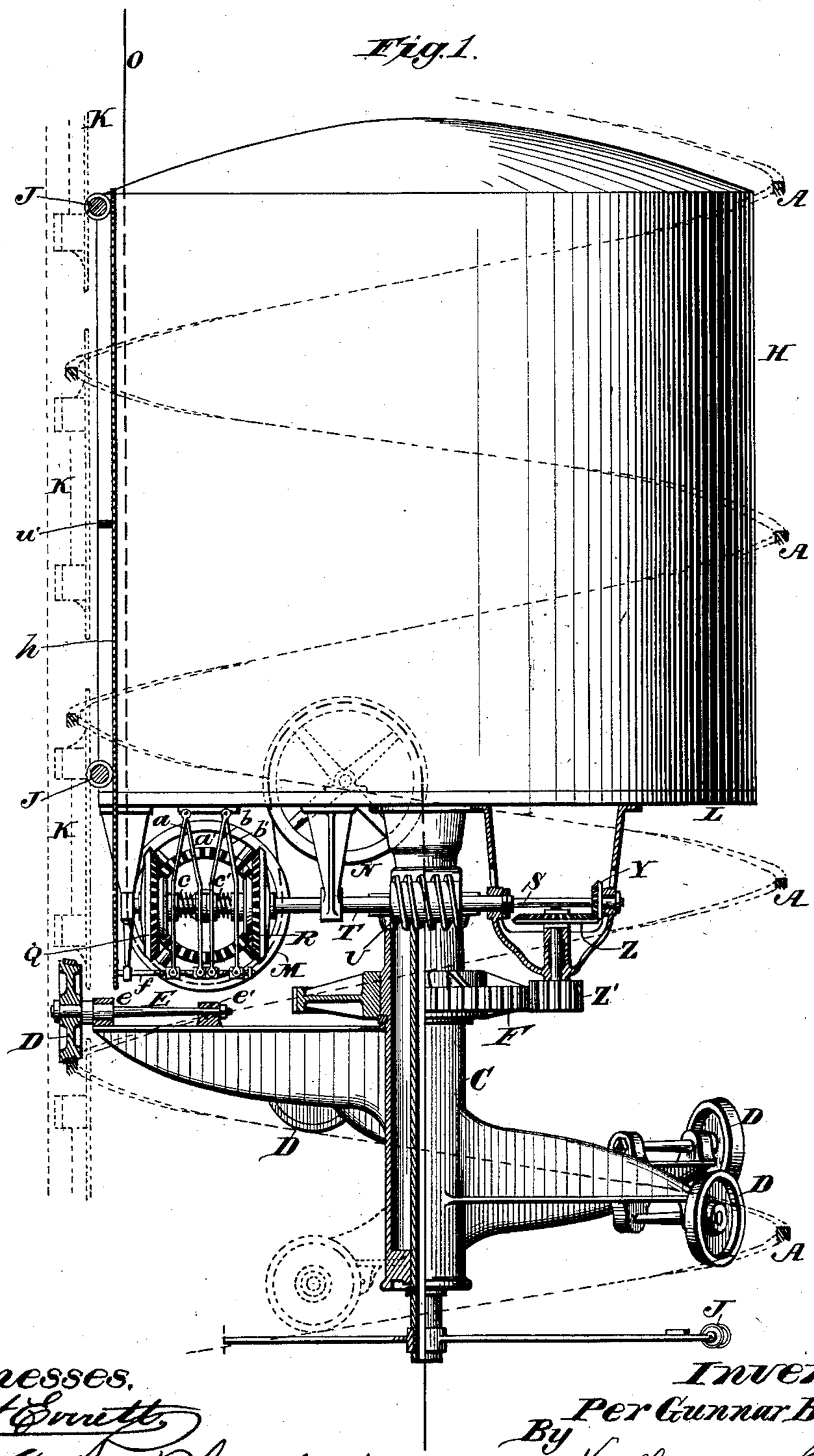
(No Model.) 4 Sheets—Sheet 1.

P. G. BACKMAN.

HOISTING APPARATUS.

No. 374,442. Patented Dec. 6, 1887.

Fig. 1.



