No. 700,458. Patented May 20, 1902.

S. B. TRAPP.

SAFETY APPLIANCE FOR ELEVATORS.

(Application filed Oct. 16, 1901.)

(No Model.) 7 Sheets—Sheet 1.

Fig. 1.

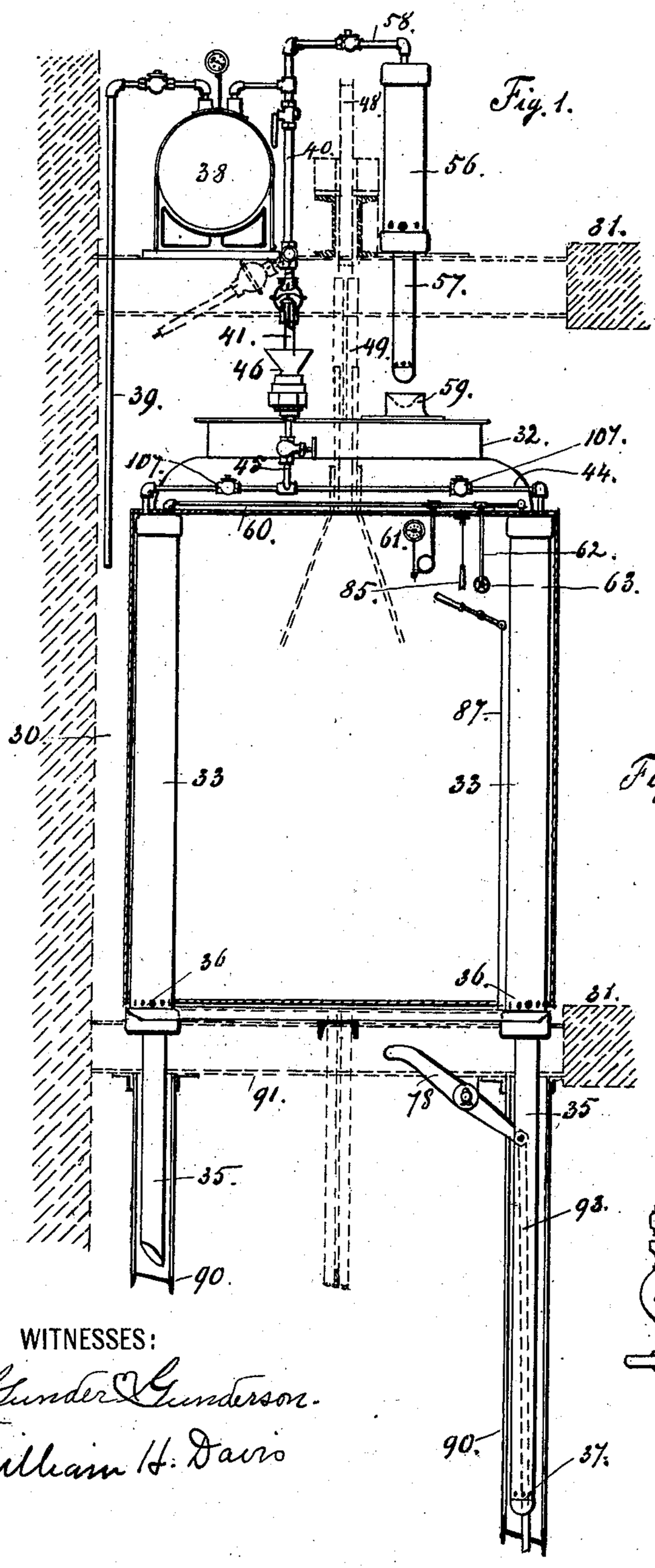


Fig. 2.

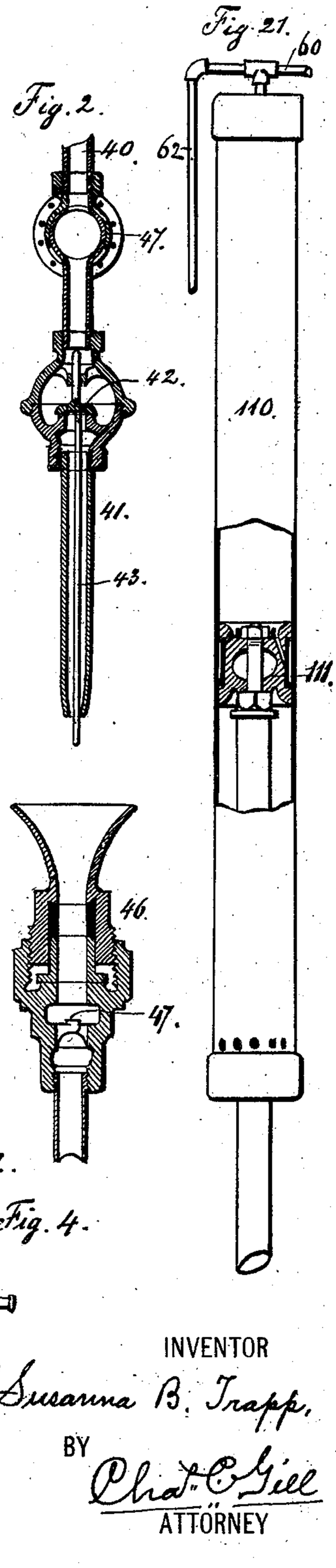


Fig. 21.

Fig. 3.

Fig. 4.

WITNESSES:

Gunder Gunderson.

William H. Davis

INVENTOR

Susanna B. Trapp,

BY Chas. C. Gill

ATTORNEY

No. 700,458. Patented May 20, 1902.

S. B. TRAPP.

SAFETY APPLIANCE FOR ELEVATORS.

(Application filed Oct. 16, 1901.)

(No Model.)

7 Sheets—Sheet 2.

Fig. 5.

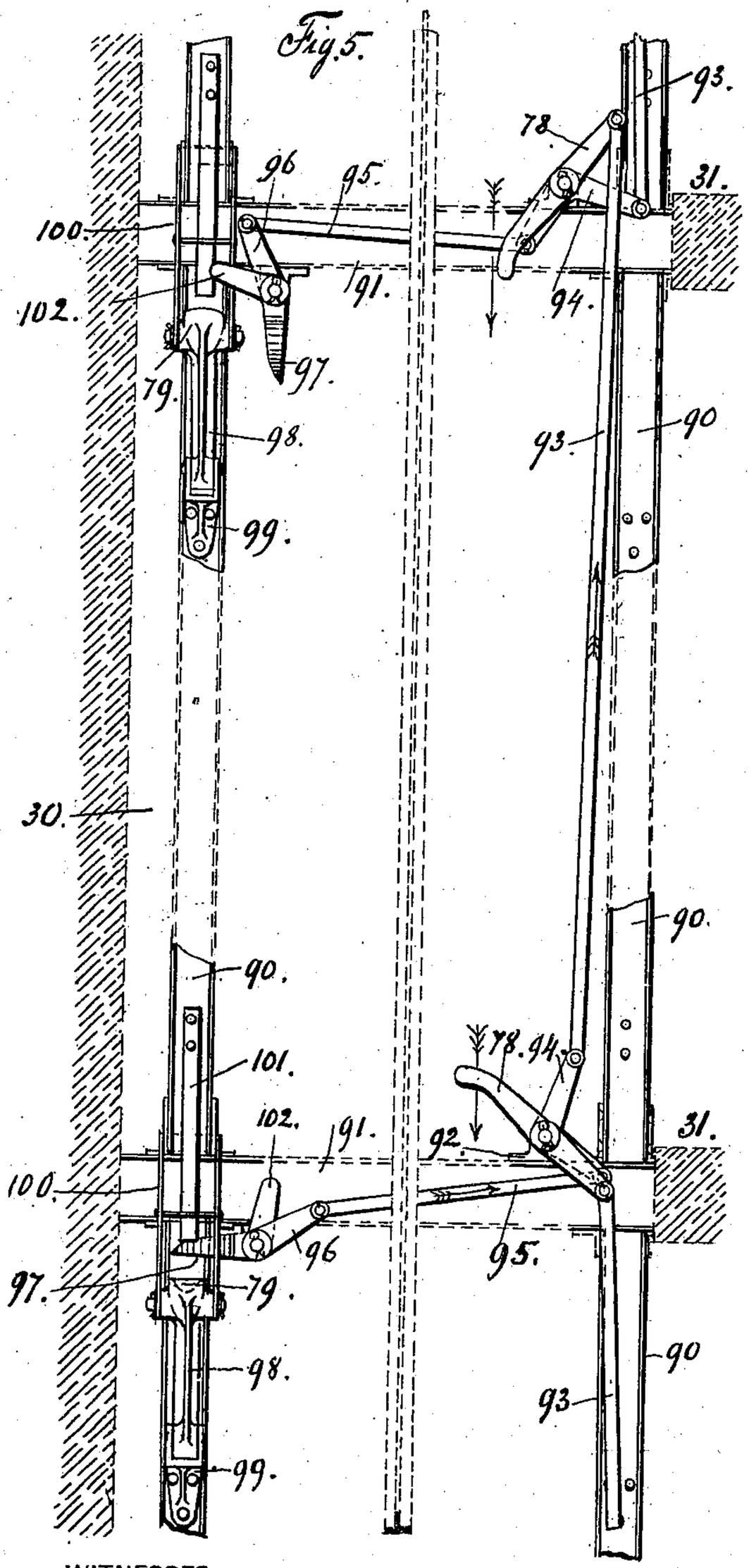
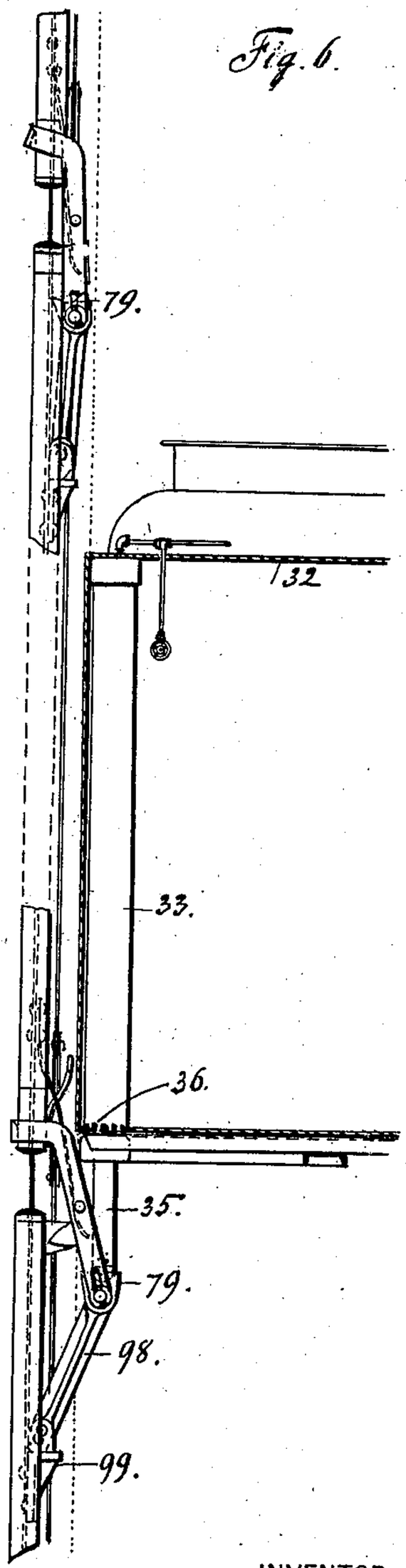


