J. L. KAIL.

ELEVATOR DOOR MECHANISM.

APPLICATION FILED AUG. 13, 1908.

993,302.

Patented May 23, 1911.

6 SHEETS—SHEET 1.

Fig. 1.

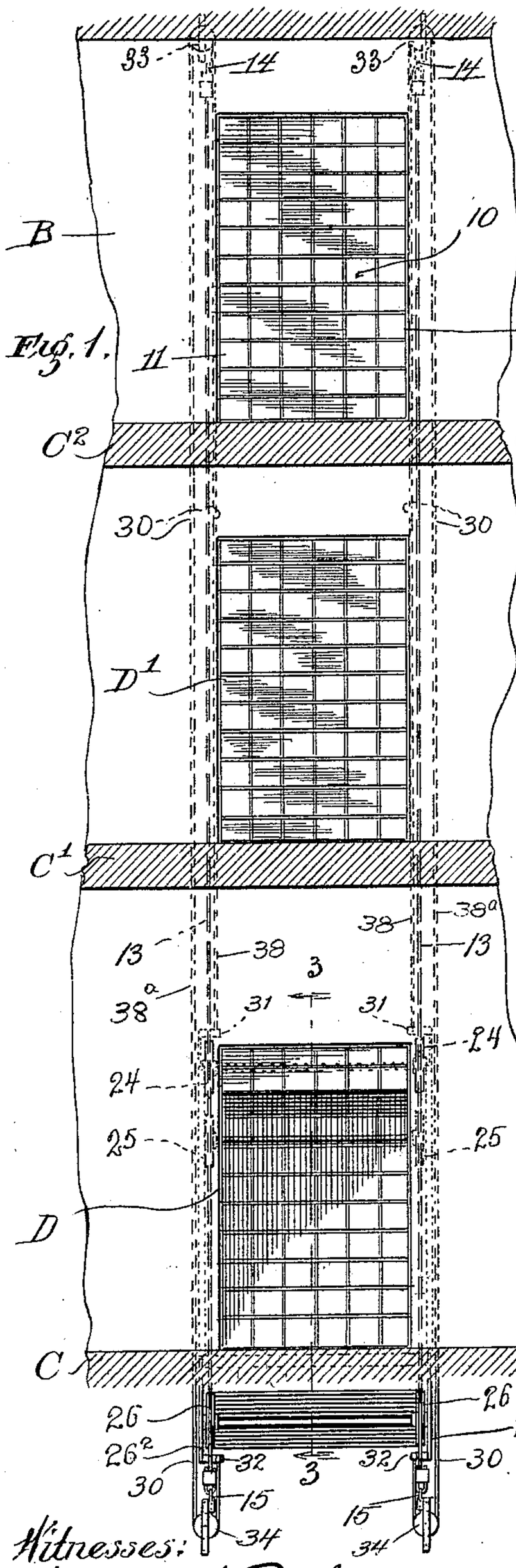
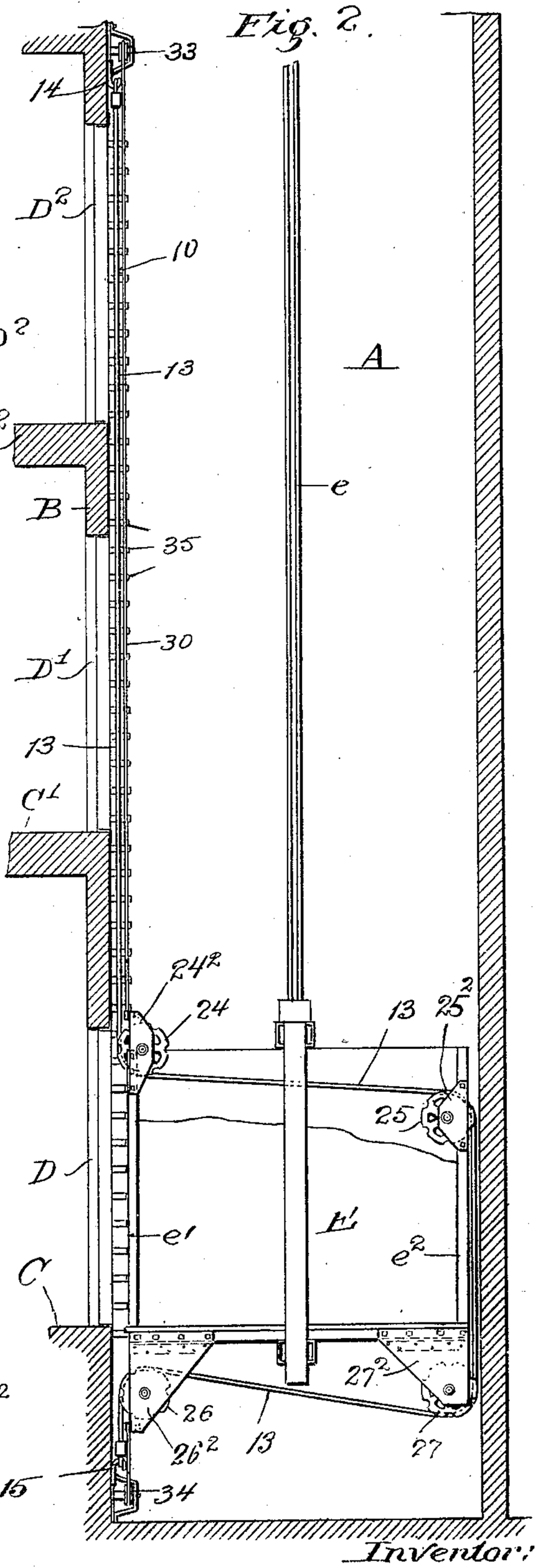


Fig. 2.



Witnesses:

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5 SHEETS—SHEET 2.

