

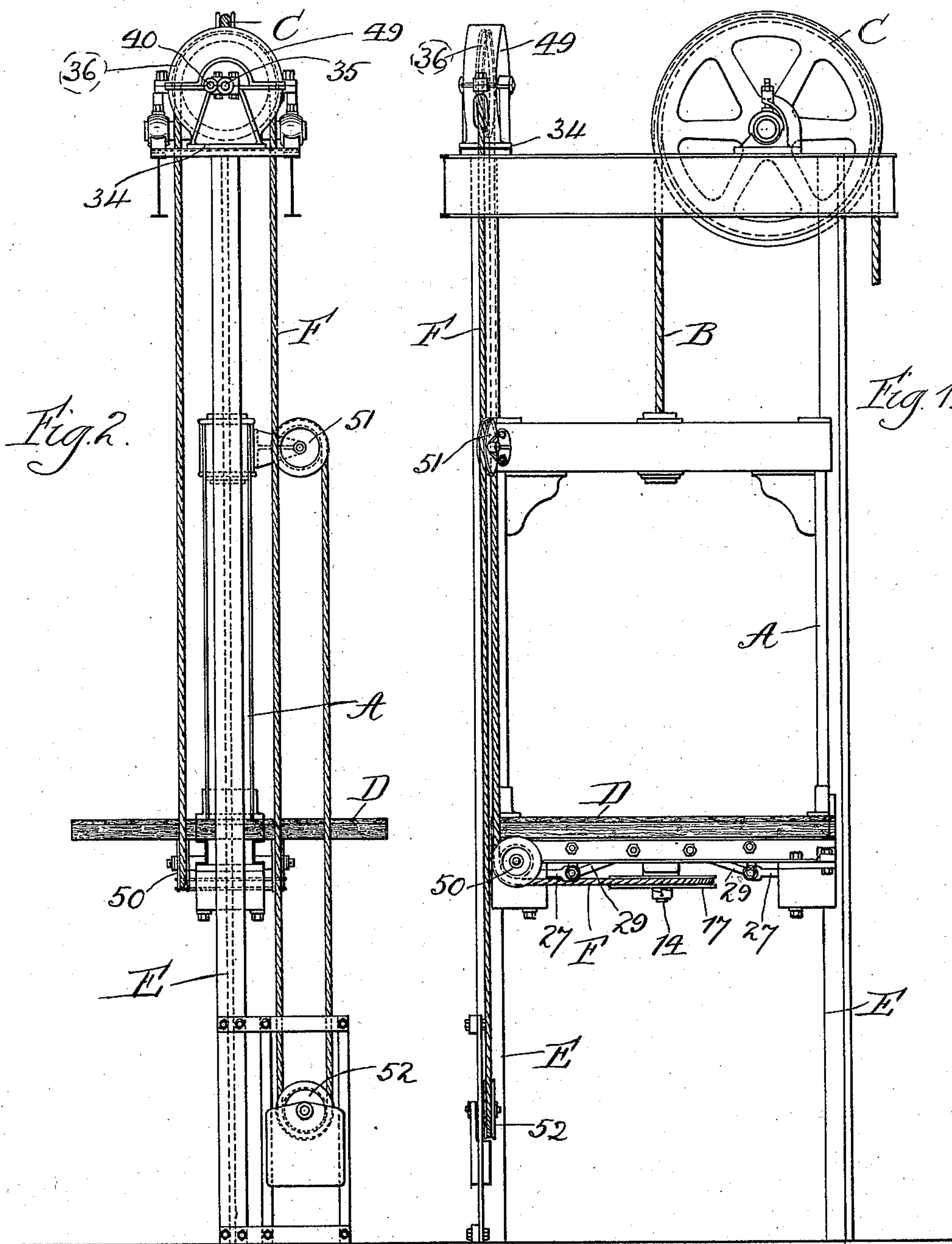
(No Model.)

3 Sheets—Sheet 1.

H. W. FORSLUND.
ELEVATOR.

No. 550,784.

Patented Dec. 3, 1895.



WITNESSES:

Wm. J. Hanning
St. M. O'Brien

INVENTOR

Hugo W. Forslund
BY
Brown & Darby
ATTORNEYS.

