C. NEWSON.

APPARATUS FOR OPERATING ELEVATORS.

APPLICATION FILED APR. 14, 1909.

966,231.

Patented Aug. 2, 1910.

3 SHEETS—SHEET 1.

Fig. 1

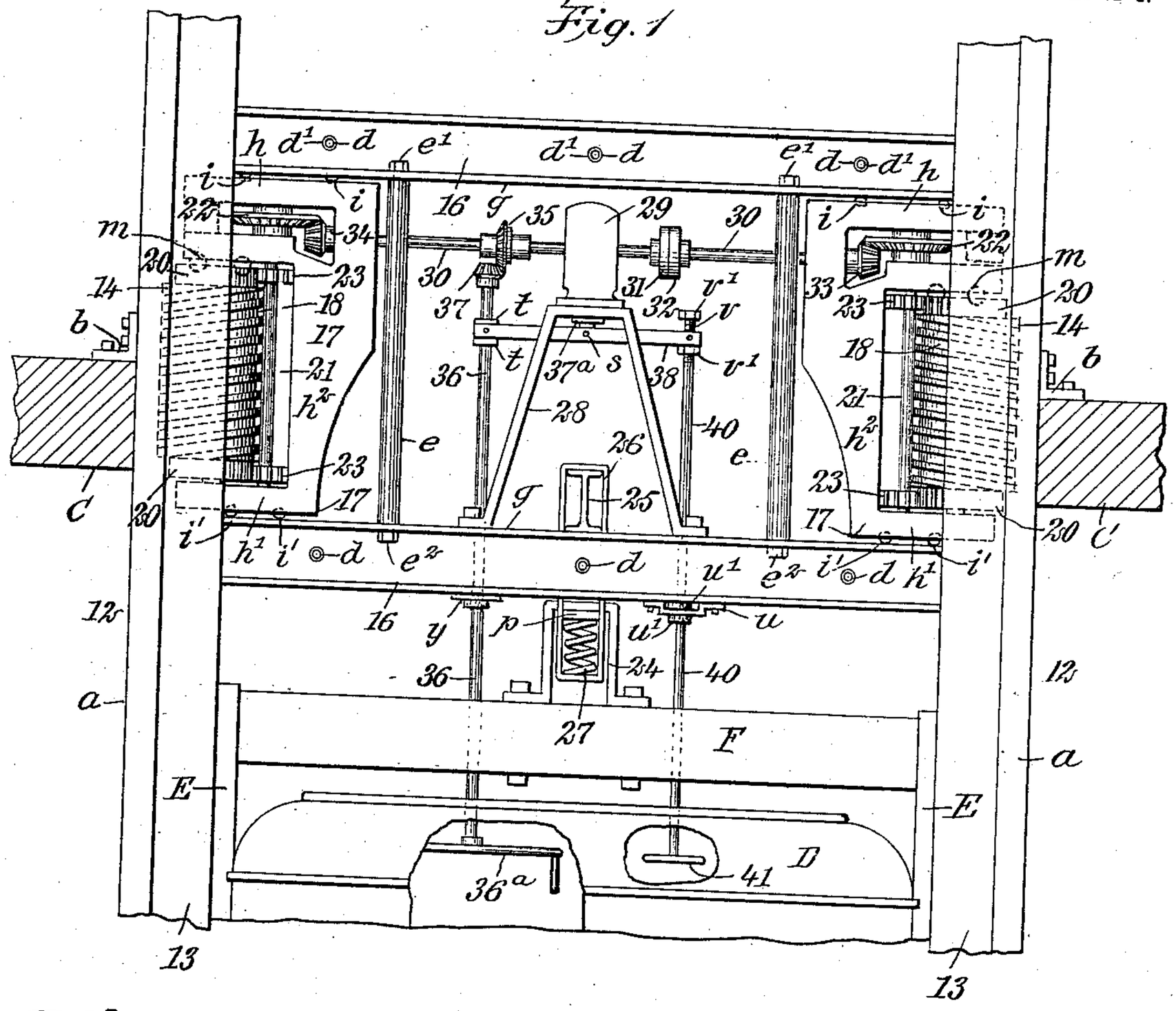