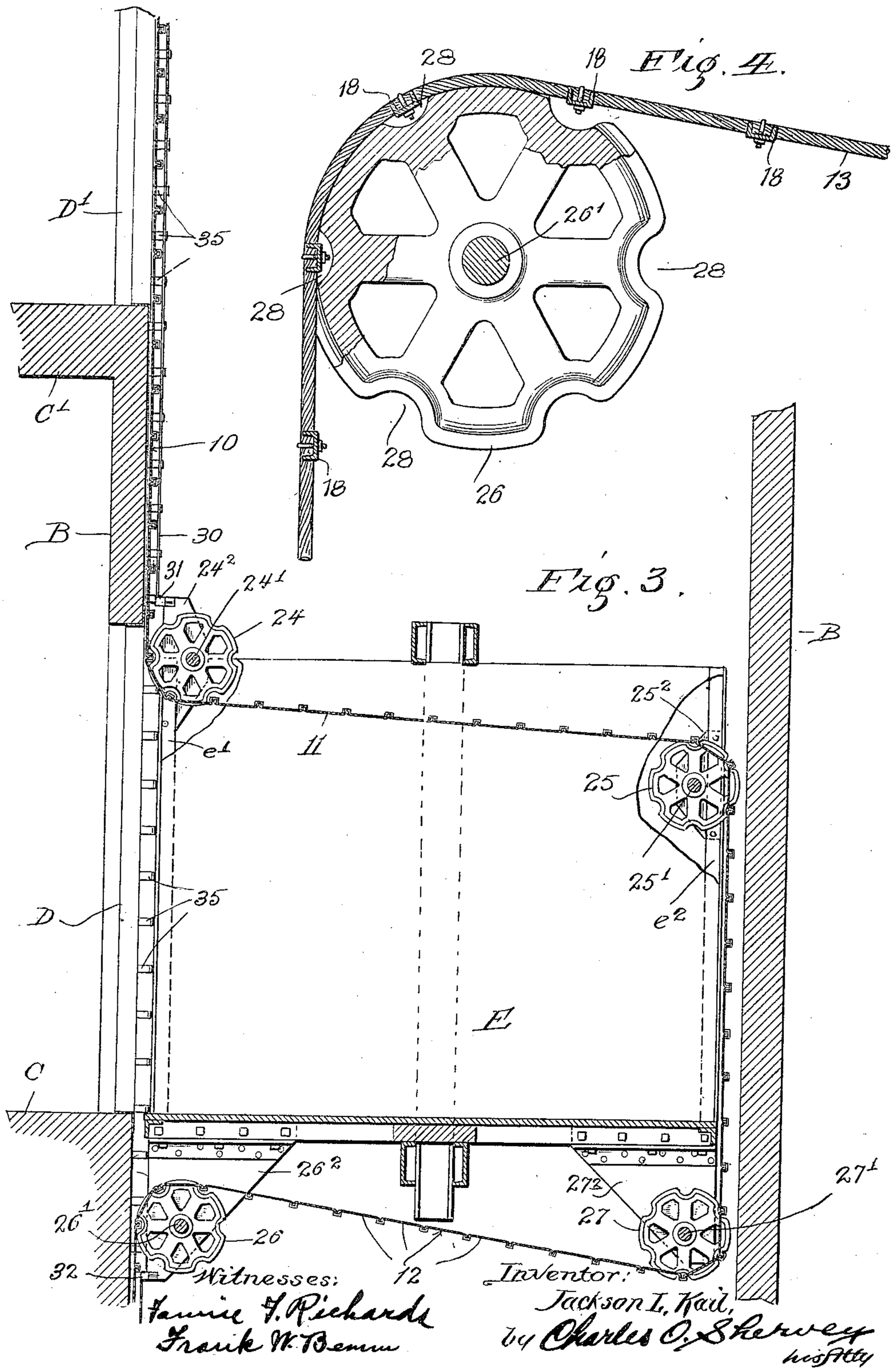

Fig. 4.

Fig. 3.

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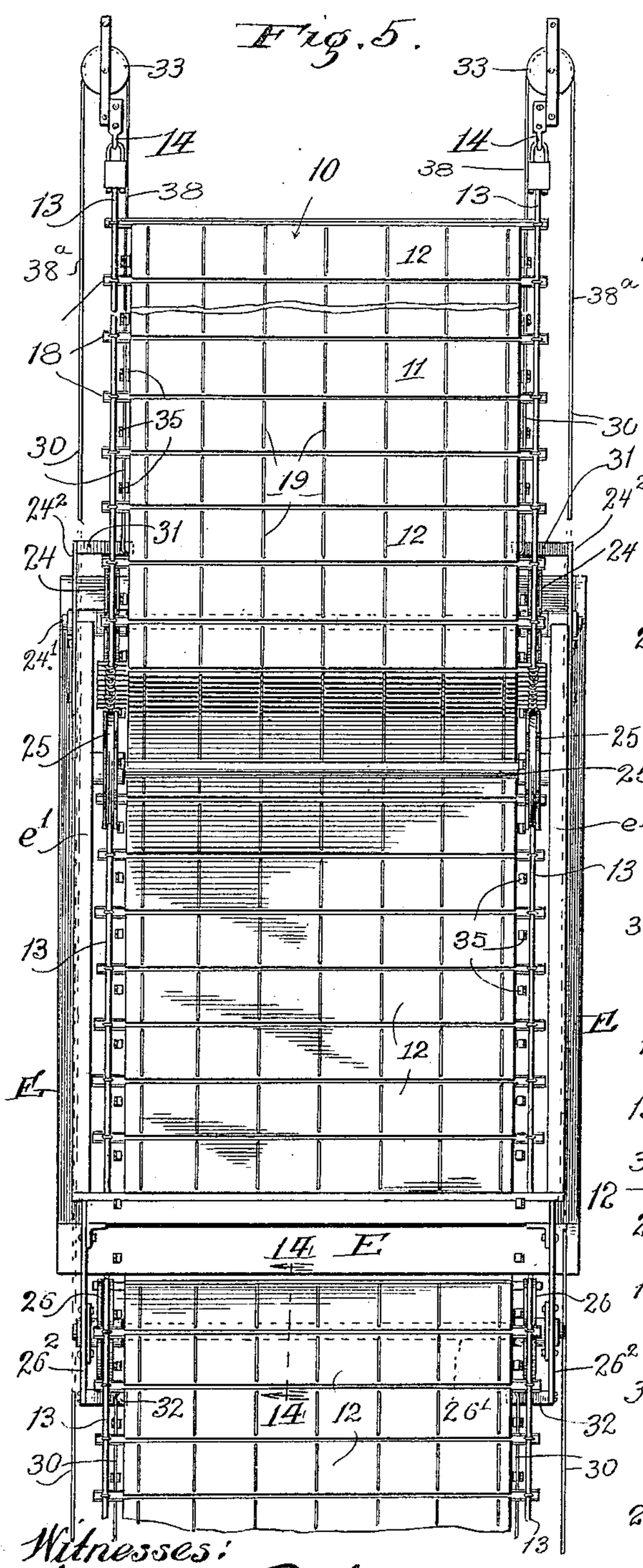
5 SHEETS—SHEET 3.