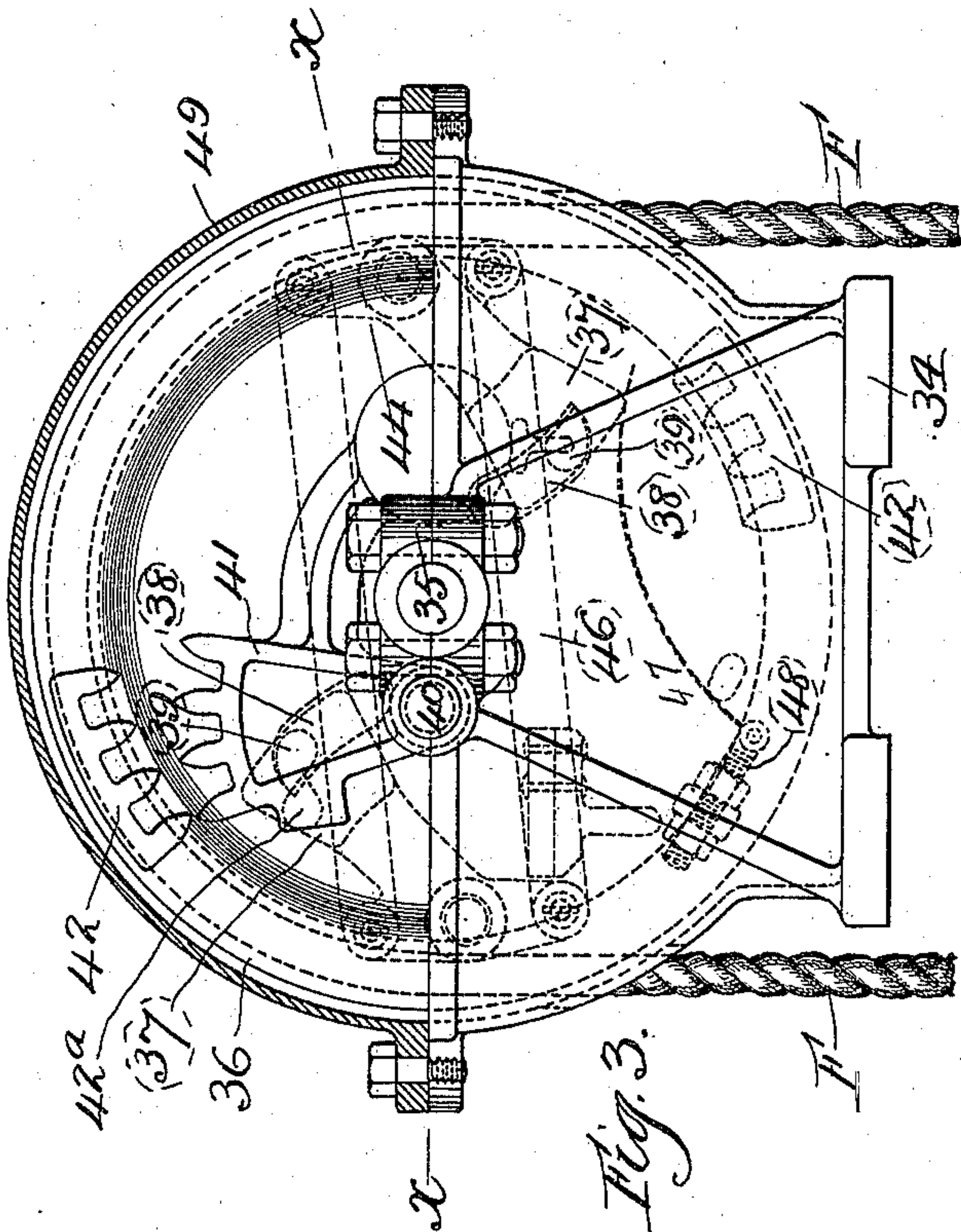
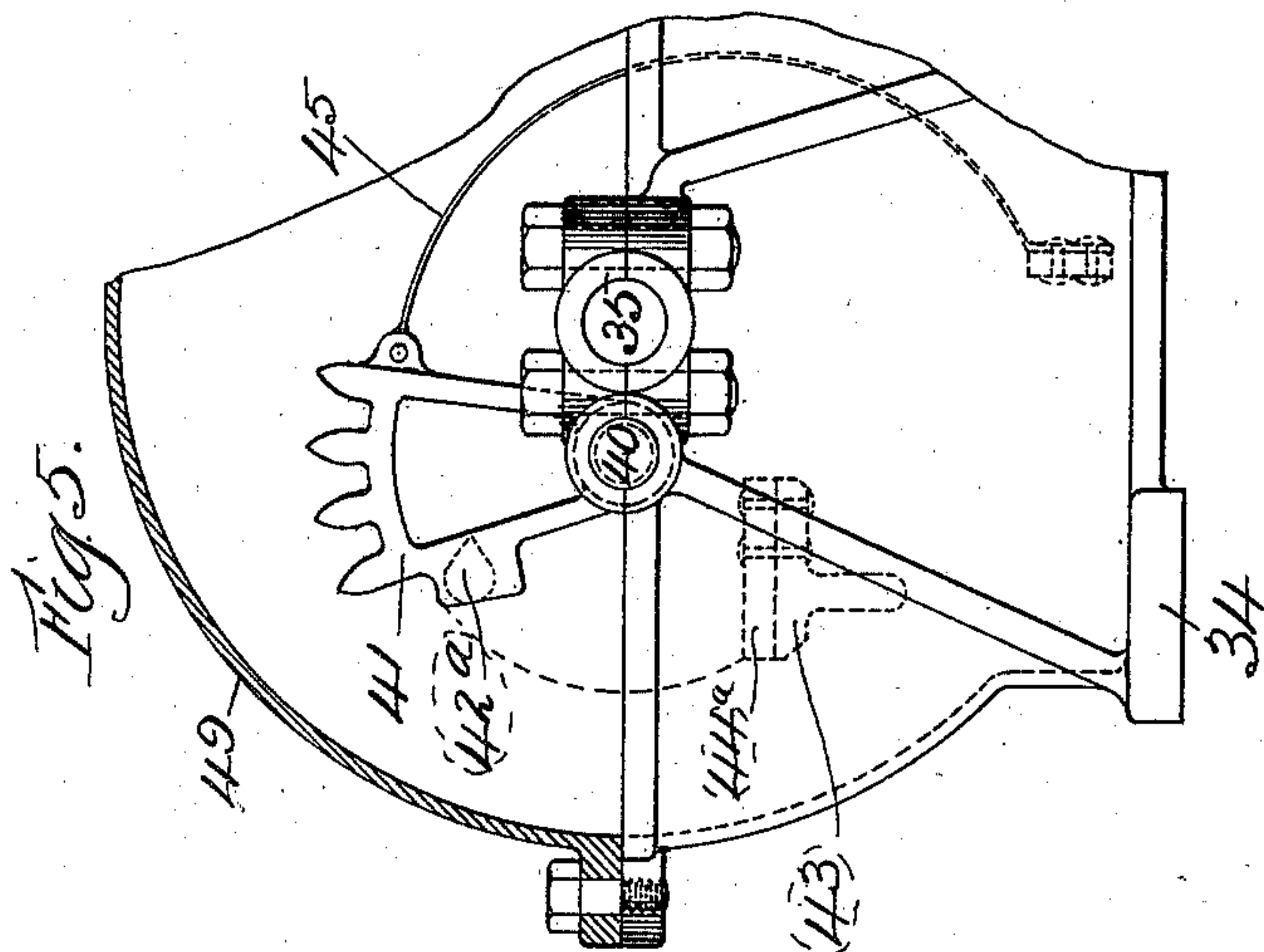
