A. H. HARTMANN.

AUTOMATIC FIRE ESCAPE.

APPLICATION FILED DEC. 20, 1907.

967,518.

Patented Aug. 16, 1910.

2 SHEETS—SHEET 1.

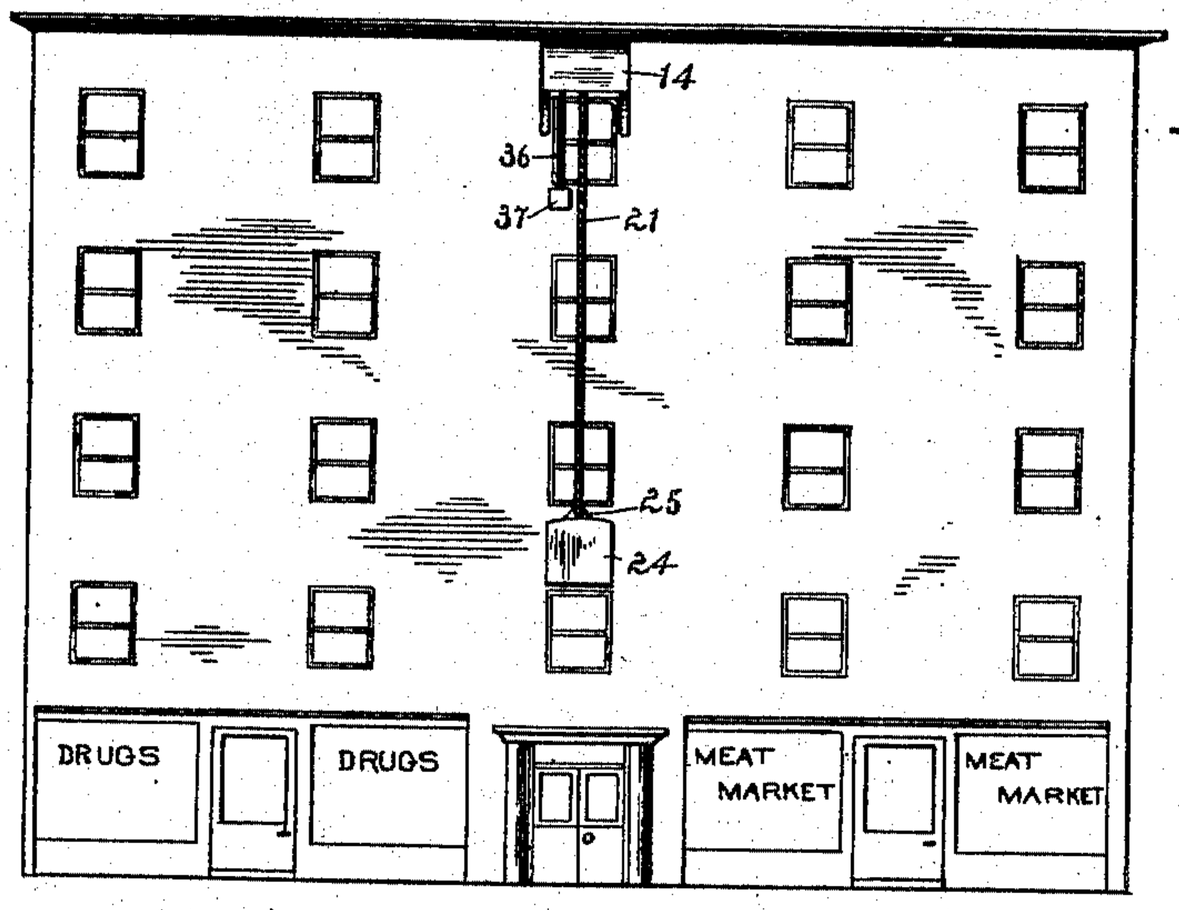

Fig. 1.