Fig. 6.



WITNESSES:

Gunder Gunderson.

William H. Davis

INVENTOR

Susanna B. Trapp,

BY

Chas. D. Gill

" ATTORNEY

No. 700,458. Patented May 20, 1902.

S. B. TRAPP.

SAFETY APPLIANCE FOR ELEVATORS.

(Application filed Oct. 16, 1901.)

(No Model.) 7 Sheets—Sheet 3.

Fig. 7.

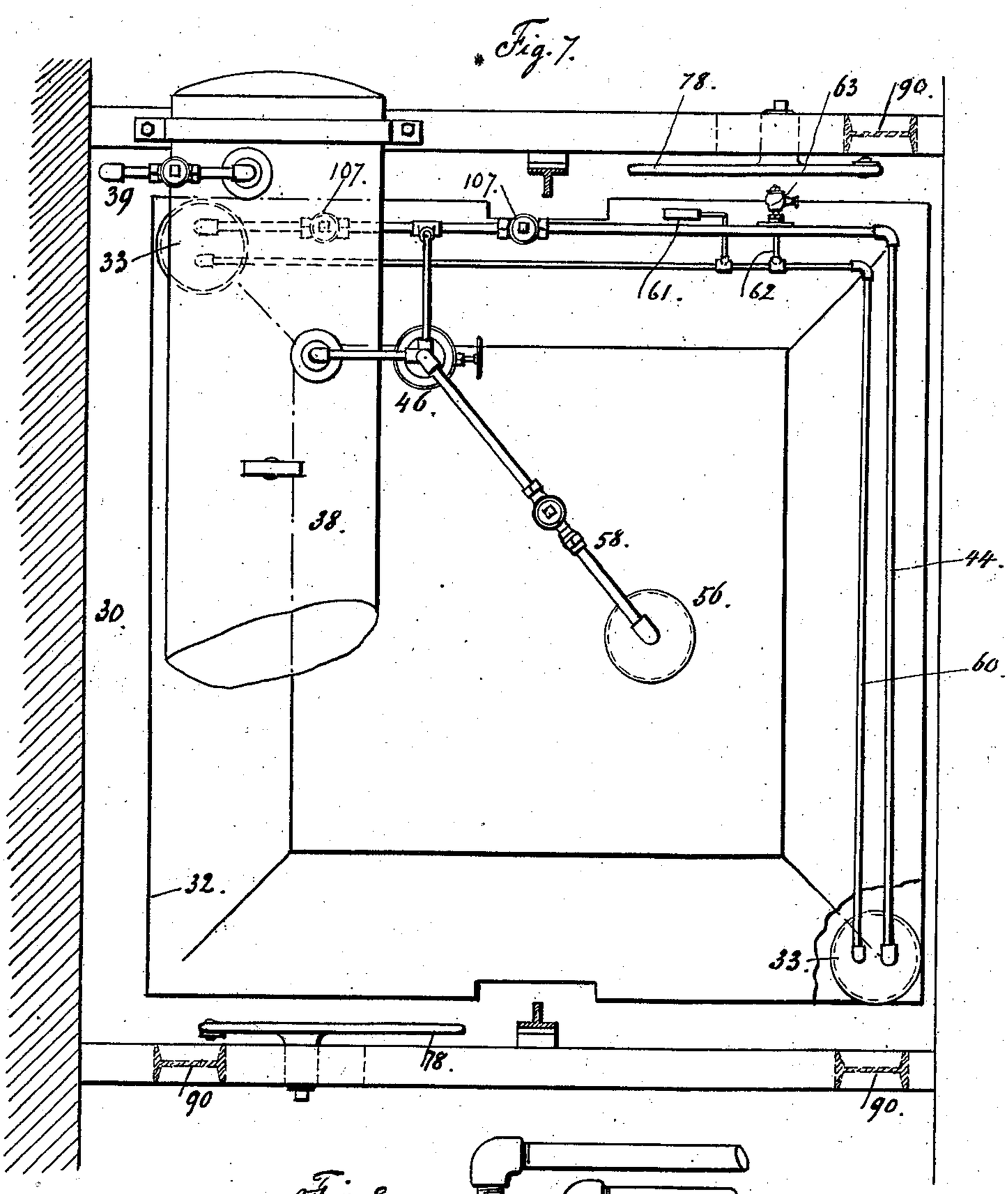
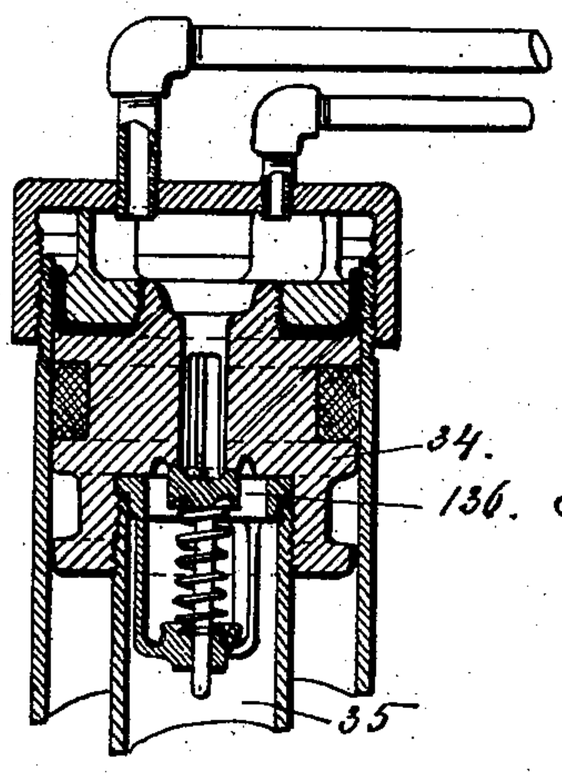


Fig. 8.



WITNESSES:

Gunder Gunderson.

William H. Davis.

INVENTOR

Susanna B. Trapp.

BY

Chas. C. Gill

ATTORNEY

No. 700,458. Patented May 20, 1902.

