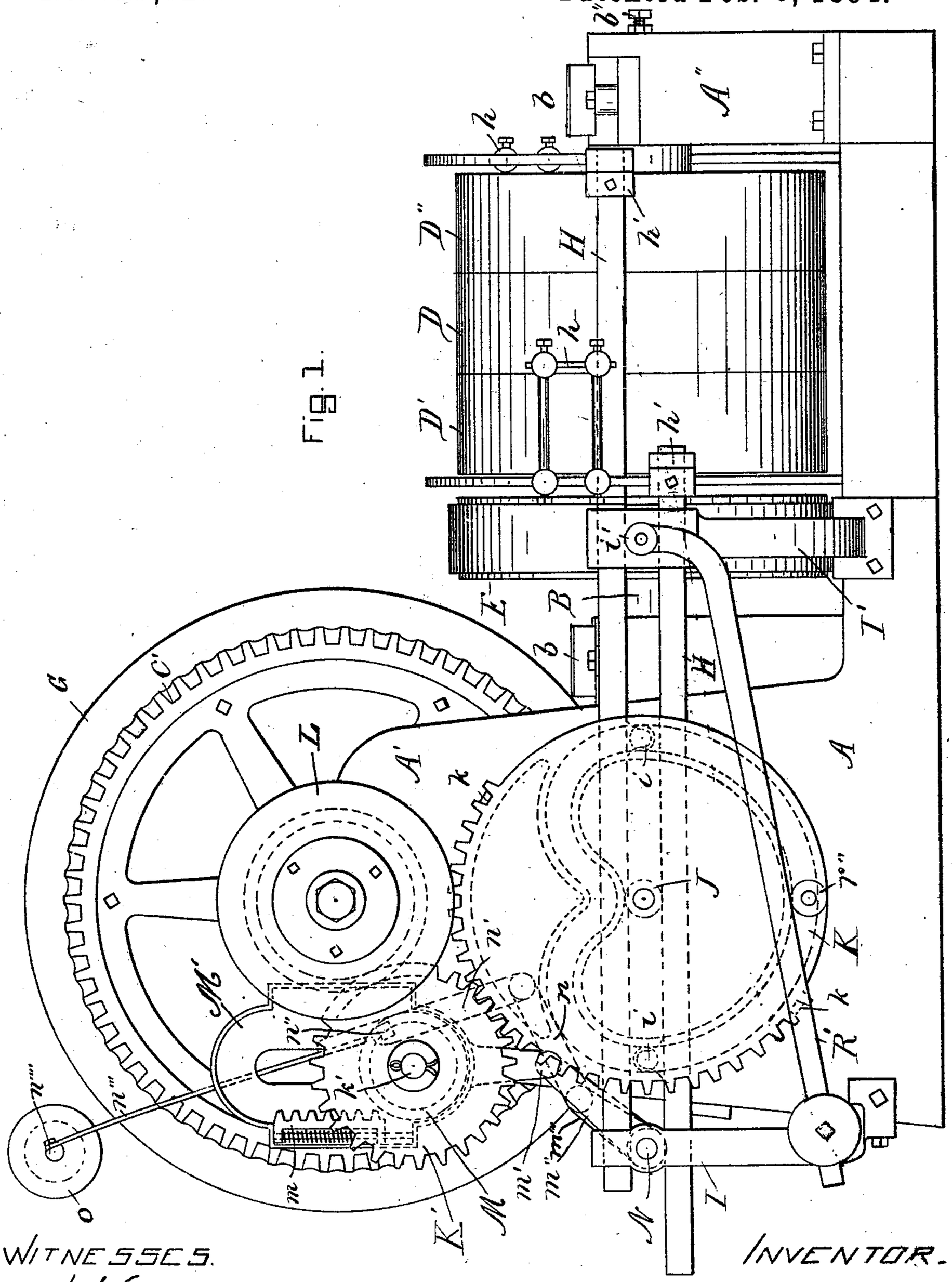
(No Model.) 6 Sheets—Sheet 1.

# J. NAYLOR, Jr.

## ELEVATOR.

No. 514,023. Patented Feb. 6, 1894.

Fig. 1.

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## ELEVATOR.