Fig. 2

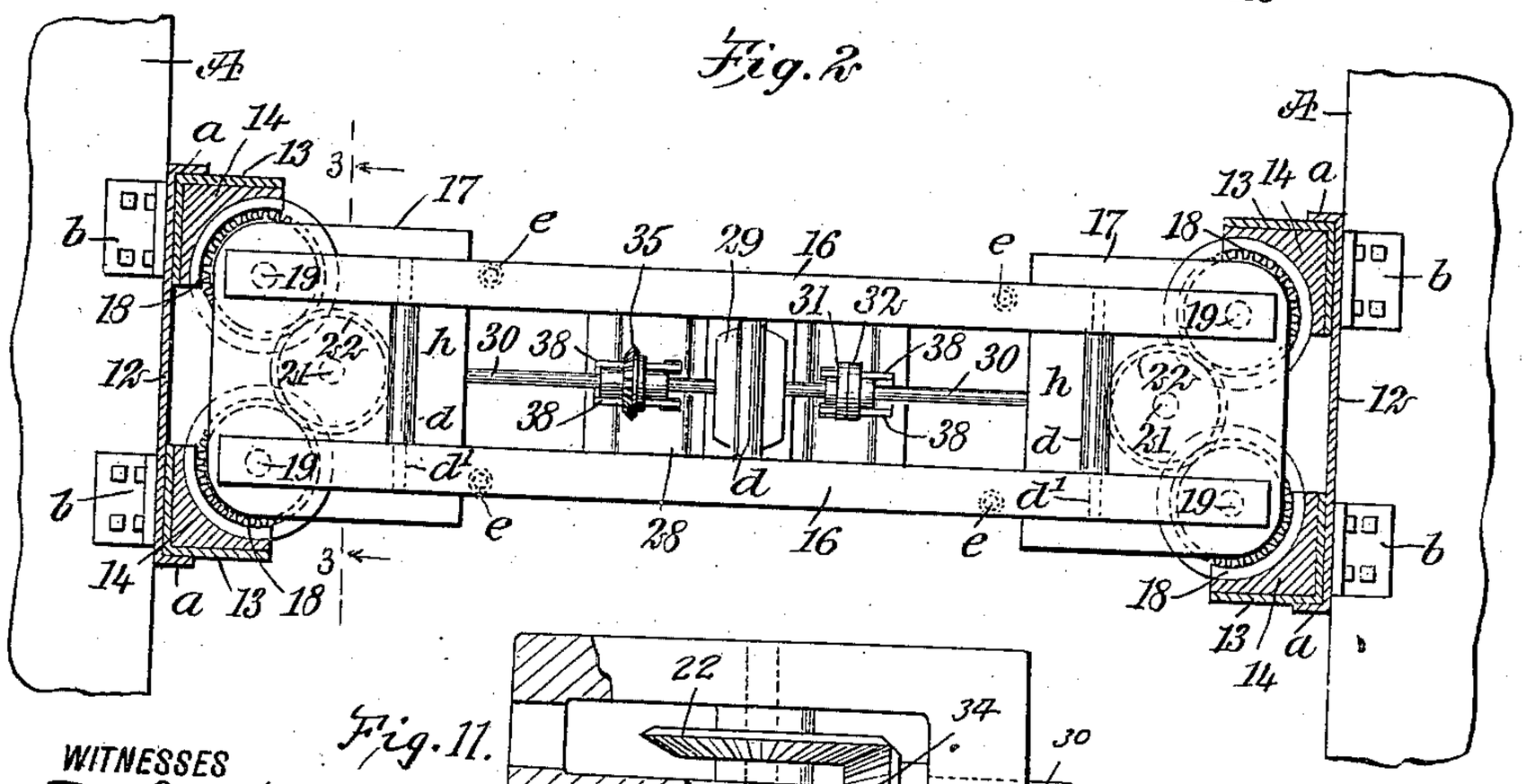
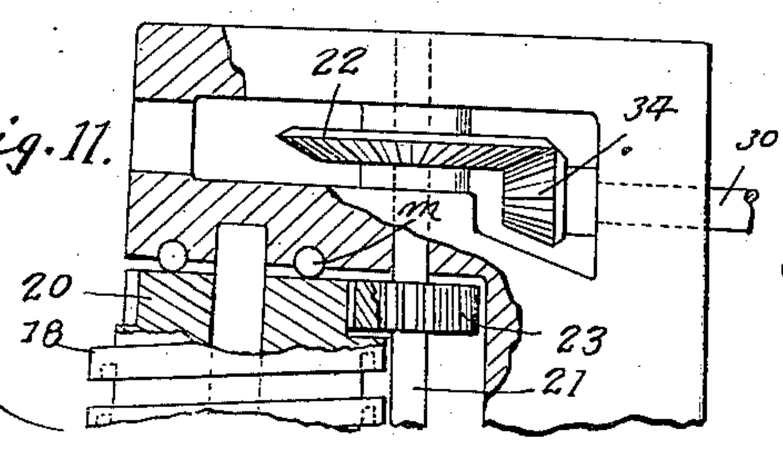


Fig. 11.



WITNESSES

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3 SHEETS—SHEET 2.