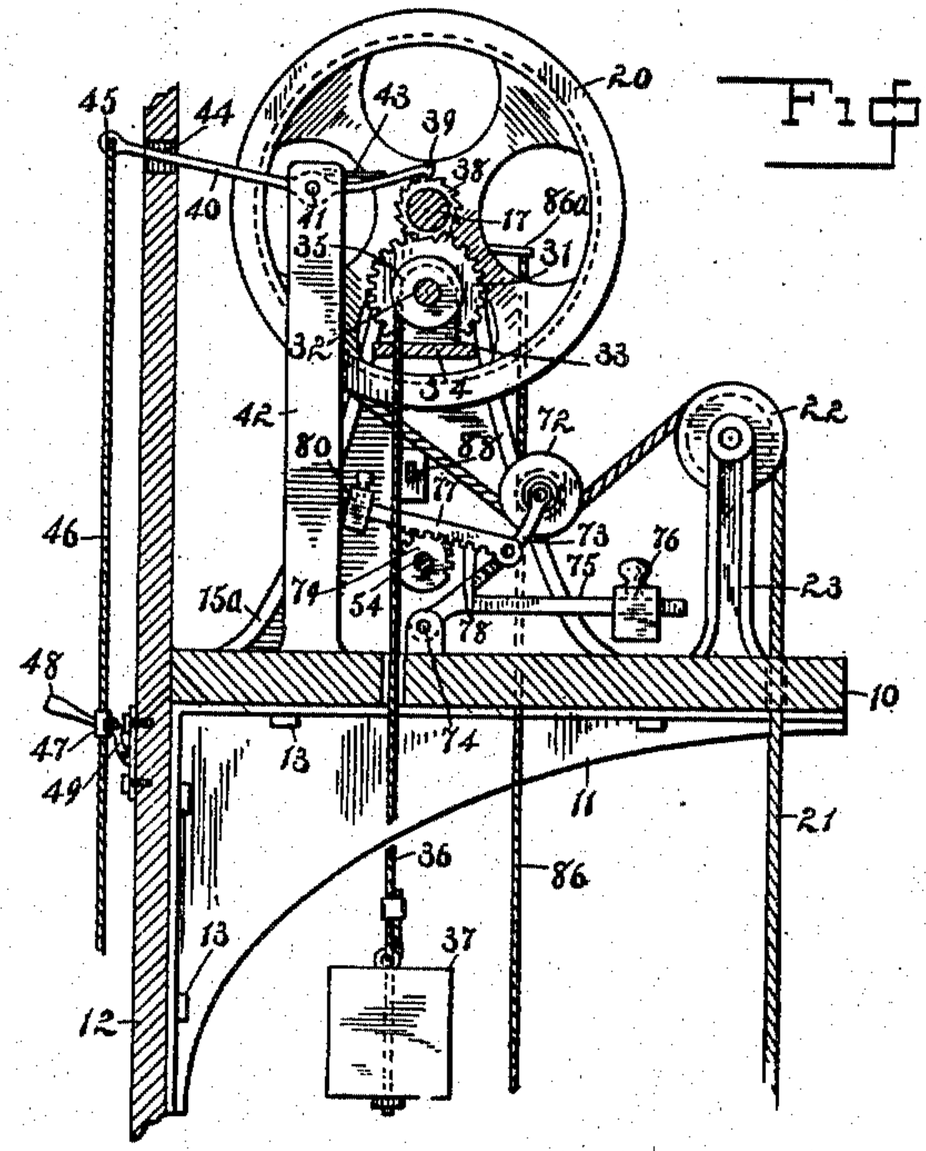

Fig. 2.

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2 SHEETS—SHEET 2.

FIG. 4.

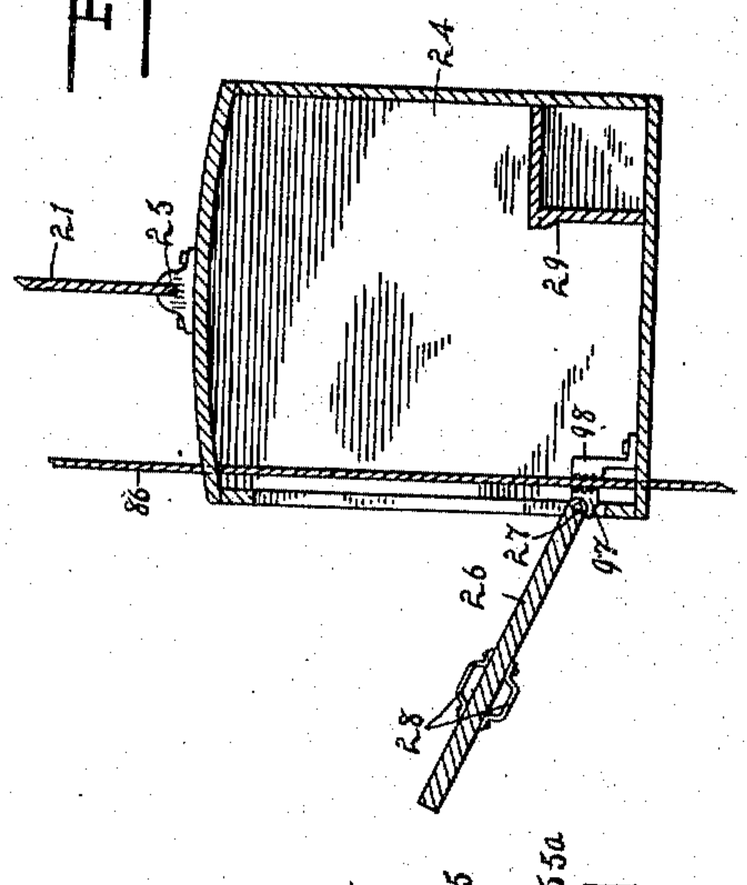


FIG. 7.