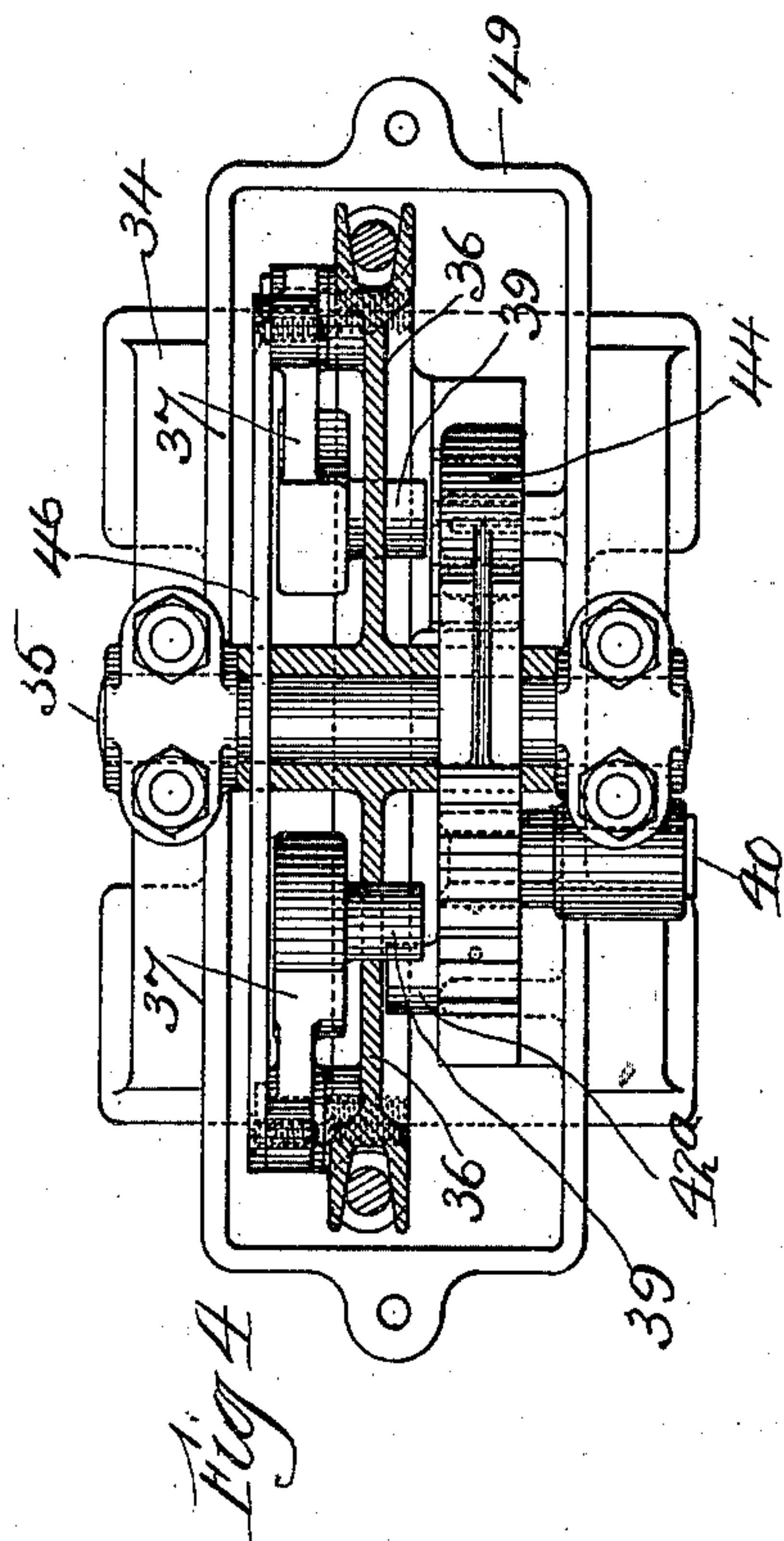
(No Model.)