Fig. 3

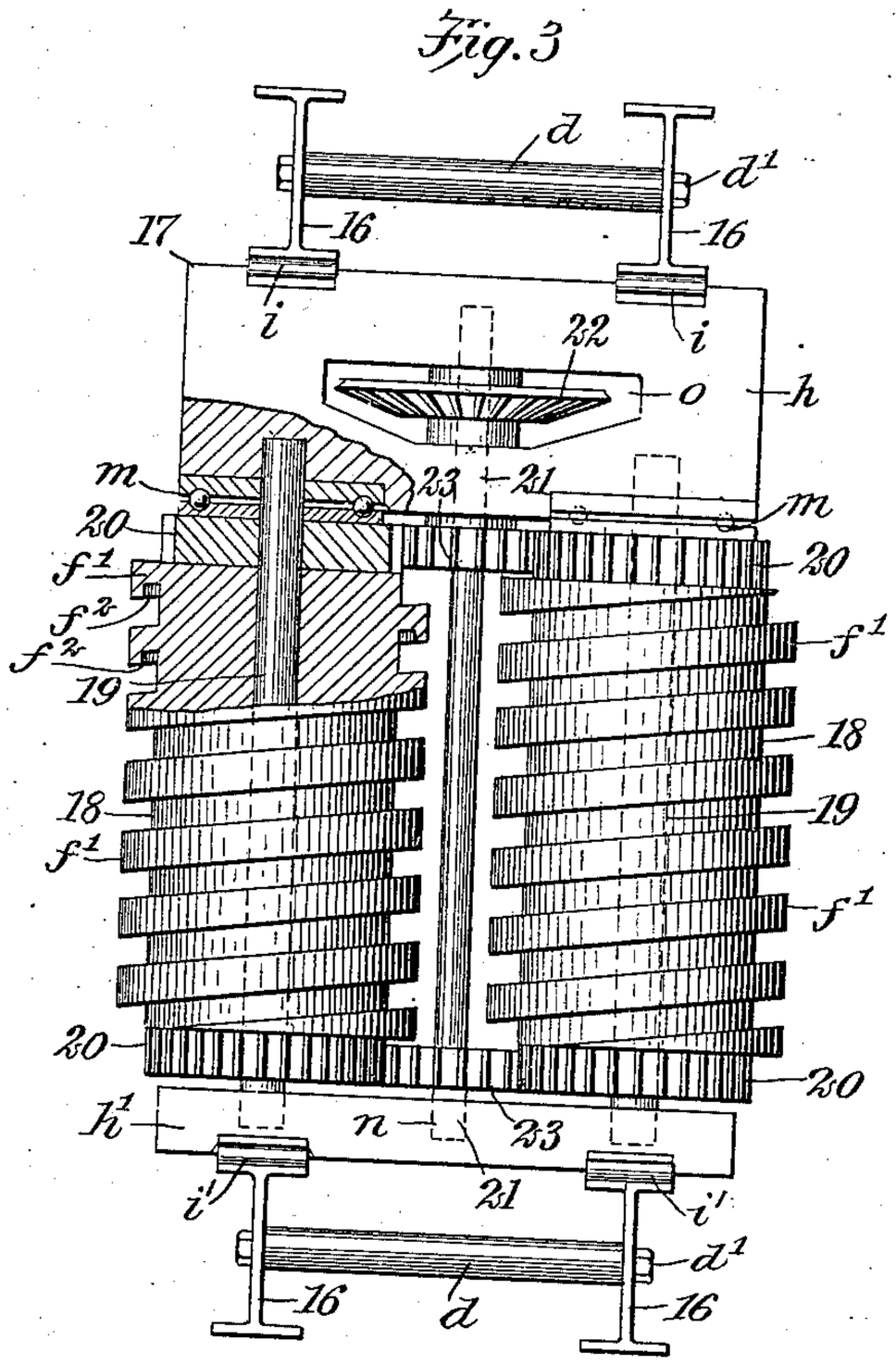


Fig. 4

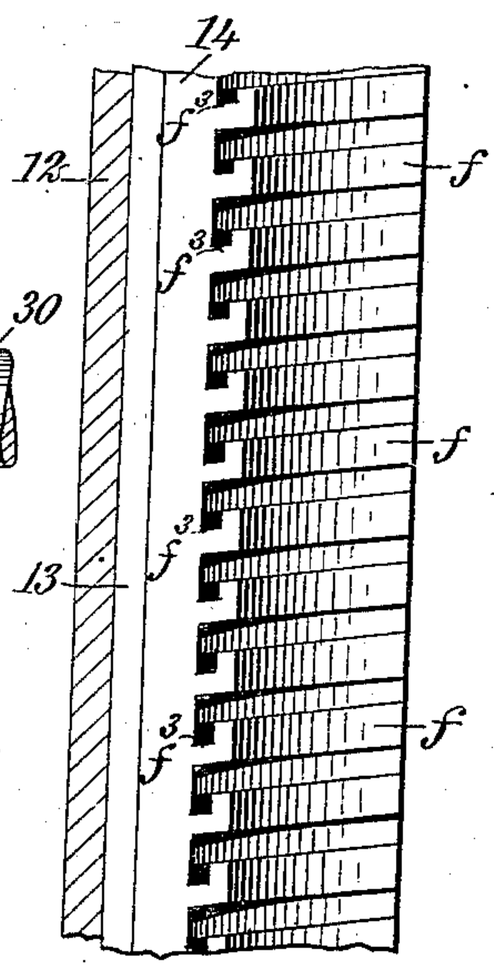


Fig. 5

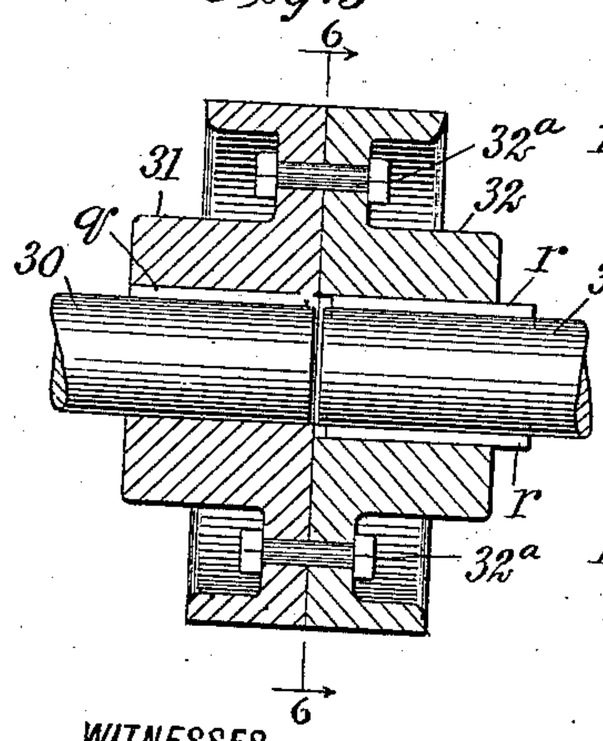
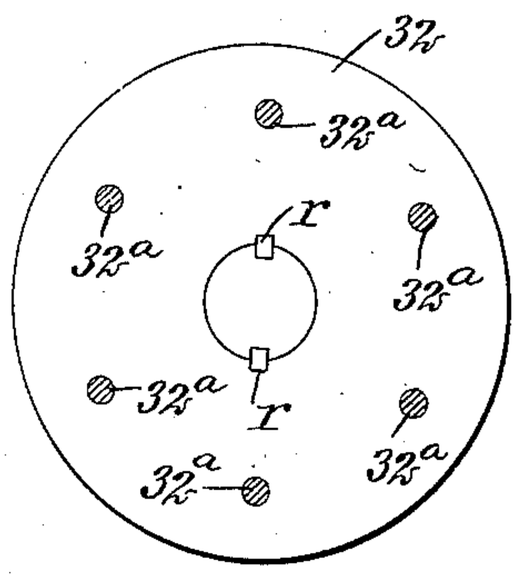