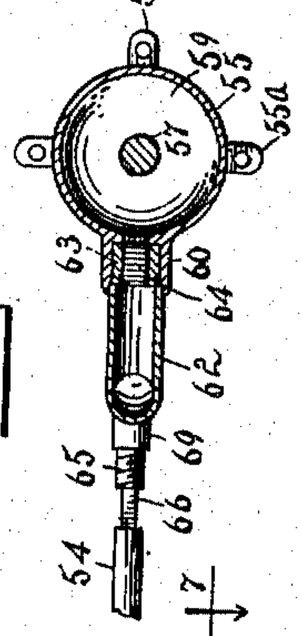


FIG. 8.

FIG. 6.

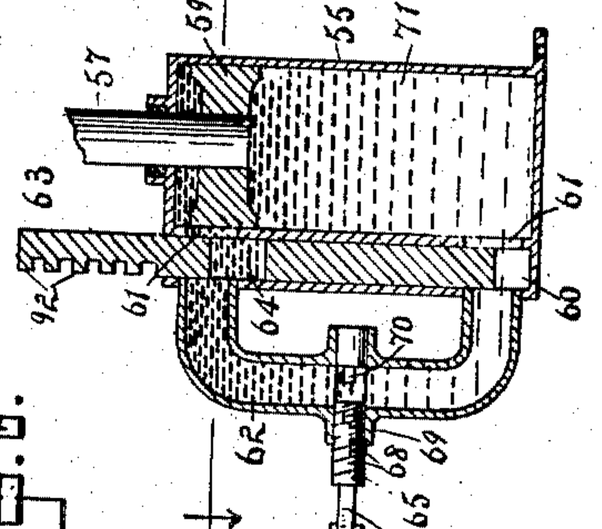


FIG. 5.

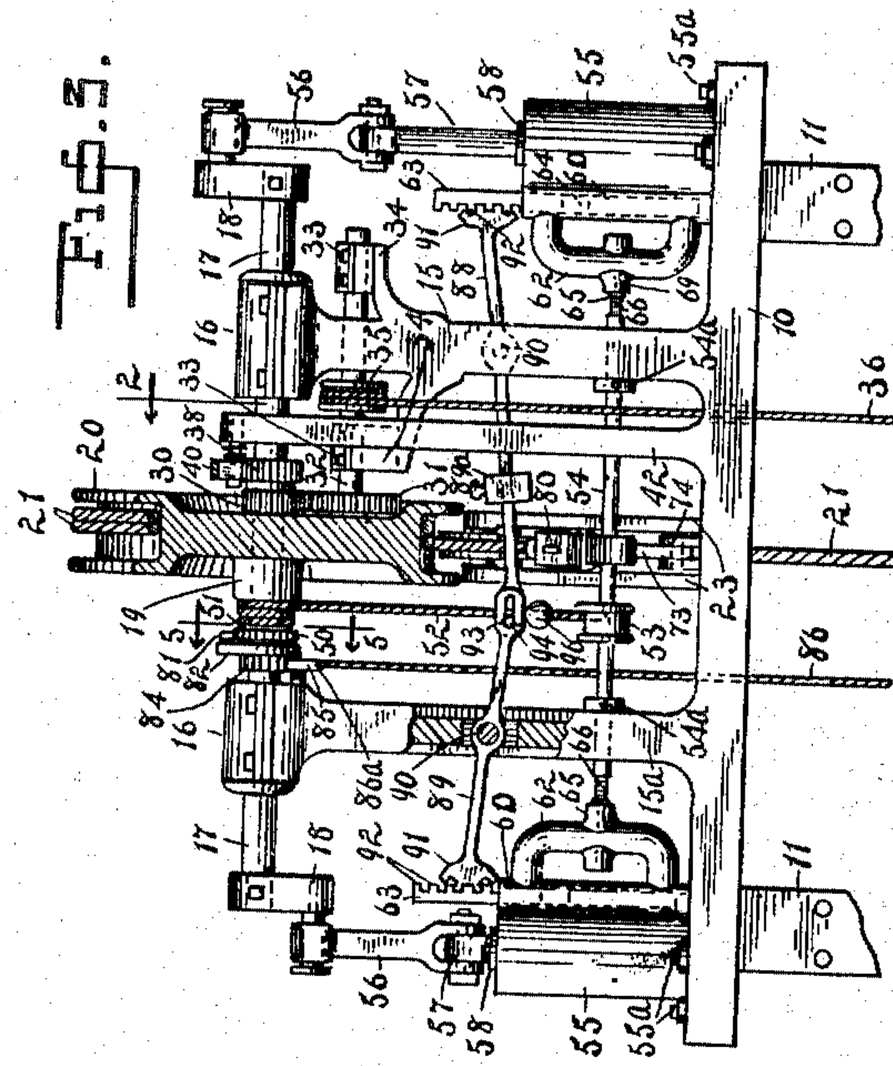
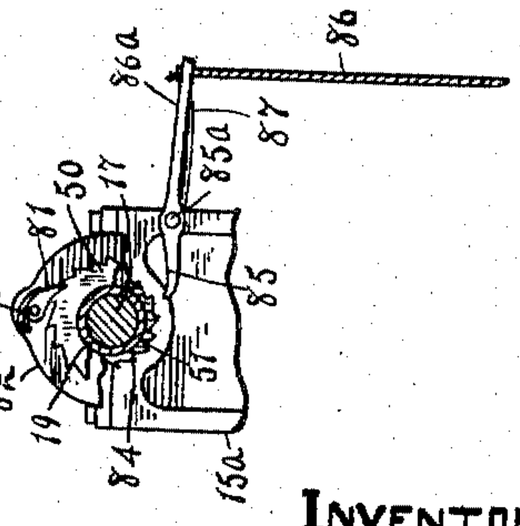