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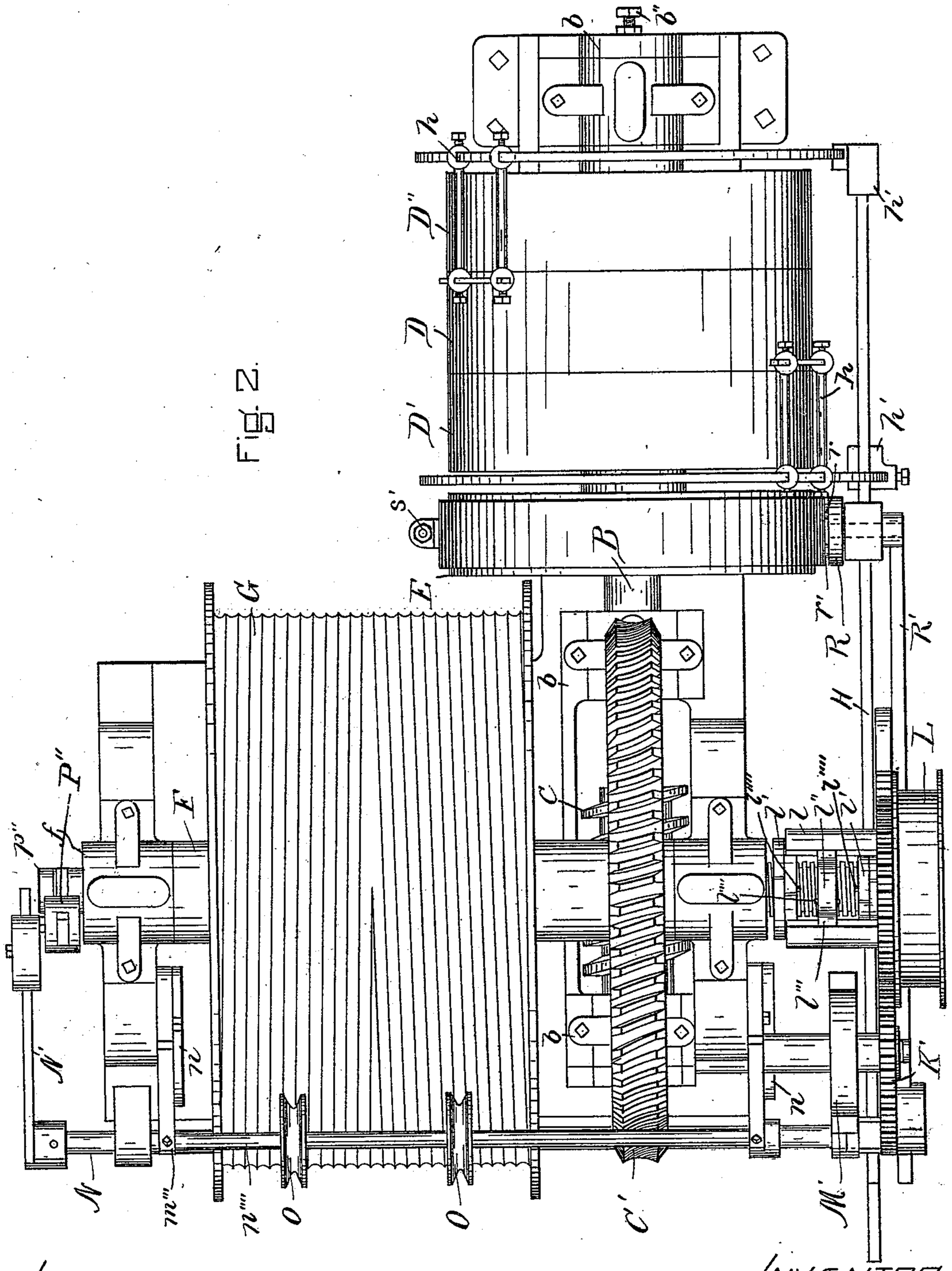
Fig. 2.

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## ELEVATOR.

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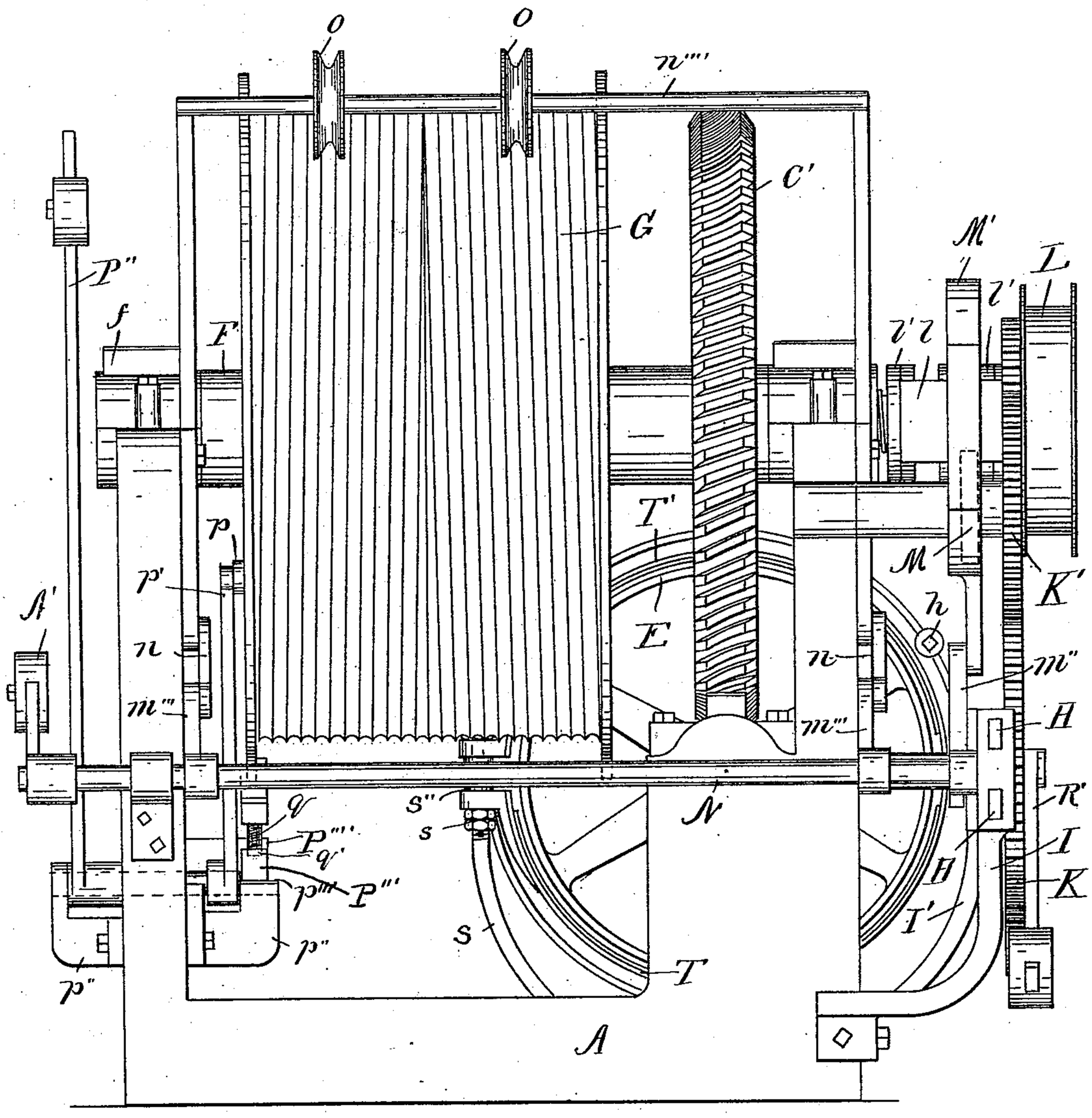


