No. 868,449. PATENTED OCT. 15, 1907.

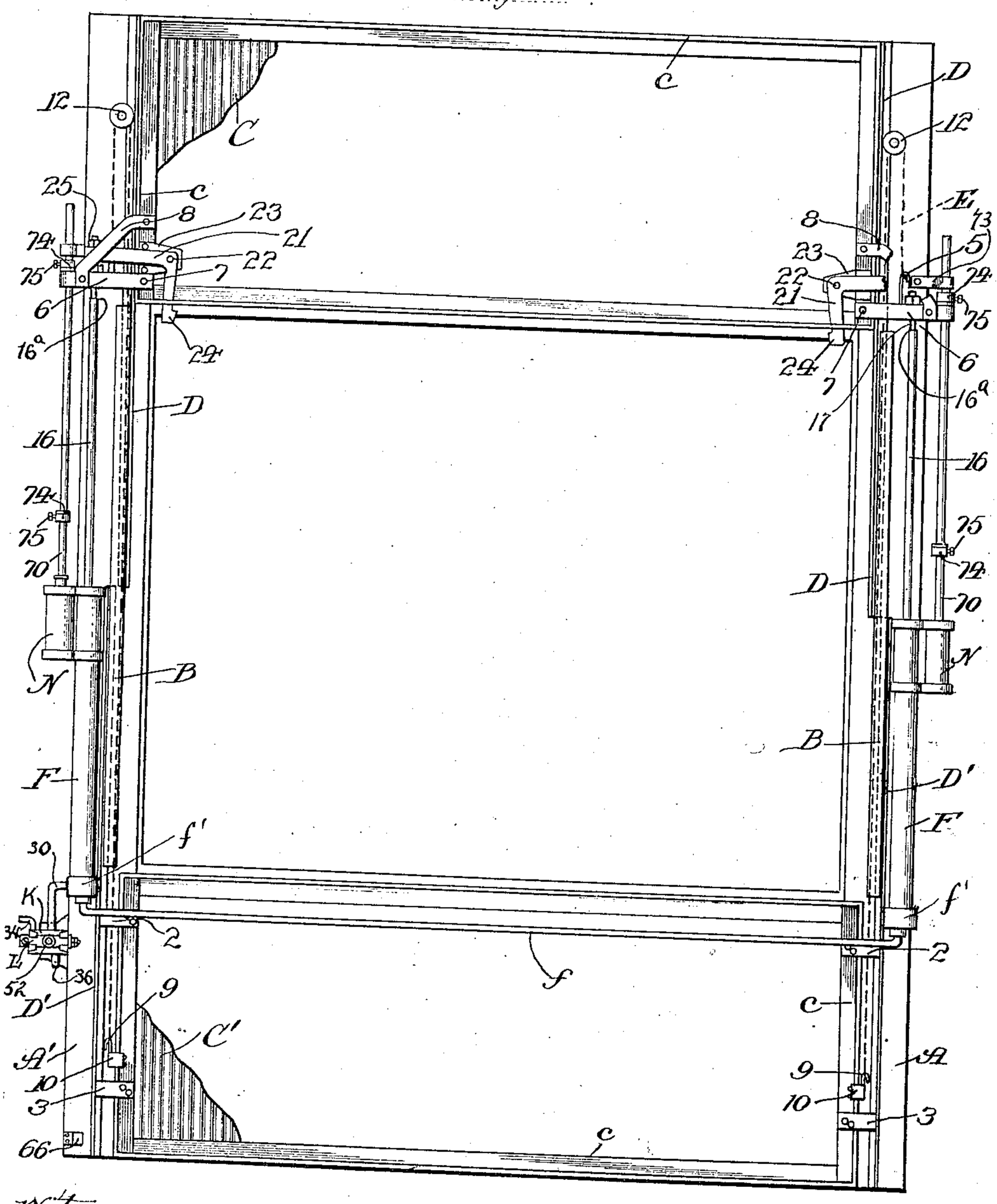
C. W. KIRSCH.

DOOR MECHANISM FOR ELEVATOR SHAFTS.

APPLICATION FILED MAR. 15, 1905.

6 SHEETS—SHEET 1.

Fig. 1.



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Lillian Prentice

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6 SHEETS—SHEET 2.

Fig. 2.

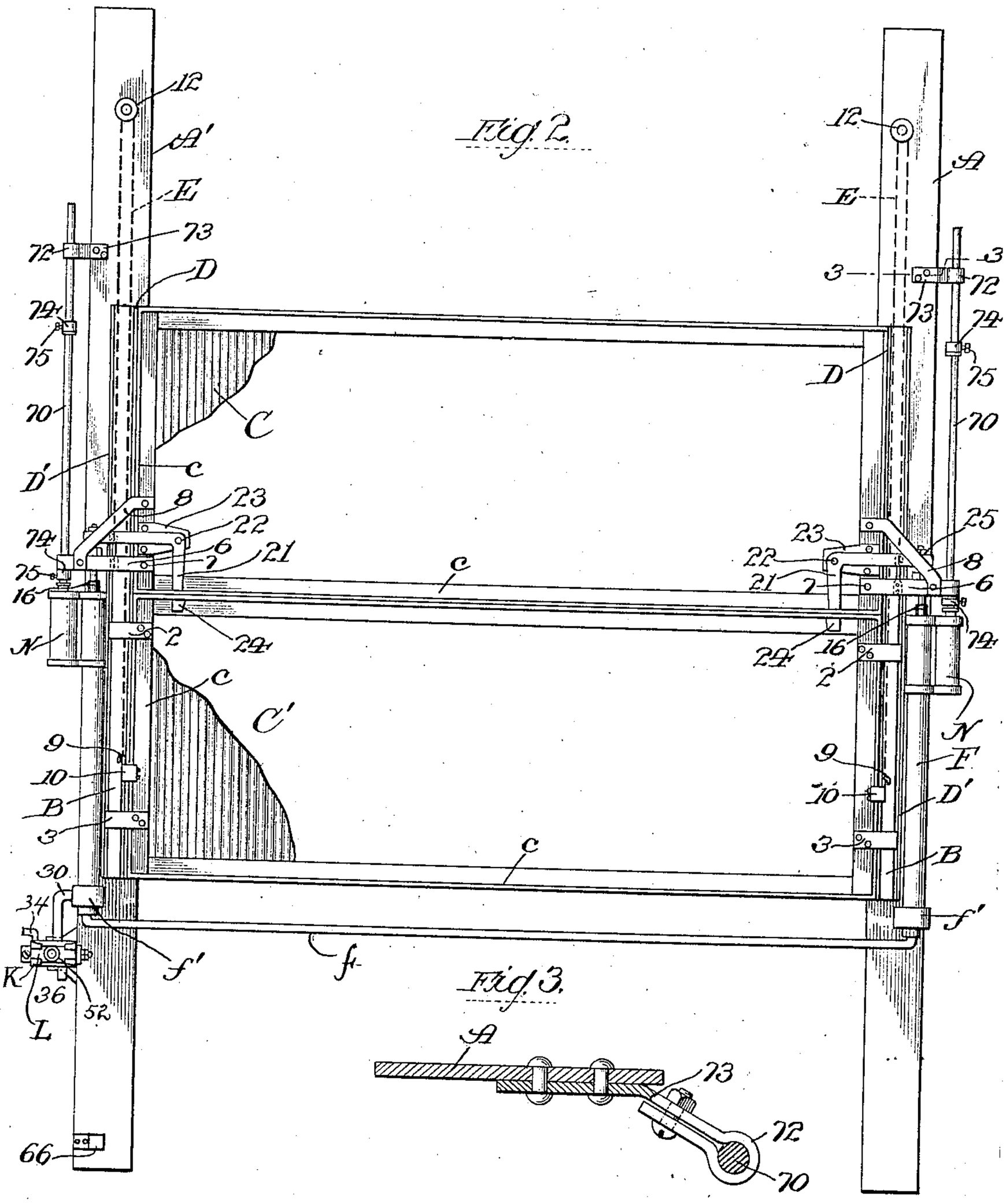

Fig. 3.