FIG. 9.



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AUTOMATIC FIRE-ESCAPE.

967,518. Specification of Letters Patent. Patented Aug. 16, 1910.

Application filed December 20, 1907. Serial No. 407,367.

To all whom it may concern:

Be it known that I, AUGUST H. HARTMANN, a subject of the Emperor of Germany, residing at Indianapolis, in the county of Marion and State of Indiana, have invented certain new and useful Improvements in Automatic Fire-Escapes, of which the following is a specification.

My invention relates to safety appliances and refers particularly to fire escapes of that class in which a permanently installed operating mechanism is arranged to lower one or more passengers at a safe rate of speed from the upper part of a building.

The danger to the lives of the occupants of ordinary buildings in case of fire is too obvious to require more than passing comment and since the modern tendency to increase the height of apartment buildings and other structures to such an extent as to be beyond the reach of ordinary ladders the difficulties connected with the saving of life at fires has proportionally increased.

The permanent iron ladders and stairways erected upon the exterior of buildings have their disadvantages and even dangers, and are objectionable on account of their unsightliness as well as great cost, which increases in a direct ratio to the height of the building.

The expense for installing my improved appliance would not be materially increased for any height, and as it occupies a comparatively small space, and is fixed at the top of the structure it will not interfere with the appearance of the building and could be placed on the front where it is usually most needed.

Other objects of my improvements are to provide mechanism for regulating the descent of the car when carrying a heavy load, and to do this automatically, to furnish means for elevating the car after it has landed the passengers, and to supply convenient and readily operated releasing means for starting the car.

Other objects are to provide mechanism for controlling the operation that will not be affected by freezing; to furnish an apparatus of simple design and positive mechanical movements that will not be likely to get out of order, and to supply a strong efficient, and simple appliance well suited to the purpose in view.

Further objects of my invention are to be found in the method of stopping the car at any point in its descent, and in providing a protective housing for the mechanism.

I accomplish the above and other important objects by means of the apparatus illustrated in the accompanying drawings, which form a part of this application, said apparatus consisting, generally described, of a passenger car suspended by a cable passing over a drum which is mounted at the top of the building upon the outside, speed regulating mechanism suitable means being provided for starting and stopping the car, and a counter weight for causing the car to ascend.

Referring to the drawing, I have set forth the principles of my invention in the following views:—

Figure 1 is a front elevation of a building equipped with my improved fire escape; Fig. 2 is a transverse section of the operating mechanism shown supported upon a bracket firmly attached to a wall, the plane of the cutting section being indicated by the line 2—2 of Fig. 3; Fig. 3 is a rear elevation of the operating mechanism, portions being in section; Fig. 4 is a vertical sectional view of the passenger car; Fig. 5 is an enlarged fragmentary sectional view on the line 5—5 of Fig. 3; Fig. 6 is an enlarged vertical section of one of the speed regulating cylinders; Fig. 7 is a section on the line 7—7 of Fig. 6; Fig. 8 is a fragmentary view, enlarged, of the joint between the rack operating levers.

