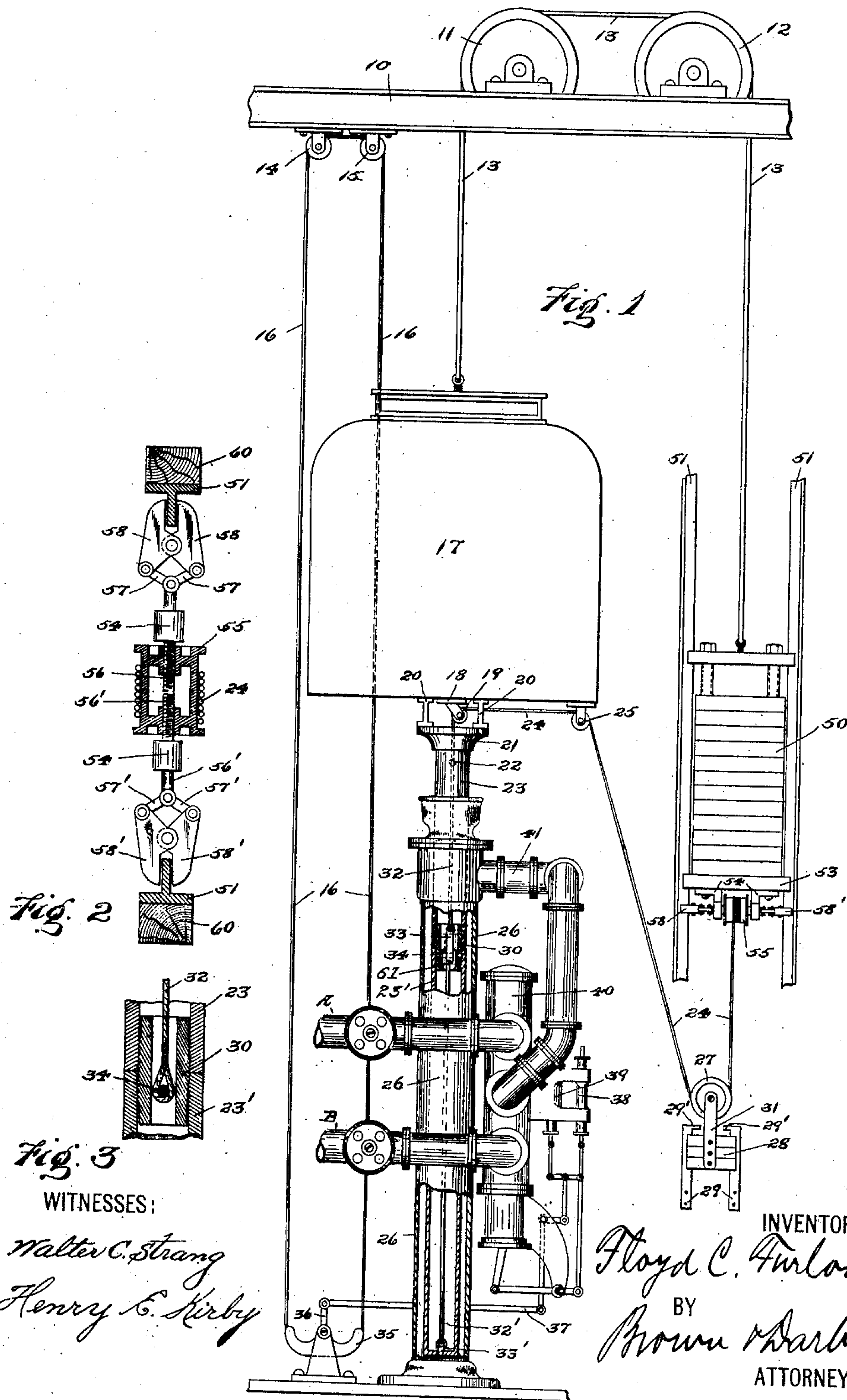


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PATENTED JULY 24, 1906.