Witnesses.
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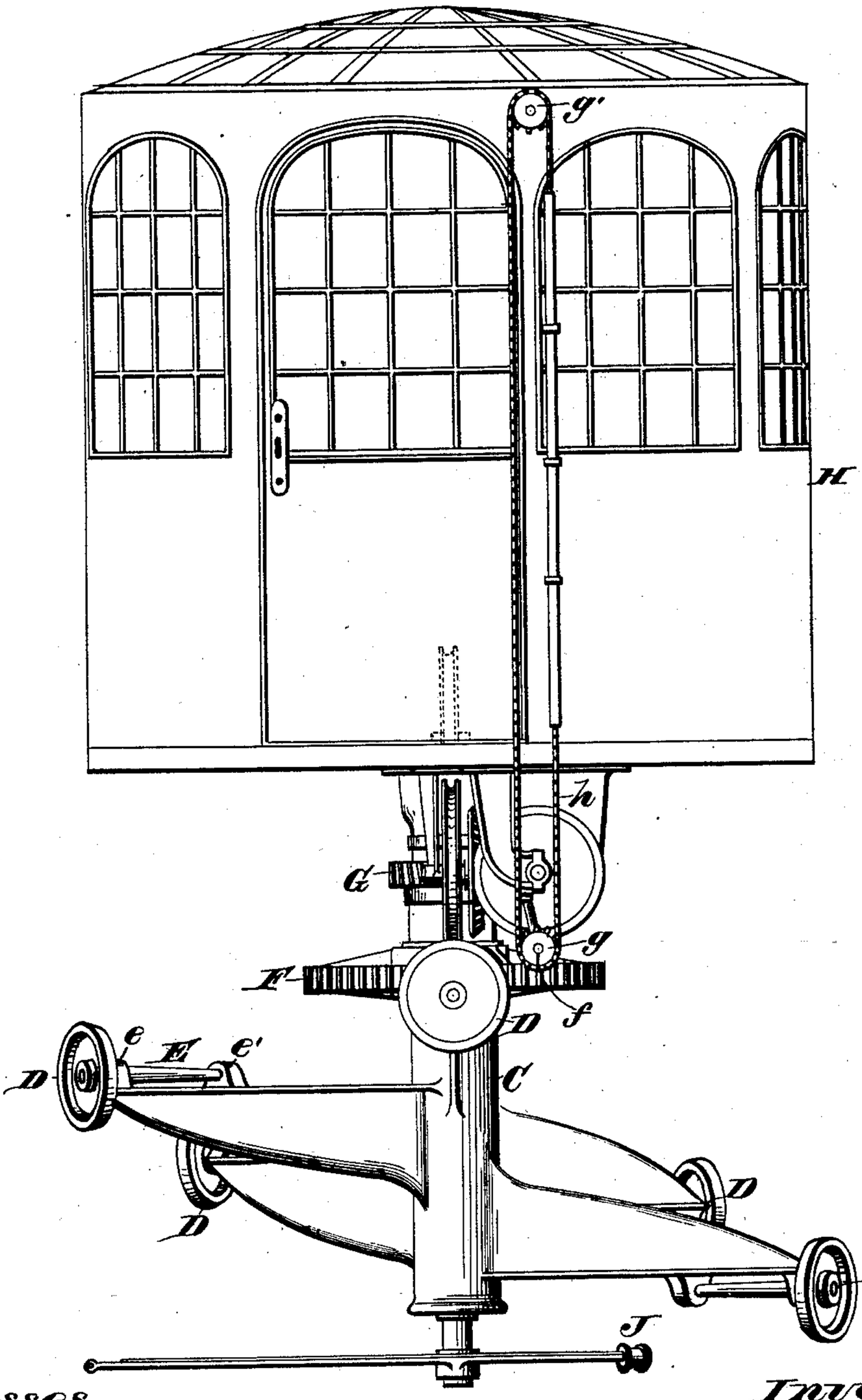
Fig. 2.



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P. G. BACKMAN.

HOISTING APPARATUS.

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Fig. 3.