Referring to the details of the drawings, the numeral 10 indicates a metal base plate or platform supported upon brackets 11, secured to a wall 12 and to the base by bolts 13. The operating mechanism is carried upon said platform and a housing 14, supported from the base or the wall of the building, forms a protective covering to preserve the movable parts from the weather. Upon the platform 10 are erected two posts or pillars 15, 15ª, which I prefer to cast integral with the platform. These pillars are surmounted by boxes 16 in which is journaled a crank-shaft 17, having its ends extended beyond the bearings 16, and furnished at the extremities with cranks 18. Upon the middle of the shaft 17 is loosely mounted a sleeve 19 carrying a drum 20. About this drum is wound a stout cable 21 one end being secured to the drum and the

other passed over an idler 22, supported on brackets 23, and attached to a car 24, at a central point 25 in the car top. This car is preferably rectangular in form, and supplied with a door 26, upon one side only, said door being hinged near the bottom at 27 and arranged to swing outwardly as shown in Fig. 4. Handles 28 are placed upon opposite sides of the door which is held in closed position by friction and is caused to assume the angular position illustrated in Fig. 4 by the effect of its own weight. The car is preferably constructed of non-combustible material and may be of sufficient size to accommodate a number of persons, a seat 29 being furnished when the car is of large capacity. Upon the said sleeve 19 is fixed a pinion 30 which meshes with a gear wheel 31, mounted upon a shaft 32 journaled in boxes 33 supported upon brackets 34, attached to the post 15. Upon said shaft 32 is mounted a grooved pulley or drum 35 and around this is wound a rope or cable 36, one end being fixed to said drum and the other attached to a counter-weight 37, sufficiently heavy to overbalance the weight of the car 24. Upon the sleeve 19 adjacent to the pinion 30 is a ratchet wheel 38 normally engaged by a tooth 39 in the end of a detent lever 40, pivoted at 41 to a post 42 rising from the platform 10. A spring 43 tends to hold the said tooth 39 in engagement with the ratchet 38, and thus hold the sleeve 19 and main drum 20 against rotation from the traction of the weight 37. The rear end of said detent lever is prolonged sufficiently to pass through an aperture 44 in the supporting wall 12 of the building and terminates in an eye 45 to which is attached a rope 46. This rope extends downward and is passed through a clasp or sleeve 47 tightly embracing the rope and furnished with a handle 48. The sleeve is secured to the inner face of the wall 12 by a pivoted link 49, which will permit the sleeve to be depressed by means of the handle sufficiently to release the tooth 39 from engagement with the ratchet 38. Upon the end of the said sleeve 19 opposite to the ratchet 38 is fixed a driving ratchet 50 having its teeth pitched in a direction opposite to the teeth of the said ratchet 38, and between this ratchet 50 and the main drum 20 the sleeve is reduced in size to form a groove 51, and fixed to this drum and wound thereon is a rope 52, which drops down to a spool 53, mounted upon a shaft 54, journaled in the pillars 15, 15ª, and furnished with retaining collars 54ª. Said rope 52 is fixed to said spool 53 and is slack when the car is elevated above the ground and its length is so proportioned relatively to the diameter of the reduced portion 51, on the sleeve 19, and this, in turn, has such a ratio to the main drum 20 and the cable 21 that when the car is near the ground the said rope 52 is completely wound upon the sleeve 19 and either just reaches the spool 53 or is wound thereon a part of a turn in accordance with conditions hereinafter described.

As previously stated the weight 37 is heavy enough to cause the empty car to ascend which it will do when the detent lever 40 is operated through the rope 46 by manipulating the handle 48, thus releasing the ratchet 38. The preponderance of the mass of the counter-weight 37 over that of the car is so slight that the presence of a single person will overbalance the counter-weight and cause the car to descend, winding the rope 36 upon its drum and raising the counter-weight proportionally. Since the drum 35 is of much less diameter than the main drum 20, the excursion of the counter-weight will be proportionally less than that of the car 24.

It will be readily understood that unless some provision were made to inhibit the speed rate of the car especially when carrying a number of passengers, the momentum acquired by the time the ground was reached would endanger the integrity of the apparatus and be liable to injure the passengers. To avoid any possibility of such a contingency I provide a governor for regulating the speed and produce thereby a uniform rate in the descent of the car under wide variations in the load carried.