F. C. FURLOW.
ELEVATOR SAFETY DEVICE.
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ELEVATOR SAFETY DEVICE.

No. 826,558.

Specification of Letters Patent.

Patented July 24, 1906.

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To all whom it may concern:

Be it known that I, FLOYD C. FURLOW, a citizen of the United States, and a resident of Montclair, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Elevator Safety Devices, of which the following is a specification.

My invention relates to elevator safety devices, and has for its object to provide means to bring the counterweight of an elevator-car to rest should the operating-plunger be fractured or detached from the car.

My invention is particularly adapted to that type of elevator generally known as a "plunger-elevator," and which comprises a car carried on the upper end of a plunger or piston which travels vertically in a cylinder under the action of fluid-pressure.

It is customary in such elevators to heavily counterbalance the car in order to produce an economical operation. An element of danger is thus introduced for the reason that should the car from some accident become detached from the plunger or should the plunger break the counterweight would at once carry the car to the top of the hatchway at great speed and there would be every prospect of a serious accident. It is one of the objects of this invention to prevent this and similar occurrences.

Referring to the accompanying drawings, in which like characters of reference refer to similar parts throughout the different figures, Figure 1 represents a typical plunger system having my safety device applied thereto. Fig. 2 is a detailed view, partly in section, of the gripping device or safety device shown directly below the counterbalance-weights in Fig. 1. Fig. 3 is a modified detailed view in section of the nipple which is used to join the sections of the plunger together.

Referring now to Fig. 1, 17 represents an elevator-car supported by the plunger 23 by means of the I-beams 20 and the platen 21. The counterbalance-weights 50 are connected to the car by the cable 13, which passes over the pulleys 11 and 12, which in turn are supported by the I-beam 10. 14 and 15 designate guide-pulleys over which the operating-cable 16 passes. This cable 16 is attached to the rocker 35, which is con-

nected by arm 36 to the lever 37. Any movement of the rocker 35 about its pivot produces a corresponding movement in the levers 36 and 37 and through the system of levers shown connected thereto operates the pilot-valve 39. In a well-known way this valve controls the throttling-valve 38 and the main valve 40, which is connected by the pipe 41 to the plunger-cylinder 26. A and B are the supply and exhaust pipes, respectively. All of the foregoing parts are of well-known construction and need not be particularly described. The plunger (designated by the numeral 23) is shown as being made up of two sections 23 and 23'. Where these sections join is a nipple 30, having a central vertical hole, in which is fastened by the pin 34 a piece 33, having an eye at its upper end. To this eye is fastened the cable or rod 32. Secured to the nipple 30, also by means of the pin 34, is a clevis 61, to which is connected the rod 32'. This rod 32' extends to the lower end of the plunger 23', where it is secured by means of an eye-screw 33'. Therefore an additional securing device is provided for the connection 24, insuring the operation of the safety device on the counterweight should the plunger be fractured at a point below the nipple 30. The rod 32' may be omitted, however, or the rod 32 may be extended to the screw 33', if desired, in which case no pin 34 need be used.

It is a well-known fact that there is a variable neutral point in elevator-plungers, above which the plunger is in tension and below which it is in compression, the exact location of this neutral point depending upon the position of the car and plunger. The neutral point is at its lower limit when the car is unloaded and at its upper limit of travel. I therefore preferably place the nipple 30 connecting the two sections 23 and 23' of the plunger a short distance below this lower limit of the neutral point. In such a case no rod 32' need be connected to the lower end of the plunger. Now if a fracture of the plunger occurs in the part which is in tension the safety device for the counterweight will be operated as desired. Furthermore, it is preferable that the operation be not dependent on the connection of the rod 32' to the screw 33', as this screw may be gradually corroded by the