Fig. 5.



Witnesses:

Fannie F. Richards

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Fig. 6.

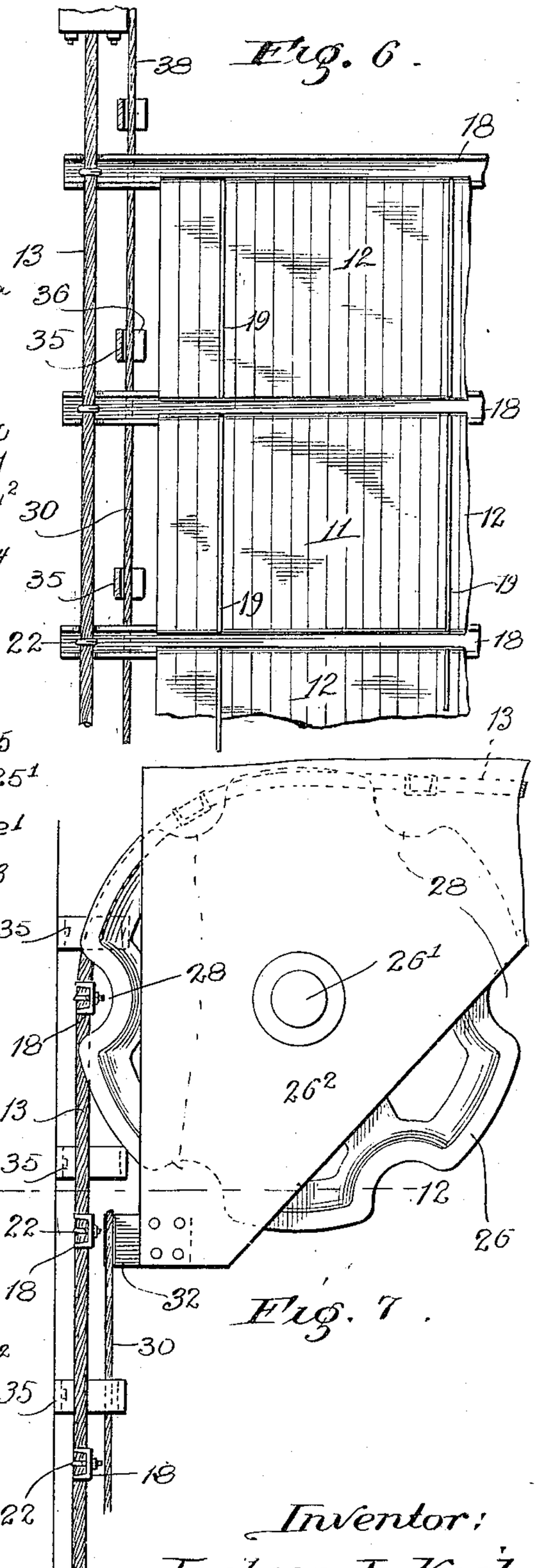

Fig. 7.

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5 SHEETS—SHEET 4.

Fig. 8.

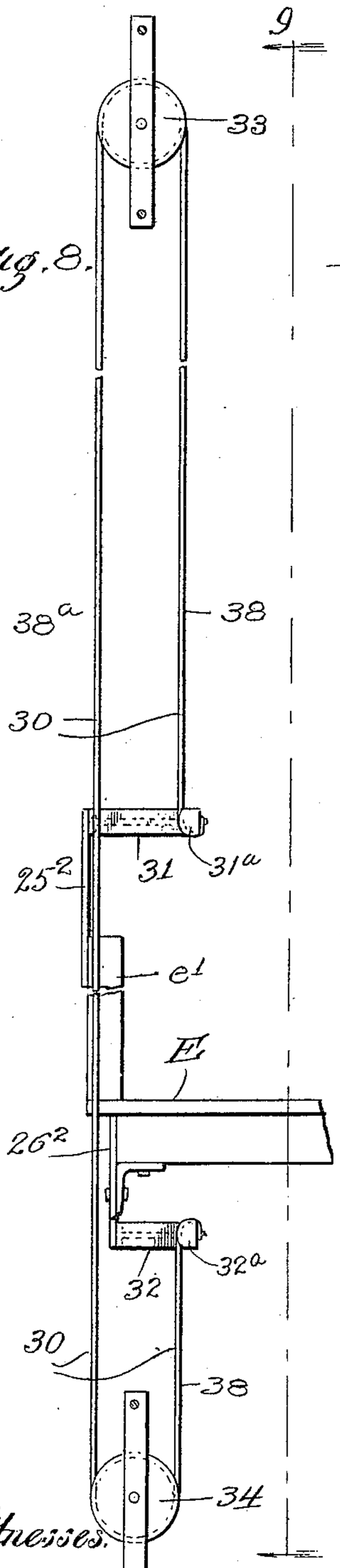


Fig. 9.