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6 SHEETS—SHEET 3.

Fig. 4.

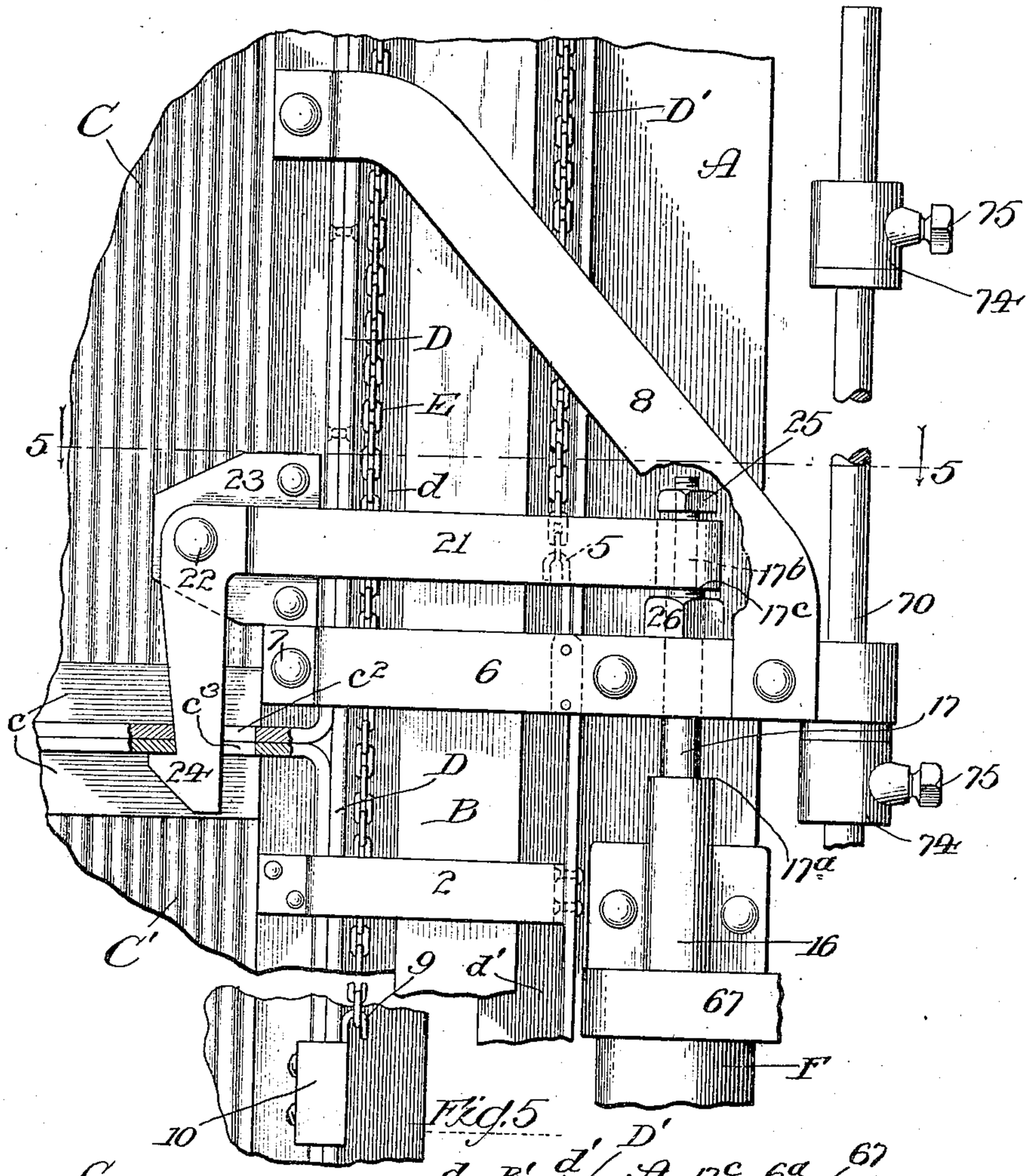
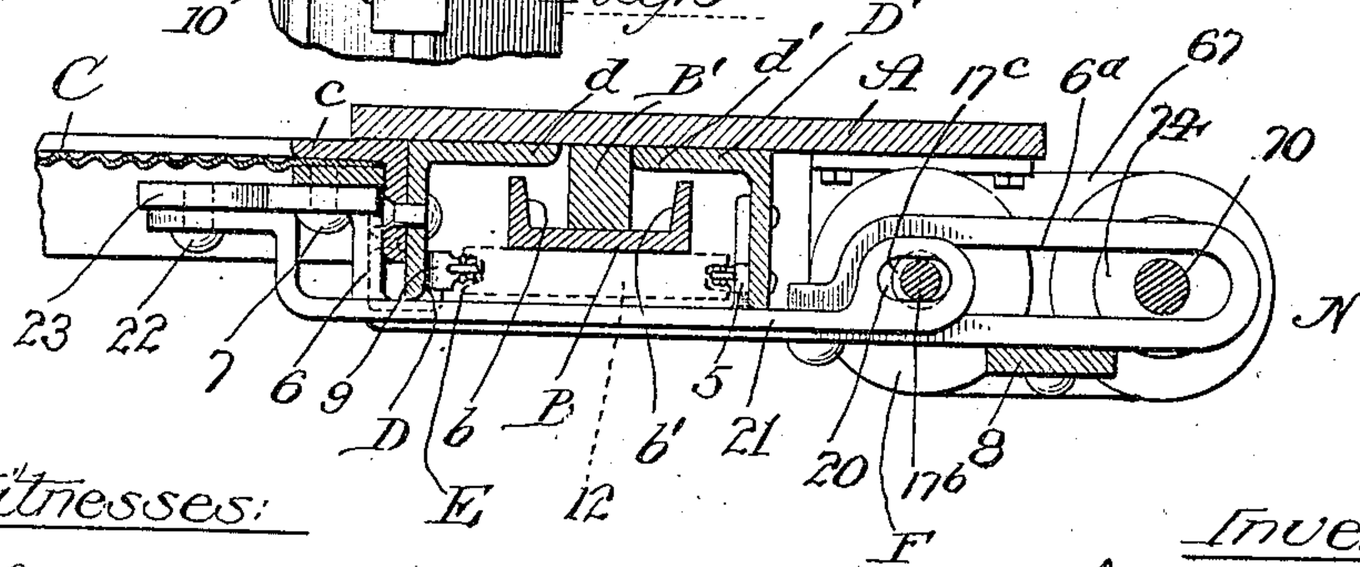


Fig. 5.



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6 SHEETS—SHEET 4.

Fig. 7.