water gaining access to the plunger through leakage or otherwise and finally causing disconnection of the rod 32' from the screw 33', and therefore destroying the operativeness of the means for actuating the safety device. At the top of this cable or rod 32 is a union or joint 22, to which is fastened the cable or any other suitable connection 24. This cable 24 may pass over pulleys 19 and 25, which latter are fastened to the bottom of the car 17. After passing over the pulley 25 the cable 24 passes under the pulley 27. To this pulley is fastened, by means of the bridle 31, the weights 28. These weights have a small vertical movement on the guides 29, which may be fastened to any suitable framework in the vicinity in an upward direction, being limited by the stop-pieces 29'. From the pulley 27 the cable 24 passes to the small drum 55, about which it is coiled and to which its free end is made fast. This drum 55 is suspended from the lower portion of the counterbalance-framework 53 by means of the brackets 54. In order to show this portion of the apparatus clearly, attention is called to Fig. 2 of the drawings. 51 designates the counterbalance-guides. 60 represents wooden supports for the guides, which may be secured to any convenient fixture in the vicinity. The drum 55 has two threaded portions at either end, into which are screwed the rods 56 and 56', having left and right handed threads, respectively. These rods pass through the supports 54 and are connected at their extreme ends by means of the arms 57 and 57', respectively, to the gripping-jaws 58 and 58', respectively. These gripping-jaws are adapted to move freely over the lateral faces of the guides when the elevator is in its normal running condition. The combination of this drum with the gripping-jaws and the mechanism actuated by the drum to operate the gripping-jaws constitutes a gripping device and serves as a brake for the counterweight. This gripping device is in its nature a locking device, stopping both the counterweight and the car upon severance of the normal relation between the car and the plunger fixed thereto.

Fig. 3 is a slight modification of the nipple 30, as shown in Fig. 1, and in which the sections 23 and 23' of the plunger are fastened together by the threaded nipple 30, which is screwed for a portion of its length into each section of the plunger.

Having described an elevator system embodying my invention, I will now show its operation should some accident happen to the plunger. As the plunger 23, carrying at its upper end the car 17, is moved up or down by the fluid-pressure in the cylinder 26 the counterbalance-weights 50 will move at the same speed, only in a reverse direction. Therefore that portion of the cable 24 lying

between the pulleys 25 and 27 will increase in length as the car ascends in inverse proportion to the length of the cable 24 between the pulley 27 and the drum 55. From this it will be seen that as the car travels in either direction the cable 24 runs freely under the pulley 27, the purpose of the weight 28 being merely to keep a uniform tension on the cable 24 by taking up slack in it occasioned by any well-known cause. It is manifest that with this construction if the plunger should become fractured or if the car in any manner becomes disconnected from its support the counterbalance will at once overbalance the car and move downward with an accelerated speed and the car likewise rise with an accelerated speed. Since one end of the cable is fastened to the plunger and its other end to the gripping device and the intermediate portion of such cable is connected to the car, the result will be that as the car by reason of its disconnection from the plunger changes its relative position to the plunger, and thereby to the point of attachment of the flexible cable, a stress or tension will be thereby put upon the cable to unwind the same from the drum 55. This will cause this drum to be revolved and the screw-rods 56 and 56' to be moved outward to operate the toggle-arms 57 and 57' and close the gripping-jaws 58 and 58', which will then grip the guides 51 and prevent any further movement of the counterweight 57. In the case of a plunger-elevator this operation of the gripping-jaws will bring also the car to a stop.

The foregoing description illustrates one form in which the invention may be applied; but it is obvious that persons skilled in the art may make changes in the details of construction without departing from the principle of the invention, and I do not wish to be understood as being limited to the exact construction shown and described. It is also evident that the principle of the invention may be applied by slight modification of details to other types of elevators than plunger-elevators—such, for instance, as electric elevators and horizontal-cylinder hydraulic elevators—for it is evident that if by reason of the disconnection of the car from its means of support the distance between the fixed point to which one end of the flexible connection is secured and the gripping device is varied it will put a stress upon the flexible connection and cause it to revolve the drum of the gripping device and will consequently operate such gripping device with great force.

What I claim, and desire to secure by Letters Patent, is—

1. In an elevator system, the combination with a car and its support, of a counterweight therefor, a gripping device connected to said counterweight, and means for actuating said

gripping device to stop both the counterweight and the car upon disconnection of the car from its support.