Fig. 6



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3 SHEETS—SHEET 3.

Fig. 7

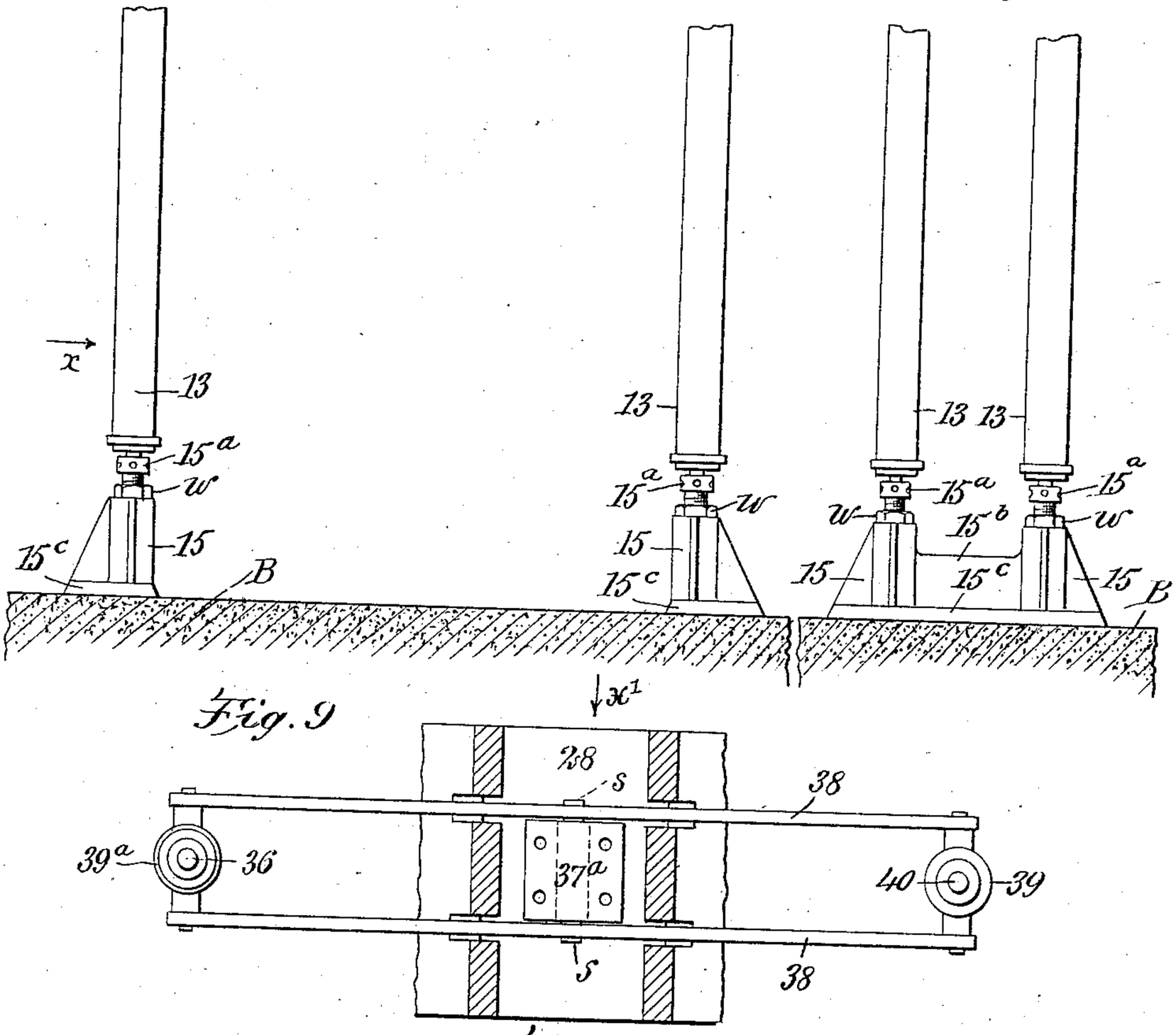
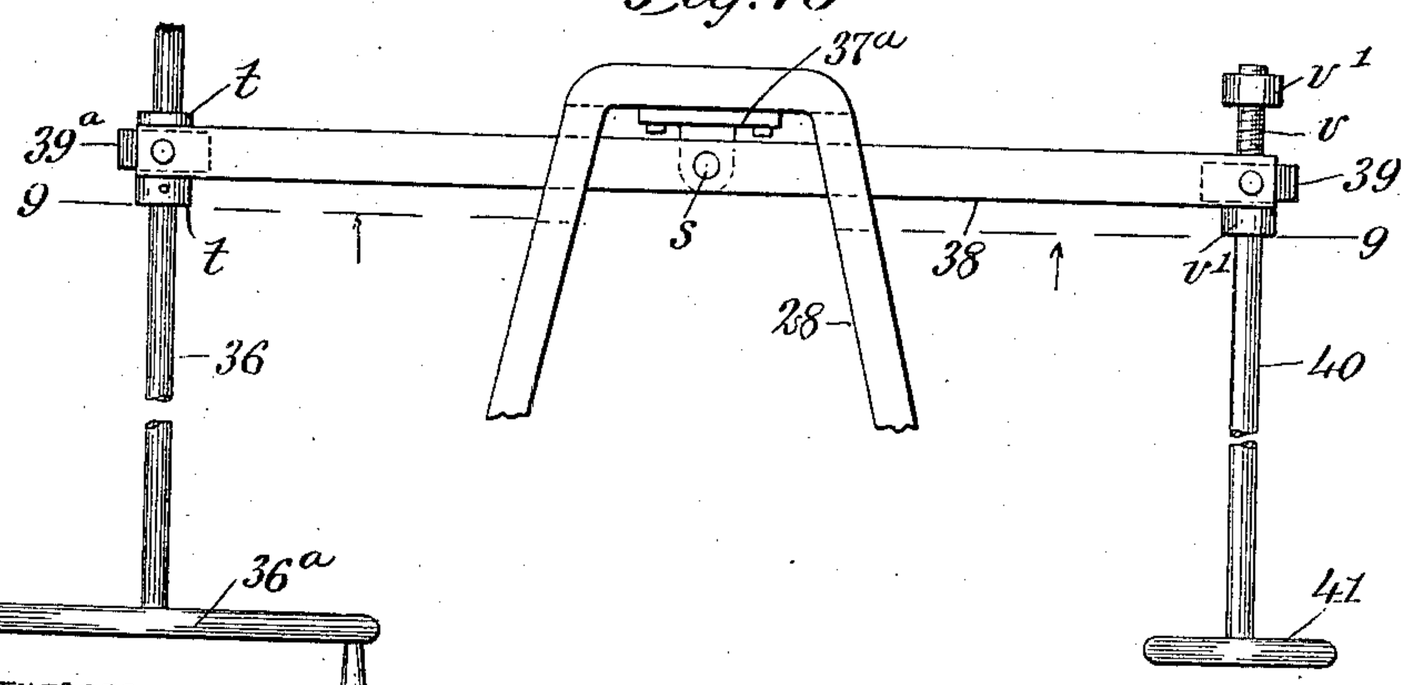