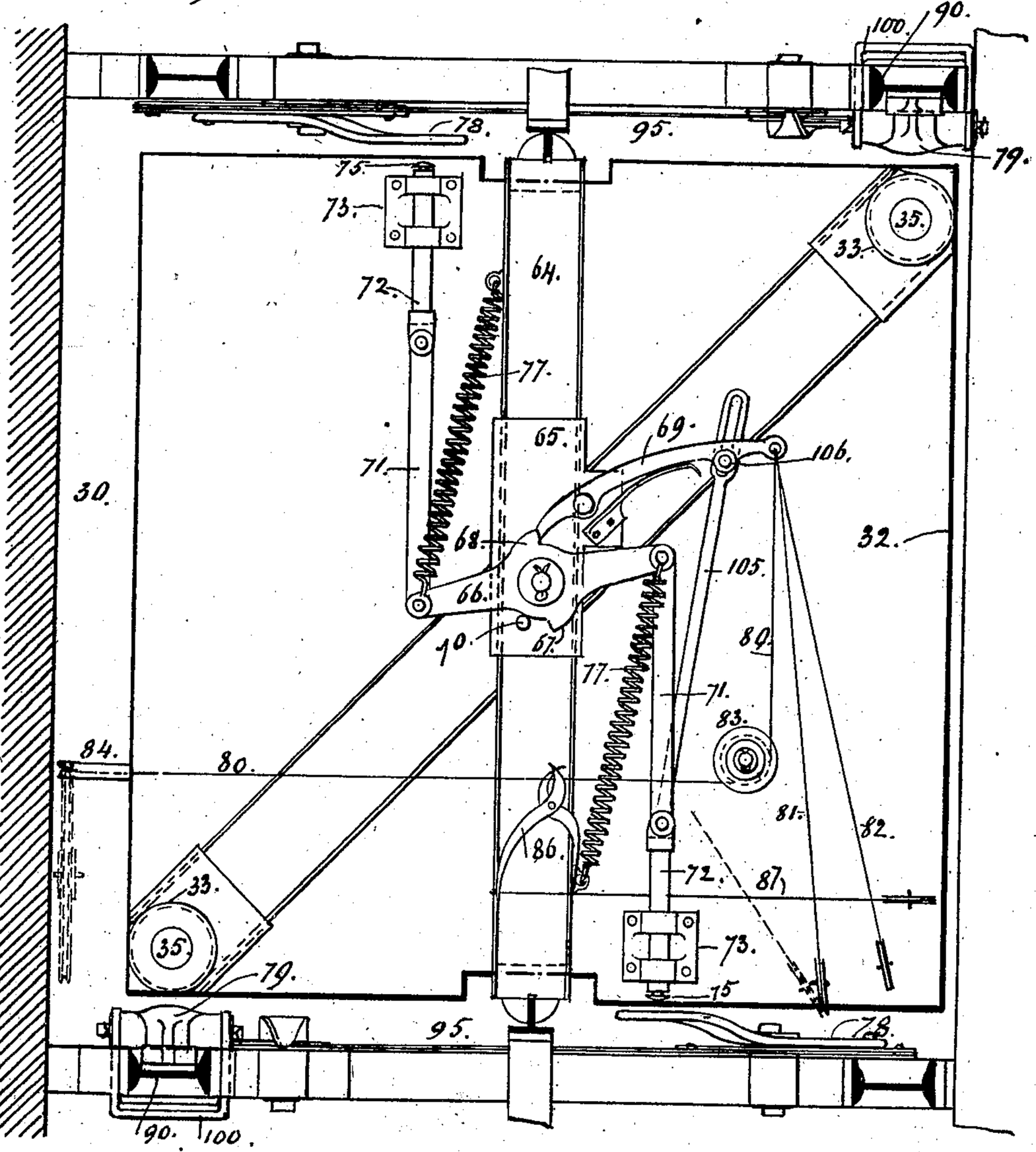
S. B. TRAPP.

SAFETY APPLIANCE FOR ELEVATORS.

(Application filed Oct. 16, 1901.)

(No Model.) 7 Sheets—Sheet 4.

Fig. 9.



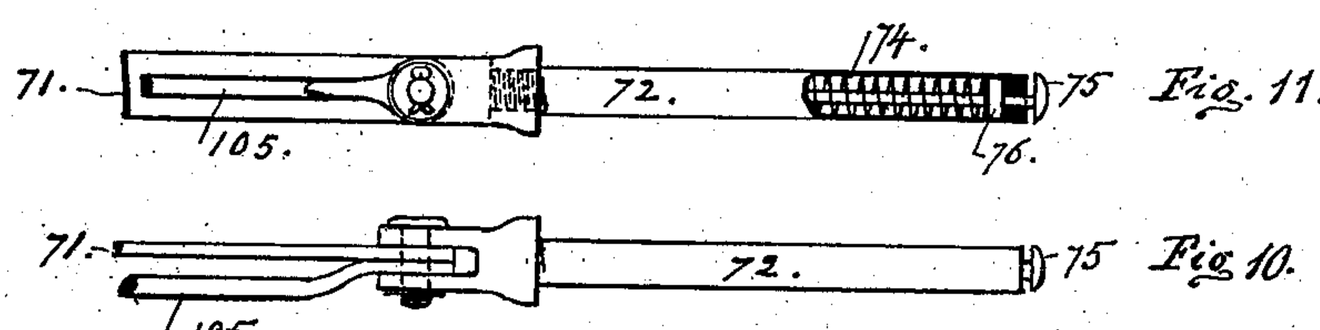


Fig. 11.

Fig. 10.

WITNESSES:
Arthur Marion.
Anna V. Brodrick.

INVENTOR
Susanna B. Trapp.
BY
Chas. C. Gill
ATTORNEY

No. 700,458. Patented May 20, 1902.

S. B. TRAPP.

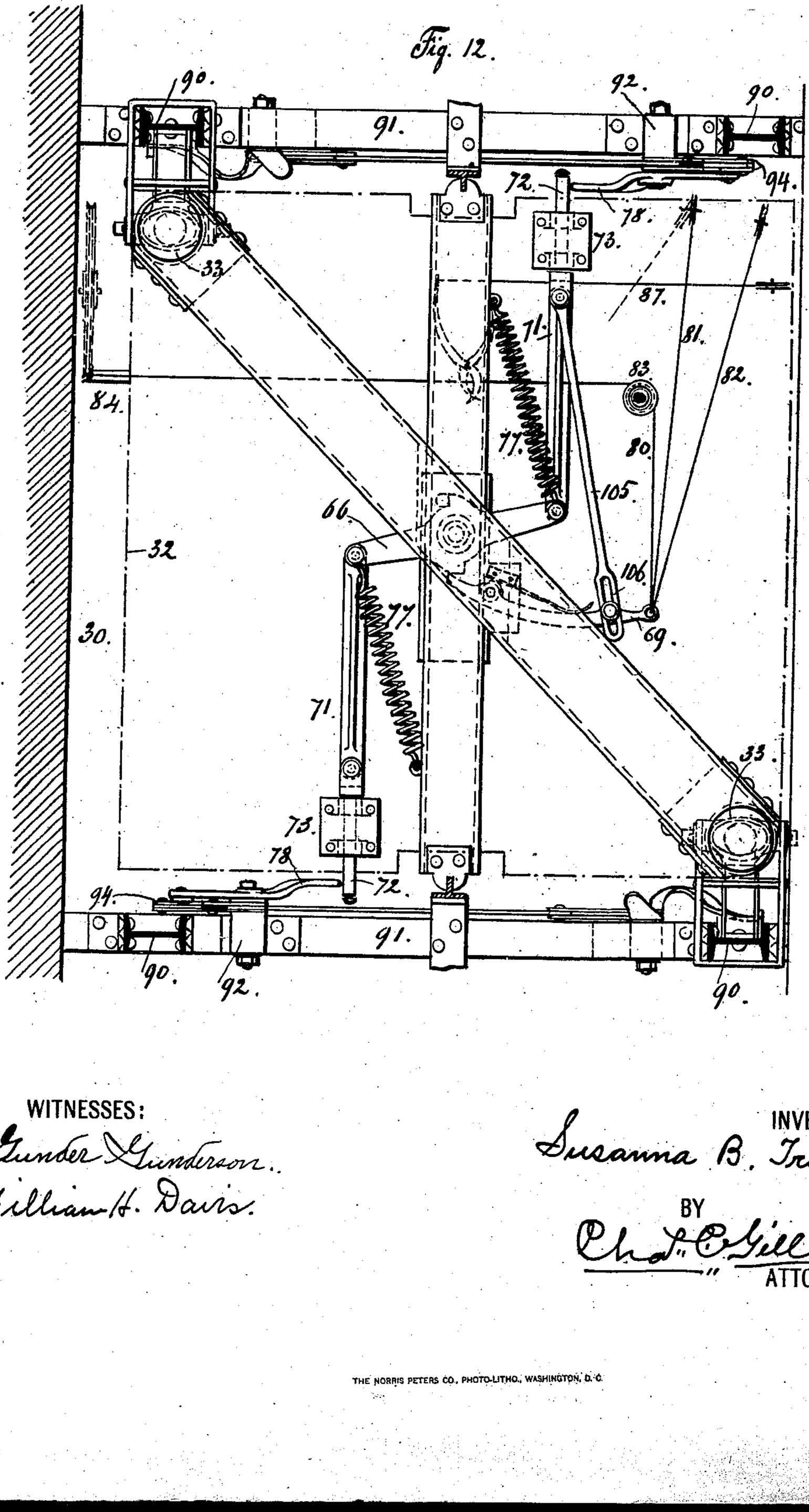
SAFETY APPLIANCE FOR ELEVATORS.

(Application filed Oct. 16, 1901.)

(No Model.)

7 Sheets—Sheet 5.

Fig. 12.



WITNESSES:

Gunder Gunderson.

William H. Davis.

INVENTOR

Susanna B. Trapp,

BY

Chas. C. Gill

ATTORNEY

No. 700,458. Patented May 20, 1902.

S. B. TRAPP.

SAFETY APPLIANCE FOR ELEVATORS.

(Application filed Oct. 16, 1901.)

(No Model.)

7 Sheets—Sheet 6.

Fig. 13.