3 Sheets—Sheet 2.

H. W. FORSLUND.
ELEVATOR.

No. 550,784.

Patented Dec. 3, 1895.



WITNESSES:
Wm. J. Fleming
Sam. M. Rheem.

INVENTOR
Hugo W. Forslund
BY
Brown & Darby
ATTORNEYS.

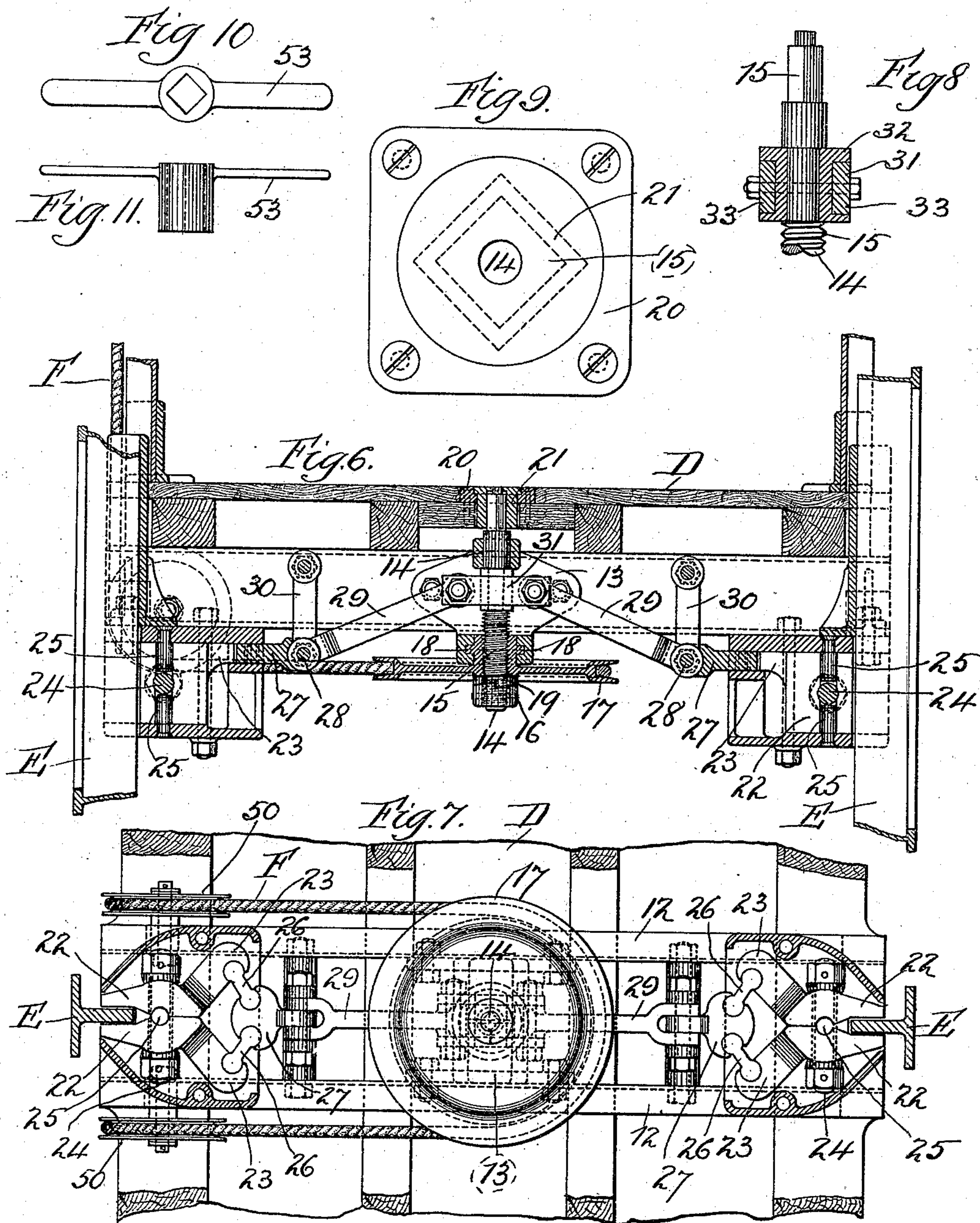
(No Model.)

3 Sheets—Sheet 3.

H. W. FORSLUND.
ELEVATOR.

No. 550,784.

Patented Dec. 3, 1895.



WITNESSES:

Wm. F. Hanning
St. M. Rheem

INVENTOR
Hugo W. Forslund
BY
Brown & Darby
ATTORNEYS.

UNITED STATES PATENT OFFICE.