Fig. 8

Fig. 9

Fig. 10



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APPARATUS FOR OPERATING ELEVATORS.

966,231. Specification of Letters Patent. **Patented Aug. 2, 1910.**

Application filed April 14, 1909. Serial No. 489,772.

To all whom it may concern:

Be it known that I, CHARLES NEWSON, a citizen of the United States, and a resident of Salt Lake City, in the county of Salt Lake and State of Utah, have invented a new and Improved Apparatus for Operating Elevators, of which the following is a full, clear, and exact description.

This invention relates to electrically-operated elevators, and the purpose of the invention is to provide novel details of construction for a power-actuated apparatus, located in the hollow shaft for an elevator, which adapt a car connected therewith to traverse the hollow shaft in either direction with absolute safety, permit the car to be stopped at a desired point, positively hold the car stationary when purposely stopped, avoid shock or jar thereto while moving or stopping, and enable the operator in the car to perfectly control the speed of travel had by the car.

A further object is to so construct the improved apparatus that all working parts thereof are self-adjusting, so as to compensate for wear or disalinement due to settling of the foundation walls of the elevator shaft, and thus reduce friction to a minimum, so that applied power will give maximum service in the operation of the apparatus and a connected car.

The invention consists in the novel construction and combination of parts, as is hereinafter described and defined in the appended claims.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a broken side elevational view of a portion of an elevator shaft, the upper portion of an elevator car slidable in the shaft, and a side view of details of the improved apparatus connected with the car for its slidable movement; Fig. 2 is a plan view of details of the improved apparatus, partly in section, and held in operative position between the opposite walls of the elevator shaft shown partially; Fig. 3 is an enlarged partly sectional view of gearing of the apparatus, taken substantially on the transverse line 3—3 in Fig. 2 and seen in the direction of the arrows thereat; Fig. 4 is an enlarged fragmentary inner side view of a nut block that is a detail of the invention; Fig. 5 is an enlarged longitudinal sectional view of a shaft coupling employed for slidably connecting two portions of a motor-driven shaft; Fig. 6 is a transverse, partly sectional view of the shaft coupling, substantially on the line 6—6 in Fig. 5 seen in the direction of the arrows in said view; Fig. 7 is a side elevational view of two elongated nut blocks that are details of the invention, and of means for vertically adjusting said parts; Fig. 8 is an end view in elevation of two of the improved nut blocks, seen in the direction of the arrow *x* in Fig. 7; Fig. 9 is a partly sectional reversed plan view of novel details, substantially on the line 9—9 in Fig. 10; Fig. 10 is a broken side view of parts, seen in the direction of the arrow *x'* in Fig. 9, and Fig. 11 is an enlarged partly sectional side view of details that also appear in the upper portion of Fig. 1.