Fig. 3.

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## ELEVATOR.

No. 514,023. Patented Feb. 6, 1894.

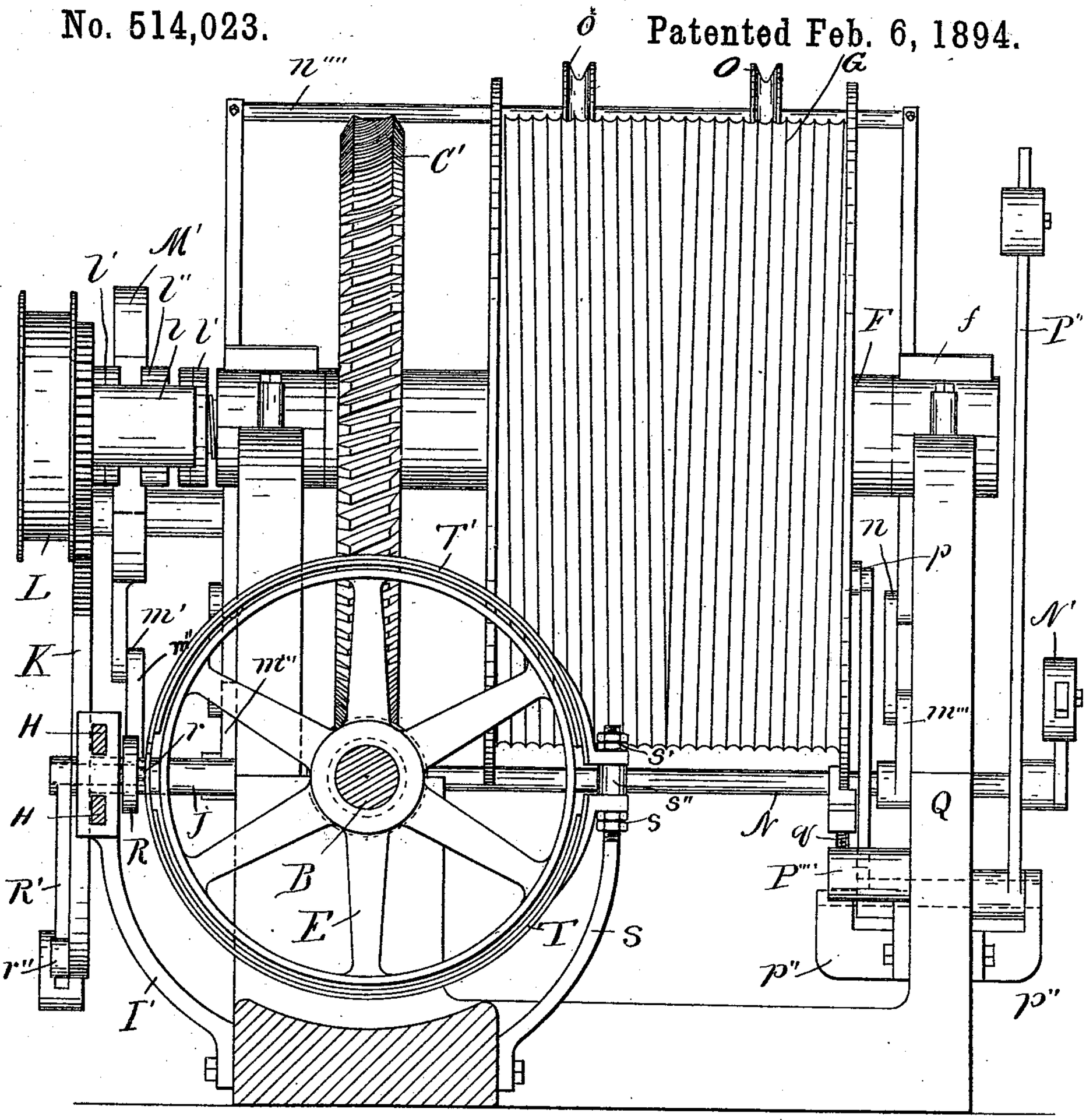


Fig. 4.