HUGO W. FORSLUND, OF CHICAGO, ILLINOIS.

ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 550,784, dated December 3, 1895.

Application filed December 24, 1894. Serial No. 532,752. (No model.)

To all whom it may concern:

Be it known that I, HUGO W. FORSLUND, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Elevator Apparatus, of which the following is a specification.

This invention relates to elevator apparatus, and particularly to a governor-controlled safety-grip mechanism for automatically arresting the fall of an elevator-car in case of accident.

The object of the invention is to provide a safety-grip mechanism of simple and improved construction, thoroughly reliable, and effective in operation.

The invention consists substantially in the construction, combinations, location, and relative arrangement of parts, all as will be more fully hereinafter set forth, as shown in the accompanying drawings, and finally pointed out in the appended claims.

In the drawings, Figure 1 is a front elevation of an elevator well and car with the invention applied thereto. Fig. 2 is a side elevation of the same. Fig. 3 is a detailed view in side elevation, the casing being in section, of a governor for automatically actuating the grip device. Fig. 4 is a view in horizontal section of the same, taken on the line *x x*, Fig. 3, the protecting-casing being removed. Fig. 5 is a partial view in side elevation of the same, the casing being in section, illustrating a slightly-modified form of construction. Fig. 6 is a vertical sectional view of the safety-gripping mechanism applied to the car. Fig. 7 is a horizontal sectional view of the same. Fig. 8 is a detailed view in section illustrating means for equalizing the gripping action of the two sets of gripping-jaws. Fig. 9 is a plan view on an enlarged scale illustrating the manner of journaling the gripping-jaw-operating shaft in the floor of the car. Figs. 10 and 11 are detailed views in plan and side elevation of an operating-lever for operating the gripping-jaw-controlling shaft for releasing the gripping-jaws and resetting the governor.

The same reference-sign is employed to designate the same part wherever it occurs throughout the several views.

Reference-sign A designates an elevator-

car; B, the hoisting-cable therefor; C, the guide-sheave for the hoisting-cable; D, the floor of the car; E, the guide-rails, and F the safety-grip-operating cable. This cable is of the type arranged to travel with the car.

Secured underneath the floor of the car are suitable beams 12, arranged to extend transversely across the floor of the car on the under side thereof. In a suitable bracket 13, secured to said beams 12, is mounted and vertically arranged a shaft 14, having a squared shank 15 (see Fig. 8) arranged to be received in a seat or socket of similar shape formed in and through the floor of the car, as will be presently more fully described. By this construction shaft 14 is held against rotation, but is permitted an endwise movement through its bearing in bracket 13. Shaft 14 is provided with a threaded portion 15, and upon the lower end of said shaft to move with the same is one jaw of a clutch 16. (See Fig. 6.)

Upon the screw-threaded portion of shaft 14 is mounted a guide-sheave 17, the hub of which is internally screw-threaded to receive the screw-threads upon shaft 14. The hub of sheave 17 is provided with a flange 18 upon the periphery thereof, adapted to be received in a suitable groove formed in the bracket which constitutes the bearing for shaft 14. By this construction said sheave, while permitted to rotate, is held rigidly against side-wise movement. When, therefore, said sheave is rotated, the effect is to move shaft 14 longitudinally through the threaded hub of sheave 17. Cast or formed with sheave 17 is a jaw 19, adapted to co-operate with clutch-jaw 16, carried by shaft 14, whereby sheave 17 may be locked against rotation independently of the shaft, as will more fully hereinafter appear.

I will now describe the manner in which the squared end 15 of shaft 14 is received in its socket in the floor D of the car, reference being had to Figs. 6 and 9. The floor D of the car is provided with a countersink, rectangular in outline, adapted to receive a rectangular plate 20 therein, said plate being provided with a squared opening centrally therein, adapted to receive a rectangular-shaped bushing 21. Plate 20 is suitably bolted or secured in any manner in its seat in the floor D. Bushing 21 is rectangular in

shape exteriorly and also interiorly and is arranged to receive the squared end 15 of shaft 14. From the construction above described it will be seen that ready access may be had from the inside of the car to the squared end of shaft 15, and as the plate 20 and bushing 21 are arranged in a countersink or opening in the floor D of the car objectionable projections into the car are avoided. Moreover, by the construction described, shaft 14 is rigidly and effectively locked against rotation while permitted to slide endwise when the sheave 17 is actuated by the construction and operation presently to be described.

In a suitable casing at each side of the car and upon the under side of the floor thereof is arranged a pair of gripping-jaws 22, each provided with a gripping-surface arranged, when suitably actuated, to grip the T-flange of the guide E, and also provided with an inwardly-projecting flange 23.

About midway the length of the gripping-jaws upon the meeting faces thereof are provided semicircular depressions, adapted to register with each other from circular seats when the jaws are assembled. Arranged in the seat thus formed to act as pivots for the jaws, are short studs or pins 25, one projecting a short distance into the seat from each side, top, and bottom of the pair of jaws. The jaws are held together in assembled position and against the pins 25 by means of a bolt 24, arranged to pass transversely through the jaws and between the adjacent ends of the pins or studs 25, as shown. The contour of the outer sides or faces of the jaws is such as to permit the bolt to hold the jaws together and at the same time to rock about the studs as pivots, the bearing parts of the bolt against the jaws being shaped to conform with the shape of the jaws.