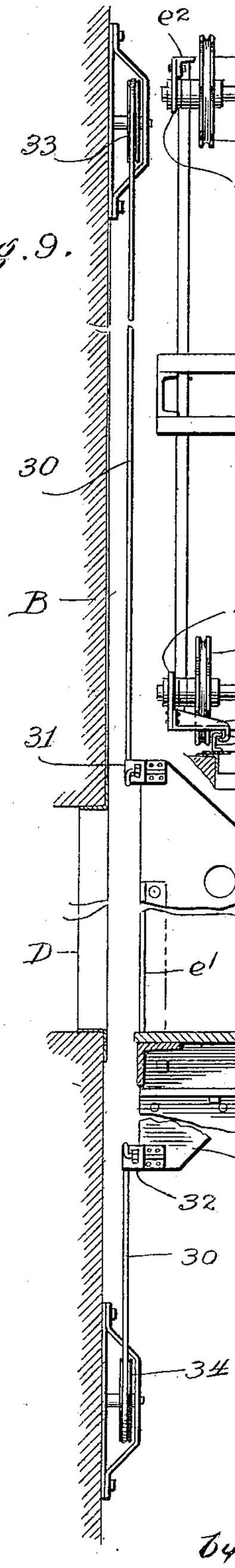
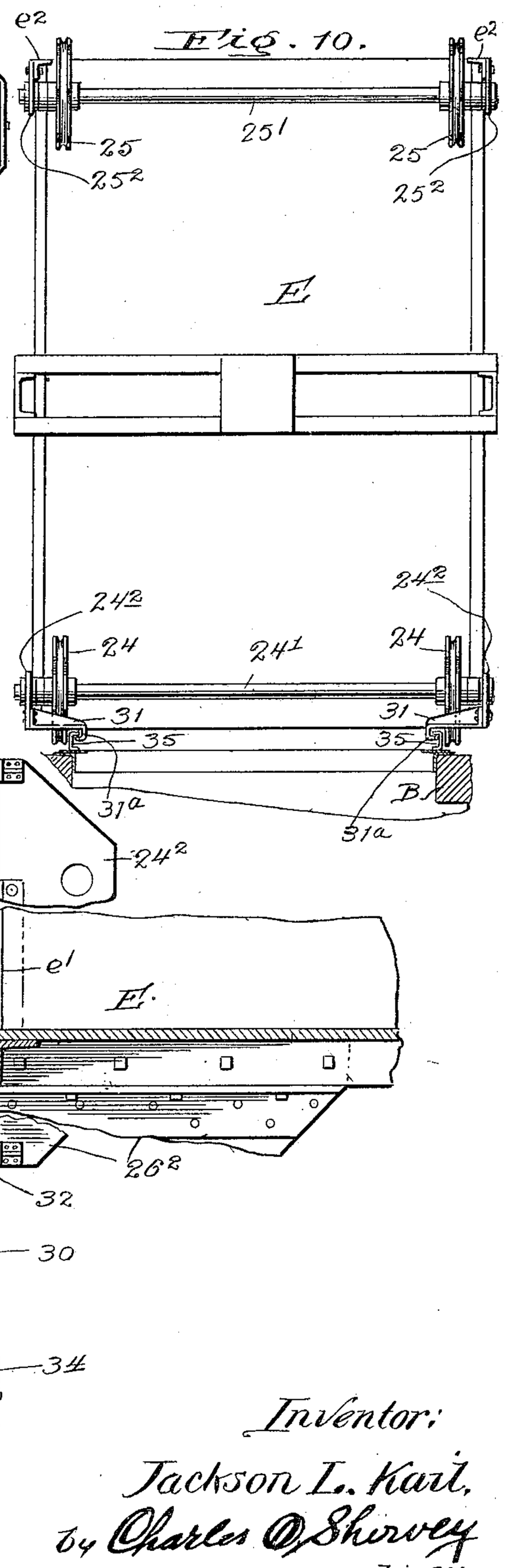


Fig. 10.



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ELEVATOR DOOR MECHANISM.

APPLICATION FILED AUG. 13, 1908.

993,302.

Patented May 23, 1911.