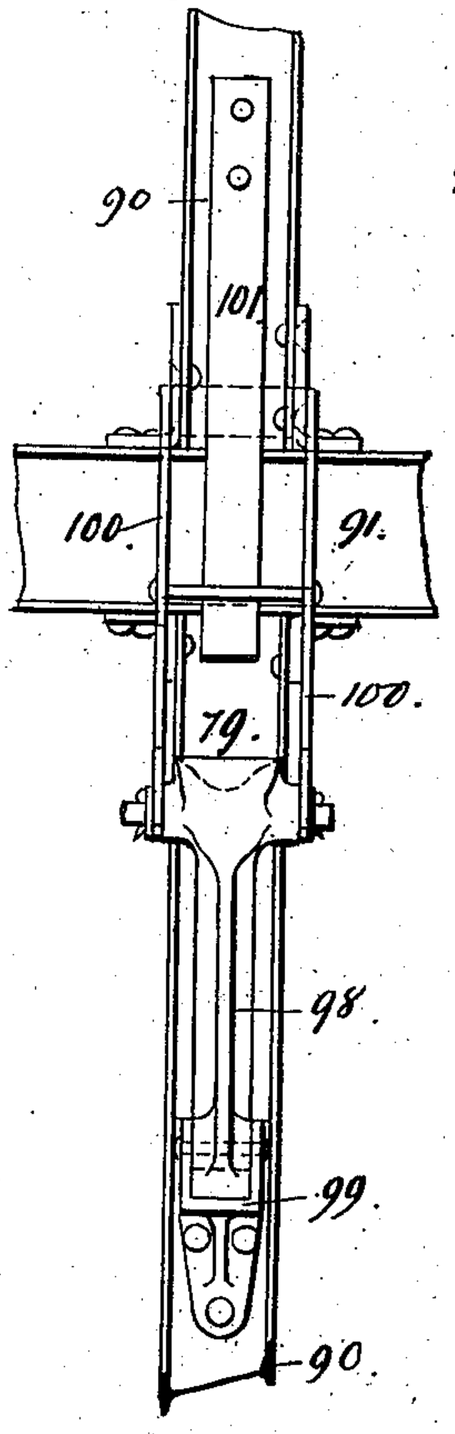


Fig. 14.

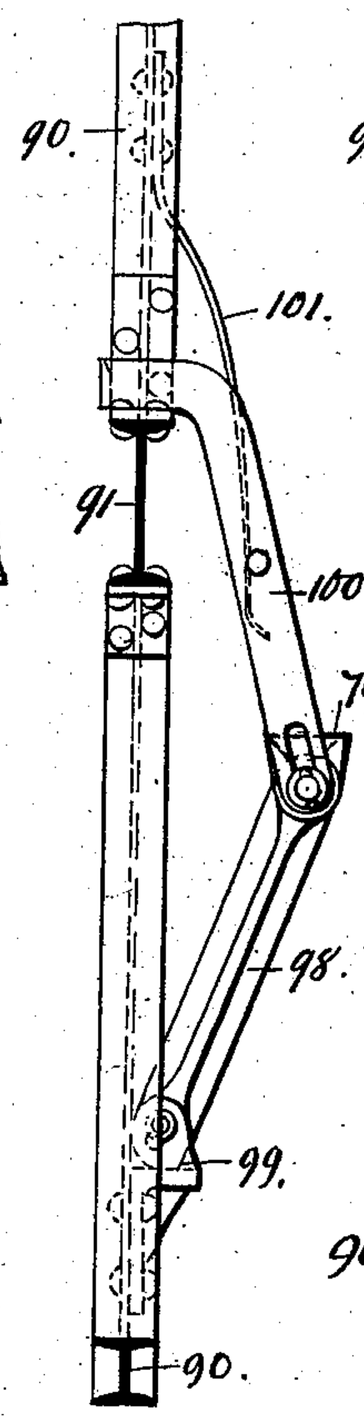


Fig. 15.

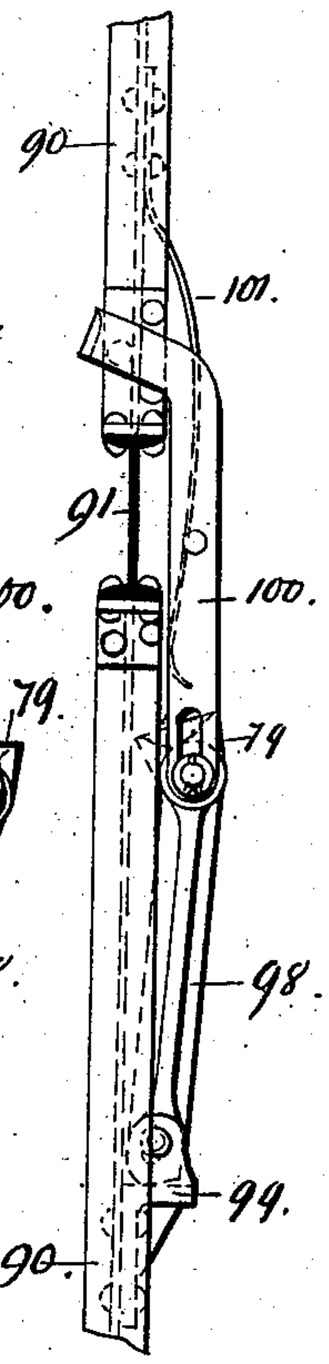


Fig. 16.

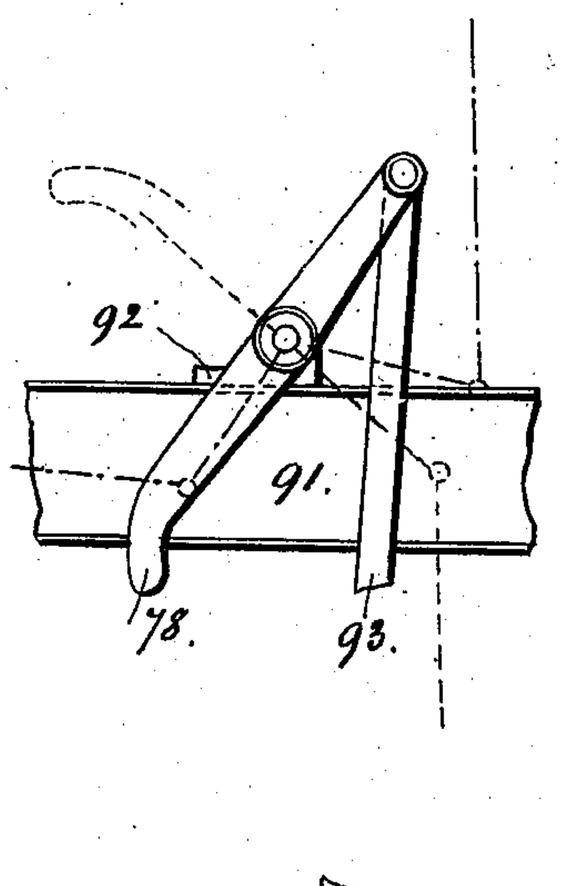


Fig. 17.

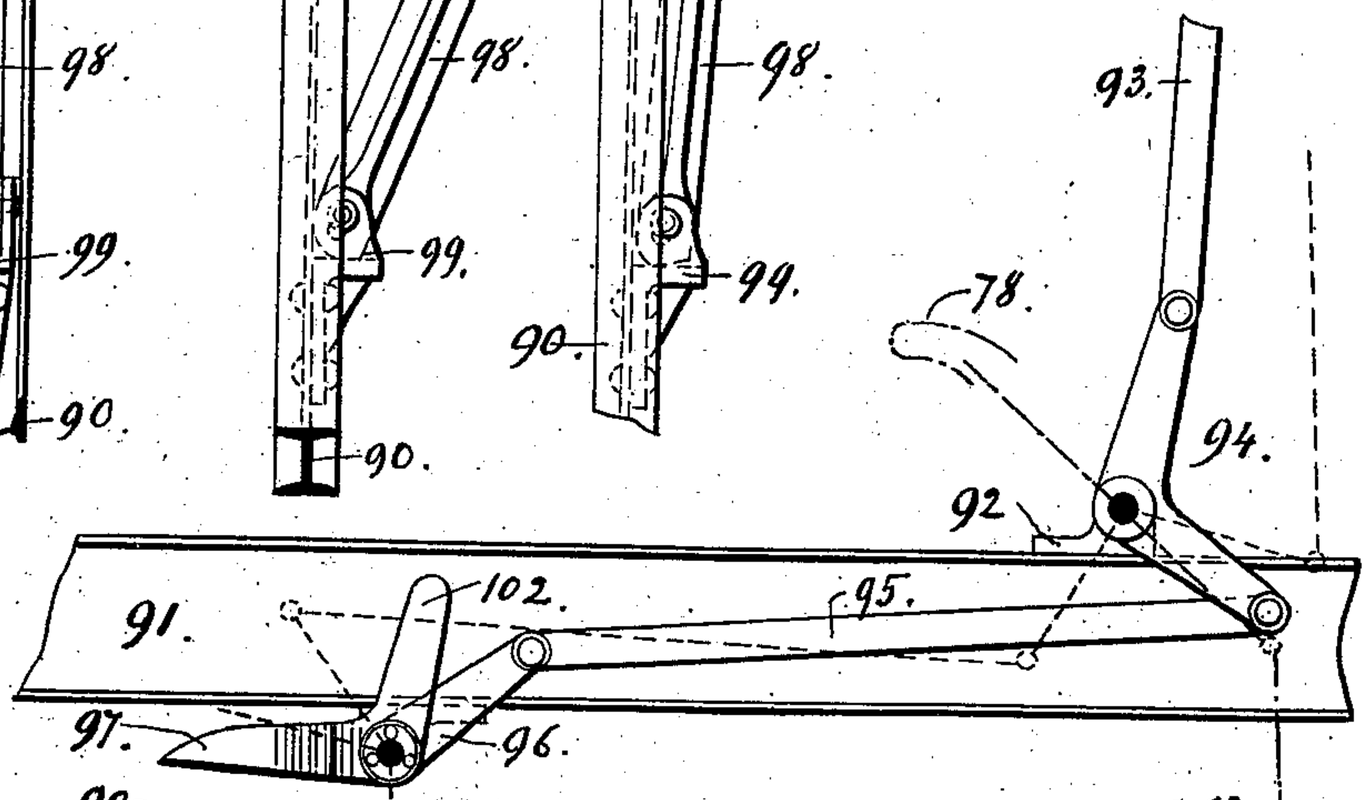
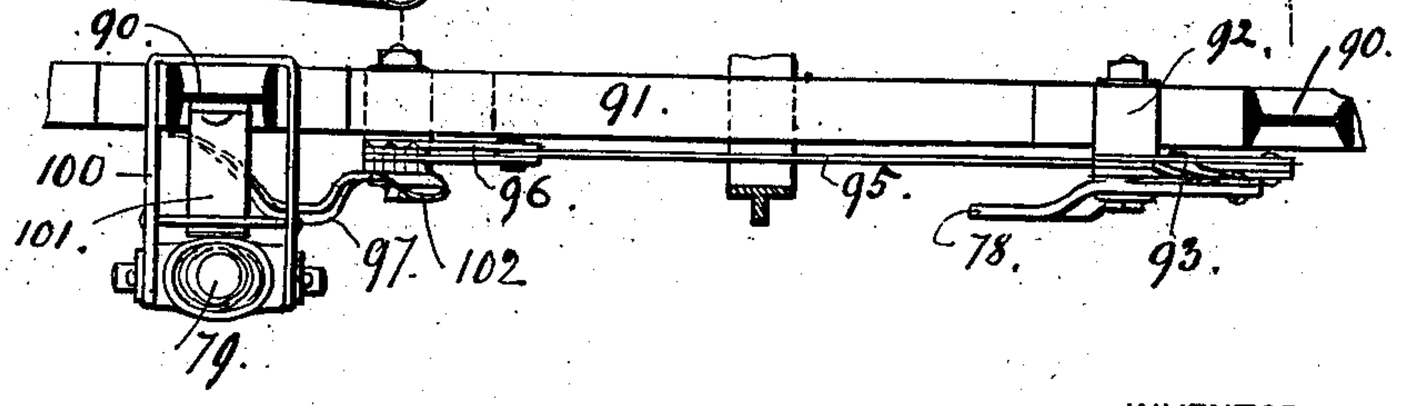