The flanges 23 diverge from each other inwardly, as shown, and to each flange 23 is connected a link 26, which in turn is pivotally connected to a link or head 27, carried by a head pivoted, as at 28, to toggle-levers 29, and also to swinging levers 30, pivoted to bars 12, as shown. (See Figs. 6 and 7.) The inner ends of levers 29 are each pivoted to a movable head 31, which is mounted upon to move with shaft 14.

From the above description it will be seen that the system of levers and links described constitute in effect toggle-levers, and when shaft 14 is moved endwise and downwardly from the floor of the car the inner ends of levers 29, connected to move with the shaft 14, tend to straighten out, and hence exert an outward pressure upon the heads 27, which, being transmitted through links 26 to the inwardly-diverging flanges 23 of the gripping-jaws, cause the gripping-jaws to rock about pins 25 as a pivot and to grasp or grip the flange of the guide-rail, the depending links 30 acting as guides. Upon the movement of shaft 14 in the opposite direction,

carrying with it head 31, the inner ends of levers 29 are raised, heads 27 are withdrawn, and the diverging ends or flanges 23 are thereby drawn together, thus again rocking the jaws about their pivots and releasing the gripping-faces of said jaws from the T-flanges.

In order to provide a convenient means for equalizing the gripping action of the two sets of gripping-jaws, I provide the following construction: Mounted upon shaft 14 is a sleeve or spool 32, provided with a cylindrical bore adapted to receive the shaft therein and permitting said shaft to rotate therein freely. A suitable collar upon the shaft secures simultaneous travel of sleeve 32 when the shaft is moved endwise. The sleeve 32 is provided with a peripheral groove, as shown, adapted to receive the side bars 33 of the head 31. The head 31 being substantially rectangular in shape it will be seen that said head may freely slide horizontally in the peripheral groove of sleeve 32; but said side bars 33 are held to move with said spool, and hence with said shaft when it is moved endwise. By this construction I provide a convenient arrangement for equalizing the gripping action of the gripping-jaws on the guides on opposite sides of the elevator-well and compensate by the movement of head 31 for any inequalities in the T-flanges of the gripping-rails or in the gripping-surface of the jaws, and hence secure a simultaneous gripping of the guide-rails.

I will now describe the construction of the governor apparatus which peculiarly adapts it for use in conjunction with the gripping devices above described.

Reference-sign 34 (see Figs. 3, 4, and 5) designates a suitable stand or bracket arranged in any suitable or convenient location, but preferably at the top of the elevator-well. In suitable bearings formed in said bracket or casting is journaled a pintle 35, upon which is mounted a governor-sheave 36, adapted to rotate freely thereon. Pivotally supported upon the face of said sheave are the weighted governor-arms 37, adapted and arranged to rock about their pivots by centrifugal force when said sheave is rotated. The sheave is circularly grooved or slotted, as at 38, the curve of said slot being struck from the pivot of the weighted arms, (see dotted lines in Fig. 3,) and upon each weighted arm 37 is formed a lug 39, arranged to project through said slots, as shown more clearly in Fig. 4.

Upon a pivot-pin 40, suitably journaled in fixed bearings formed in the standard or bracket 34, is mounted to rock a segment 41, having gear-teeth thereon, as shown, and also provided with a lug 42^a, arranged to project into the path of rotation of lug 39, formed on the weighted arms when said arms are unduly rocked about their pivots—as, for instance, when the sheave 36 is rotated at an abnormal velocity. For convenience and compactness I arrange the segment 41 upon the opposite side of the governor-sheave 36

from the weighted levers. Suitably secured to or formed on the sheave 36 are gear-teeth, as shown at 42, arranged when segment 41 is suitably rocked upon its pivot to engage the gears on said segment, and hence to complete the rocking of said segment about its pivot. A suitable bracket 43, provided upon its upper surface with a rubber block 44^a, is arranged to arrest the movement of rocking segment 41 at a desired point in the rotation thereof about its pivot, thereby effectually locking the governor-sheave against further rotation.

In order to prevent segment 41 from being displaced until properly actuated, I may provide said segment with a counterweight, opposing any undue or abnormal movement of said segment. In the form shown in Fig. 3 this may be accomplished by securing to said segment a weighted arm, as at 44; or, as in Fig. 5, a bow-spring, as at 45, may be employed to accomplish the same result.

The weighted governor-arms 37 may be connected by a system of parallel links 46, as shown, (see Figs. 3 and 4,) in order to secure simultaneous movement thereof, and in order to prevent any undue or abnormal rocking of said arms about their pivots I may, if desired, provide a spring 47, adapted to bear against one or both of said arms, (see Fig. 3,) an adjustable support, as at 48, being provided for said spring in order to adjustably secure the proper pressure of said spring. In order to protect the governor mechanism from dust or dirt, I completely inclose the sheave and the mechanism connected therewith within a shell or casing 49.