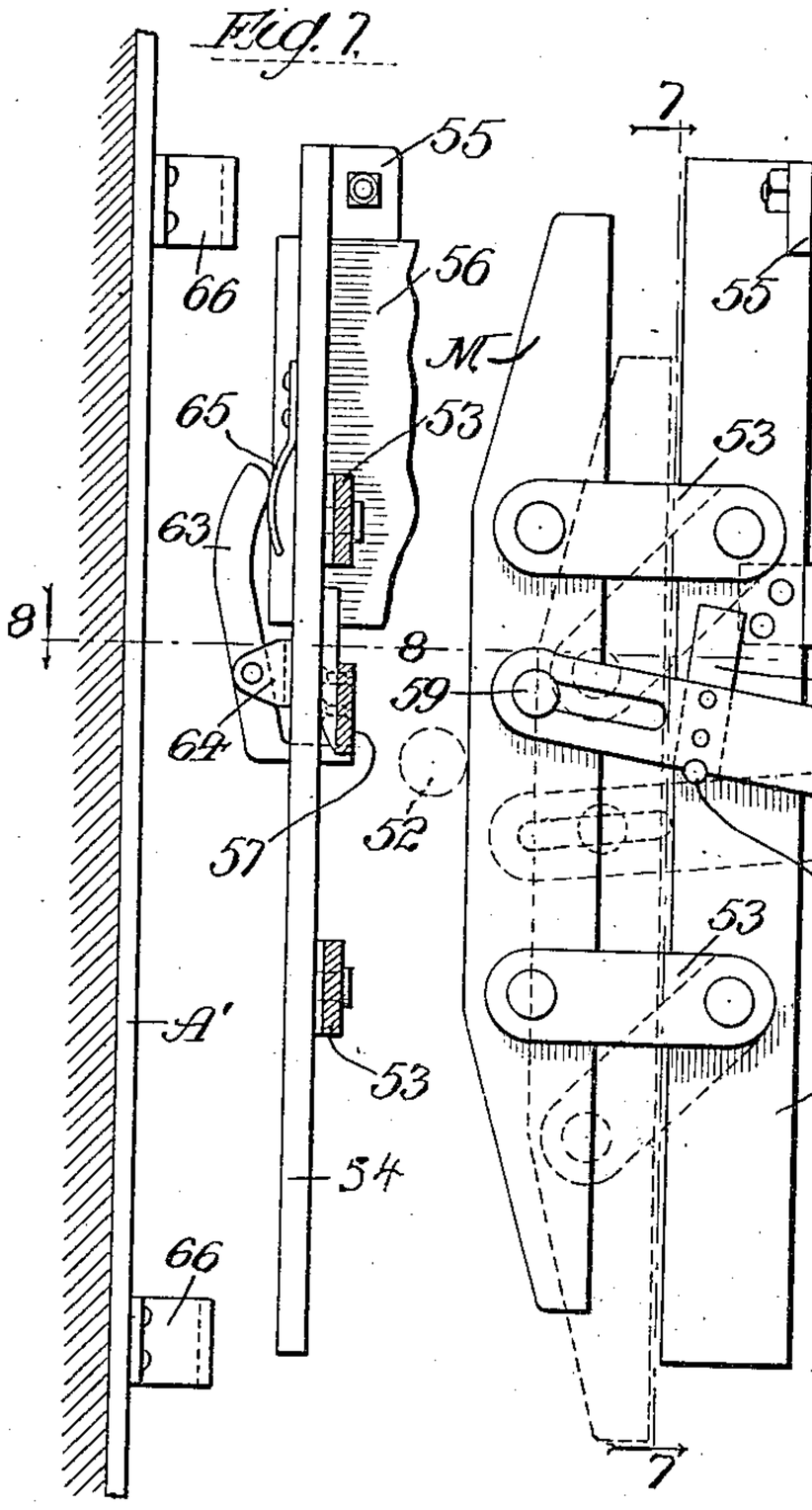


Fig. 6.

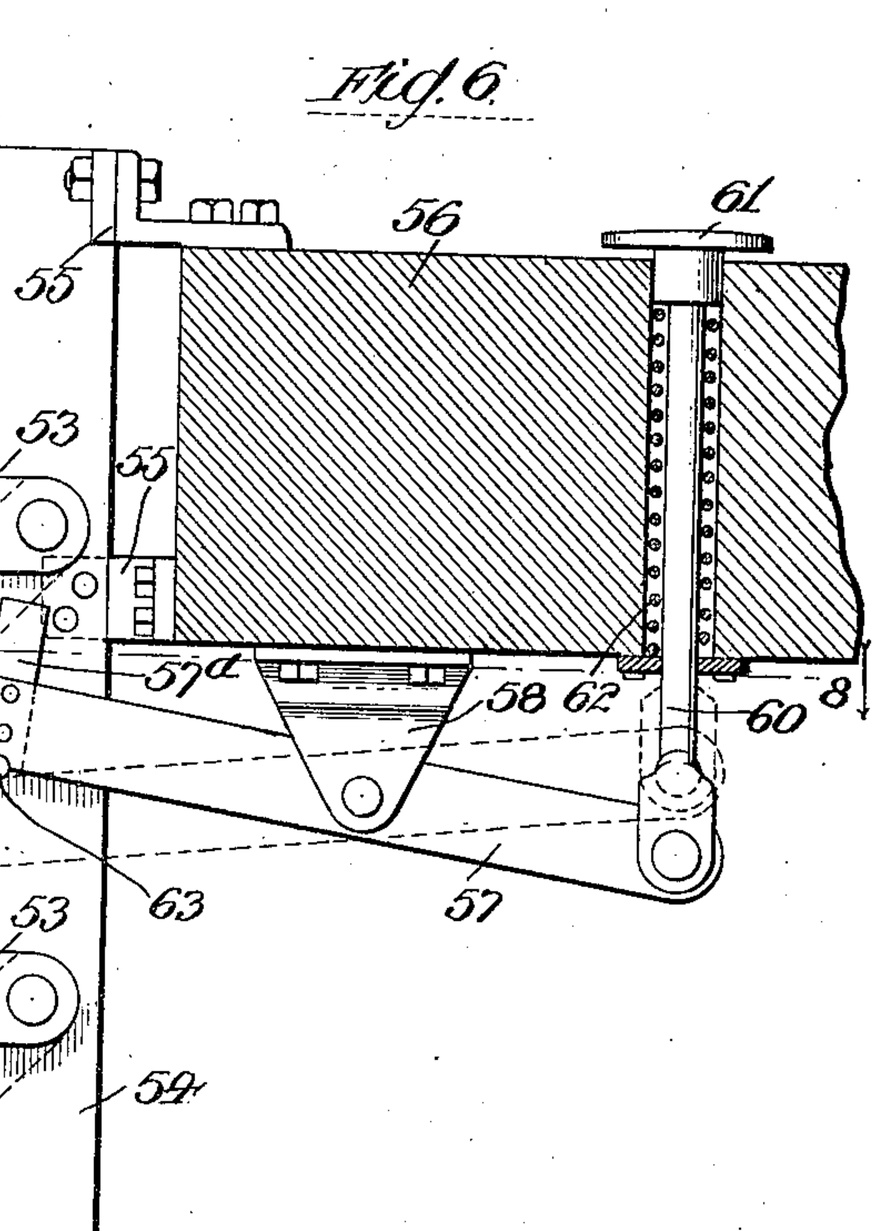
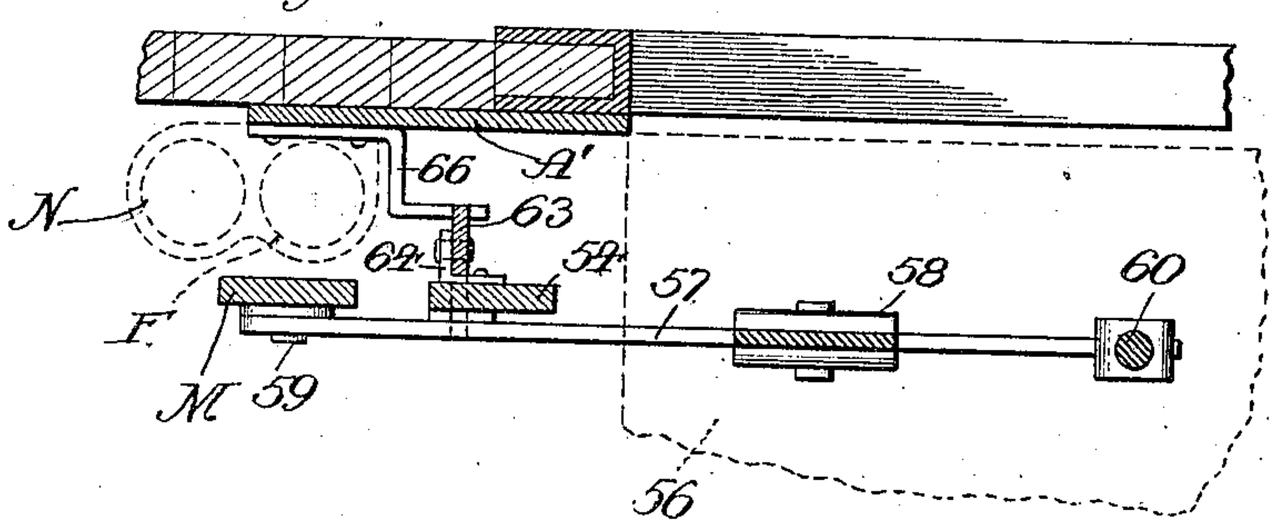


Fig. 8.