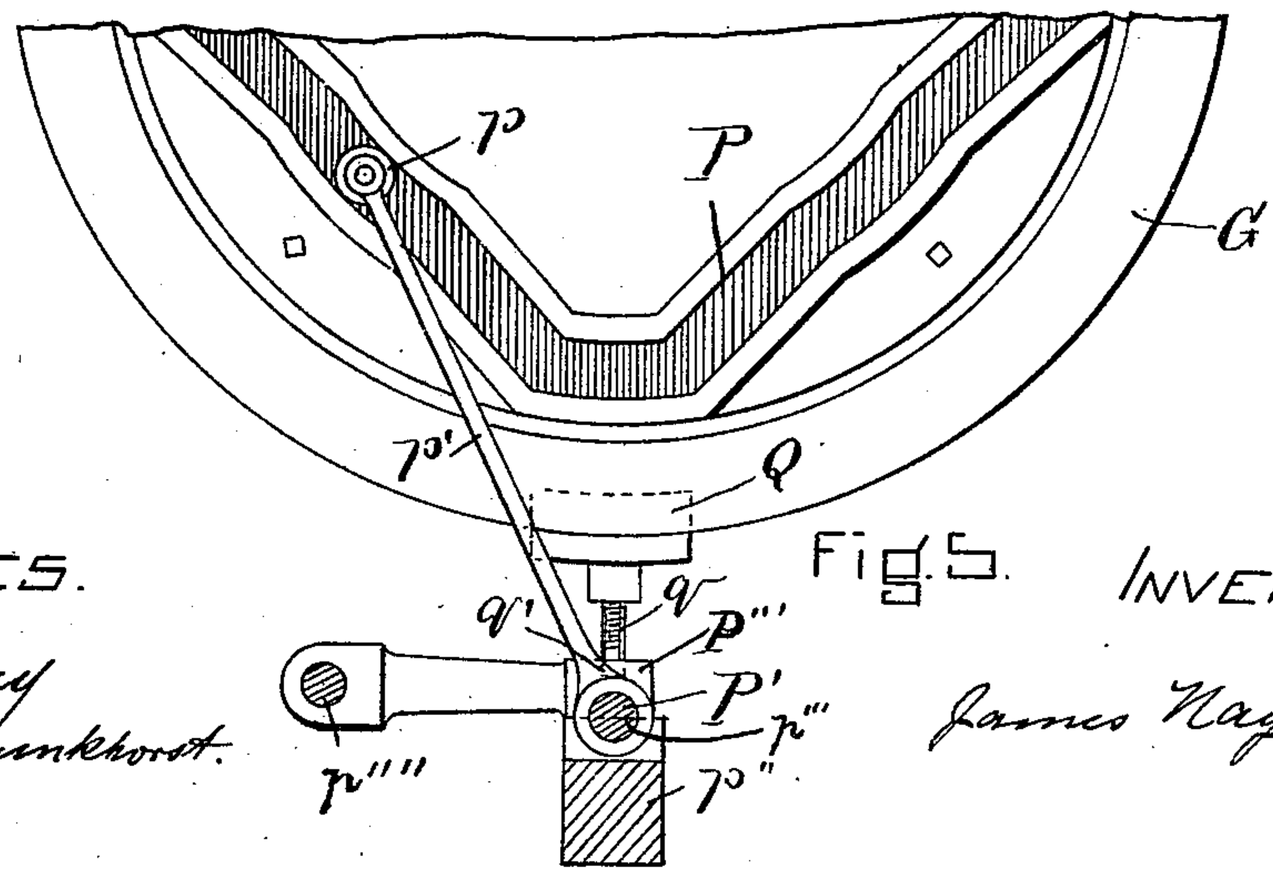


Fig. 5.

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## ELEVATOR.