It will be observed that the governor-sheave 36 and also the grip-actuating sheave 17 are each provided with a peripheral groove slightly wedge-shaped in cross-section adapted to receive the governor-cable F. The purpose of this construction will presently appear more fully.

The operation of the governor mechanism is as follows, the relative position of the parts being that shown in Fig. 3 and the sheave is supposed to rotate in a direction opposite to that in which the hands of a clock normally travel: If an undue rotation or an undue increase of speed of rotation is for any reason imparted to the governor-sheave, the weighted arms 37 are rocked about their pivots, the weighted ends thereof being caused to move toward the periphery of the sheave. This rocking of the governor-arms about their pivots causes the lugs 39 to travel in the slots 38 into position to engage the lugs 42^a upon the stationary segment 41, and hence causes said segment to rock about its pivot as it is carried along by the rotating lug until the gear-teeth formed on the sheave engage or mesh with those formed on the segment. Further rotation of the sheave will further rock the segment 41 about its pivot until it impinges against the rubber-faced block 43, when further rocking thereof is arrested; the sheave

being thereby effectually locked against further rotation, a reverse rotation of the sheave being necessary to effect an unlocking thereof and a resetting of the segment 41. It will be observed that the normal position of segment 41 is such that the teeth formed on the sheave clear, during the rotation of said sheave, the teeth formed on the segment.

I will now describe the arrangement whereby the gripping device above described is actuated by the governor. As shown, the governor-cable F is an endless cable and is arranged as follows: After passing over the governor-sheave from right to left, as shown in Fig. 3, it passes down through the well to a guide-sheave 50, carried upon the car, and thence around the sheave 17 of the gripping mechanism, thence around a similar guide-sheave 50 upon the car, the sheave 50 being arranged adjacent to the floor of the car, thence said cable passes over a guide-sheave 51, suitably secured to the car, preferably near or adjacent to the roof of the car, thence down and through a weighted traveling sheave 52, whereby said cable is maintained taut, and thence back to and over the governor-sheave. It will be readily seen that the friction due to the peculiar construction and shape of the groove in the grip-operating sheave, and also to the number and arrangement of guide-sheaves carried by the car is sufficient to lock the cable to move with the car. This travel of the cable F causes a rotation of the governor-sheave.

Should an accident occur to cause the car to descend more rapidly than it should—as, for instance, should the hoisting-cable break and the car begin a rapid descent—the governor-sheave is caused to rotate rapidly, thereby throwing out the weighted arms, causing the segment 41 to be engaged by the teeth on the governor-sheave, thereby effecting a locking of the governor-sheave against further rotation. The friction of the cable F in the peripheral groove of the governor-operating sheave arrests the cable from being paid out to the car as it descends; but as the weight of the car is greater than the friction of the gripping-sheave and as the cable is held rigidly by the governor mechanism, the car is forced to travel upon the cable, thereby effecting a rotation of the grip-actuating sheave, the hub of which, acting as a nut upon the threaded portion of shaft 14, causes said shaft to travel endwise, carrying with it the head 31, and hence through the system of toggle-levers above described effecting a simultaneous and quick gripping of the pairs of gripping-jaws against the flange of the guide-rail, and hence arresting the further descent of the car.

In order to release the gripping-jaws and to again set the governor mechanism, the plate 20 is removed from the floor of the car and the squared portion 15 of shaft 14 is engaged by a suitable wrench 53 (see Figs. 10 and 11) and the shaft rotated in a suitable direction

to effect a reverse pull upon the governor-operating grip-cable, thereby rotating the governor-sheave in an opposite direction, whereby, through the engagement of the gears 42 and 41, the segment 41 is returned to its normal position where it is held by weight 44 or spring 45, as the case may be, and again ready to be actuated to again effect an actuation of the gripping-jaws by locking the governor-sheave against rotation.

It will be understood that inasmuch as the sheave 17 is locked against movement by the flange 18 thereon the rotation of shaft 14 to effect a resetting of the governor will first cause said shaft to travel endwise sufficiently for the jaws 16 19 to engage with each other, when further rotation of said shaft will effect a rotation of the sheave 17, and further longitudinal movement of said shaft will thereupon be arrested.

When the governor is again set ready for actuation when required, the plate 20 with the squared socket 21 therein is again replaced in the recess in the floor of the car in position to receive the squared end 15 of shaft 14 to lock the same against further rotation.

By the above construction it will be seen that I provide an exceedingly simple safety-grip mechanism and operating means therefor, easily repaired, inexpensive, and thoroughly reliable.

Many variations in the details of construction and arrangement would readily suggest themselves to persons skilled in the art, and I do not desire, therefore, to be limited or restricted to the exact details shown and described; but,

Having now fully explained the nature of my invention, its principle and mode of operation, and a form of mechanism embodying the same, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In an apparatus of the class described, a car, a shaft or stud carried thereby and arranged to project into the car, said shaft rigidly held against rotation, but capable of moving endwise, pivoted gripping jaws, devices operated by the endwise movement of said shaft or stud for positively setting said jaws, said shaft adapted to be operated from the car to release said jaws; as and for the purpose set forth.