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No. 868,449. PATENTED OCT. 15, 190

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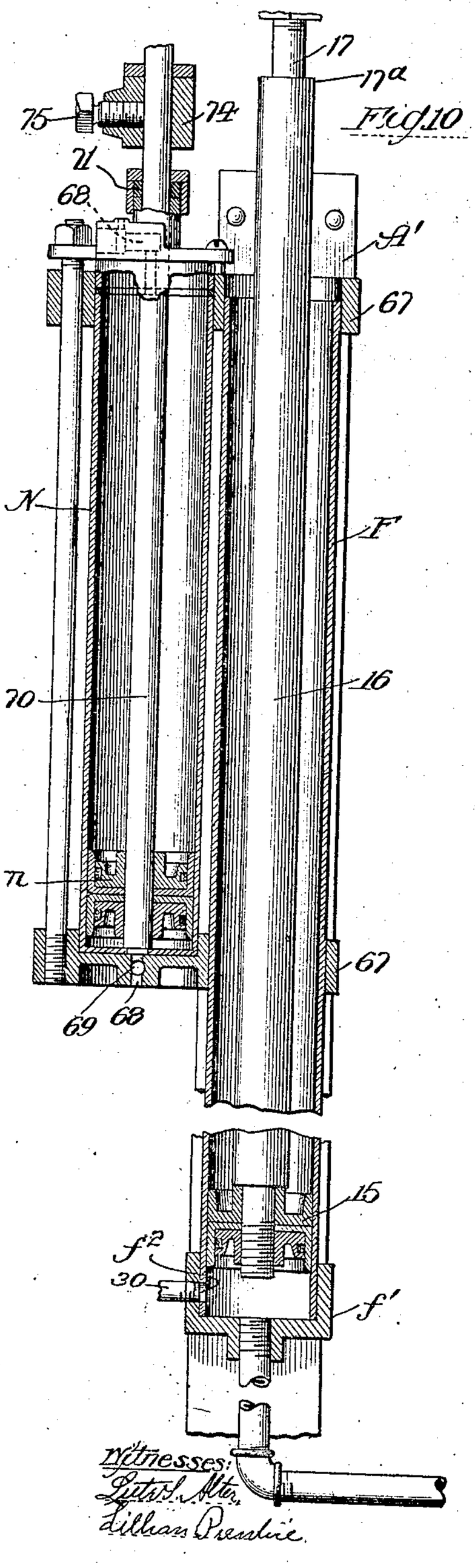
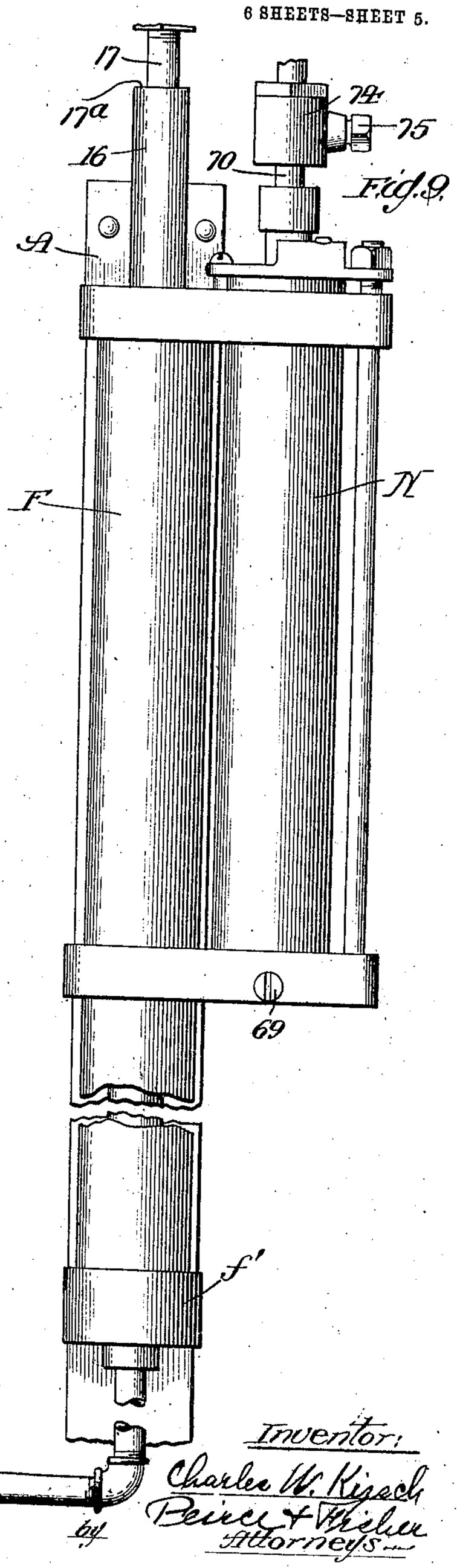
DOOR MECHANISM FOR ELEVATOR SHAFTS.

APPLICATION FILED MAR. 15, 1905.

6 SHEETS—SHEET 5.





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No. 868,449. PATENTED OCT. 15, 1907.

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DOOR MECHANISM FOR ELEVATOR SHAFTS.

APPLICATION FILED MAR. 15, 1905.

6 SHEETS—SHEET 6.

Fig. 11.

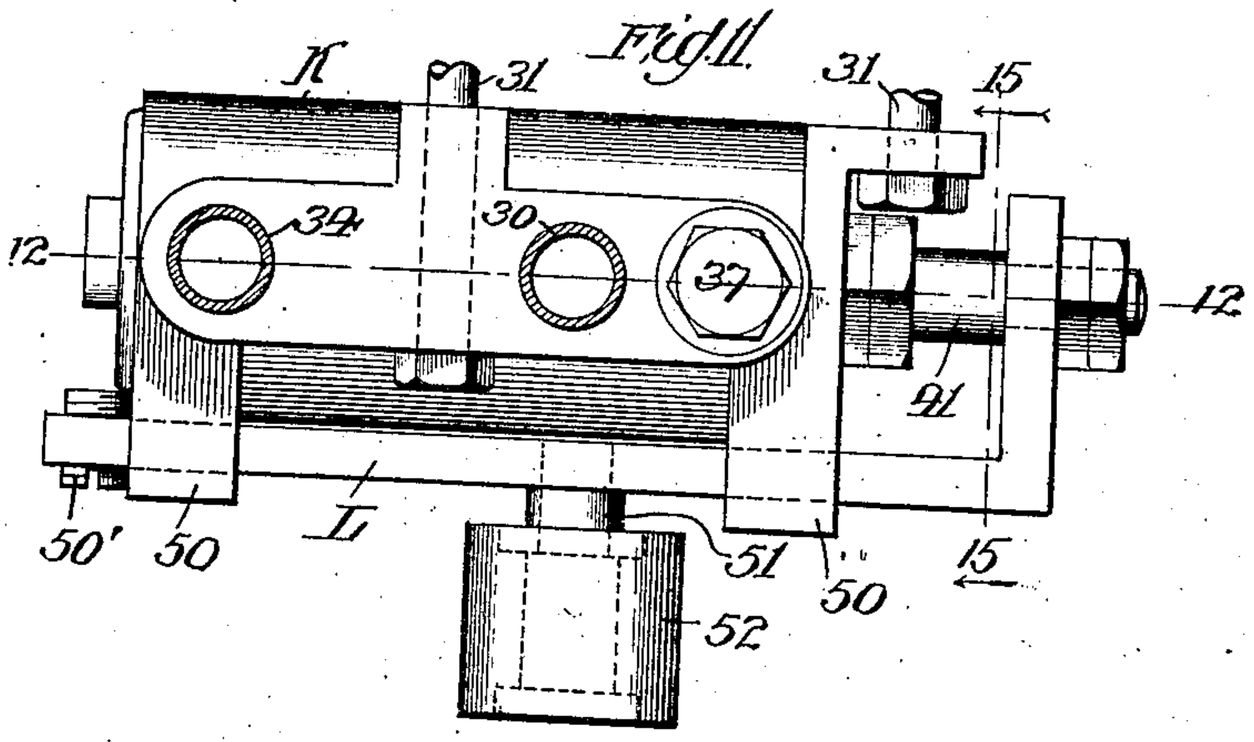


Fig. 12.