Fig. 18.



WITNESSES:

Gunder Gunderson.

William H. Davis.

INVENTOR

Susanna B. Trapp.

BY

Chas. J. O'Gill

ATTORNEY

No. 700,458. Patented May 20, 1902.

S. B. TRAPP.

SAFETY APPLIANCE FOR ELEVATORS.

(Application filed Oct. 16, 1901.)

(No Model.) 7 Sheets—Sheet 7.

Fig. 19.

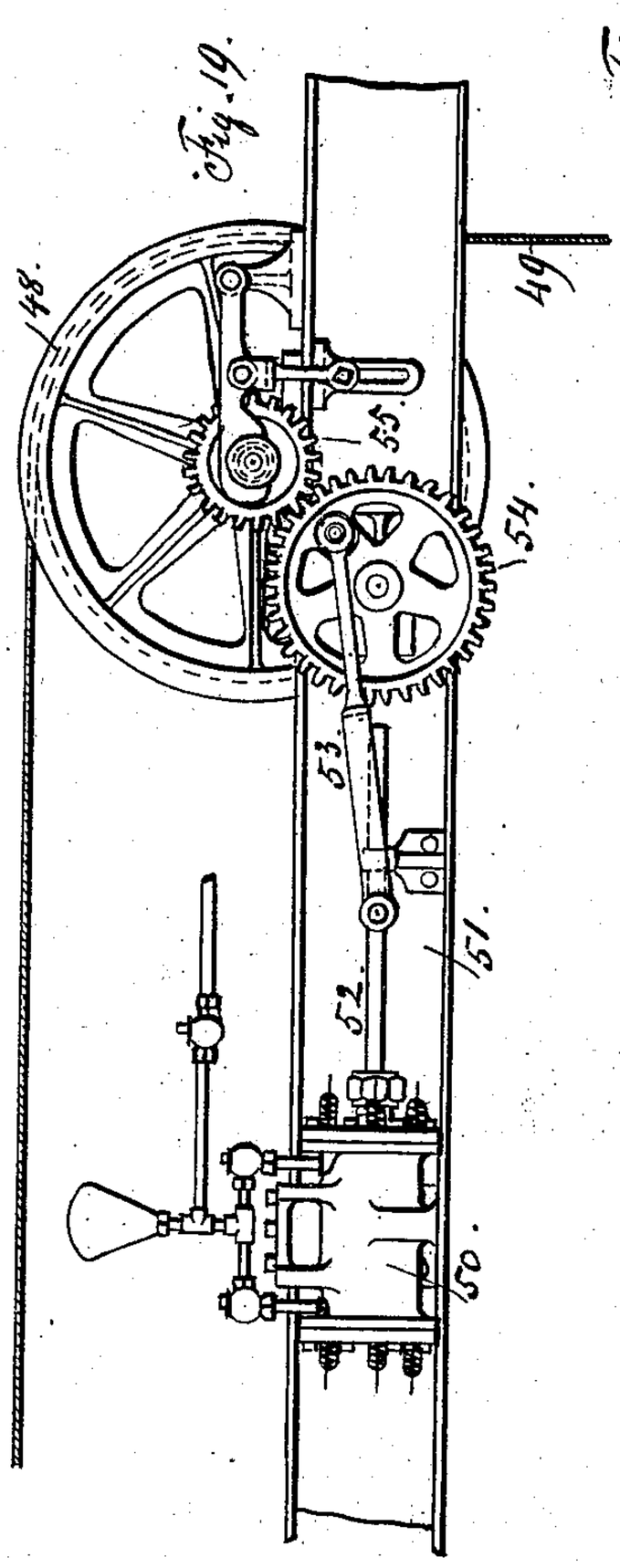
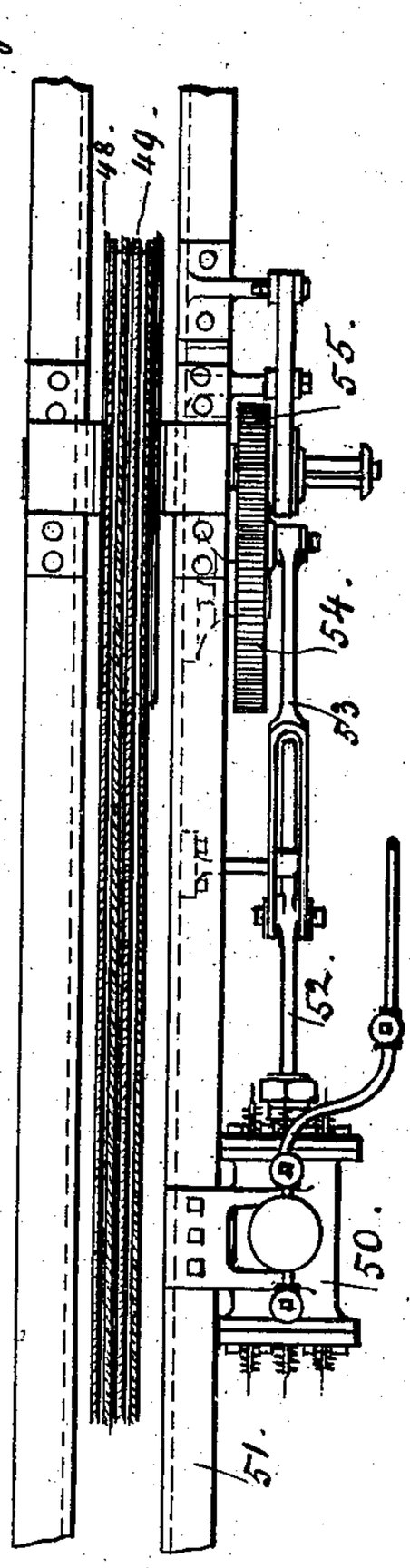


Fig. 20.



WITNESSES:

Gunder Gundersen.

William H. Davis

INVENTOR

Susanna B. Trapp.

BY

Chas. C. Gill

ATTORNEY

UNITED STATES PATENT OFFICE.

SUSANNA B. TRAPP, OF NEW YORK, N. Y.

SAFETY APPLIANCE FOR ELEVATORS.

SPECIFICATION forming part of Letters Patent No. 700,458, dated May 20, 1902.

Application filed October 16, 1901. Serial No. 78,798. (No model.)

To all whom it may concern:

Be it known that I, SUSANNA B. TRAPP, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Safety Appliances for Elevators, of which the following is a specification.

The invention relates to improvements in safety appliances for elevators; and it consists in the novel features, arrangements, and combinations of parts hereinafter described, and particularly pointed out in the claims.

The invention comprises means for arresting the car in case of accident at any one of the several floors of a building and in so cushioning the car upon the stoppage thereof as to relieve the car from breakage and its passengers from unnecessary shock or jar.