5 SHEETS—SHEET 5.

Fig. 11

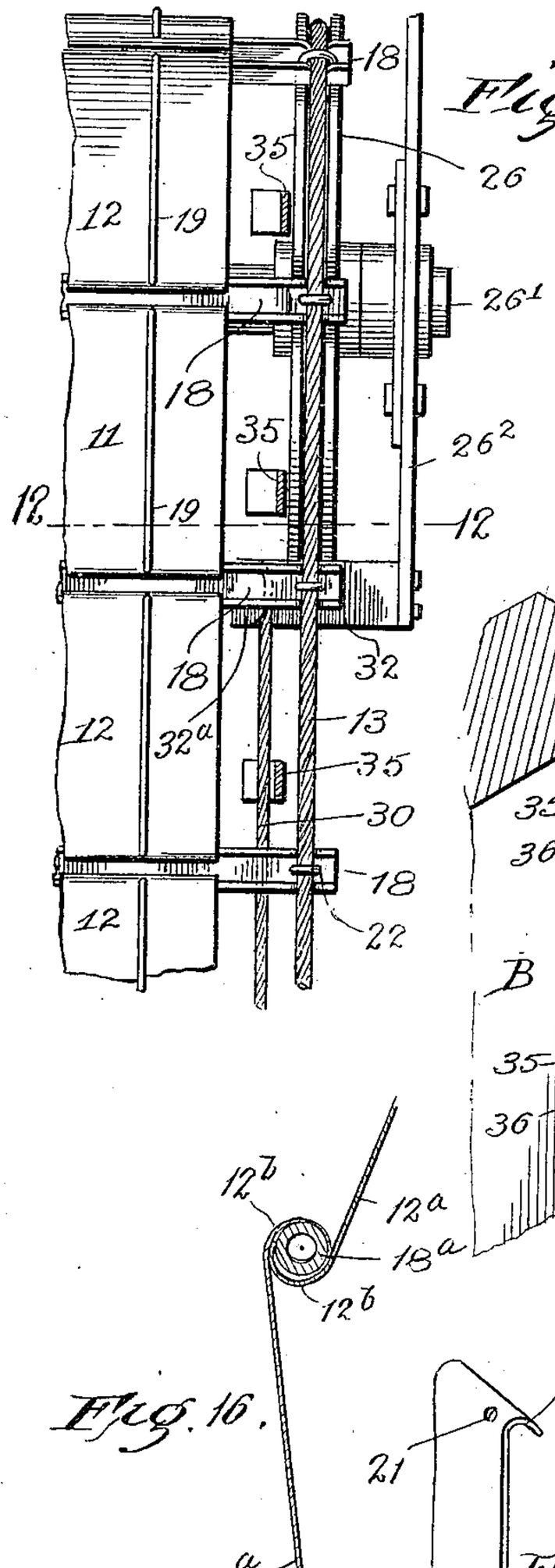


Fig. 12.

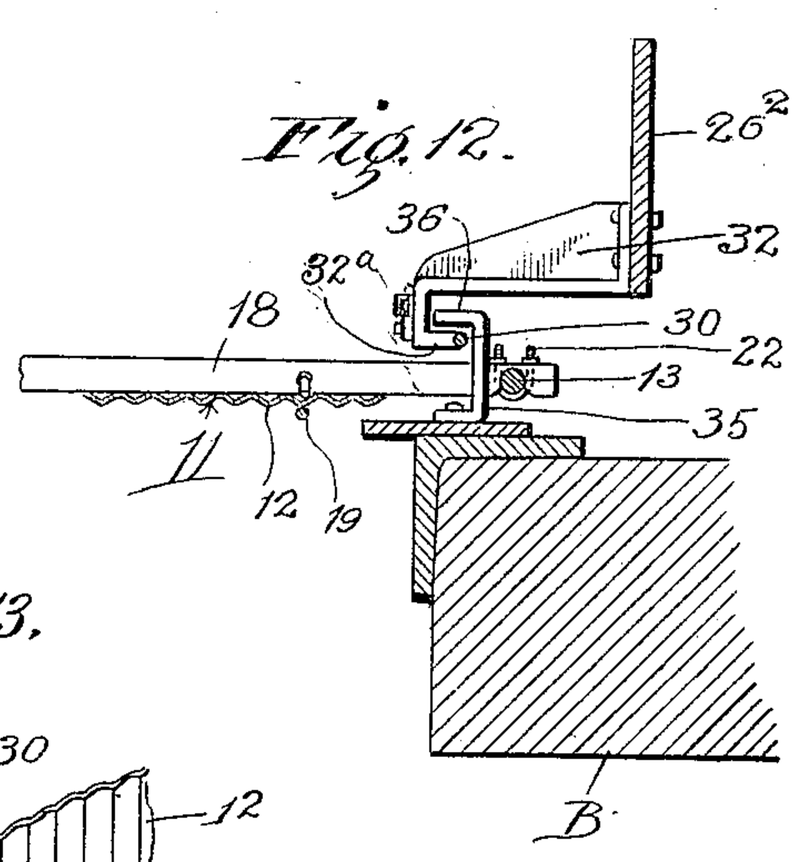


Fig. 13.

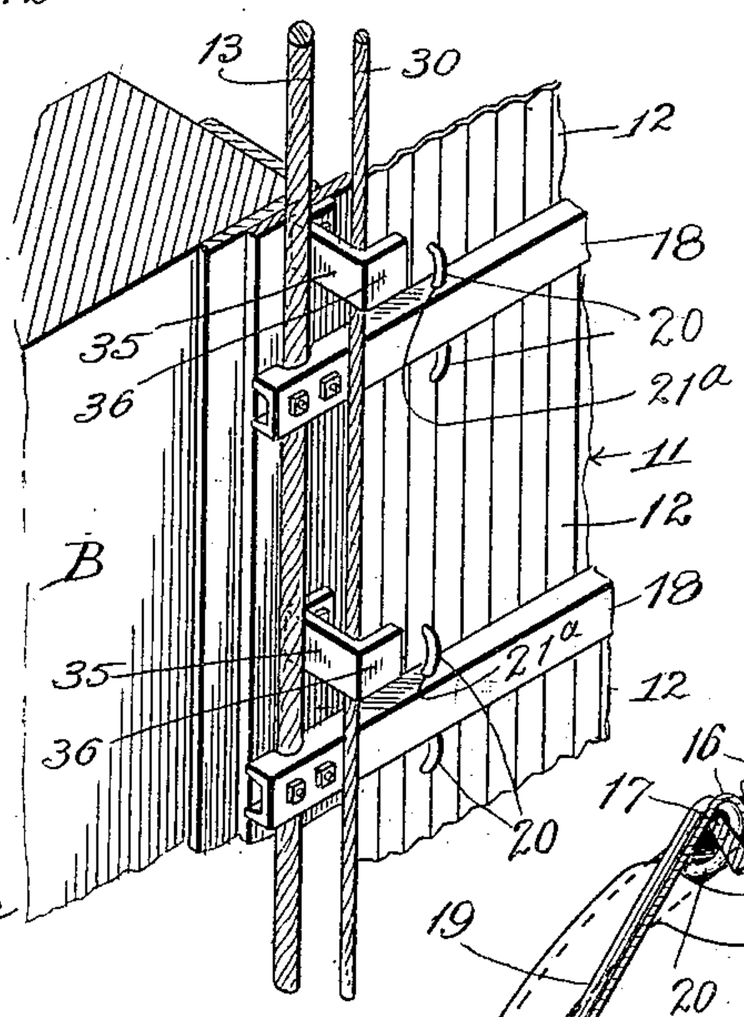


Fig. 14.