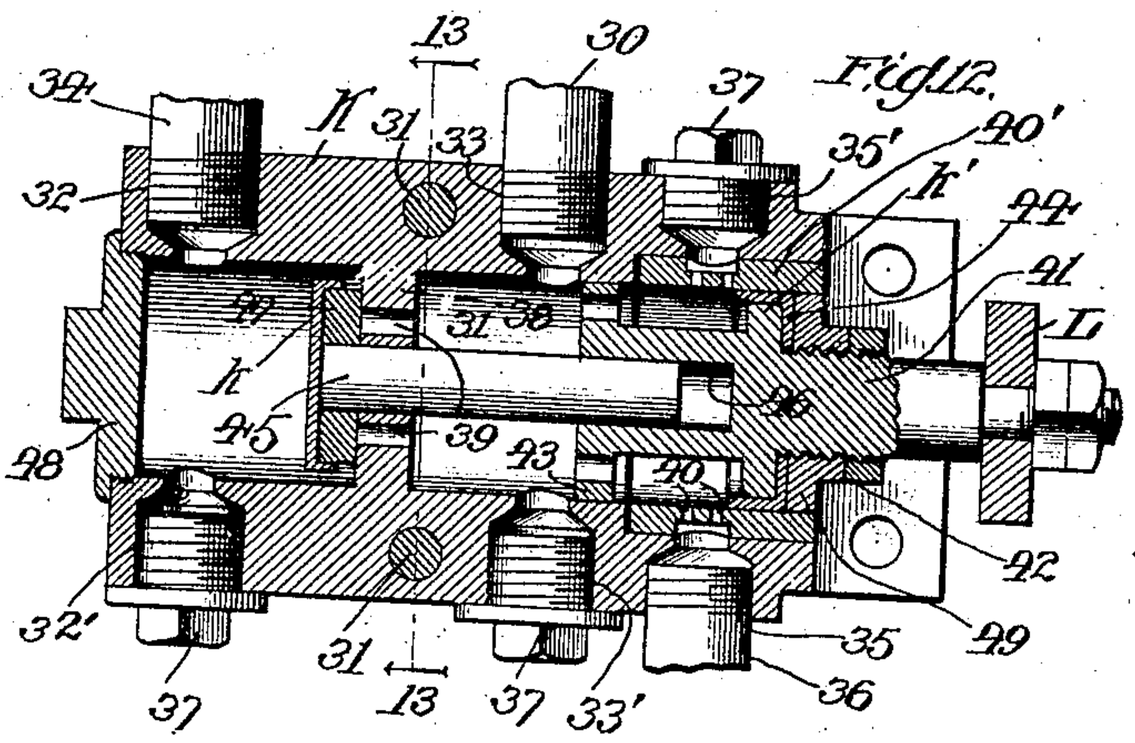


Fig. 13.

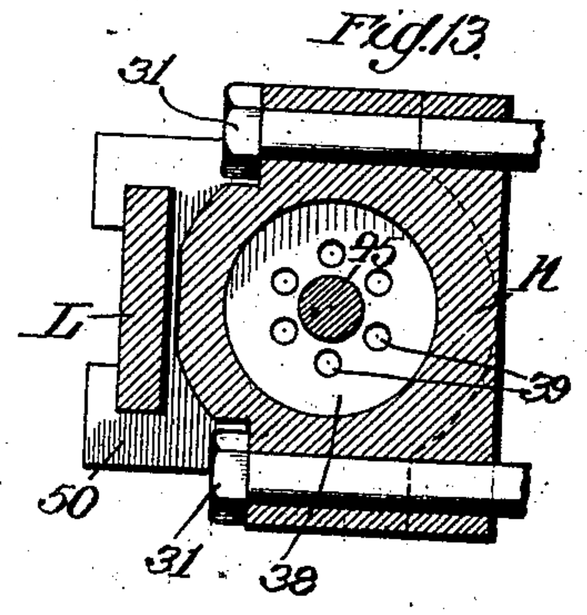


Fig. 14.

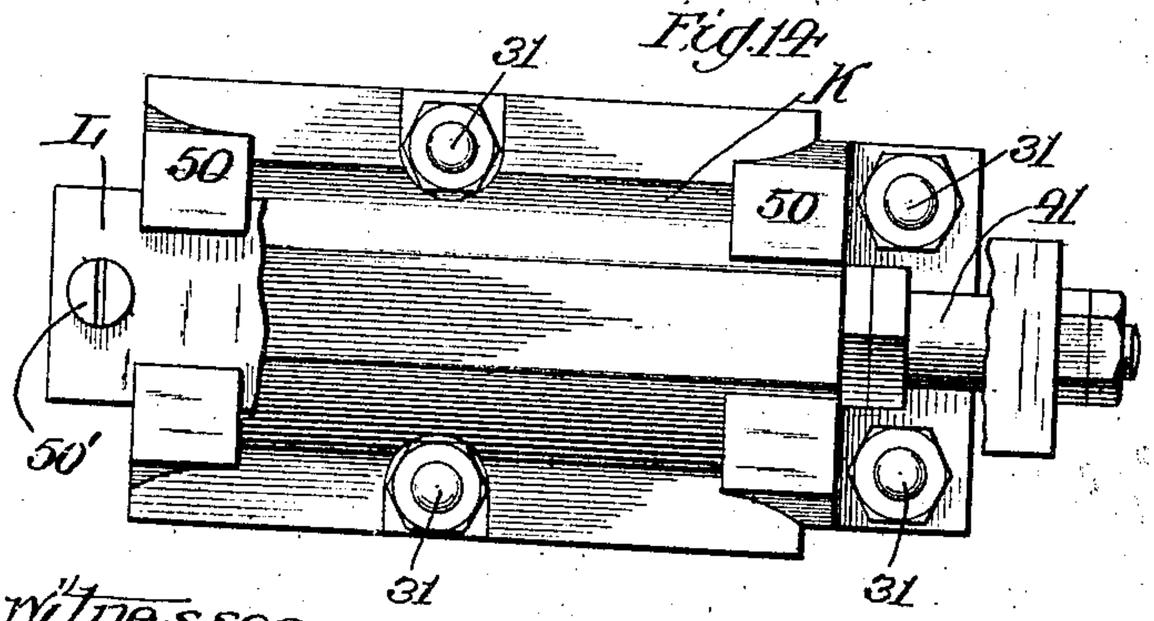
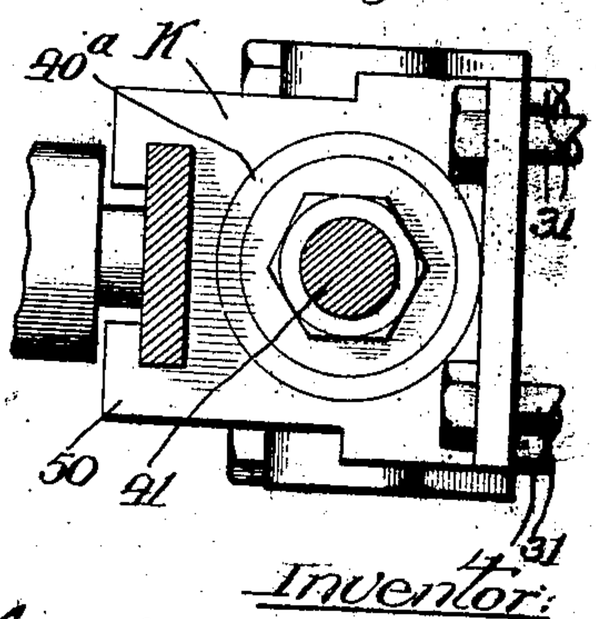


Fig. 15.



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UNITED STATES PATENT OFFICE.

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DOOR MECHANISM FOR ELEVATOR-SHAFTS.