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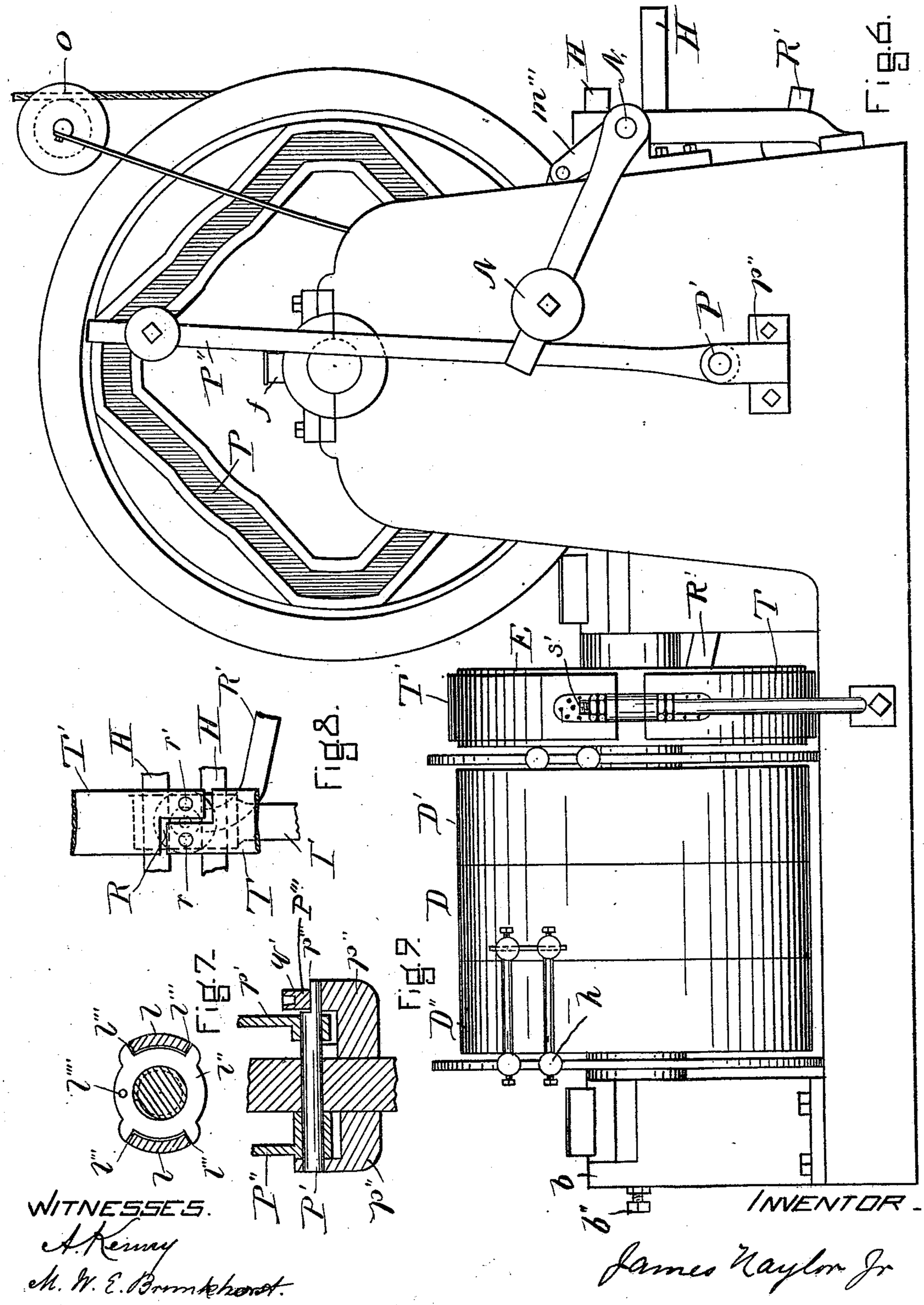


Fig. 6.

Fig. 8.

Fig. 7.

Fig. 9.

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(No Model.) 6 Sheets—Sheet 6.

# J. NAYLOR, Jr.

## ELEVATOR.

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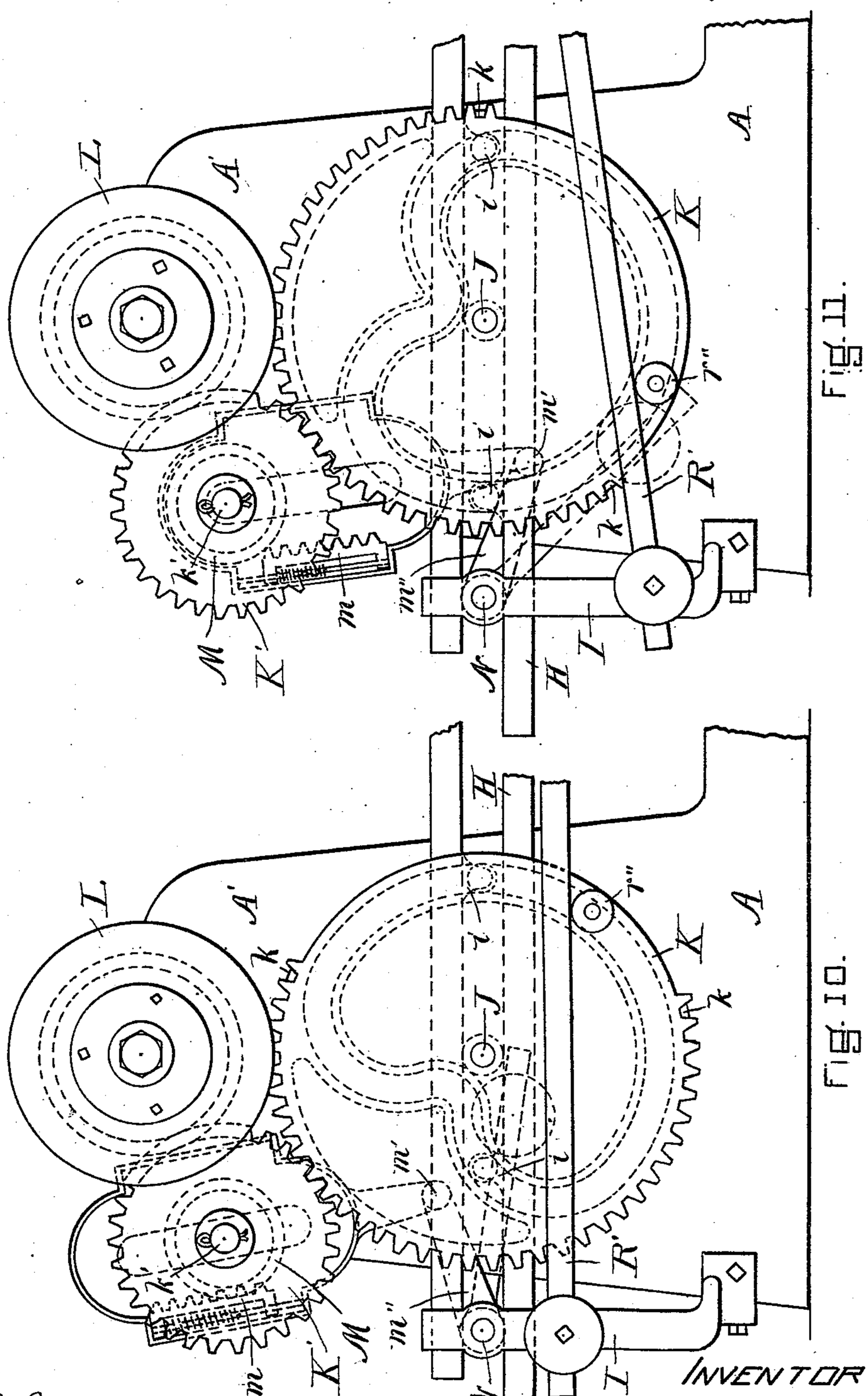