2. In an elevator, the combination with a car and its support, of a counterweight therefor, a safety device for said counterweight, and means for operating said safety device to stop the counterweight and the car upon disconnection of the car from its support.

3. In an elevator, the combination with a car and its support, of a counterweight therefor, a brake on said counterweight, and means for operating said brake to stop the counterweight and the car upon disconnection of the car from its support.

4. In an elevator system, the combination with a car, a support therefor, a counterweight, a safety device for said counterweight, and means connected between said safety device and support for operating said safety device should the car become disconnected from said support.

5. In an elevator, the combination with a car and its support, of a counterweight therefor, a brake for said counterweight, flexible means connecting said car and counterweight for operating said brake upon disconnection of the car from its support.

6. In an elevator, the combination with a car and its support, of a counterweight therefor, a gripping device for said counterweight, flexible means connected to said gripping device at one end and to said support at the other end for operating said gripping device upon disconnection of the car from its support.

7. In an elevator system, the combination with a car and its support, of a counterweight therefor, a gripping device connected with the counterweight, a flexible connection between said gripping device and said support, and means on the car for coacting with said flexible connection to operate said gripping device should the car become separated from its support.

8. In an elevator system, the combination with a car and its support, of a counterweight therefor, of a gripping device connected with the counterweight, a flexible connection between said gripping device and said support, and means for applying a stress to said flexible connection to operate said gripping device when the car is disconnected from its support.

9. In an elevator, the combination with a car and its supporting means, of a counterweight therefor, a gripping device connected to the counterweight, a flexible connection between said gripping device and said car, and means for exerting a pull on said flexible connection to actuate the gripping device when the car is severed from its supporting means.

10. In an elevator, the combination with a

car and its support, of a counterweight, a safety device for the counterweight, a flexible connection between said safety device and said support, and means connected to the car for increasing the normal tension on said flexible connection to operate said safety device upon disconnection of the car from its support.

11. In an elevator, the combination with a car and its support, of means for moving the same, a counterweight, a safety device for said counterweight, a flexible connection between said counterweight and said support, and means connected to the car coacting with said flexible connection for operating said safety device upon disconnection of the car from its support to stop both the counterweight and the car.

12. In an elevator, the combination with a car and its support, of means for operating same to elevate and lower said car, a counterweight for the car and its support, a safety device for said counterweight, a rope or cable connected rigidly at one end to the safety device and at its other end to the car-support, means for deflecting and guiding said rope or cable, and means connected to the car for exerting a pull on said rope or cable from said support and guiding means as fixed points to operate the safety device upon severance of the car from its support.

13. The combination in an elevator of a car, a counterweight, means for moving the car, flexible connections between the car, counterweight and means for moving the car, and locking devices connected with the counterweight and actuated by said flexible connections to hold the counterweight at any point upon the severing of the relation between the car and the means for moving the same.

14. The combination in an elevator with a car, of a counterweight, means for moving and controlling the car, a retarding device for the counterweight, a flexible connection between said retarding device and means for moving the car, and means connected to the car for increasing the tension on said flexible connection to operate said retarding device and stop the car and counterweight at any point in its travel upon the severance of the relation between the car and the means for moving and controlling the same.

15. In an elevator, the combination with a car, of means for moving the same, a counterweight, a gripping device secured to the counterweight, a flexible connection secured at one end to the gripping device and at its other end to the part of the moving means fixed to the car, and guides on the car over which said flexible connection freely passes for applying a stress on the flexible connection to operate the gripping device upon the severance of the car from its moving means.

16. In a hydraulic elevator, the combination with a car and a plunger therefor, of a counterweight for said car and plunger, a safety device connected to the counterweight, and means dependent for its operation upon a relative movement of the car and plunger for actuating said safety device.