In Fig. 2 of the drawings, A, A, indicate two opposite vertical walls of a four-sided hollow shaft, wherein a car of any preferred construction is reciprocated. The bottom wall B of the shaft A, is preferably formed of concrete, so as to provide a solid base, and upon said bottom wall, two similar back plates 12, 12, are oppositely erected and secured on the walls A at their centers of width and are extended the full height thereof. The back plates have flanges *a* bent at a right angle outwardly from the respective walls A, and in each of the angular corners produced by the formation of the flanges on said back plates, an L-shaped beam 13, formed of heavy plate metal, is embedded and thus given an erect position. The two angular beams 13 in each back plate 12, respectively receive in their angular corners two elongated racks 14 of similar form, said racks that are right-angular on the sides that engage the beams 13, having an equal height therewith, and each beam 13, together with the rack that engages it, receives support at the lower end by a seated engagement with the upper end of a jack screw 15^a, which is adjustable in a respective base block 15 that is seated on the bottom wall B of the elevator shaft.

In some situations, the elevator shaft is simply a series of rectangular apertures formed by frames secured in the floors of a building, such as are indicated sectionally at C in Fig. 1. In this construction of the elevator shaft, the back plates 12, 12, are rigidly supported erect by the attach-

ment of knee brackets *b*, *b*, at each well hole in a floor C, upon the floor and back plates, as appears in Fig. 1.

It will be noted in Fig. 8 that the base blocks 15 for each pair of jacks, are connected by a web 15^b and bottom flange 15^c, thus affording a wide base for the connected blocks 15 and a stable foundation for the erected beams and nut blocks.

While the improvement is adapted for the reciprocation of a suitable car in an elevator shaft, either by engaging the upper end of said car, or by pushing it from below the same, the present arrangement of constructive details is for the suspension of a car from the operating apparatus, as shown in Fig. 1; and as partially represented in said view, the car body D of usual form, is provided with a rectangular frame, consisting of two spaced vertically-disposed slide bars E at each side of said body, which have a slidable engagement with the vertically-disposed pairs of stationary racks 14 that serve as guides for the car, these slide bars being spaced apart by transverse frame members F, one being shown in Fig. 1 that is disposed above and near the top wall of the car body.

A primary element of the improved car-moving apparatus, consists of a hanger frame that is positioned above and is connected with the transverse frame members F, as will hereinafter be described.

The hanger frame comprises two pairs of I-beams 16, the pairs of beams being spaced apart parallel with each other horizontally by transversely-disposed thimbles or tubes *d*, *d*, and bolts *d'* passed through the tubes and through opposite perforations in the webs of the I-beams; the thimbles or tubes having equal length. The duplicate pairs of I-beams 16 are held spaced apart one above the other in parallel planes by two pairs of thimbles *e*, *e*, that are introduced between the opposite pairs of lateral flanges *g* on the beams, said flanges being perforated for the reception of bolts *e'*, *e'* that are inserted through said perforations and through the intermediate thimbles *e*, *e*, so that upon mounting and properly adjusting nuts e^2 on the ends of the bolts, the two pairs of I-beams will be connected together in the form of a skeleton rectangular frame.

Between the upper and lower pairs of the I-beams 16, at each end thereof, a gear casing 17 is positioned, these similar casings each consisting of a top wall *h*, a bottom wall *h'* and similar side walls h^2 that engage the side edges of the top and bottom walls and space them apart in parallel planes. Between the top wall *h* of each casing 17, and the lower surfaces of the upper pair of spaced I-beams 16, similar rollers *i* are introduced and disposed transversely, as shown in Figs. 1 and 3, and between the lower wall *h'* of each casing and the upper surface of the lower pair of spaced I-beams 16, similar rollers *i'* are located, the service of which will be hereinafter explained.

The pairs of vertically-disposed triangular racks 14, that are positioned oppositely in the hollow, elevator shaft, have like concavities formed in their surfaces that are disposed opposite their angular corners, and in said concavities that each represent an arc of a circle in cross section, coarsely pitched threads are formed, thus producing spirally-trending teeth *f* on each rack body. It will be noted that the pair of concave-faced racks at one side of the elevator shaft, have the threads formed therein opposite in pitch from the threads in the pair of racks at the opposite side of the elevator shaft, as shown in Fig. 1 by dotted lines, the spiral teeth on the racks at the left side thereof being of right hand pitch, while the teeth on the racks at the right side are left hand pitch.

In each casing 17, two short cylindrical screws 18, having such diameter and pitch of threads as will adapt them to freely engage with the respective pairs of spiral toothed racks 14, are introduced and rotatably secured, each screw 18 being centrally mounted and secured upon a shaft 19, that projects at each end of a respective screw, and is rotatably seated in a socket in an adjacent top and bottom wall of a corresponding casing.

As shown in Figs. 3 and 4, the spiral threads f^1 on the screws 18 are recessed on their lower sides, as shown at f^2 in Fig. 3, and in the corresponding spiral teeth *f* on the racks 14, similar recesses f^3 are formed in their upper surfaces as shown in Fig. 4, the recesses in the screw threads and spiral teeth reducing the bearing surfaces thereon and lessening the friction therebetween, the recesses also affording receptacles for lubricant that will keep the wearing surfaces coated, so that the screws will turn in the racks with but a minimum of friction thereon. Further, the threads on the screws 18, being concentric with the concavity of a corresponding rack 14, it will be seen that the flanges on the threads and teeth of the screws and racks may be interlocked, and thus hold the said screws and racks from separation when so engaged. On the shafts 19, at each end that extends beyond the adjacent end of a screw 18, a spur gear 20 is mounted and affixed.