Upon opposite ends of the platform 10, and directly beneath the said cranks 18 are installed hollow upright cylinders 55, fastened to the platform by bolts 55ª. These cylinders and their attachments are duplicates of each other and serve an identical purpose, which is to regulate the movement of the main shaft, the duplication of the devices being for the purpose of equalizing the strain upon said shaft. The cranks 18 are set at an angle of 180° with each other, and are attached by links 56 to piston rods 57 which enter the pistons through stuffing boxes 58 and are connected to pistons 59. Each cylinder is supplied with a valve chamber 60, connected to the cylinder bore through apertures 61. The upper and lower ends of said valve chamber are connected by a by-pass consisting of a pipe 62. In the valve chamber 60 is mounted a slide valve, which consists of a rectangular bar 63, having an opening 64 which registers with the upper aperture 61 when the slide valve is at its highest position, at which time the lower orifice 61 is open and there will be free communication between the cylinder and the pipe 62 below the end of said bar valve. At the middle point of said pipe is placed a valve 65, provided with a squared stem 66, received in a socket 67 in the end of the shaft 54. The said valve is furnished with threads 68 to engage similar threads in the valve casing 69. A lug 70 fixed in the

valve casing partly closes the space and as the end of the valve approaches this lug the passage area through the valve chamber will be more rapidly lessened than during the first part of the valve movement. The cylinders 54 and communicating passages are completely filled with a liquid 71, and for this purpose I prefer to employ oil or glycerin, and the latter is especially desirable since it is not appreciably affected by low temperatures.

It will be readily seen that the liquid will pass freely through the pipe 62 when the structures are in the positions shown in Fig. 6 but that a partial closure of the valve 65 will cause an obstruction in the flow in said pipe in direct ratio to the degree of such closure. It will also be understood that a movement of the slide valve to its lowest position will close the communicating apertures 61 so that the liquid cannot circulate and the piston will be rendered immovable so long as the slide valve is closed. The valves 65 are operated by turning the shaft 54 in the following manner: A grooved pulley 72 mounted upon the end of a forked lever 73 pivoted to the base at 74, rests upon the main cable between the drum 20 and the idler 22. The said lever 73 is inclined at an angle approximating 45 degrees and from near its attachment it is furnished with a comparatively long arm 75 which extends forwardly and upon this is carried a slidably adjustable weight 76. A rack bar 77, pivoted to the lever 73 and extending rearwardly, is furnished with rack teeth 78, which mesh with a pinion 79 mounted on the shaft 54. This pinion is shown incomplete since its rotation is governed by the limited movement of the rack bar 77. It will be evident that the slack of the cable 21 between the drum 20 and the idler 22 will vary with the traction upon the said cable, and the effect of the weight 76 upon the grooved pulley 72, and variations in the load upon the cable will cause corresponding movements of the shaft 54 through the action of the rack bar 77, and as the said shaft is connected directly with the valves 65, the latter will be extended or retracted according to the direction of rotation, the connection of the socket 67 and stem 66 permitting of sufficient longitudinal movement of the valve. To insure proper contact between the rack teeth 78 and the incomplete pinion 79 the rack bar 77 carries a weight 80.

The main shaft 17 and consequently the pistons 59 are operated when the car is descending by the engagement with the driving ratchet 50 of a dog 81, pivoted to a disk 82 fixed upon said shaft 17. This dog is held against its ratchet by a spring 83, and will yield when the drum 20 is operated by the descent of the weight 37, while the empty car is ascending and the piston 59 will be at rest, but as soon as the loaded car descends this dog will operate the said pistons to inhibit the speed of said car, according to the relation between the areas of the by-pass and cylinder. Upon the shaft 17 adjacent to the disk 82 is fixed a ratchet wheel 84 having teeth projecting in the same direction as the teeth of the driving ratchet 50. A detent pawl 85, pivoted to the pillar 15ª at 85ª is adapted to engage the teeth of said ratchet 84 to stop the movement of the shaft when elevated by traction made upon a rope 85 attached to the forwardly projecting end 86ª of said pawl, a spring 87 normally holding the pawl out of engagement with its ratchet.