2. In an apparatus of the class described a gripping mechanism, means for setting said gripping mechanism, comprising an endwise movable shaft, a sheave mounted thereon to move the same endwise, and a governor mechanism adapted to actuate said sheave, in combination with means for locking said sheave to rotate with said shaft, whereby said gripping mechanism may be released and said governor mechanism reset; as and for the purpose set forth.

3. In a governor mechanism a sheave mounted to rotate, and having a slot therein, a weighted arm pivoted to said sheave hav-

ing a lug arranged to project through said slot, a locking arm mounted upon a stationary support and adapted to be engaged by said lug, whereby said arm is moved to engage said sheave and lock the same against rotation; as and for the purpose set forth.

4. In an elevator apparatus a governor mechanism comprising a sheave mounted to rotate, an arm pivoted thereto, a locking device for said sheave, adapted to be thrown into locking position by said arm when said sheave is unduly rotated, a cable arranged to rotate said sheave, a gripping device, adapted to be operated when said cable is locked, and means operated from the car for resetting said locking device; all combined and arranged as and for the purpose set forth.

5. In an elevator apparatus a car, a governor mechanism comprising a sheave mounted to rotate, a locking device for said sheave arranged to be moved into locking position when said sheave is unduly rotated, a cable arranged to normally move with said car and to rotate said sheave, a gripping mechanism carried by the car and adapted to be operated by said cable when said governor sheave is locked, and means adapted to be operated from the car for releasing said gripping mechanism and unlocking said locking device; as and for the purpose set forth.

6. In an apparatus of the class described, a car, an endwise movable shaft mounted thereon, a sheave mounted on said shaft and adapted to move the same endwise, gripping devices adapted to be actuated by the endwise movement of said shaft, a cable wound upon said sheave, and held to travel with the car, a governor around which said cable is arranged to pass, said governor adapted to be locked against movement by undue movement of the car, whereby said cable is held against movement with the car, thereby rotating said shaft and moving the same endwise to set said gripping devices, and means for simultaneously releasing said gripping devices and unlocking and resetting said governor; as and for the purpose set forth.

7. In an apparatus of the class described, a gripping mechanism, means for actuating the same, a governor for controlling said means, said governor adapted to be locked, whereby said gripping mechanism is actuated, and means for simultaneously releasing said gripping mechanism and unlocking said governor; as and for the purpose set forth.

8. In an apparatus of the class described, a car, a gripping mechanism carried thereby, means for actuating said gripping mechanism, a governor for said actuating means, said governor being independent of the car and adapted to be locked, whereby said actuating means are operated, and means for simultaneously releasing said gripping mechanism and unlocking and resetting said governor; as and for the purpose set forth.

9. The combination with a car, a shaft mounted thereon and capable of endwise

movement but held against rotation, gripping jaws adapted to be actuated by the endwise movement of said shaft, a sheave mounted on said shaft and adapted when rotated to move the same endwise, a cable adapted to rotate said sheave, and means for coupling said sheave and shaft to revolve in unison; as and for the purpose set forth.

10. The combination with a car, a shaft mounted thereon, and capable of endwise movement, but normally held against rotation, gripping jaws adapted to be actuated by the endwise movement of said shaft, a sheave mounted on said shaft, and adapted when rotated to move the same endwise, a cable for rotating said sheave, a governor arranged to lock said cable, and means for coupling said shaft and sheave to rotate in unison, whereby said governor is unlocked and reset, and the gripping jaws are released; as and for the purpose set forth.

11. The combination of a car, a threaded shaft, normally held against rotation, a sheave having a threaded hub mounted on said shaft, said sheave held against other but rotary movement, detachable connections between said sheave and shaft, gripping jaws actuated by said shaft, and a governor for actuating said sheave; as and for the purpose set forth.

12. The combination of a car, an endwise movable shaft, gripping jaws adapted to be set or reset by the movement of said shaft endwise, a sheave arranged to move said shaft endwise, a cable adapted to actuate said sheave, a governor arranged to lock and to

be reset by said cable, clutch jaws carried by said sheave and shaft respectively adapted to engage each other, whereby said sheave and shaft are locked to revolve in unison; as and for the purpose set forth.

13. In an apparatus of the class described, a car, an endwise movable shaft arranged to extend into the car, gripping jaws adapted to be actuated by the endwise movement of said shaft, a sheave mounted on said shaft to move the same endwise, a cable mounted on said sheave and normally held to travel with the car, a governor adapted to lock said cable whereby said sheave is actuated and said shaft moved endwise to set said gripping jaws, and means for coupling said shaft and sheave whereby the rotation of said shaft will rotate said sheave to reset said governor; as and for the purpose set forth.

14. In an apparatus of the class described, guides arranged on opposite sides of the elevator well, gripping jaws arranged to grip said guides, means for actuating said gripping jaws, and a head having sliding connection with said gripping jaw operating means, and connected to said gripping jaws, whereby the action of said jaws is equalized; as and for the purpose set forth.

In witness whereof I have hereunto set my hand this 20th day of December, 1894.

HUGO W. FORSLUND.

In presence of—

M. I. CAVANAGH,
S. E. DARBY.