To reduce friction between the upper walls *h* of the casing 17 and the upper faces of the spur gears 20, a ball bearing device is introduced between each of said upper spur gears and the lower surface of the top wall of a respective casing, as appears at *m* in Figs. 1 and 3.

Centrally in each casing 17, in front of

a respective pair of screws 18, a countershaft 21 is journaled at the upper portion thereof in the upper wall *h* of a respective casing, the lower end of each countershaft seating and rotating in a socket, as indicated at *n* in Fig. 3 for one shaft. The upper portion of each countershaft 21 extends through an opening *o* formed transversely in a respective casing 17, and on said extended end a bevel gear 22 is mounted and secured. On the body of each countershaft 21, opposite the pairs of gears 20 at the upper and lower ends of the screws 18, two smaller gears 23 are firmly secured, that respectively mesh with the opposite spur gears 20, and it will be noted that the rotation of each countershaft will rotate the screws 18 thereat in the same direction, and a reversed rotatable movement of said shaft will reverse the direction of rotation given to said screws.

On each pair of the transverse frame members F that are connected to the car body D and disposed above it, two similar yokes 24 are centrally secured, and directly above said pair of yokes an I-beam 25 is seated transversely on the lower pair of I-beams 16. Two elongated rectangular links 26 are hung on the transverse I-beam 25, one near each end thereof.

Transversely in the pair of yokes 24, a bearing plate *p* is located, and upon said bearing plate the upper ends of two spaced spiral springs 27 are seated, the lower ends thereof engaging within the lower ends of the respective links 26.

It will be noted that the means for connecting the hanger frame with the car affords resilience therebetween, which will absorb all shocks or jars, if such should occur, that the car body may receive on its upward travel, which is improbable if the apparatus is in running condition.

Upon each I-beam 16 that comprises the lower section of the hanger frame, an end portion of a flat, arched bracket stand 28 is secured at an equal distance from the screws 18 in the casings 17, and upon the flat, upper side of the bracket stand, an electric motor 29 is mounted. The motor may be of any preferred type which will effectively operate the apparatus, and may be driven by electricity derived from any convenient source that is controlled by ordinary means located in the car body D. A driving shaft 30 extends laterally and horizontally through the center of the motor 29 and at a suitable point is bisected, preferably near the right side of the motor casing, said two-part shaft at its adjacent ends being coupled together in alinement by a coupling head shown best in Figs. 5 and 6. One section 31 of the coupling head, is rigidly keyed upon the end of the shaft 30, which is nearest to the motor, as shown at *q*, and the remaining section 32 thereof, which is loosely fitted upon the adjacent end of the two-part shaft, is thereon slidably mounted and adapted for rotating said portion of the shaft along with the other portion thereof, by connecting the coupling section 32 with the end portion of the shaft it is mounted upon by means of two oppositely-disposed feather keys *r*, as clearly shown in Figs. 5 and 6. The coupling head sections 31, 32, are secured together so that the sections of the shaft 30 are axially alined, by spacing bolts and nuts 32ª, as shown in Fig. 5.

The right hand end of the motor shaft 30, is provided with a bevel pinion 33 that is thereon secured in meshed engagement with the larger bevel gear 22, and as shown in Fig. 1, the portion of the motor shaft 30 which extends leftward, is furnished with a bevel pinion 34 similar to the pinion 33, and adapted for meshing with the bevel gear 22 that is at the left side of the apparatus.

On the motor shaft 30, at the left in Fig. 1, a bevel gear 35 is secured near the motor 29; and on the upper end of a vertically-supported shaft 36, a similar bevel gear 37 is secured that may be meshed with the bevel gear 35.

On the lower side of the top wall of the bracket stand 28, a fulcrum block 37ª is secured at the center thereof and from said block two trunnions *s* project oppositely. Two rocker bars 38 of similar form and size are centrally pivoted on the trunnions *s* and at the right hand end thereof, said bars are spaced apart by a nut block 39, which is pivoted between said ends of the rocker bars. At the left hand ends of the bars 38, a centrally-perforated spacing block 39ª is pivoted between them, said block serving as a guide for the upper portion of the shaft 36, and as indicated at the left in Fig. 10, two collars *t*, *t*, are secured on said shaft respectively above and below the spacing block 39ª. The shaft 36 passes through a collar *y* on a lower I-beam 16 and thence is extended down into the car D through its top wall, and on its lower end a hand wheel 36ª is secured for manually turning the motor shaft if occasion should require such an operation.

A shaft 40 is provided of sufficient length to extend from the upper portion of the car D up to engage with the nut block 39, said shaft passing through a bracket plate *u* that is affixed upon the lower side of an adjacent lower I-beam 16, the shaft having two collars *u'* thereon which loosely embrace the bracket plate and thus prevent longitudinal movement of the shaft. The shaft is provided with a hand wheel 41.

There is a thread *v* formed on the upper end portion of the shaft 40, which is screwed up through the nut block 39 and on this threaded portion above and below the nut

block, two collars v' are respectively mounted adjustably, their distance from the ends of said block defining the degree of rocking movement which may be given to the rocker bars 38.