17. In a hydraulic elevator, the combination with a car and a hollow plunger rigidly attached thereto, means for moving the plunger to elevate the car, of a counterweight for the car and plunger, a retarding device for the counterweight, a flexible connection operatively secured at one of its ends to the retarding device and fastened at its other end inside of said hollow plunger, and means operative upon a relative movement of the car and plunger for exerting a pull upon said flexible connection to actuate said retarding device.

18. In a hydraulic elevator, the combination with a car and a plunger attached thereto, of a counterweight for said car and plunger, a retarding device for said counterweight, and means dependent for its operation upon a relative movement of the car and the plunger or a part of said plunger for actuating said retarding device.

19. In a hydraulic elevator, the combination with a car and a plunger for supporting the same, of means for operating said plunger to elevate and lower the car, a counterweight connected to the car, a safety device on said counterweight, a flexible connection suitably secured at one of its ends to said counterweight and at its other end rigidly with said plunger, and means connected with the car for exerting a pulling force on said flexible connection to operate said safety device upon severance of the car from its plunger.

20. In an elevator, the combination with a car and a counterweight therefor; guides for said counterweight; a safety device for the counterweight; a hydraulic plunger supporting the car; and a flexible connection between said counterweight and plunger, intermediately connected with said car.

21. In an elevator, the combination with a car and a counterweight therefor, guides for such counterweight, a safety device connected with the counterweight, a hydraulic plunger for supporting the car, sheaves connected to the car, a flexible connection between said counterweight and plunger and running over said sheaves.

22. In an elevator, the combination with a car and a counterweight therefor, guides for said counterweight, a gripping device connected with the counterweight, a hydraulic plunger for lifting the car, sheaves connected to the car, a flexible connection operatively secured at one end to said gripping device,

fastened at its other end to said plunger and running over said sheaves.

23. In an elevator, the combination with a car and means including a hydraulic plunger for lifting same, of a counterweight for the car, guides for the counterweight, a gripping device secured to the counterweight for acting upon said guides, guides on the car, and a flexible connection fixedly attached at one end to the plunger, passing over said guides on the car, and attached at its other end to a movable part of the gripping device.

24. In an elevator, the combination with a car, of means including a hydraulic plunger for lifting same, a counterweight for such car, guides for the counterweight, gripping-jaws for acting on said guides, a rotatable drum secured to the counterweight, mechanism connected to the said drum for operating said gripping-jaws, guide-pulleys on the car, and a flexible connection secured and wound at one end upon said drum, passing over said guide-pulleys on the car, and connected at its other end to the plunger.

25. The combination in an elevator with a car, of a counterweight, means for operating said car, a safety device for said counterweight, a flexible connection operatively secured at one of its ends to said safety device and at its other end to the part of the operating means fixed to the car, guides connected to the car for said flexible connection, an additional guide for said flexible connection, and stops limiting the upward movement of said additional guide.

26. In an elevator of the hydraulic type, the combination with a car, of a plunger fixed to the car, means for moving and controlling said car and plunger, a counterweight for the car and plunger, guideways for the counterweight, a safety device connected with said counterweight for acting on said guideways, a flexible connection connected at one end to said safety device and fastened at its other end to the plunger, guide-pulleys on the car for said flexible connection, an additional guide-pulley for said flexible connection, a weight connected to said additional guide-pulley, guideways for said weight and stops for limiting the upward movement of said weight and additional guide-pulley.

27. In a hydraulic elevator, the combination with a car, of a plunger fixed thereto, means for lifting said car and plunger, a counterweight for said car and plunger, guideways for said counterweight, gripping-jaws connected to said counterweight for acting on said guideways, a drum rotatably supported by said counterweight, mechanism operated by said drum for operating said gripping-jaws, a flexible connection secured at one end to and wound on said drum and at

the other end to said plunger, guide-pulleys on the bottom of the car for said flexible connection, an additional guide-pulley for the same and normally suspended thereby, a weight connected to said additional guide-pulley, guides therefor, and stops for limiting the upward movement of said weight and additional guide-pulley.

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

FLOYD C. FURLOW.

Witnesses:

FRANK T. BROWN,
JESSE H. VAN ALSTYNE.