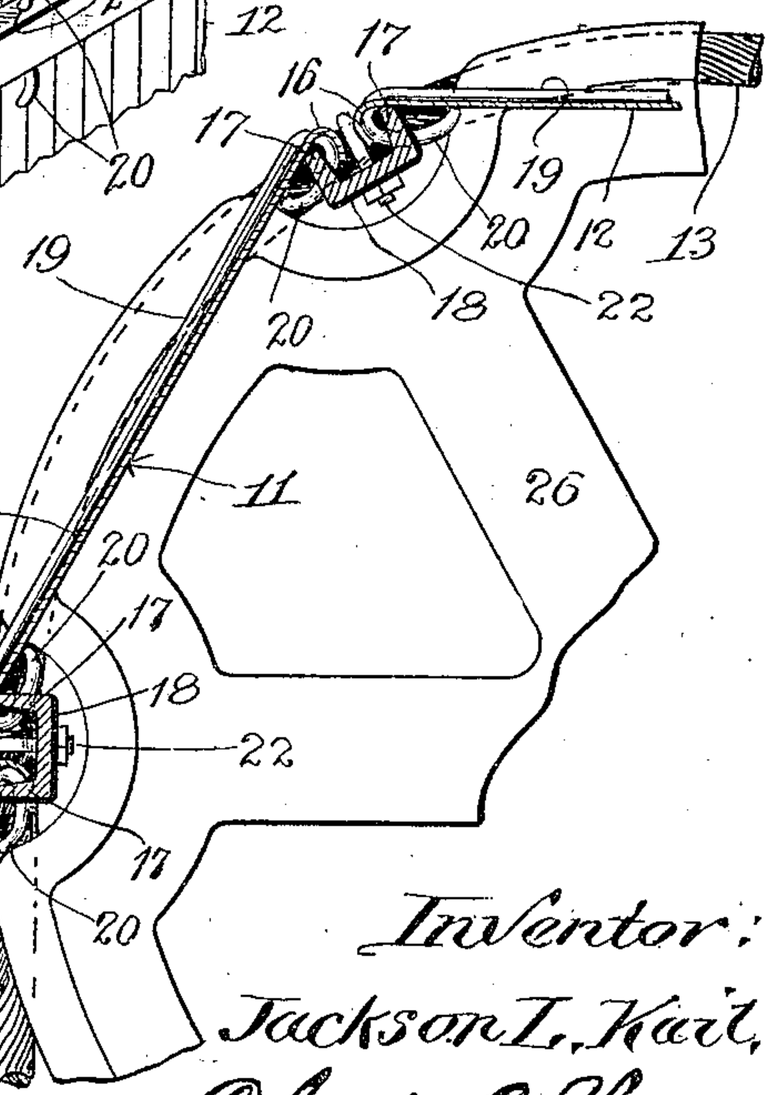
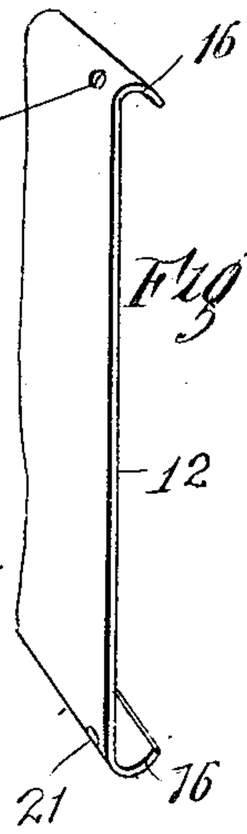


Fig. 16.

Fig. 15.



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UNITED STATES PATENT OFFICE.

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ELEVATOR-DOOR MECHANISM.

993,302. Specification of Letters Patent. **Patented May 23, 1911.**

Application filed August 13, 1908. Serial No. 448,329.

To all whom it may concern:

Be it known that I, JACKSON L. KAIL, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Elevator-Door Mechanism, of which the following is a full, clear, and exact description.

This invention relates to certain new and useful improvements in elevator door mechanism, and more particularly to improvements in that class of elevator doors in which a single door device or curtain is employed to cover a plurality of vertically alined doorways in the elevator well.

One of the objects of this invention is to provide a door of this type which shall protect the elevator well against fire.

Another object is to provide means whereby a metal door device or curtain of inflexible connected panels may pass around the elevator car so as to leave an opening immediately in front thereof, regardless of the position of the car.

Another object is to provide improved means for locking the door to the inclosure at every point along its length, except at the place where it passes around the car.

Another object is to provide a door device, which is constructed of inflexible panels, with slip connections between the panels so that they will pass around the pulleys on the car without buckling or bending.

Another object is to simplify and otherwise improve upon devices of this character and to these ends this invention consists in certain novel features of construction and arrangement that are clearly set forth in this specification and more particularly defined in the claims appended hereto.

The invention is clearly illustrated in the drawings furnished herewith, in which—

Figure 1 is a front view of the inclosure or wall of an elevator well showing the door openings therein, and my improved elevator door mechanism applied thereto. Fig. 2 is a vertical cross section through the elevator well. Fig. 3 is a somewhat enlarged vertical cross section taken on the line 3—3 Fig. 1. Fig. 4 is a detail side view, partly in vertical section of one of the curtain guiding pulleys, and a fragment of the supporting cable. Fig. 5 is a front view of a fragment of the elevator door mechanism and elevator car. Fig. 6 is a detail front view of a fragment of the curtain showing the shanks of certain holding devices for the locking cables in cross section. Fig. 7 is a detail side view illustrating the locking and releasing mechanism. Fig. 8 is a skeleton front view of the locking cable and a fragment of the car. Fig. 9 is a vertical cross section through the line 9—9, Fig. 8. Fig. 10 is a plan view of the elevator car, with a fragment of the wall of the elevator well in section. Fig. 11 is a detail front view of one of the curtain guiding pulleys and a fragment of the curtain and adjacent parts. Fig. 12 is a detail horizontal section taken on line 12—12 of Figs. 7 and 11. Fig. 13 is a perspective view of a fragment of the well inclosing wall and curtain. Fig. 14 is a detail vertical cross section taken on line 14—14 of Fig. 5. Fig. 15 is a perspective view of a fragment of one of the panels and Fig. 16 is a detailed vertical cross section through a slightly modified form of curtain.