When the loaded car is descending at a uniform rate produced by the regulated flow of the liquid 71 as it is driven through the constricted passages by the piston movements, automatic means must be provided for stopping the car as it reaches the ground. This is accomplished by closing the openings 61 through the descent of the bar valves 63, the valve movement being set up at the proper time through the medium of levers 88, 89, pivoted to the pillars 15, 15ª, at 90 and held in initial position by a weight 89ª their outer ends being formed into segment gears 91, which engage rack teeth 92, in the slide valves 63. The approximated ends 93 of the said levers are bifurcated and pivotally joined by rivets 94, sufficient play being allowed at the pivots to permit of a slight longitudinal adjustment to avoid binding during the moderate movement needed to close the slide valves. The rope 52 passes through the aperture 95 formed between the forked ends of the levers at their juncture, and between said juncture and the spool 53 the rope is furnished with an operating device in the form of a ball 96. When the car is at the upper limit of its movement the rope 52 is unwound from the sleeve 19, and a part of a turn upon the spool 53, the remainder of the rope hanging slack. As the car descends said rope is wound upon the sleeve 19 and when approximately all the slack is thus taken up the ball 96 will engage the joined ends of the levers 88, 89 and cause the valves 63 to descend, completely closing the openings 61 thus bringing the pistons and connected mechanism to a stop.

In case the rope should not be completely unwound from the spool 53, the action of said rope will be to turn the spool until the rope is entirely unwound therefrom, which will have the effect to further close the valves 65, but as this action always takes place when it is desired to stop the car, it will be an advantage by supplementing the cut-off action of the valves 63.

It will be understood that the rope 46 used to start the car upon its downward journey,

may be continued by way of suitable apertures to every floor of the building. It has been hereinbefore stated that traction upon the rope 86 will stop the car at any point in its descent by causing the pawl 85 to engage the ratchet 84. In order to bring this rope within reach of the passengers it is carried down through the car alongside the door where it passes between clamping members 97, 98. The jaw or member 98 is fixed to the car and the companion jaw 97 is attached to the door 26. By this arrangement the rope 86 will be clamped and the car stopped whenever the door of the car is opened, and conversely, shutting the door will release the rope and the car will be automatically started.

The functions of the various groups of mechanisms have been set out in connection with the detailed account of the construction and the method of using the apparatus when emergencies arise will be here described. Supposing the car to be at some point below the place where it is desired to take on passengers, the handle 48 is depressed thus releasing the ratchet 38 and permitting the weight 37 to revolve the drum 20 in a direction to wind the cable 21. When the car has reached the desired location the said handle 48 is released and the car remains stationary, held by the pawl 39. The passenger then opens the car door by means of the handle upon the outside, this act clamping the rope 86 by means of the jaws 97, 98, and enters the car. He then pulls the door shut releasing the said rope and the car begins to descend raising the counterweight 37 and operating the shaft 17 and pistons 59 which are retarded by the liquid 71 sufficiently to cause a moderate and uniform descent, the valve 65 being partially closed by the strain upon the slack of the rope between the drum 20 and the idler 22, the degree of such closure being proportional to such strain, as previously stated. If at any time the occupant of the car desires to stop he has only to push the door open, which is preferably kept in closed position by friction only, when the clamping action of the jaws 97, 98, will throw the pawl 85 into engagement with ratchet 84, and bring the drum to a rest. More passengers can now be taken on and as soon as the door is again closed the spring 87 will throw the said pawl out of engagement and the car will complete its downward journey, the valve 65 still further closing the by pass, so that the increase in the load will be automatically compensated. When the rope 52 has become wound upon the sleeve 19 so as to be taut the ball 96 will close the slide valves, thus stopping the piston action automatically. To cause the car to reascend the detent 39 must be again disengaged by the operation of the rope 46 and thus the car can be thus alternately elevated and depressed so long as there are any passengers to descend.

Having thus described my invention what I claim as new, is:—

1. The combination with a drum and a cable therefor, of a cylinder containing a cushioning fluid and a by-pass between the ends of such cylinder and a piston therein operated by the rotation of the drum, a pulley carried by a lever arranged in the path of the cable, said lever being weighted to divert the course of the cable, and a shaft having a gear thereon and a rack bar pivoted to said lever and weighted to hold it in engagement with said gear so that movement of the lever due to the weight of the cable acting on said pulley will rotate said shaft and an endwise moving valve operated by said shaft to more or less close the by-pass in proportion with the movement with the pulley lever.

2. The combination with a drum and a cable therefor, of a cylinder containing a cushioning fluid and a by-pass between the ends of such cylinder and a piston therein operated by the rotation of the drum, a pulley carried by a lever arranged in the path of the cable, said lever being weighted to divert the course of the cable, and a shaft having a gear thereon and a rack bar pivoted to said lever and weighted to hold it in engagement with said gear so that movement of the lever due to the weight of the cable acting on said pulley will rotate said shaft and a screw threaded valve rod engaging the end of said shaft and operating such valve.