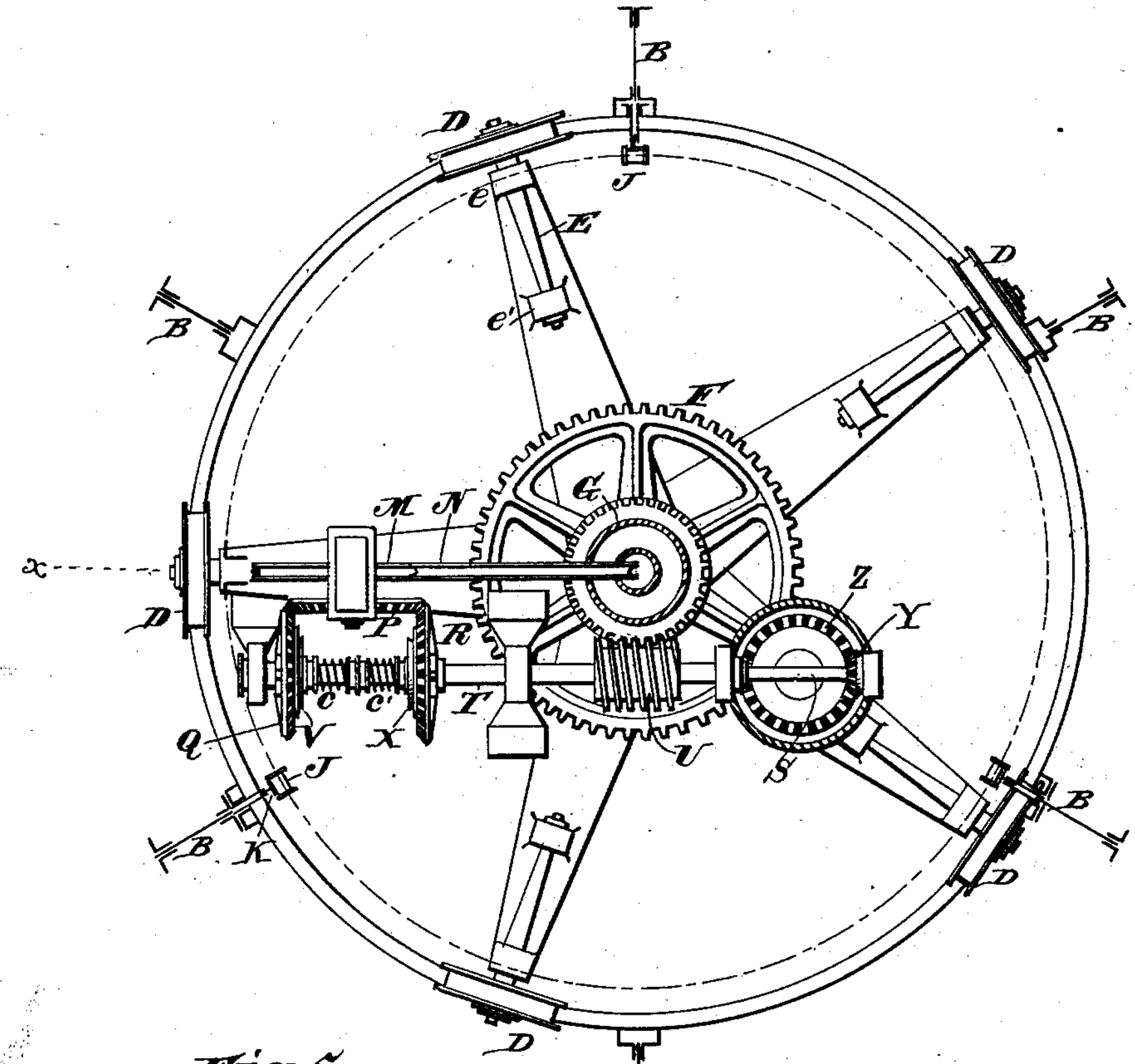


Fig. 5.