No. 868,449. Specification of Letters Patent. Patented Oct. 15, 1907.

Application filed March 15, 1905. Serial No. 250,234.

To all whom it may concern:

Be it known that I, CHARLES W. KIRSCH, a citizen of the United States, and a resident of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Door Mechanism for Elevator-Shafts, &c., of which I do declare the following to be a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

The present invention, while susceptible of use in operating doors intended for other purposes, is more especially designed for the operation of the doors to elevator shafts.

The invention is directed more particularly to the operation of that class of elevator doors arranged to slide in vertical direction, a pair of doors being provided for each opening of the shaft.

The primary object of the invention is to provide improved mechanism whereby the operation of the doors may be effected by fluid under pressure (compressed air preferably) delivered from a common source of supply to the operating mechanism adjacent each door opening of the shaft.

The invention consists in the features of novelty hereinafter described, illustrated in the accompanying drawings and particularly pointed out in the claims at the end of this specification.

Figure 1 is a view from the inside of an elevator shaft (looking outwardly), showing my invention as applied to the operation of a pair of vertically sliding doors, the doors being in open position. Fig. 2 is a view similar to Fig. 1 but showing the doors in closed position. Fig. 3 is an enlarged detail view in horizontal section on line 3—3 of Fig. 2 showing the bracket for guiding the upper end of the rod of the door cushioning mechanism. Fig. 4 is a view in elevation, with parts broken away showing upon an enlarged scale the automatic locking and unlocking mechanism, the doors and the parts adjacent thereto. Fig. 5 is a view in horizontal section on line 5—5 of Fig. 4. Fig. 6 is a view showing in vertical section a portion of the floor of the elevator car and showing in elevation the parts connected thereto for automatically controlling the door-operating mechanism. Fig. 7 is a view in vertical section on line 7—7 of Fig. 6. Fig. 8 is a view in cross-section on line 8—8 of Figs. 6 and 7. Fig. 9 is a view in elevation of one of the power cylinders and one of the cushion cylinders connected therewith. Fig. 10 is a view in central vertical section through the other cylinder and its cushion cylinder, adjacent parts being shown in elevation. Fig. 11 is a plan view of the valve mechanism for controlling the motive fluid supplied to the power cylinders. Fig. 12 is a view in section on line 12—12 of Fig. 11. Fig. 13 is a cross-section on line 13—13 of Fig. 11. Fig. 14 is a view in side elevation of the valve casing. Fig. 15 is a view in section on line 15—15 of Fig. 11.

A and A′ designate metal plates or bars at the sides of one of the openings of an elevator shaft. Along the face of each of the bars A and A′ extends a channel-bar B (see Fig. 5) the inwardly extending walls *b* and *b′* of which are held at a slight distance from the bar or plate A by means of the strip B′ that is bolted to the plate A and channel-bar B. Channel-bars B form stationary guides for the upper and lower doors C and C′ of the elevator hatch-way. The doors C and C′ as shown, are formed of corrugated metal plates inclosed by an angle-bar frame *c*. The door C has connected to each of its ends a movable guide-bar D. A portion *d* of each guide-bar D projects within the space between the inner edge of guide channel-bar B and the door plate A. The movable guide-bars D of the upper door C depend to a considerable distance below the lower edge of the door C and hence serve to guide the door throughout the entire extent of its movement (see Fig. 1). The movable guide-bars D′ for the lower door C′ are shown as connected by means of the brackets 2 and 3 that project laterally from the frame of the door C′. These brackets are riveted to the door C′ at their inner ends and have their outer projecting ends riveted to the guide-bars D′. Each of the guide-bars D′ has one of its angular portions *d′* extending within the space between the outer edge of the fixed channel-bar B and the door plate A, as clearly shown in Fig. 5 of the drawings. The movable guide-bars D′ extend to a considerable distance above the top line of the lower door C′ and hence serve to guide the lower door throughout the full extent of its vertical movement.

The upper and lower doors C and C′ are connected for balanced shift in opposite directions by chains or cables E in any convenient manner. As shown, one end of each cable E is connected to the upper door by means of a hook 5 riveted to the inner face of an abutment or bracket 6 that is secured as at 7 to the inner face of the upper door C. This bracket 6 is braced by an arm 8 that extends upwardly from the outer portion of the bracket to a higher point on the frame of the door C. The opposite end of the chain or cable E is connected to the frame of the lower door C′ by means of a hook 9 projecting upward from a plate 10 that is riveted to the frame *e* of the door C′ (see Fig. 4). Hence, it will be seen that when the upper door C is raised, the lower door C′ may descend by gravity by being controlled in its downward movement by the chains or cables E. The chains or cables E at the ends of the doors C and C′, pass over suitable pulleys 12 projecting inwardly from the door plates A and A′.

Upon the plates A and A′ at each side of the hatch-way opening, are mounted the vertically arranged power cylinders F that are cross-connected by a pipe *f*

at their lower ends so that the compressed air or other fluid under pressure, may pass freely from one cylinder to the other. Within each of the power cylinders F is a piston 15 from which extends upwardly the shifter rods 16. Connections between the shifter rods and the parts operated thereby are similar so that the description of the operating mechanism at one side of the door-way will answer for both. The upper end of the rod 16 has a reduced portion 17 that passes through a slot 6^a that is formed in the brackets 6 (see Figs. 4 and 5), and the upper end 17^b of the part 17 which is further reduced, of the shifter-rod 16 passes loosely through a hole 20 in the free end of a pivoted latch-bar 21. This latch-bar 21 is pivoted as at 22 upon a plate or bracket 23 secured to the frame of the door C and the angular hooked end 24 of the latch-bar 21 depends through openings c^2 and c^3 formed respectively in the upper and lower doors when the doors are in closed position, and by its engagement with the frames of the upper and lower doors, serves to hold them securely in locked position. A shoulder 17^c between the reduced portions 17 and 17^b and a nut 25 threaded on the portion 17^b are arranged to engage with the free end of the latch-bar 21 and determine its movement. When the doors C and C′ are closed as shown in Figs. 2 and 4, the latch-bar 21 will hold them securely locked but when compressed air is admitted to the lower end of the cylinder F (in manner to be presently defined) and the piston 15 and rod 16 are forced upward thereby, the initial movement of the shifter rod 16 will cause the latch-bar 21 to rock about its pivot point 22 until the hooked end 24 of the latch-bar is swung from engagement with the angle frames of the doors, thereby permitting the further upward movement of the rod 16 to effect the opening of the doors in manner as will presently appear.

As shown, the power cylinders F at the opposite sides of the door-way are provided with closed caps or ends f' having ports between which extends the connecting pipe f, and the cap f' of one of the cylinders F is provided with an admission port f^2 that is connected by a short pipe 30 with the casing K of the valve mechanism whereby the passage of compressed air to and from the cylinders F is controlled.

By reference more particularly to sheet 6 of the drawings, the preferred construction of valve mechanism (which however may be varied widely without departure from the scope of the invention) will be readily understood.

Valve casing K is secured in position by bolts 31 and is provided with a cylindrical bore having screw-threaded openings 32 and 33 with which the feed pipe 34 and cylinder pipe 30 engage, and, on the opposite side of the casing, a screw-threaded opening 35 is provided with which the exhaust pipe 36 engages. Similar openings 32′, 33′ and 35′ are arranged opposite the openings 32, 33 and 35 so that the valve may be arranged either on the right or left hand side of the door, the openings which are not used being closed by suitable plugs 37. Between the openings 32 and 33 is arranged a diaphragm 38 which forms the seat of the inlet valve k, and through which extend the inlet ports 39. Exhaust ports 40 communicate with the opening 35 and these exhaust ports are preferably arranged in the cylindrical valve seat 40′ formed separate from the body of the casing and arranged within one end thereof. The exhaust valve k' is carried on a stem 41 which snugly fits within the open end of the bore of the valve casing. The inner end of the valve stem is provided with a perforated guide head 43 which fits the bore of the valve casing. Exhaust valve k' is provided as shown, with a suitable packing ring 44 of leather or other suitable yielding material, held in place by a washer 49 and lock nut 42.