FIG. 10.




FIG. 11.

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# UNITED STATES PATENT OFFICE.

JAMES NAYLOR, JR., OF BOSTON, MASSACHUSETTS, ASSIGNOR TO GEORGE THOMAS McLAUTHLIN, OF SAME PLACE.

## ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 514,023, dated February 6, 1894.

Application filed December 16, 1892. Serial No. 455,345. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES NAYLOR, Jr., a citizen of the United States, and a resident of Boston, in the county of Suffolk and State of Massachusetts, have invented new and useful Improvements in Elevator-Machines, of which the following, taken in connection with the accompanying drawings, is a specification.

These improvements relate to that class of elevators in which the platform or car is suspended by a cable or wire rope in suitable guides and raised or lowered by the cable winding or unwinding upon a drum.

The object of such improvements is to make the operation of such machines and cars safer and more reliable than heretofore.

They consist of devices for extraordinary purposes, together with the general construction, all of which will be herein fully specified and set forth in the claims.

Figure 1 is a front elevation; Fig. 2, a plan view; Figs. 3 and 4, end elevations; Fig. 5, a detail of controller for speed; Fig. 6, a rear elevation; and Figs. 7, 8 and 9, detail views. Figs. 10 and 11 are views showing other positions of parts shown in Fig. 1.

A A′ A″ represent the frame of the machine. The part A′ is an extension of the main frame A, and may be bolted thereto or parted in the pattern so as to cast it solid at different heights in different machines to suit different diameters of the main gear. The part A″ is bolted to the main frame so as to be easily removed in re-placing the loose pulleys which are always the first to wear out.

B is the worm shaft having bearing boxes at *b b b*. Solid with the shaft is the worm C, and also upon this shaft is the drive pulley D, and on each side are the loose pulleys D′ and D″. A brake pulley E is also secured to the worm shaft. This arrangement of pulleys provides for the keeping in place of the loose pulleys D′ and D″. The worm shaft B has a suitable anti-friction step at both ends and a set screw *b″*, by which all end play and wear may be taken up. The worm C engages with the worm-wheel C′ upon the drum-shaft F, to which it is firmly secured; this worm-wheel may be a part of the drum G and not connected with the shaft except through or by the drum. The drum G receives the cable, and by winding or unwinding gives motion correspondingly to the car; it is secured to the drum shaft, which is held to the frame in its revolutions by the bearing caps *f f*. This construction constitutes the means whereby the car is raised or lowered by the belts, one of which runs in one direction and the other reverse. The belts are held free in yokes *h h;* these yokes are adjustable and may be set at any point around the pulleys to suit the direction of the belts. Secured to the shipper arms H H are the pieces *h′ h′* having extensions concentric to the pulleys and to these extensions the belt yokes *h h* are adjustably secured.

The shipper bars H H have an endwise and parallel motion and are supported and held in place by the brackets I and I′. The bars have projecting lugs *i i*, one turned up and the other down; into these lugs are fastened studs upon which are anti-friction rollers, moving in the same plane.

J is a bracket and stud secured to the frame, which holds freely in place the cam wheel K having a part of its circumference geared so that it may receive half a turn, and provided with stops *k k* which come in contact with the teeth of the gear K′ to prevent it receiving any more than this required motion. The shape of the cam may be described as being over half the circle concentric, the rest of the circle being equally divided into two regular approaches to the center, one from the right, the other from the left; or precisely as shown in the drawings. The anti-friction rollers of the shipper bars engage in the cam groove, so that motion is communicated from the cam wheel K to the shipper bars H H.

L is the shipper wheel, to which the shipper rope is fastened from the well way and car; this wheel has a free motion upon the drum shaft and is geared so that one turn is the full scope of its motion and it is connected to the cam wheel K by the intermediate gear K′, mounted upon and loosely turning upon the stud *k′*. This whole arrangement provides for the manipulation from the car to raise, lower or stop it at will.