In these views A, represents the elevator well and B, the closing wall thereof.

C, C^1, C^2, represent various floors of the building and D, D^1, D^2, represent the doorways at the various floors.

E, is the elevator car which is supported by the cables *e*, that run to a suitable motor by means of which the car is raised or lowered in the well A.

The door device 10, is supported within the well immediately behind the doorways, and extends from the top of the uppermost door opening to the bottom of the well, passing around the car E, in the form of a loop, so as to leave a gap at the front of the car. In the form shown in the drawings the door device comprises a curtain 11, which as shown in the drawings consists of a plurality of panels 12, hinged together and carried by two cables 13, 13, which are supported by hooks or other supporting devices 14, at the top of the well and are connected to hooks 15, at the bottom of the well, whereby the curtain may be held in a comparatively taut condition. As shown in Figs. 6, 7, 12 and 14, the panels 12, are preferably made up of corrugated metal and have their upper and lower edges bent over to form flanges 16, that lie between the flanges 17, of the cross bars, which are here shown as channel irons 18. The panels are secured in place upon said channel-irons as by rods 19, which have hooks 20, upon their

ends that pass through openings 21, in the upper and lower flanges 16, of the panels, and through openings 21ª, in the upper and lower flanges 17, of the channel-irons 18. The panels and connecting channel-irons form a continuous curtain extending across all of the door openings, except of course the one at which the car is located, where it passes around the car, thus forming a perfect fire shield and protecting the elevator well against fire. It is obvious that in place of the corrugated metal panels, ornamental scroll-work or open-work panels may be substituted therefor if it is desired to use the door mechanism upon passenger cars. The cross bars 18, are connected to the supporting cables 13, as by U bolts 22, that extend around the cables, and pass through the webs of the cross bars and have nuts threaded upon their ends for clamping the cables upon the bars.

Guide pulleys 24, 25, 26 and 27 are mounted upon the elevator car E, and are adapted to carry the curtain around the car in the form of a loop so as to leave the gap at the front thereof. There are four pairs of pulleys, each pair being mounted upon a cross shaft of which there are four, 24^1, 25^1, 26^1, 27^1, which shafts are journaled in brackets 24^2, 25^2, 26^2, 27^2, that are supported upon the body of the car. The brackets 24^2, 25^2, are supported at the top of the car by means of posts e^1, e^2, and the brackets 26^2, 27^2 are supported below the platform of the car. As shown in Fig. 4, the pulleys are grooved upon their peripheries and are formed with equidistant notches or depressions 28, on their peripheries, said notches or depressions being provided for the purpose of receiving the cross bars 18, as the curtain passes over the pulleys. The supporting cables 13, rest in the grooves of the pulleys and the panels pass between the pairs of pulleys, while the cross bars enter the notches or depressions in passing around the pulleys; thus very little if any noise is produced by the curtain in turning and passing around the pulleys. Inasmuch as the panels are inflexible and remain in flat planes as they pass around the pulleys, some means must be provided to compensate for the variation in the distance between the cross bars 18, caused by the passing of the flexible cables around the pulleys, in curved lines while the panels pass around in straight lines. This I have accomplished by forming a sliding connection betwen the panels and the cross bars so that as the curtain passes around the pulleys the panels may not only swing upon the cross bars, but may shift bodily with respect thereto. In the form shown in the drawing for accomplishing this result, the hooks 20, of the rods 19, are elongated slightly so that the rods can play freely in the holes in the flanges of the cross bars, and as the distance between the latter shortens when they pass around the pulleys, the cross bars slip along the hooks 20, thus permitting the flexible cables to bend around the pulleys, and the panels to remain in their flat condition.

Locking cables 30, are provided for locking the curtain to the inclosure. As shown in the drawings, each locking cable is attached to the elevator car by means of arms 31, 32, secured at the top and bottom of the car. Said arms are arranged in pairs, one pair 31, being secured upon the brackets 24^2 and the pair 32, being secured upon the brackets 26^2. Said cables 30, pass around sheaves 33, 34, located at the top and bottom of the well, and said cables move with the elevator car, the ends of the cables being separated between the arms 31 32, thus forming a gap between the top and bottom of the car, through which gap the curtain may pass in its movement around the car. The strands 38, of the locking cables extend along the edges of the doorways immediately behind the curtain, while the strands 38^a pass up and down beyond the edges of the curtain. As clearly seen in Figs. 11 and 12, movement of the cable into the well is prevented by a series of locking or holding devices 35, which are secured to the elevator inclosure and have overhanging flanges 36, that engage with the strands 38, of the locking cables and prevent movement thereof toward the well-side of the inclosure. The locking cables and holding devices coöperate to lock the unbent portion of the curtain to the inclosure. Any pressure upon the curtain from the side facing the room of the building will be resisted by said locking means. The curtain is however free to move into the well and around the elevator car in the gap between the ends of the locking cables, and as this gap is maintained immediately in front of the car, the curtain is free to bend in and around the car as the car moves up and down in the elevator well.

The arms 31, are located immediately above the pulleys 24, and the arms 32, are located immediately below the pulleys 26, so that the curtain may pass around the pulleys 24, 26, and through the gap between the ends of the locking cables 30. This particular form of locking cable is immaterial to my invention broadly considered, as there are various ways in which a gap may be provided in the locking cables through which the curtain may pass in being carried around the elevator car. Looking at Figs. 10 and 12 it will be seen that the arms 31, 32, extend toward each other from their points of support and that they are located in the rear of the supporting cables 13. The ends of the arms 31, 32, extend back at 31^a, 32^a, at which points the locking cables are attached to the arms. It will thus be seen that the arms feed the locking cables between the

curtain and the overhanging flanges 36, of the holding devices, so that the curtain is confined between the inclosure and the locking cables 30, except at the gaps between the ends of the locking cables.