The invention comprises cushioning apparatus located on the elevator-car and means disposed at predetermined points along the elevator-shaft for engaging said apparatus and arresting the car in case of accident to the latter, and this cushioning apparatus carried by the car and said means secured along the elevator-shaft will be fully understood from the detailed description hereinafter presented, reference being had to the accompanying drawings, in which—

Figure 1 is a vertical sectional view through a portion of an elevator-shaft, the car and shaft being equipped with safety appliances constructed in accordance with and embodying the invention. Fig. 2 is an enlarged detached sectional view of a portion of the apparatus for supplying air to the cushioning-cylinders carried by the car. Fig. 3 is a like view of means carried by the car for receiving the nozzle shown in Fig. 2 when the car is in its upper position and air is to be supplied to the cushioning-cylinders carried thereby. Fig. 4 is an enlarged detached view of a valve intended, as hereinafter described, for application to the car. Fig. 5 is a vertical sectional view through a portion of an elevator-shaft equipped with means for arresting the car. Fig. 6 is also a vertical sectional view through a portion of an elevator-shaft equipped with said means for arresting the car, the section for Fig. 6 being at right angles to the section of Fig. 5 and the said means being illustrated in operative position arresting the car. Fig. 7 is a top view, partly broken away and partly in section, taken from the top of the elevator-shaft and illustrating the compressed-air mechanism located at the top of said shaft, together with the upper ends of the cushioning-cylinders and their piping carried by the car. Fig. 8 is an enlarged detached vertical central section through a portion of one of the cushioning-cylinders carried by the car, together with the piston within said cylinder. Fig. 9 is a horizontal transverse section through the elevator-shaft looking at the bottom of the car. Figs. 10 and 11 are detached views, partly broken away and in Fig. 11 being partly in section, of one of the sliding arms carried at the bottom of the car for engaging and setting in position in case of accident the devices disposed in the elevator-shaft. Fig. 12 is a view corresponding with Fig. 9, but looking downward at the car-bottom framing, the flooring of the car being removed and illustrating a different position of the parts carried by the car-bottom, Fig. 9 showing said parts in their normal inoperative position, as when the car is traveling safely, and Fig. 12 showing the position of said parts when in case of accident they are thrown into their operative position to set the arresting devices disposed in the elevator-shaft. Figs. 13, 14, 15 are detailed views showing the arresting devices secured in the elevator-shaft in their operative and inoperative positions, Fig. 13 being a front elevation, and Figs. 14 and 15 side elevations. Fig. 16 is a detailed side elevation of a portion of the lever mechanism mounted in the elevator-shaft. Fig. 17 is a like view of a further portion of the lever mechanism disposed in the elevator-shaft. Fig. 18 is a horizontal section through a portion of the elevator-shaft and illustrates the lever mechanism mounted therein for arresting the car. Fig. 19 is a side elevation of an air-pump to be located at the upper end of the elevator-shaft and operable from the hoisting-cables for supplying the air-reservoir with air during the traveling motion of the car. Fig. 20 is a top view of same, and Fig. 21 is an enlarged side elevation, partly

broken away and partly in section, of a modified construction embodying a portion of my invention.

In the drawings, 30 designates a portion of a usual elevator-shaft, 31 the several floors of a building, and 32 the elevator-car, upon which are provided one or more, but preferably two, cushioning-cylinders 33, containing pistons 34, Fig. 8, the latter being secured upon the upper ends of the hollow piston-rods 35, which project downward below the car 32 in position to engage at the proper time certain stops, hereinafter described, when in case of accident said stops shall be moved into the path of said piston-rods 35. The normal position of the pistons 34 is at the lower ends of the cylinders 33, and said cylinders 33 are provided adjacent to their lower ends with apertures 36, which during any sudden ascent of the pistons 34 within their cylinders 33 prevent the formation of a vacuum below said pistons. The pistons 34 are utilized when brought into action to compress the air above them, and said pistons are provided with the downwardly-acting valve 136, which is held to its seat by a spring and is adapted to yield downwardly under an excess of pressure above it within the cylinder 33. The hollow piston-rods 35 are formed at their lower ends with vents 37, Fig. 1, and any air passing downward through the piston-heads 34 may enter the piston-rods 35 and escape through the vents 37.

The cylinders 33 are carried by the car 30 and are by preference filled with air under pressure, this air being supplied to the cylinders 33 by any means desired, but preferably with the use of the apparatus illustrated in the drawings and disposed at the upper end of or over the elevator-shaft 30, as shown in Fig. 1, wherein 38 denotes a supply-reservoir for compressed air, this reservoir being supplied from any suitable source through the pipe 39 and being, in connection with a suitably-valved pipe 40, equipped at its lower end with a nozzle 41 and upwardly-acting valve 42, the stem 43 of the valve 42 extending downward through the nozzle 41 and projecting a short distance below the lower end thereof, as illustrated in Fig. 2. The purpose of the nozzle 41 is upon every ascent of the car 32 or as often as may be desired to charge the cylinders 33 with compressed air. The upper ends of the cylinders 33 are connected by a pipe 44, Fig. 7, and this pipe 44 is connected with a branch pipe 45, which is in communication with a funnel-shaped receiver 46, disposed vertically over and carried by the car 32. The receiver 46 is in such position with relation to the nozzle 41 that it will upon the ascent of the car 32 pass upward upon said nozzle 41, and at the base of the receiver 46 is provided a spider or frame 47 to contact with the lower end of the valve-rod 43 and elevate the valve 42 from its seat upon the ascent of the car in order that upon such ascent the cylinders 33 may be automatically supplied with air from the reservoir or tank 38 through the pipe 40, thereby establishing a communication from the tank 38 through the pipe 40, nozzle 41, pipe 45, and pipe 44 to the upper end of the cylinders 33. When the nozzle 41 is in its vertical position, (denoted by solid lines in Figs. 1 and 2,) the car 32 upon each ascent will unseat the valve 42 to establish communication between the tank 38 and cylinders 33; but if it shall be desired not to supply the cylinders 33 with each ascent of the car 32, but at other predetermined intervals, the nozzle 41 may be secured to the lower end of the pipe 40 by a swiveled joint 47, as indicated, so that said nozzle may be moved to one side, as denoted by the dotted lines in Fig. 1, and remain free of the receiver 46. At such times as it may be desired to charge the cylinders 33 the nozzle 41 should be turned from the position in which it is shown by dotted lines in Fig. 1 to its vertical position (denoted by solid lines) in order that upon the ascent of the car the valve 42 may be unseated and said cylinders charged. The nozzle 41 may thus be used for charging the cylinders 33 upon each ascent of the car 32 or only at such other predetermined times as may be deemed sufficient. When the car 32 descends, the receiver 46 will slip off from the nozzle 41 and the air-pressure from the tank 38 will close the valve 42, which valve is also adapted to close by gravity.

The tank 38 may be charged in any suitable manner, but in the absence of other preferred means for accomplishing this purpose I recommend the employment of the pump shown in Figs. 19 and 20 for charging the tank with compressed air.

In Figs. 19 and 20, 48 denotes the usual sheaves for the hoisting-cable 49, and 50 a double-acting pump to be driven from the sheaves 48. The pump 50 I secure to a beam 51, and its piston-rod 52 is connected with the crank-rod 53, adapted to be driven by the gear-wheel 54, which receives its motion from the shaft of the hoisting-sheaves 48 by means of the pinion-wheel 55, secured upon said shaft.

The apparatus illustrated in Figs. 19 and 20 enables the charging of the reservoir or tank 38 during the traveling of the car 32, the sheaves 48 being utilized not only for the hoisting-cable, but also for operating the pump 50, whereby to charge the reservoir or tank 38 with compressed air during both the ascent and descent of the car.

If desired, one of the air-cushioning cylinders may be applied over or within the upper part of the elevator-shaft 30, as shown in Fig. 1, this cylinder (numbered 56) being identical in construction with the cylinders 33 and having a downwardly-projecting hollow piston-rod 57, in all respects corresponding with the above-mentioned piston-rods 35. The upper end of the cylinder 56 is connected by a pipe 58 with the tank 38 and receives its supply of air from said tank. The cylinder 56 is pro-

vided to cushion the car 32 upon the ascent of the same in order to prevent the car 32 in the event of accident from passing upward unduly. On the top of the car 32 is provided a stop 59, containing a socket, (indicated by dotted lines in Fig. 1,) which will pass against the lower end of the piston 57 upon any undue ascent of the car 32 and drive the piston 57 upward within the cylinder 56, the compressed air within the latter affording a cushion to retard any undue upward motion of the car 32 and prevent undue shock or jar to the latter. The upper ends of the cylinders 33 will also be connected by a pipe 60, to which a suitable pressure-gage 61 may be secured for denoting the pressure in the cylinders 33. The pipe 60 will also be supplied with a downwardly-extending branch pipe 62, which will be equipped with an outlet-valve 63 for manual operation by the attendant in the car at such time as it may be desired to permit of the escape of a part of the air within the cylinders 33, as when in case of accident the car has been arrested and it is desired that a part of the air shall be permitted to escape from the cylinders 33 in order that the car may settle down to a level with a floor of the building.

During the travel of the car 32 the cylinders 33 have no connection whatever with any of the appliances at the upper end of the shaft nor with those, hereinafter described, secured along the wall of the elevator-shaft, and hence the car 32 is a self-contained structure and will be operated in the usual manner.

Upon the lower end of the car 32 will be provided suitable means (shown in Figs. 9 to 12, inclusive) for use in case of accident in engaging certain levers, whereby the stops, hereinafter described, are moved into the path of the lower ends of the piston-rods 35 for the purpose of being engaged by the latter and effecting the gradual stoppage of the car, and first I will describe the said means carried upon the lower end of the car.