3. The combination with a drum and a cable therefor, of a cylinder containing a cushioning fluid and a by-pass between the ends of such cylinder and a piston therein operated by the rotation of the drum, a pulley carried by a lever arranged in the path of the cable, said lever being weighted to divert the course of the cable, and a shaft having a gear thereon and a rack bar pivoted to said lever and weighted to hold it in engagement with said gear so that movement of the lever due to the weight of the cable acting on said pulley will rotate said shaft, a throttle valve in said by pass, a threaded rod for said valve, said rod being operatively connected with the shaft, a cord reversely wound by the unwinding of the cable, and a stop adjustably attached to the said cord and adapted to close the shut-off valve when the car has reached a predetermined point.

4. The combination with a main shaft, a drum thereon, a cable engaging said drum, and a car suspended from the cable, of a cylinder containing a cushioning fluid, a by-pass between the ends of said cylinder, a piston in the cylinder operated by the rota-

tion of the drum, a throttle valve in said by-pass, a threaded stem for said valve, a shaft operatively engaging said stem, a gear on said shaft, a pulley carried by a lever arranged in the path of the cable, said lever being weighted to divert the course of the cable, a rack bar pivoted to said lever and weighted to hold it in engagement with said gear, a cord reversely wound by the unwinding of the cable, a stop on the cord adapted to operate the throttle valve, a pawl lever adapted to engage the main shaft to restrain the unwinding of the cable, means for holding said pawl lever normally out of engagement, a cord secured to said pawl lever and passing through the car, and means attached to the door adapted to clamp said cord when the door is opened, thereby throwing the said pawl into engagement with the shaft to stop the downward movement of the car.

5. The combination with a shaft, a drum on said shaft, a cable therefor, and a car suspended from the cable, of a pawl lever adapted to engage said shaft to restrain the unwinding of the cable, means for holding said pawl lever normally out of engagement with the shaft, a cord secured to said pawl lever and passing through the car, a door on said car having a cam surface adapted to engage said cord when the said door is opened thereby engaging said pawl lever with the shaft thereby stopping the downward movement of the car.

6. In a fire escape, the combination with a main shaft, a drum mounted on said shaft, a cable engaging said drum, a car attached to said cable, and a counter-weight for said car, of a cylinder, a piston in said cylinder, operative means connecting said main shaft with the piston, a by-pass connecting the ends of the cylinder, a shut-off valve for said by-pass and means for automatically closing said valve when the car has reached a predetermined point in its descent.

7. In a fire escape, the combination with a main shaft, a drum mounted on said shaft, a cable engaging said drum, a car attached to said cable, and a counter-weight for said car, of a cylinder, a piston in said cylinder, operative means connecting said main shaft with the piston, a by-pass connecting the ends of the cylinder, a shut-off valve for said by-pass, a throttle valve in the by-pass, means for automatically closing said shut-off valve when the car has reached a predetermined point in its descent, and means connected with said cable for operating said throttle-valve.

8. In a fire escape the combination with the main shaft, a drum thereon, a cable engaging said drum and a car attached to said cable, of a counterweight for said car, a cylinder, a piston in said cylinder, operative means connecting said main shaft with the piston, a by-pass connecting the ends of the cylinder, a shut-off valve for said by-pass and means for automatically closing said valve when the car has reached a predetermined point in its descent, said means comprising a rack bar attached to the valve, a pivoted lever, a segment gear on the lever engaging said rack, and operative connection between said lever and the main shaft.

9. In a fire escape, the combination with a main shaft, a drum mounted on said shaft, a cable engaging said drum, a car attached to the cable, and a counterweight for the car, of a pair of cylinders, pistons in said cylinders, operative connection between the pistons and the main shaft, a bypass connecting the ends of each cylinder, shut-off valves in the bypasses, throttle valves controlling the bypasses, means for automatically closing said shut-off valves when the car has reached a predetermined point in its descent, and means connected with said cable for operating said throttle valves.

10. In a fire escape, the combination with a main shaft, a loose sleeve for the shaft, a drum fixed on said sleeve, and a cable engaging said drum, of a car attached to said cable, a counter-weight for the car, means for controlling the descent of the counterweight, means for releasing said locking means, means for stopping the car at any point in its downward travel, said stopping means consisting of a ratchet fixed to said shaft, a pawl, a rope attached to the pawl and clamping means fixed to the door of the car and adapted to engage said rope, and means for stopping the car at a predetermined point in its descent.

In testimony whereof I affix my signature in the presence of two witnesses.

AUGUST H. HARTMANN.

Witnesses:
CHARLES SCHWEIBERT,
PAUL RYOCK.