The modification illustrated in Fig. 16, shows a slightly different form of connection between the panels and cross bars. In this case the panels 12ª are bent around upon their edges to form round flanges 12ᵇ, that partially encircle round rods or tubes 18ª. This construction permits the panels to turn upon the cross bars and at the same time allows them to slide or slip upon them, so that the curtain may pass around the sheaves without buckling the panels.

The construction above described has many advantages over the ordinary elevator doors. It provides a fire proof curtain in the elevator inclosure, in which every door opening is closed except the one in front of the elevator car, and as the curtain passes above and below the elevator car, it thereby prevents the flame from passing up through the elevator shaft. The sliding connection between the panels and cross bars provides a flexible curtain whereby the inflexible panels may pass around the pulleys without buckling, and the notched pulleys afford means whereby cross bars may pass around the pulleys without touching them, whereby the structure becomes practically noiseless.

I am aware that various modifications and alterations of this structure are possible without departing from the spirit of my invention, and I do not desire therefore to limit myself except as may be necessitated by the prior state of the art.

I claim as new and desire to secure by Letters Patent:

1. Elevator door mechanism comprising a curtain adapted to close a series of vertically alined doorways in an elevator inclosure, a vertically movable car, means upon said car for forming a loop in said curtain around the car to leave a gap in said curtain in front of the car, flexible locking cables carried by the car and having portions extending behind the unbent portion of the curtain, said locking cables having a gap at the car through which the curtain may pass in forming the loop, and holding devices for holding said locking cables against lateral movement toward the well-side of the elevator inclosure.

2. Elevator door mechanism comprising a curtain adapted to cover a series of vertically alined doorways in an elevator inclosure, an elevator car, means for forming a loop in said curtain around the car to leave a gap in the curtain in front of the car, and locking devices for said curtain comprising flexible cables carried by the car and having portions extending behind the unbent portion of the curtain, and holding devices for holding said locking cables against lateral movement toward the well-side of the elevator inclosure.

3. Elevator door mechanism comprising a flexible curtain adapted to cover a series of vertically alined doorways in an elevator inclosure, an elevator car, means for forming a loop in said curtain around the car to leave a gap in the curtain in front of the car, locking cables passing around pulleys at the top and bottom of the wall, arms upon the car located beyond the loop forming means for carrying the locking cables behind the unbent portion of the curtain, and cable holding devices for holding said locking cables against lateral movement toward the well-side of the elevator inclosure.

4. Elevator door mechanism comprising a curtain adapted to cover a plurality of vertically alined doorways in an elevator inclosure, an elevator car, pulleys upon said car for forming a loop in said curtain around the car to leave a gap in front of the car, locking cables traveling behind the curtain, suitably spaced arms upon the car for carrying said locking cables behind the curtain, and cable holding devices for maintaining said locking cables against lateral movement toward the well-side of the inclosure.

5. Elevator door mechanism comprising a flexible curtain for covering a plurality of vertically alined doorways in an elevator inclosure, and having laterally projecting cross bars and flexible supporting cables, an elevator car, pulleys upon said car around which said curtain extends to form a loop around the car to leave a gap at the front of the car, arms supported upon said car, locking cables carried by said arms and having portions traveling behind the projecting cross bars and holding devices arranged to hold said locking cables against lateral movement toward the well-side of the elevator inclosure.

6. Elevator door mechanism comprising a curtain having a pair of supporting cables, cross bars secured thereto, and panels slidably connected with said cross bars, an elevator car, pulleys upon said car for forming a loop in said curtain, locking cables traveling behind the cross bars, means upon the car for forming a gap in said locking cables through which the curtain may extend to form the loop, and holding devices for holding the locking cables against lateral movement toward the well-side of the elevator inclosure.

7. Elevator door mechanism comprising a curtain having a pair of supporting cables, a plurality of cross bars secured thereto, and a plurality of panels slidably connected with said cross bars, an elevator car, pulleys upon said elevator car for forming a loop in said curtain, locking cables carried by said car and having portions which travel

behind the cross bars, and cable holding devices secured to the elevator inclosure and extending between the cross bars and engaging the locking cables to hold them against lateral movement toward the well-side of the inclosure.

8. Elevator door mechanism comprising a curtain having cables, a plurality of cross bars secured thereto, and a plurality of panels slidably secured upon said cross bars, an elevator car, pulleys upon said car for forming a loop in said curtain, to pass around the car and suitable mechanism operated by the elevator car for locking said curtain to the elevator inclosure.

9. Elevator door mechanism comprising a curtain having a pair of supporting cables, cross bars secured thereto, and sheet metal panels slidably connected with the cross bars, an elevator car, pulleys upon said car for forming a loop in the curtain to extend around the car, arms upon said car located outside of the loop, locking cables secured to said arms and extending to the top and bottom of the elevator well and holding devices secured to the elevator inclosure for holding said locking cables against lateral movement toward the well side of the elevator inclosure.

10. Elevator door mechanism comprising a door adapted to close a series of vertically alined doorways in an elevator inclosure, a vertically movable elevator car, means upon said car for forming a loop in said door around the car so as to leave a gap in said door in front of the car, flexible locking cables traveling with the car, and secured thereto at points above and below the gap in the door and holding devices secured to the elevator inclosure coöperating with said locking cables to hold said door against lateral movement toward the well side of the inclosure.

In witness whereof, I have hereunto subscribed my name at Chicago, Cook county, Illinois, this 29th day of July A. D. 1908.

JACKSON L. KAIL.

Witnesses:

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M. D. Millner.