The reciprocating inlet valve k is mounted upon a stem 45 which extends through a central opening in the diaphragm 38 and the end of which extends within a socket 46 in the inner end of the stem 41 of the exhaust valve. The inlet valve casing is provided with a suitable packing ring 47 of leather or other suitable material, and the end of the bore of the valve casing is closed by screw-plug 48, which may be easily removed, when it is desired to renew the packing of the inlet valve. A reciprocating shifter L on the outer face of the valve casing is arranged to slide in suitable guideways formed in lugs 50, projecting laterally from the valve casing. One end of the reciprocating shifter is bent laterally and is connected to the outer end of the exhaust valve stem 41. A stop 50′ limits the throw of the shifter and of the exhaust valve.

In the normal position shown, the inlet valve k is normally closed and the exhaust valve k' is normally open. In this position, the valve stem 45 projects only part way within the socket 46 so that there is a lost-motion connection between the exhaust valve stem 41 and the inlet valve stem 45. By this arrangement, when the shifter L is moved to actuate the valve, the initial movement thereof will close the exhaust valve before it opens the inlet valve so that there is no loss of the motor fluid. As soon as the exhaust ports 40 are closed, the play or lost-motion between the valve stems 41 and 45 is taken up and the further movement of the shifter L will open the inlet valve k to admit air or other suitable motor fluid under pressure to the motor cylinders F through the pipe 30 and common connection f.

It will be noted that the exhaust valve opens against the pressure within the motor cylinders and that the inlet valve k opens against the pressure in the main feed pipe so that as soon as the shifter L is released the valves will be returned to normal position by the pressure of the motor fluid to open the exhaust ports 40 and close the inlet ports 39. This arrangement does away with the necessity of employing spring mechanism for returning valves to normal position.

The horizontal, reciprocating valve shifter L is arranged to be actuated by a suitable trip carried by the car, and for this purpose is provided with a laterally projecting stud 51 which carries a roller 52 with which the trip M on the car engages. Trip M (see Figs. 6 and 8) is in the form of a vertically disposed shoe connected by swinging links 53 with a vertically disposed strip 54, which is connected by lugs 55 with the floor 56 of the car. An actuating link 57 is pivoted intermediate its ends to a lug 58 on the bottom of the car floor, and its outer end is slotted to engage a pin 59 secured to the trip M, and a vertically reciprocating plunger 60, arranged to shift through an opening in the car floor, is provided on its upper end with a foot-piece 61 and at its lower end is pivoted to the operating link 57. A spring 62 coiled about the plunger normally holds it in its uppermost position with the trip M and link 57 in inoperative posi-

tion indicated by dotted lines in Fig. 6. A latch 63 is pivoted on a lug 64 on the inner face of the strio 54. A spring 65 on the inner face of the strip 54 engages the tail of the latch 63 and the lower bent end of the latter extends through an opening in the strip 54 and engages the notch in the lower edge of the link 57 when the trip M is shifted to operative position shown in full lines in the drawings. By this means the trip M will be locked in its operative position. The lower end of the latch is prevented from engaging the upper edge of the link 57 when the latter is in lowermost position by an upright lug 57ª secured to the inner face of the link. A pair of lugs 66 are secured to the plate A′ in the elevator shaft and are arranged respectively above and below the valve casing K. These lugs are arranged to engage the outer curved edge of the tail of the latch 63 to shift it against the tension of its spring so that the trip M may be returned to normal, idle position by the coiled spring 62. Lug 57ª normally holds latch 63 so that it will not engage lugs 66.

To the upper end of each of the power cylinders F is connected a cushioning cylinder N, secured thereto by straps 67. The ends of each cushioning cylinder are closed and provided with restricted ports 68, the lower one of which is controlled by a screw valve 69 by which the port may be opened or closed to any desired extent. The piston *n* within the cylinder, is provided with a piston-rod 70 which extends upwardly through a suitable stuffing-box 71 upon the upper edge of the cylinder. This piston-rod extends through the slot 6ª of the abutment 6 and its upper end is guided in a loop 72 formed on the end of a bent strap 73, which is bolted to the side plates A, A′, as shown in Figs. 2 and 3. A pair of stops 74 are adjustably secured to each of the piston-rods 70 by set screws 75, and are arranged in such position that they will be engaged by the abutment 6 when the doors are near the ends of their movement, either in opening or closing.

It will be noted that as shown most clearly in Fig. 4, a shoulder 17ª is formed upon the upper end of the main portion of the shifter rods 16 and at the lower ends of the reduced portions 17 thereof, which extend through the slots of the abutment straps 6. In the normal position, and when the doors are closed, this shoulder is spaced a short distance below the abutment straps 6 so that a lost-motion connection is provided between the shifter rods and the abutments 6 on the door C, and the shoulder 17ª will not engage the abutments to lift the door until after an initial shift thereof sufficient to release the latches 21.

The operation is as follows: In all of the drawings, except Fig. 1, the doors are shown in closed position and the other parts in their normal, idle position. As the car approaches the desired floor, the operator will depress the plunger 60 and thereby shift the trip M to operative position through the medium of the link 57. The trip will then be locked in its operative position by the latch 63 and will engage the roller 52 on the shifter L and operate the controlling valves *k* and *k′* as described, to first close the exhaust from the power cylinders F and then open the inlet ports leading thereto. Air or other suitable motor fluid will then flow from the feed pipe 34 to the valve casing K, through the inlet ports 39 and pipe 30 to one of the motor cylinders F and through the connecting pipe *f* to the other motor cylinder, so that the pistons 15 will be actuated to lift the shifter rods 16. The initial shift of the rods 16 will move latches 21 about their pivots 22 to release the doors and the continued upward movement of the rods will bring the shoulders 17ª thereon into engagement with abutments 6 so as to lift the upper door C and permit the lower door C′ to descend by gravity. As the doors approach the end of their opening movement, the abutment or brackets 6 on the upper door C will engage the upper pair of stops on the piston rods 70, so that the pistons *n* within the cushioning cylinders N will be shifted upwardly, and the slow escape of the air from the upper end of the cushioning cylinders will arrest the movement of the doors without shock. Inasmuch as the trip M is locked in its operative position, it will hold the valve shifter and valves in their shifted position and the fluid pressure within the motor cylinders will hold the doors open as long as the car remains at the floor. As soon however as the car moves in either direction from the floor, the trip M will be disengaged from the valve shifter and a release of the latter will permit the closing of the inlet valve *k* and the opening of the exhaust valve *k′* under influence of the pressure in the motor cylinders and in the feed pipe, as before described. The upper door and its connected parts, are then free to descend by gravity. The doors are so connected by the chains or cables E that they nearly balance each other and can be shifted with the expenditure of but little energy, but the upper door and its connected parts are necessarily somewhat heavier than the lower door so that it will descend by gravity when the pressure in the motor cylinders F is released and lift the lower door through the flexible connections E. As the doors approach their closed position, the abutment straps 6 will engage the lowermost stops on the piston rods 70 and thus shift the pistons *n* within the cushioning cylinders N downwardly. The slow escape of air from the lower end of the cushioning cylinders through the restricted ports 68, will check the closing movement of the doors so that they are brought together without shock. During the downward shift of the upper door the abutment 6 thereon will rest on the shoulder 17ª of the shifter rods 16 and the shoulders 17ᵉ will hold the latches 21 in such position that their lower ends will enter the openings c^2, c^3 in the edges of the doors. As soon as the doors meet, the shifter rods will continue to descend until nuts 26 threaded on the portions 17 strike the brackets 6 and the shoulders 17ª will move away from the brackets 6. Latches 21 will be swung about their pivots by nuts 25 back to normal position and will lock the doors together so that they cannot again open at any floor until the car is at such floor. In this way any accidental opening of the doors is prevented by the safety latches 21.

The lugs 66 shown in Figs. 7 and 8, are arranged between the floors so that when a car moves from any floor, either up or down, latch 63 will be shifted by one of the lugs 66 to release the trip M and permits its return under influence of spring 62 to the inoperative position indicated by dotted lines in Fig. 6, and none of the doors at the other floors will be opened unless the car operator again sets the trip.