An improved device to automatically stop the motion of the car at the top or bottom of the well way, independent of the ordinary

shipper rope stops, is arranged as follows:—Extending inwardly from the geared shipper wheel L are two wings *l l* and inside of these wings are fitted the double set nuts *l' l'* and traveling nut *l''*; the set nuts are turned to freely enter the wings, but the traveling nut is only given an endwise motion, it being in continual engagement with the wings, as shown by the shoulders *l'''*. Upon the drum shaft F within the wings *l l* is cut a screw thread, and corresponding screw threads are cut in the set nuts and traveling nut. When the set nuts are set at any point on the screw threads, they are to all intent a part of the drum shaft and have its motion. The traveling nut is always loose and is held from turning by the wings *l l* and therefore the motion of the drum shaft will travel the nut *l'''* in either direction toward the set nuts. Into the faces of the traveling nut and set nuts are inserted steel pins *l''''*; these pins come in contact when the traveling nut approaches the set nuts and thereby the motion of the drum shaft is communicated to the shipper wheel gear L through the intermediate gear K' to the cam wheel K, which moves the shipper bars and belts.

A new arrangement for automatically stopping the machine in event of obstruction in the well way and to prevent the unwinding of the rope and winding in the wrong direction is made as follows:—Secured to the intermediate gear K' is the gear M; this gear performs no function in the ordinary running of the machine. It is incased within the sliding frame M' and to said frame the spring-supported rack *m* has a vertical sliding motion to engage and disengage said gear M. The frame M' has a sliding motion up and down when in gear, and is held in place by the stud upon which the gear M turns, and has a connection at *m'* to the end of an arm *m''* secured to the rock-shaft N, which is held to the frame by bearing boxes. The sliding motion of the frame M carries the rack *m* with it, the latter having another sliding motion independent of the former. A weight and lever N' is secured to the shaft N and so set that it acts from horizontal to vertical, or nearly so. Also secured to the shaft N are the arms *m'''* and to the ends of these arms are pivoted the connecting links *n n*, to the lower ends of the levers *n' n'* pivoted to the stationary frame at *n'' n''*; these levers have the springs *n''' n'''* secured thereto, which extend upwardly sufficiently to reach the cable above the drum and to the ends of these springs is fastened a shaft *n''''* extending across the face of the drum, and upon which are the sheaves O O, which bear upon the cables and travel along the shaft as the cables revolve them. When the cables are tight and all in running order, the weight lever N' is set horizontal so as to be continually exerting its full influence on the rock-shaft N. The arms *m''' m'''* and connecting links *n n* are set so as to make a knuckle joint, as shown at Fig. 1. The arm *m''* and frame M' carrying the spring supported sliding rack *m*, are set at their uppermost position, so that the rack *m* is clear of the gear M and when all is thus secured to the rock-shaft N, it will be apparent that the weighted lever N' is pressing the sheaves O O to the cables, and that the presence and pressure of the cables is holding the rack *m* from engagement with the gear M. Another new feature is to prevent any acceleration of speed of car which may be occasioned by breakage of belt while car is running down, or by an excessive load overcoming the adhesion of belts and slipping or throwing them off, or from the general wear out or too free motion carelessly given the parts of the machine.

A cam P is bolted to the drum and within its groove is the roller *p* free to turn upon the end of the spring lever *p'*, which is secured to the rock-shaft P' supported by the bearings *p'' p''* and carrying an inverted pendulum P'' on the outside of the frame. Over the inside bearing the rock-shaft P' has half its diameter cut away so that when the inverted pendulum is perpendicular this surface at *p'''* is horizontal; upon this flat surface rests the arm P''' with a like flat surface coming in close contact, and this arm is pivoted to the frame at *p''''*. Q is a brake-shoe applied to the rim of the drum and has a square headed set-screw *q* tapped into it, the head of which sets into the square recess *q'* of the arm P''', and makes the brake-shoe adjustable to the arm. It acts as a lock by the square recess and also by the brake-shoe being held by the rim from turning. The adjustment is made by removing the parts P''', *q*, and Q from the machine together or as a whole and afterward so replacing them. The motion of the drum gives the vibrations to the spring lever, which normally communicates them without springing to the inverted pendulum. Should the speed of the drum increase, the vibrations increase, and this by the stiffness of the spring lever gives an excess of momentum to the inverted pendulum which exerts at the end of every vibration a leverage upon the rim of the drum shaft through the parts shown and which instantly checks any acceleration at the start and therefore acts as a preventative.

Another improvement is the double brake applied to the worm shaft and which serves an extraordinary use over the single one now used.

The bracket I' bolted rigid to the frame has a bearing *i'* for the piece R, and with this piece are two lugs *r r'* at equal distances from its axis and opposite to each other. The lug *r* enters a hole in the lower brake strap T, and the lug *r'* is so connected to the upper strap T' that the weighted lever R' is exerting its force to pull down the strap T' and pull up the other. The weighted lever R' is secured to the piece R with said lever resting upon a stud *r''* fastened to the outside of the cam wheel, so that motion of same raises and

lowers the lever R′ and gives a motion to the piece R to rock in the bearing *i* and to the lugs *r r′*, one to move up and the other down. Secured to the frame opposite the bracket I′ is the adjusting and supporting post S, its upper end being screw threaded, and provided with jam nuts *s* and *s′*.