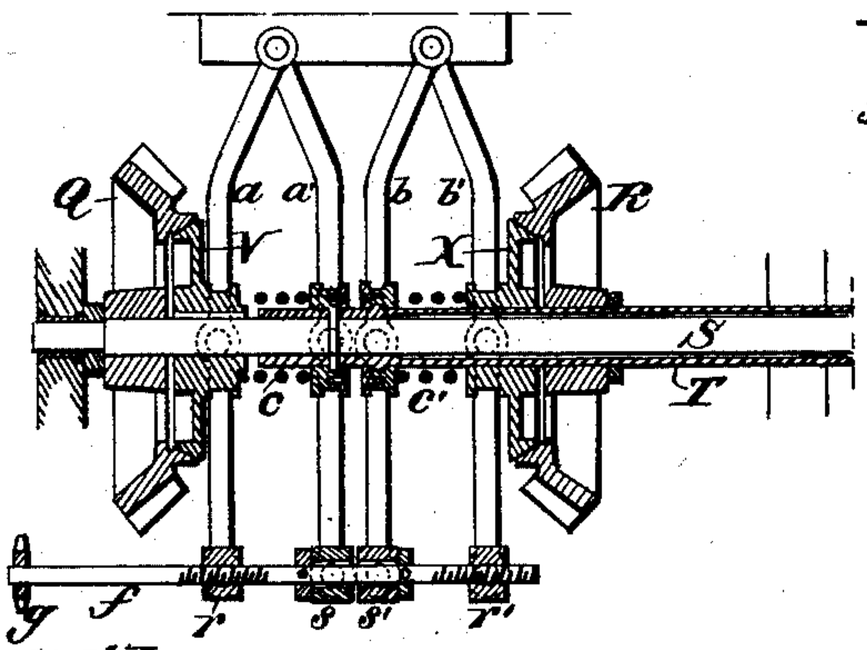
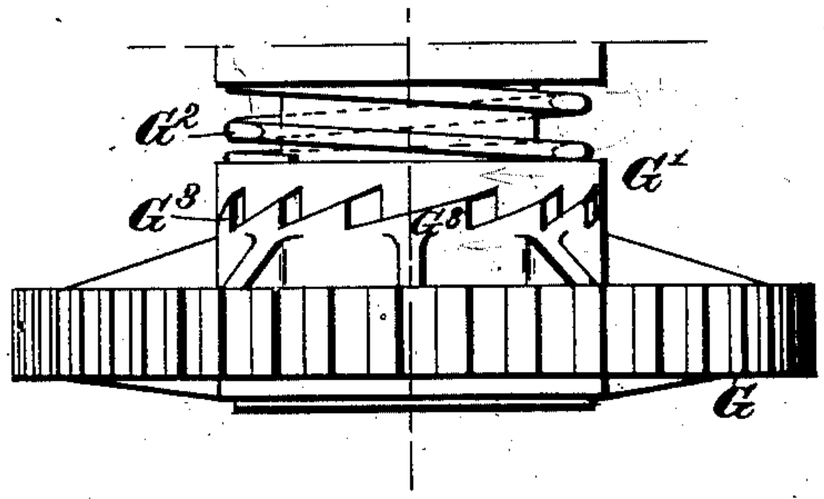


Fig. 6.



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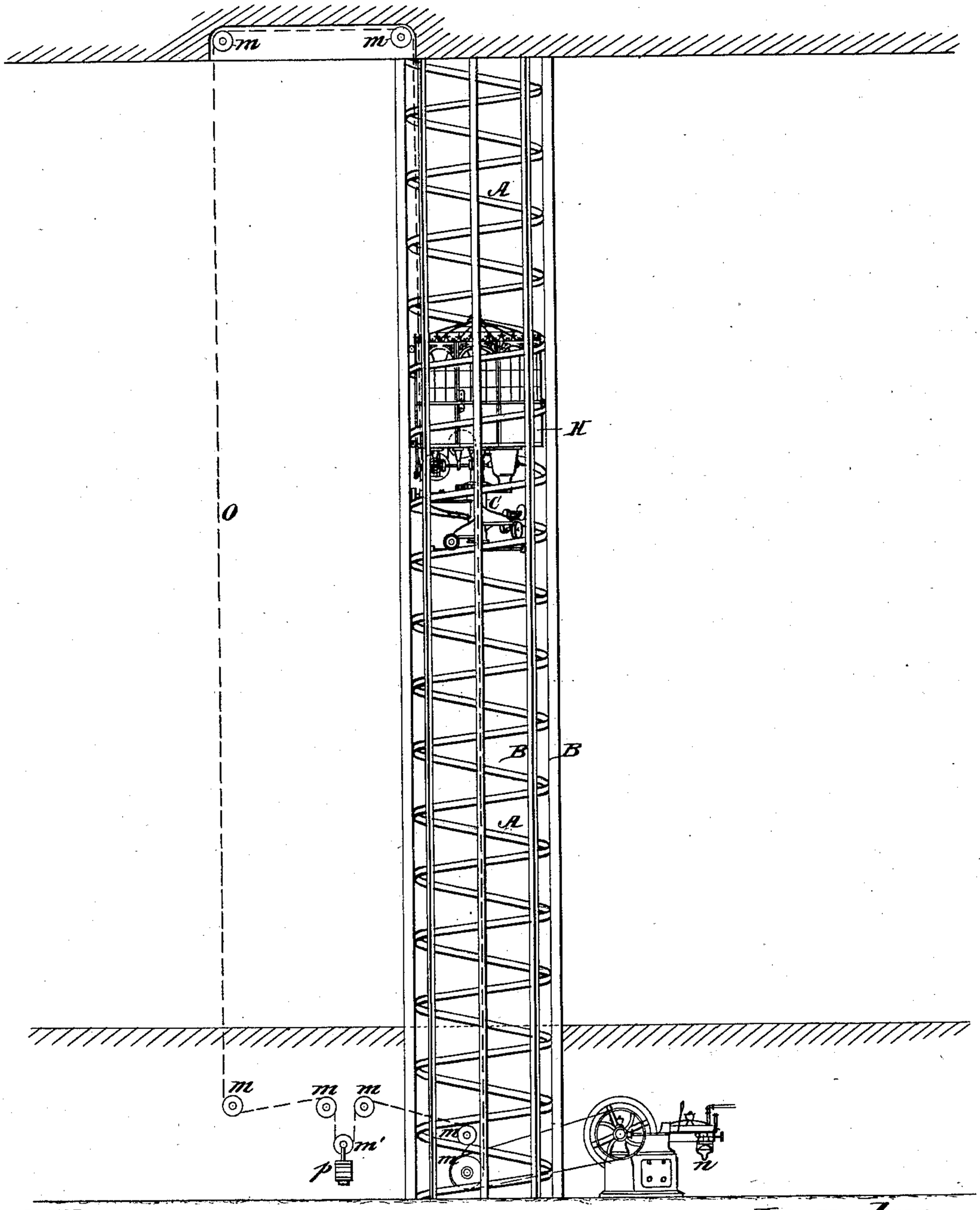
(No Model.) 4 Sheets—Sheet 4.