The improved construction is particularly applicable for use to a fire-proof door for the freight elevators

of warehouses and the like. Such doors are necessarily of heavy construction, and even when double vertically sliding doors connected for balance shift are employed, they cannot be readily operated by hand. Fire doors of this type now employed, are frequently left open so that they will not afford protection from fire and are frequently rendered inoperative by the rough handling because no adequate means are provided for checking the momentum of the heavy doors. In the present device, a strong durable construction is provided. Vertically reciprocating rods and vertically arranged power cylinders having a common control mechanism provide means by which they may be easily and quickly operated with certainty, and by which they are automatically closed and the cushioning appliances prevent any shock or jar to the door mechanism as they are opened and closed. The automatically controlled locking device insures that the doors will be held snugly together in closed position to afford the desired fire protection. It is understood however, that the mechanism is not limited to the operation of fire doors, that numerous changes may be made in the details of construction without departure from the essentials of the invention and that parts may be taken without its adoption as a whole.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is:—

1. The combination of the vertically sliding, upper and lower doors, guides above the ends of said doors, flexible connections between said doors extending over said guides, a lock for holding said doors in closed position, a motor, means operated by said motor for releasing said lock and shifting said doors, and control means for said motor governed by the travel of the elevator car.

2. The combination of the vertically sliding, upper and lower doors, guide pulleys above said doors, flexible connections between the ends of said doors extending over said guide pulleys, means for locking said doors in closed position, and a shifter connected to one of said doors arranged to release said locking means.

3. The combination of the vertical sliding, upper and lower doors, a stationary guide on each side of said doors, and a pair of guide bars engaging the opposite edges of each of said guides, connected respectively to said upper and lower doors.

4. The combination of the vertical sliding, upper and lower doors, a stationary guide on each side of said doors, a pair of guide bars engaging the opposite edges of each of said stationary guides connected respectively to said upper and lower doors, flexible connections between the ends of said doors, guide rollers above said doors over which said connections extend, and a shifter connected to one of said doors, substantially as described.

5. The combination of the stationary guides, pairs of sliding guide-bars engaging respectively the inner and outer edges of said stationary guides, the upper and lower doors connected respectively to the upper and to the lower ends of said guide bars, connections between said doors and operating shift mechanism therefor.

6. The combination of the vertically sliding, upper and lower doors, flexible connections between the ends of said doors, guides above said doors over which said connections extend, shifters connected to the opposite ends of one of said doors, motors for operating said shifters and common control mechanism for said motors.

7. The combination of the vertically sliding, upper and lower doors, flexible connections between the ends of said doors, guides above said doors over which said connections extend, a vertically reciprocating shifter-rod connected to one of said doors, a vertically disposed cylinder, and piston therein for operating said shifter-rod, and a controllable valve governing the admission to, and exhaust from, said cylinder.

8. The combination of the pair of vertically sliding doors connected for balanced shift in opposite directions, a pair of vertically reciprocating shifter-rods connected to the ends of one of said doors, vertically disposed motor cylinders for actuating said shifter-rods and control mechanism therefor governed by the travel of the elevator car.

9. The combination of the pair of vertically sliding doors connected for balanced shift in opposite directions, vertically reciprocating shifter-rods connected directly to the ends of one of said doors, pistons on said rods, cylinders for said pistons and controllable valve mechanism governing the admission to, and exhaust from said cylinders.

10. The combination of a vertically sliding elevator door, a reciprocating shifter-rod mounted on the wall of the elevator shaft and for operating said door arranged to engage the same after a slight initial movement, a latch mounted on said door, released by the initial movement of said shifter-rod, and actuating means for said shifter rod controlled by the travel of the car.

11. The combination with a vertically sliding elevator door, of a reciprocating shifter-rod, a lug on said door with which said rod engages after a slight initial movement, a latch pivoted on said door, engaged by said rod and released by the initial shift thereof, a piston on said rod, a cylinder for said piston and a controllable valve governing the admission to and exhaust from said cylinder.

12. The combination with a pair of oppositely and vertically sliding doors, of locking means for said doors and shifter mechanism therefor mounted on the wall of the elevator shaft and arranged by initial shift to release said locking means.

13. The combination with a pair of vertically sliding doors connected for simultaneous shift in opposite directions, of a latch connecting said doors in closed position, and a shifter mounted on the wall of the elevator shaft, having a lost motion connection with one of said doors and arranged by preliminary shift to release said latch.

14. The combination of a pair of vertically sliding doors connected to shift in opposite directions, a reciprocating shifter-rod mounted on the wall of the elevator shaft and having a lost motion connection with one of said doors, and a latch on the latter door arranged to engage the other in closed position and released by initial shift of said rod.

15. The combination with a pair of vertically sliding doors connected for simultaneous shift in opposite directions, of a latch connecting said doors in closed position, shifter mechanism mounted on the wall of the elevator shaft and having a lost motion connection with one of said doors, and means on the car for controlling the operation of said shifter mechanism, said shifter mechanism being arranged by preliminary shift to release said latch, substantially as described.

16. The combination of the pair of vertical sliding elevator doors connected for balanced shift in opposite directions, an abutment on one of said doors and a latch thereon arranged to engage the other door in closed position, a vertically reciprocating shifter-rod having a lost motion connection with said abutment and arranged to release said latch by initial movement, and means for actuating said shifter-rod.

17. The combination of the pair of vertical sliding elevator doors connected for balanced shift in opposite directions, abutments on the ends of one of said doors, latches pivoted thereon arranged to engage the other of said doors in closed position, vertically reciprocating shifter-rods having lost motion connection with said abutments and arranged to release said latches by initial shift, pistons on said rods, cylinders for said pistons and valve mechanism controlling the admission to and exhaust from said cylinders.

18. The combination with an elevator door and operating means therefor, of a controlling trip carried by the car, means for setting said trip in operative position and means mounted on the wall of the elevator shaft for returning the trip to normal position.

19. The combination with an elevator door and its operating means, of a shiftable controlling trip carried by the car, a latch for locking said trip in operative position and lugs upon the wall of the elevator shaft for

releasing said latch to restore said trip to normal position.

20. The combination with an elevator door, of a shifter therefor, a motor for operating said shifter, controlling mechanism for said motor, a shiftable trip carried by the car to actuate said controlling mechanism, means for setting said trip in operative position and means on the wall of the elevator shaft for returning said trip to normal position.

21. The combination with an elevator door, of a reciprocating shifter therefor, a cylinder and piston for operating said motor, valve mechanism controlling the admission to and exhaust from said cylinder, a trip for said valve mechanism carried by the car, a latch for holding said trip in operative position and lugs in the elevator shaft for releasing said trip.

22. The combination with an elevator door and its operating mechanism, of a spring-held trip for controlling said mechanism carried by the car, a spring-held latch for holding said trip in operative position and lugs in the elevator shaft arranged to engage and release said trip.

23. The combination with an elevator door, a shifter therefor, and a cylinder and piston for operating said shifter, of a valve casing communicating with said cylinder having normally open admission and normally closed exhaust ports, valves controlling said ports and a trip carried by the car for successively shifting said valves, to first close said exhaust port and subsequently open said inlet port.

24. The combination with an elevator door, a shifter therefor, and a cylinder and piston for operating said shifter, of a valve casing communicating with said cylinder having normally open admission and normally closed exhaust ports, reciprocating exhaust and inlet valves held in normal position by the fluid pressure, a shifter for successively actuating said valves and a trip carried by the car for actuating said shifter.

25. The combination with an elevator door, a shifter therefor, and a cylinder and piston for operating said shifter, of a valve casing communicating with said cylinder having admission and exhaust ports, a normally closed reciprocating admission valve, a normally open reciprocating exhaust valve having a lost motion connection with said inlet valve and arranged to close said exhaust port by initial movement, a shifter connected to said exhaust valve and a trip carried by the car for operating said shifter.

CHARLES W. KIRSCH.

Witnesses:
GEO. P. FISHER, Jr.,
EDWARD WYLDE.