T T′ are brake straps nearly semi-circular, one end of each of which loops on to one of the lugs and the other over and on to the post. A rubber or other spring *s‴* between the ends of the straps on the post serves to hold the straps hard against the jam nuts *s* and *s′*. The automatic action of the machine opens and closes these brake straps T T′ upon the outer surface of the brake pulley E secured to the worm shaft; there being a leather facing upon the inside of the straps. The pull or strain of the brake comes on the post S. In one direction of the motion one of the straps is doing the most holding, in an opposite direction this order is reversed. This is an essential improvement, in that ofttimes it is important that a sufficient brake be applied to the car in its ascent, and especially so if the car be overbalanced, which may be done in certain cases to advantage. Its especial value consists in that it is always right and uniform in its action and is therefore correct for both right and left hand machines.

The operation of the whole machine may be stated as follows:—The running direction of belts is through the yokes *h h* to the pulleys; so that D″ is driven right-hand, or with the sun, and D′ in an opposite direction. The worm C being right-hand lead engages the gear and turns the drum to pull down on the cable when the belt is shifted from pulley D″ on to pulley D. The belts running in opposite directions are running on the loose pulleys and through the belt yokes, and the car is stationary and suspended in the well way. The brake straps T T′ are drawn snug around the brake pulley E. A pull down on the shipper rope causes half a turn of the shipper wheel and gear, which through the intermediate gear gives a quarter turn to the cam wheel. This motion causes the groove of the cam wheel to affect the shipper bars by the anti-friction rollers which run in the grooves and are secured to the bars. One of the bars remains stationary for the reason that its roller is running in the concentric part of the cam, while the other is running in the part approaching the center, and therefore the bar moves, carrying the belt yoke with it and the belt is pulled on to the tight pulley. At the same time the stud *r″* on the outer surface of the cam wheel K raises the weighted lever, which releases the grip of the double brake straps T T′, and the car ascends. A reversion of this movement on the shipper rope and the car stops with the double brake snug to the brake pulley and the shipper rope again at its original position or at the middle of its scope of travel. A further lift of the shipper rope causes a reverse action of the shipper bars, but a like action to release the brake, and consequently the belt running in a reverse direction is brought on to the tight pulley, which causes the car to descend. A reversion of this last movement and the car is again stopped. The double brake takes a like effect in both directions as already described. Without any manipulation on the shipper rope on its ascent or descent, the car will stop wherever the adjusted set nuts *l′ l′* determine, and the same will take place should the shipper rope break. In the descent of the car, it may unexpectedly come in contact with an obstruction; when such occurs the ropes become slack, the weighted lever forces the sheaves O O against the slack of the ropes, and engaging the rack into the gear M, it gives it half a turn which gives a movement to bring the belt from the tight to the loose pulley, and the machine stops unknown to the car attendant, who has no other way out but to ascend, and in pulling the shipper rope the gear M moving with the other parts depresses the spring-supported rack on contact of each tooth and the car ascends; a reversion of this movement stops the car, and in so doing engages the spring-supported rack, which raises the frame and weighted lever and all other parts dependent on the rock-shaft N′ to their original position, and these parts are thus held by the tension of the cables, and the devices are re-set ready to again re-act in event the obstruction is not removed.

While the speed of the machine is normal the brake-shoe Q is adjusted so that at the end of its upward movement it just clears contact with the rim of the drum. At normal speed the spring lever is sufficiently stiff as not to yield in its vibrations to the momentum of the weighted lever. On the least increase of speed a quicker vibration is given the levers which by the peculiar shape of the cam gives time at the end of every vibration for the excessive momentum to exert its multiplied force to the brake shoe Q and upon the rim of the drum, and which instantly checks any acceleration by the friction of one against the other.

Having thus described my improvements, what I desire to secure by Letters Patent is—

1. In an elevator machine as described, the combination with a brake pulley of the duplicate brake straps T and T′ the connecting piece R provided with the lugs *r r′*, and mounted in the bearing *i′* the weighted lever R′ stud *r″* and means to adjust said brake straps as shown.

2. The combination with the gear M of the sliding frame M′ provided with the rack *m*, the counter weighted rock shaft N operatively connected with the sliding frame, and having the arms *m‴* and operating mechanism therefrom to the sheaves O O which bear upon the cables as shown and described.

3. The combination with a shaft of the sheaves O O loose thereon, spring arms supporting said shaft, rock shaft N, connections

between said rock shaft and spring arms, the gear M, belt yokes *h h*, connections between said yokes and gear M, the sliding frame M′, a rack carried by said frame meshing with gear M, connections between the frame M′ and the rock shaft N and the weighted lever N′ on said shaft N, substantially as described.

4. The combination, with the shipper wheel L, of the gear M, gearing connecting said shipper wheel and gear M, the sliding frame M′ carrying a spring supported rack *m* adapted to engage and rotate said gear M, the rock shaft N, connections between the frame M′ and the rock shaft N, means whereby the rock shaft is rotated by the slacking of the cable, and means whereby the driving belt is shifted by the rotation of gear M substantially as described.

5. The combination in a speed controlling device with the drum cam P spring-lever *p′* engaging said cam, the inverted pendulum, the rock shaft having a flat surface *p″*, connecting mechanism therefrom to the brake shoe, of said brake shoe, to bear upon the drum as shown and described.

6. The combination with the brake shoe Q, its adjusting screw *q*, the pivoted arm P‴ having its free end engaging a flat surface of the rock shaft, of said rock shaft having the inverted pendulum secured thereto as shown, and for the purpose set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 4th day of November, A. D. 1892.

JAMES NAYLOR, JR.

Witnesses:
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FRANK C. PIKE.