cylinder will be moved, and means thrown into operation by the movement of the cylinder for stopping the car, substantially as described.

11. In a safety appliance, the combination with a car, of a fluid-containing cylinder carried thereby, a piston working in said cylinder, a by-pass permitting an escape of fluid from one side of the cylinder to the other sufficient to allow the piston to operate at a given rate of speed whereby the piston will move without moving the cylinder until the rate of speed is exceeded, means controlled by the movement of the car for reciprocating the piston, stopping devices, and connections controlled by the movement of the cylinder to throw the stopping devices into action, substantially as described.

12. In a safety appliance, the combination with a moving body such as a car or carrier, of a pair of gripping devices, one constructed to control the movement of the car or carrier in one direction and the other constructed to control the movement of the car or carrier in the opposite direction, devices located along the path of travel of the car or carrier with which the gripping devices coöperate, a movable liquid-containing cylinder, and means whereby the movement of the cylinder throws the gripping devices into operation, substantially as described.

13. In a safety appliance, the combination with a car or carrier, of a pair of gripping devices located on the car or carrier, one operating to control the movement of the car or carrier in one direction and the other operating to control the movement of the car or carrier in the opposite direction, means located along the path of movement of the car or carrier with which the gripping devices coöperate, and means brought into operation by an excessive speed of the car or carrier whereby

the said devices are released simultaneously, substantially as described.

14. In a safety appliance, the combination with a car or carrier, of a pair of gripping devices carried thereby, one operating to control the movement of the car or carrier in one direction and the other operating to control its movement in the opposite direction means located along the path of travel of the car or carrier with which the gripping devices cooperate, and automatic devices brought into action by an excessive speed of the car or carrier for causing the action of the gripping devices, substantially as described.

15. In a safety appliance, the combination with a car or carrier, of a pair of automatic gripping devices, one operating to control the movement of the car in one direction and the other operating to control the movement of the car in the opposite direction, means located along the path of travel of the car or carrier with which the gripping devices cooperate, locking devices whereby said gripping devices are normally held out of action, and means brought into operation by an excessive speed of the car or carrier for releasing the locking devices and permitting the automatic action of the gripping devices, substantially as described.

16. In a safety appliance, the combination with a car or carrier, of a stopping mechanism therefor, a movable liquid-containing cylinder, means whereby the cylinder is moved by an excessive speed of the car, and means whereby the stopping mechanism is thrown into operation by the movement of the cylinder, substantially as described.

17. In a safety appliance, the combination with a car or carrier, of a normally inactive stopping mechanism, a movable liquid-containing cylinder, a stationary head with which the cylinder coöperates, said head being connected to the cylinder by a fluid-tight joint means for producing a movement of the cylinder with respect to the head, and means whereby the movement of the cylinder brings the stopping devices into action, substantially as described.

18. In a safety appliance, the combination with a car or carrier, of two normally inactive automatic spring-operating clutch devices, means with which said devices coöperate in stopping the car, one of said clutch devices being constructed to control the movement of the car in one direction and the other being constructed to control the movement of the car in the opposite direction, and means whereby said clutches are brought into operation by an excessive speed of the car or carrier, substantially as described.

19. In a safety appliance, the combination with a car or carrier having guides thereon, of a movable fluid-containing cylinder supported in said guides, a stationary head with which said cylinder coöperates secured to the car or carrier, a piston in the cylinder, a by-pass permitting the escape of sufficient fluid in either direction to allow the piston to move at a given rate of speed, means whereby the piston is given a rate of movement corresponding to the movement of the car, stopping devices, and connections operated by the movement of the cylinder for causing the operation of the stopping devices, substantially as described.

20. In a safety appliance, the combination with a car or carrier having guides thereon, of a movable fluid-containing cylinder supported in the guides, a stationary head secured to the car or carrier with which said cylinder coöperates, a piston working in the cylinder, a by-pass permitting the escape of fluid from one side of the piston to the other sufficient to allow the piston to travel at a given rate of speed without moving the cylinder, means whereby the piston is given a rate of movement corresponding to the movement of the car or carrier, a pair of automatic clutch devices mounted on the car or carrier, means lying along the path of movement of the car or carrier with which the clutch devices operate, a locking mechanism for holding the clutch devices normally out of operation, and means between the locking devices and the cylinder and operated by the movement of the cylinder for releasing the locking devices, substantially as described.

21. In a safety device, the combination with a car or carrier traveling in two directions, a pair of clutches carried by the car or carrier, said clutches including a pair of spring-controlled cams, each clutch operating to control the movement of the car or carrier in one direction, means lying along the path of the car or carrier with which the clutches coöperate, a locking mechanism normally holding the cams out of action, and means for operating the locking devices, substantially as described.

22. In a safety appliance, the combination with a car or carrier, of a pair of automatically-operating gripping devices supported thereon, a single locking-bolt having projections which hold each gripping device out of action, a movable cylinder, means whereby the movement of the cylinder operates the locking-bolt, and means brought into operation by an excessive movement of the car or carrier to cause the movement of the cylinder, substantially as described.

23. In a safety appliance, the combination with a car or carrier traveling in two directions, of a pair of automatically-operating clutches, each clutch operating to control the movement of the car or carrier in one direction, means lying along the path of travel of the car or carrier, with which the clutches coöperate, a locking mechanism for holding the clutches normally out of action, a movable cylinder, means whereby the movement of the cylinder operates the locking mechanism, a

piston in the cylinder, a stationary head with which the cylinder coöperates, a by-pass allowing the escape of a given quantity of fluid from one side of the piston to the other, and means operated by the movement of the car or carrier for operating the piston, substantially as described.

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

FRANCIS L. ELLINGWOOD.

Witnesses:

T. F. KEHOE,

A. V. BOURKE.