It will be seen that a rotation of the motor shaft 30 in a proper direction will rotate the screws 18 and cause the car D to move up or down in accord with the direction of rotary motion communicated to the screws 18 from the motor through the gearing that connects the latter therewith. Furthermore, the manipulation of the hand wheel 36^a will enable the manual adjustment of the screws 18 to raise or lower the car.

The starting and stopping of the motor is controlled by the usual means, such as a switch in the car, and current transmitting wires that lead from a source of electricity to the motor, and as these adjuncts are in common use, they are omitted from the drawings.

The shaft 36 is normally lowered so as to detach the bevel pinion 37 from the mating bevel gear on the motor shaft 30, this being effected by communicating a rocking movement to the rocker bars 38, due to a rotation of the shaft 40 by the manipulation of the hand wheel 41 in a proper direction.

If at any time power should fail and the car be arrested between floors, the operator first turns the hand wheel 41, so as to draw the right hand ends of the rocker bars downward and cause an elevation of the shaft 36 and a meshed engagement of the bevel gear 37 with the mating bevel gear 35 on the motor shaft 30.

The hand wheel 36^a on the lower end of the shaft 36, is now manually turned so as to operate the screws 18 and thus effect an upward or downward movement of the car D to a point opposite an opening in the elevator shaft at a floor, for the debarking of persons from the car.

The features of advantageous construction had by the improved apparatus for the transfer of a car up or down in an elevator shaft will be manifested by a brief résumé of portions of the description.

It is of the first importance for the stability, durability and proper operation of an elevator, that all working parts be preserved from undue friction that may result from wear, or the settling of the foundation that supports the guideways for the apparatus. To this end the provision of the jacks whereon the racks 14 and angular beams 13 are seated is very advantageous, as by an adjustment of the screws 15^a in the blocks 15 and their locked retention as adjusted by the collar nuts w, shown in Figs. 7 and 8, will retain the racks erect, and in case the foundation whereon the jacks are seated should settle, any depression from a normal position incurred by the racks may be readily corrected by an obvious adjustment of the jack screws 15^a and the nuts w.

The provision of the rollers i, i' between the beams 16 and the casings 17, permits the latter and the screws, as well as the gearing mounted in the casings, to become self-adjusting and work without excessive friction; and to further provide for such reduction of friction the ball bearings m obviously are very advantageous.

To compensate for a slight divergence of the racks 14, from their perpendicular positions, the connection of the two-part shaft 30 is very effective, as it will permit the shaft to vary slightly in length and prevent cramping between the pinions 33, 34 and bevel gears 22, with which they are engaged.

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

1. In an elevator of the character described, two pairs of upright racks, and a jack screw for supporting each rack.

2. An elevator embodying two pairs of spaced racks vertically supported in an elevator shaft, and jack screws seated on the bottom of the shaft, the racks being seated on the jack screws.

3. An elevator, embodying a hollow shaft, two pairs of spaced racks vertically supported in said hollow shaft and disposed oppositely in pairs, the racks having concaved faces and spirally-trending teeth thereon, a hanger frame extended transversely in the hollow shaft, a gear casing at each end of the hanger frame, two screws journaled in each casing and meshed with the respective racks, and means for rotating the screws in either direction.

4. In an apparatus for operating elevators, the combination with a hanger frame formed of four spaced I-beams, of a gear casing at each end of said frame, and anti-friction rollers placed between the adjacent walls of the casings and the corresponding I-beams.

5. In an apparatus for operating elevators, the combination with a hanger frame formed of four spaced I-beams, of two gear casings one at each end of the hanger frame, screws in the casings, spur gears on the ends of the screws, a countershaft rotatable in each casing, spur gears on each countershaft meshed with the spur gears on adjacent screws, a bevel gear on the upper end of each countershaft, a motor carried by the hanger frame, a shaft extended each side of the motor and rotated thereby, and bevel pinions on the ends of said shaft that mesh with the bevel gears on the countershaft.

6. In an apparatus for operating elevators, the combination with a hollow elevator shaft, spirally-toothed racks vertically positioned

in pairs oppositely in the hollow shaft, a hanger frame, a motor thereon, and a motor shaft, of screws rotatably supported at the ends of the hanger frame and meshing with the racks, gearing connecting said screws with the motor shaft, a car hung from the hanger frame, a shaft rotatably held on the hanger frame, a hand wheel on the lower end of said shaft operable in the car, and bevel gears on the upper end of said shaft and on the motor shaft that are adapted for engagement with each other.

7. In an apparatus of the character described, the combination with racks having spirally-trending teeth thereon, said teeth each having a recess in the upper side, of mating screws having recesses in their screw threads formed in the lower sides thereof.

8. In an apparatus of the character described, the combination with a hollow elevator shaft, of back plates secured vertically on the opposite sides of said hollow shaft, and angular beams contacting with the back plates, of angular rack bodies seated against the angular beams, said racks having spirally-trending teeth, means for adjustably supporting the beams and racks, and rotatable screws adapted for engagement with the teeth of the racks.

9. In an apparatus of the character described, the combination with vertical racks having concaved faces, and spiral teeth thereon that are recessed in one side, of screws having their threads oppositely recessed and adapted for interlocked, but rotatable, engagement with the recessed teeth on the racks.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CHARLES NEWSON.

Witnesses:

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AVERY J. TIMMS.