Referring to Figs. 9 and 12, it will be seen that extending horizontally across the bottom of the car 32 is secured the beam 64, having at its center a bearing-plate 65, upon which is pivotally mounted the double-ended plate 66, having the ratchet-teeth 67 68, the latter being adapted to be engaged by the pawl-arm 69 and the tooth 67 being adapted to coöperate with the pin 70 to form a stop for checking the movement of the plate 66 in one direction after its release from the pawl-arm 69. To the ends of the plate 66 are pivotally secured the rods 71, which extend in opposite directions on parallel lines toward the outer edges of the car 32 and have pivotally secured to their outer ends the hollow arms 72, which are adapted to have a horizontal sliding motion within guides 73, secured to the bottom of the car 32. Within the arms 72 are provided the coiled springs 74, and projecting outward from the ends of the said arms 72 are the heads 75, these heads 75 being acted upon by the springs 74 through the pistons 76 to normally stand in their outward position. (Shown in Figs. 10 and 11.) The heads 75 are yieldingly held in their outward position, and should they come into face contact with any of the levers, hereinafter described, during the outward thrust of the arms 72 they will yield sufficiently to pass said levers without strain or injury to the latter or to the arms 72. During the travel of the car 32 under normal conditions the double-ended plate 66, rods 71, and arms 72 will be held at their normal inoperative position (shown in Fig. 9) by means of the pawl-arm 69; but when the pawl-arm 69 is freed from the tooth 68 of the plate 66 the latter will be turned under the action of the coiled springs 77 and move the rods 71 and arms 72 outward from their inoperative position (shown in Fig. 1) to their operative position, (shown in Fig. 12,) the plate 66 turning under the action of the springs 77 until arrested by the contact of the tooth 67 with the stop-pin 70. When the arms 72 are thus projected outward under the action of the springs 77, their outer ends will extend beyond the vertical edges of the car 32 in position to contact with the upper edges of the levers 78, disposed in the elevator-shaft; but when the arms 72 are at their inward position they will lie within the vertical edges of the car 32 and during the travel of the latter remain idle. The purpose of having the arms 72 contact with the levers 78 is to effect the outward movement of the stops 79 into the path of the piston-rods 35, so that said piston-rods 35 during the descent of the car may strike upon said stops 79 for the purpose of securing the gradual stoppage of the car, and the means for releasing the pawl-arm 69 from the plate 66, so that the springs 77 may project the arms 72 outward above the levers 78, will now be described. These means for relieving the arm 69 from the plate 66 are substantially shown and described in Letters Patent of the United States No. 634,966, granted to me on October 17, 1899, and they comprise the three wires or cables 80, 81, and 82, Fig. 9, the wire or cable 80 being connected at one end to the pawl-arm 69, and thence passing around the pulleys 83 and 84 to the usual cable (not shown) for the speed-governor (not shown) of usual or suitable construction and one form of which is illustrated in detail in the aforesaid Letters Patent No. 634,966. As is usual, upon the car attaining an undue speed the governor will effect the stoppage of the speed-governor cable which travels with the car, and when this happens the descending car will pull on the cable 80, with the result that the cable 80 will pull on the outer end of the pawl-arm 69 and release the latter from the plate 66 and permit the springs 77 to turn said plate 66 and throw the arms 72 outward into their operative position. The wire or cable 81, connected with the pawl-arm 69, will, as described in said Patent No. 634,966, be connected with the hoisting-cable 49. During the ordinary travel of the car the hoisting-

cable 49 and wire or cable 81 will maintain a uniform relation, and said cables will under such circumstances have no effect upon the pawl-arm 69; but should the hoisting-cable 49 break in any of its usual danger-points (where it passes over the several pulleys carried at the top and sides of the car) the weight of the car would throw a materially-increased strain upon the wire or cable 81, and at such time the pull on the wire or cable 81 would operate to release the pawl 69 from the plate 66, with the result that the springs 77 would be permitted to throw the arms 72 outward into their operative position.

The wire or cable 82, connected with the pawl-arm 69, passes over a suitable pulley and terminates at a handle 85, located within the car and in convenient reach of the attendant therein. By drawing downward on the handle 85 a pull may be exerted on the cable 82 for the purpose of releasing the pawl-arm 69 from the plate 66, and this operation will be performed by the attendant in the car should an occasion arise in which the usual starting and stopping cable in the car should fail to perform its duty and it should be deemed desirable to assure the stopping of the car by means of the safety appliance embracing my invention.

It may be desired, as in case of fire, to run the elevator-car 32 at full speed and to detach the car from the speed-governor cable, so that said car may travel at such increased speed as would not be permitted by a speed-governor, and under such conditions it will also be desirable that the safety appliances embracing my invention shall remain in condition to operate, so that they may be set into action by the attendant in the car should occasion arise for that result, and to this end I provide, as set forth and claimed in my above-referred-to patent, a pair of cutting-nippers 86, operable by means of the cable 87, extending into the car, for clipping the wire or cable 80, passing from the pawl-arm 69 to the speed-governor cable, these nippers 86 being of the character and used for the purpose explained in the aforesaid Patent No. 634,966, and hence requiring no special description herein.

Extending lengthwise of the elevator-shaft 30 are the vertical I-beams 90, and at the several floors of the building are provided the horizontal I-beams 91, and the beams 90 91 afford adequate supports for the lever mechanism disposed along the elevator-shaft for coöperation with the safety appliances carried by the car. Supported from or by the transverse beams 91 are the bearing-brackets 92 for the levers 78, hereinbefore referred to, one of said levers 78 being provided at each floor of the building and all of the said levers 78 being in vertical line with one another and normally projecting into the elevator-shaft, as indicated in Fig. 1, in position to be cleared by the car 32, but to be engaged by the ends of the arms 72 when the latter are projected outward beyond the vertical edges of the car. The lever 78 at each floor is connected by a rod 93 with one arm of a bell-crank lever 94, located at the floor below the same. The lever-arm 78 at the upper end of Fig. 5 is shown in the position which will be given to it when it is pressed downward by the contact therewith of one of the safety-arms 72, carried by the car, the contact of the arm 72 with the lever 78 having the effect of turning said lever 78 downward to a position (shown in Fig. 16) whereby the arm 72 may pass by it, and said lever is forced to pull upward on the rod 93 and cause the bell-crank lever 94 at the floor below to turn on its pivot from its normal position (denoted at the upper part of Fig. 5) to its operating position, (shown at the lower part of Fig. 5 and also in Fig. 17,) this movement of the bell-crank lever 94 being for the purpose of pulling on the transverse rod 95, connected with it, and through said rod turning the bell-crank lever 96 from its normal position (shown at the upper part of Fig. 5) to its operating position, (shown at the lower part of Fig. 5 and also in Fig. 17,) and this movement of the bell-crank lever 96 being for the purpose of causing its cam-arm 97 to ride behind and push outward the stop 79 into the path of a piston-rod 35, descending with the car, as hereinafter more fully explained. The lever mechanism just above referred to is in duplicate, one set being at each side of the elevator-shaft. Thus at each floor of the building there are two levers 78, and these levers 78 are connected by rods 93 with bell-crank levers 94 at the floor immediately below them. At each floor below the top floor the bell-crank levers 94 are connected by rods 95 with the bell-crank levers 96 for setting the stops 79, which also are provided at each floor below the top floor.

The stops 79 are cup-shaped and are formed on the upper ends of the hinged bars 98, Figs. 13, 14, and 15, said bars 98 being pivotally secured at their lower ends to brackets 99, which are fastened to the channel-beams 90, said brackets 99 setting in between the flanges of said beams 90, so that any downward strain passing upon the bars 98 may be exerted substantially in line with the length of said beams 90. The upper ends of the bars 98 are pivotally connected with sliding loops 100, which are bent metal bars whose ends are pivotally secured to the upper ends of the bars 98 and whose middle portion passes around the beams 90, so as to be capable of vertical sliding movement thereon, as illustrated in Figs. 13, 14, and 15. When the loops 100 are in their lower position, (shown in Figs. 13 and 14,) the middle portion thereof will rest upon the transverse beams 91, which limit the downward motion of said loops 100. The normal position of the bars 98 and loops 100 is shown in Fig. 15, in which it will be seen that the bar 98 and loop 100 lie vertically close against the beam 90. The lower ends of the loops 100 are slot-

ted, as shown in Figs. 14 and 15, to allow a certain amount of loose play at the joint between the bars 98 and loops 100. I shall preferably employ leaf-springs 101, flexed against the loops 100, to aid in moving the stops 79 from their normal inoperative position (shown in Fig. 15) to their operative position, (shown in Fig. 14,) the stops 79 when in the position shown in Fig. 14 being in the path of the lower ends of the piston-rods 35.

The stops 79, bars 98, and loops 100 are firmly held in their inoperative position (shown in Fig. 15) by means of the crank-arm 102, connected with the bell-crank levers 96, as shown at the upper part of Fig. 5, where it will be seen that in the normal position of the bell-crank levers 96 the crank-arm 102 lies against the outer edges of the loop 100 and maintains said loop in opposition to the stress of the spring 101 against the beam 90. When in case of accident it is desired that the stops 79 shall move outward into the path of the piston-rods 35, the pull on the transverse rods 95 through the instrumentality of the bell-crank levers 94 results in the crank-arms 102 being turned from the loops 100 and to the position in which said crank-arms 102 are illustrated at the lower part of Fig. 5 and in Fig. 17, thus leaving the loops 100, bars 98, and stops 79 free to be moved outward, and while the crank-arms 102 are being moved from contact with the loops 100 the cam-arms 97, forming a part of the bell-crank levers 96, will move inward between the loops 100 and beams 90, as shown in Fig. 18 and the lower portions of Figs. 5 and 6, and operate to assist in moving the stops 79 outward into the path of the piston-rods 35.

The springs 101 will move the stops 79 outward when the crank-arms 102 are relieved from the loops 100; but as positive means for assuring the full outward movement of the stops 79 I provide the cam-arms 97 for aiding the springs 101 and for holding the stops 79 in their full outward position.

I likewise provide positive means for assuring the action of the springs 77, applied to the bottom of the car for moving the double-ended combined lever and ratchet-plate 66, and these means consist of the rod 105, pivotally secured at one end to one of the rods 71 and slotted at its other end to embrace a pin 106, carried by the pawl-arm 69. When the pawl-arm 69 is pulled to relieve it from the plate 66, it will by means of its pin 106 push against the rod 105 and cause the latter by acting on the rod 71 to turn the plate 66 and effect the outward movement of the arms 72. The rod 105 is useful in assuring the movement of the rods 71, and in the event that the springs 77 should for any reason fail to operate the said rod 105 may be depended on as the means for driving the arms 72 to their outward position.

The operation of the mechanism hereinbefore described will be in large measure understood from the description hereinbefore presented without further detailed explanation. The cylinders 35, carried by the car 32, are charged with air from the tank 38 or other suitable source, and the air-pressure within the cylinders 33 is equalized by virtue of their connection by means of the pipe 60. The pipe 44 is supplied by the individual pipe 45, and both cylinders 33 receive air therefrom. The pipe 44 is provided with usual check-valves 107, which admit the passage of the air to the cylinders 33, but prevent the return of same in the opposite direction. During the travel of the car the cylinders 33, with their projected piston-rods 35, require no attention and remain idle except in case of accident.

During the safe travel of the car 32 the lever mechanism provided along the elevator-shaft remains idle, with the stops 79 at their inward position (shown in Fig. 15) and the lever-arms 78 in the position indicated in Fig. 1.

In the event of accident the pawl-arm 69 is released from the plate 66, and the arms 72 are projected outward, so that they may upon the descent of the car strike upon the upper edges of the levers 78 next below them and turn the same downward from the position shown in Fig. 1 and in the lower part of Fig. 5 to the position illustrated at the upper part of Fig. 5 and in Fig. 16, the arms 72 after turning the levers 78, as described, passing the same, so that the lower ends of the piston-rods 35 may strike upon the stops 79, then moved outward, located at the first floor below the floor at which the levers 78 were struck by the arms 72, and turned, the turning of the said levers 78 having had the effect, through the rod 93, bell-crank lever 94, rod 95, and bell-crank lever 96, of effecting the outward movement of the stops 79 into the path of said piston-rods 35. The striking of the lower ends of the piston-rods 35 upon the stops 79 results in the stoppage of the car 32, this stoppage of the car being accomplished without injury to the car or its passengers by reason of the fact that the pistons within the cylinders 33 will be driven upward against the air within said cylinders, said air affording a proper cushion. After the car has been stopped the operator may by slightly opening the valve 63 allow a part of the air at the upper end of the cylinders 33 to escape, so as to permit the settling down of the car 32 to a level with the floor adjacent to which the stops 79, arresting the car, are located.

While I recommend the employment of compressed air for the cylinders 33, I do not limit the invention in all its parts to the employment of previously-compressed air for said cylinders 33, since I may provide cylinders of the character shown in Fig. 21 and numbered 110, which will have an opening at its upper end sufficient to admit atmospheric air, and the cushioning will be effected in this construction by the driving of the piston-head 111 against the atmospheric air above the

same, so as to compress the latter and create the cushion. When previously-compressed air is not employed for cushioning the cylinders, I recommend that the cylinders be made somewhat larger in capacity, so that an adequate supply of atmospheric air may be contained therein for compression in case of accident.

The structure shown in Fig. 1 is adapted for the use of either previously-compressed air or atmospheric air in the cylinders 33. When atmospheric air is to be used in the cylinders 33, the pipe 45 will be closed, and the air may be admitted through the valve 63, which will be thereafter closed, so as to seal the air within the cylinders and assure the creation of the proper cushions therein in the event of accident to the car.

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

1. The car, the cushioning-cylinder thereon containing elastic gaseous fluid and having the projecting piston-rod, and means for relieving the pressure in said cylinder when said fluid is compressed therein by the piston, combined with stops normally out of the path of said piston-rod, and means operable from the car for effecting the movement of said stops into the path of said piston-rod for arresting the car; substantially as set forth.

2. The car, and the cushioning-cylinder thereon containing elastic gaseous fluid and having the projecting piston-rod, combined with the series of stops normally out of the path of said piston-rod, lever mechanism for controlling said stops, and an arm connected with the car and adapted, when moved from its normal position, to engage said lever mechanism for effecting the movement of the proper stop into the path of said piston-rod, for receiving said rod and arresting the car; substantially as set forth.

3. The car, and the cushioning-cylinders mounted at opposite points thereon and having the downwardly-projecting piston-rods, said cylinders containing elastic gaseous fluid, combined with stops disposed along the elevator-shaft and normally out of the path of said rods, and means operable from the car for moving said stops into the path of said piston-rods for arresting the car; substantially as set forth.

4. The car, and the cushioning-cylinders mounted at opposite points thereon and having the downwardly-projecting piston-rods, combined with the series of stops disposed at opposite points along the elevator-shaft and normally out of the path of said rods, lever mechanism also arranged at opposite points along the elevator-shaft for controlling said stops, and arms connected with the car and adapted when moved from their normal position to engage said lever mechanism for effecting the movement of the proper stops into the path of said piston-rods for receiving said rods and arresting the car; substantially as set forth.

5. The car, the air-cushioning cylinders mounted at opposite points thereon and having the downwardly-projecting piston-rods, and the pipe 60 connecting said cylinders and affording free communication from one cylinder to the other, combined with stops disposed along the elevator-shaft and normally out of the path of said rods, and means operable from the car for moving said stops into the path of said piston-rods for arresting the car; substantially as set forth.

6. The car, the cushioning-cylinder thereon and having the downwardly-projecting piston-rod, the reservoir for compressed air, and means for automatically charging said cylinder from said reservoir upon the ascent of the car, combined with a stop adapted when in the proper position to receive the end of said piston-rod and effect the stoppage of said car; substantially as set forth.

7. The car, the cushioning-cylinder thereon having the downwardly-projecting piston-rod, the reservoir for compressed air, the nozzle 41 leading therefrom and having the valve 42 and valve-stem 43, the pipe leading to said cylinder and the funnel 46 on said pipe and adapted on the ascent of the car to pass upon the end of said nozzle and unseat said valve for enabling the automatic charging of said cylinder from said reservoir, combined with a stop adapted when in the proper position to receive the end of said piston-rod and effect the stoppage of said car; substantially as set forth.

8. The car, the cylinder thereon containing air and having the projecting piston-rod, and the valve 63 within reach of the attendant in the car for establishing communication between the interior of said cylinder and the atmosphere, combined with a stop adapted when in the proper position to receive the end of said piston-rod and effect the stoppage of said car; substantially as set forth.

9. The car, the cylinder thereon having the downwardly-projecting piston-rod, the reservoir for compressed air, connections for charging said cylinder from said reservoir, the pump for charging said reservoir, and means connected with the car-hoisting sheaves for actuating said pump, combined with a stop adapted when in the proper position to receive the end of said piston-rod and effect the stoppage of said car; substantially as set forth.

10. The car, and the cushioning-cylinder thereon having the downwardly-projecting piston-rod, combined with the several stops 79 along the line of the elevator-shaft, the hinged bars 98 sustaining said stops, the sliding bars 100 loosely connected with said stops, means for normally holding said stops out of the path of said piston-rod, and means operable from the car for moving one of said stops into the path of said piston-rod for arresting the car; substantially as set forth.

11. The car, the cushioning-cylinder thereon having the downwardly-projecting piston-

rod, the vertical beam 90 along the elevator-shaft, and the transverse beams 91 in said shaft, combined with the several stops 79 along said shaft, the hinged bars 98 sustaining said stops and supported by said beam 90, the looped bars 100 connected with said stops and passing around said beam 90 above and adapted to rest on said beams 91, and means operable from the car for moving one of said stops into the path of said piston-rod for arresting the car; substantially as set forth.

12. The car, and the cushioning-cylinder thereon having the downwardly-projecting piston-rod, combined with the stop 79 at the side of the elevator-shaft and normally out of the path of said piston-rod, the lever 96 having the arm 102 to hold the said stop out of the path of said piston-rod and an arm 97 to move said stop into the path of said piston-rod, and means operable from the car for actuating said lever 96; substantially as set forth.

13. The car, and the cushioning-cylinder thereon having the downwardly-projecting piston-rod, combined with the stop 79 at the side of the elevator-shaft and normally out of the path of said piston-rod, the lever 96 having the arm 102 to hold the said stop out of the path of said piston-rod and an arm 97 to move said stop into the path of said piston-rod, the transverse rod 95 connected at one end with said lever 96, the bell-crank lever 94 to which the other end of said rod 95 is connected, the vertical rod 93 connected with said lever 94, the pivoted lever 98 to which the upper end of said rod 93 is connected, and means carried by the car for engaging under proper conditions said lever 98 and causing the latter to effect the operation of said lever 96; substantially as set forth.

14. The car, the cushioning-cylinders thereon having the downwardly-projecting piston-rods, the pivoted plate 66 carried by the car, the rods 71 pivoted to said plate, the arms 72 secured to said rods, the pawl-arm engaging said plate, and means for turning said plate when said pawl-arm is released therefrom for the purpose of projecting the arms 72 beyond the edges of said car, combined with stops normally out of the path of said piston-rods, and means operable from said arms when the latter are projected outward for effecting the movement of said stops into the path of said piston-rods; substantially as set forth.

Signed at New York, in the county of New York and State of New York, this 15th day of October, A. D. 1901.

SUSANNA B. TRAPP.

Witnesses:
CHAS. C. GILL,
GUNDER GUNDERSON.