P. G. BACKMAN.

HOISTING APPARATUS.

No. 374,442. Patented Dec. 6, 1887.

Fig. 4.



Witnesses.
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UNITED STATES PATENT OFFICE.

PER GUNNAR BACKMAN, OF PARIS, FRANCE.

HOISTING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 374,442, dated December 6, 1887.

Application filed October 14, 1886. Serial No. 216,260. (No model.) Patented in France April 16, 1886, No. 175,537.

To all whom it may concern:

Be it known that I, PER GUNNAR BACKMAN, a subject of the King of Sweden, and a resident of Paris, France, have invented certain Improvements in Lifts, (for which I have obtained a Patent in France, No. 175,537, dated April 16, 1886,) of which the following is a specification.

My invention relates to a new or improved construction of hoisting or elevating apparatus based upon the forced ascending movement of a nut around its screw when such nut is turned round and the screw kept stationary.

In order that the various details of this improved construction may be more clearly understood, I shall now refer to the accompanying drawings, in which—

Figure 1 is an exterior view of the apparatus, partly in section, on the line *x x*, Fig. 3. Fig. 2 is a front view. Fig. 3 is a plan view. Fig. 4 is a full view of the apparatus in elevation. Fig. 5 is an enlarged view of the hand or self-acting gearing for effecting the ascent or descent, or for stopping the apparatus; and Fig. 6 is a view, also enlarged, of the spiral wheel acting as self-acting stop to prevent the descent when the apparatus is left to itself.

In all these figures similar letters refer to corresponding parts.

A is a spiral or screw-form rail fixed upon standards B. The rail is continuous. The spiral rails and standards together form the well of the lift.

C is a truck-frame which, by means of friction-rollers D, arranged in spiral form, travels on the spiral track. These rollers revolve on shafts E, fixed to the truck-frame by means of brackets *e e'*. The core of the truck is hollow.

F is a cog-wheel keyed on the core of the truck.

G is a spiral wheel fixed by means of a special contrivance upon the core of the truck. This contrivance is such as to allow the spiral wheel to turn loosely on the core in one direction, but unites wheel and truck when turned in the opposite direction. This contrivance may be described as follows: The spiral wheel G is loose upon the core of the truck and its teeth G^3 are beveled, as shown, Fig. 6.

G' is a collar or muff, also with beveled teeth. It is keyed upon the core of the truck, but is movable along the axis.

G^2 is a spring pressing the collar or muff against the spiral wheel. The teeth G^3 allow the wheel G to turn loose upon the core of the truck in one direction, (that of the ascent,) but uniting wheel and truck in case of motion in the opposite direction.

H is the cage or car for receiving persons or goods, as the case may be. It is fitted with slides or rollers J, which slide or travel on guideways K, parallel with the axis of the screw and fixed to the standards. The guideways are inside the track, and are interrupted so as to leave room for the friction-rollers of the truck to pass.

L is the floor or bottom of the car. This floor or bottom is taken away in Fig. 3, and the car is shown in dotted lines. On this bottom are fixed the main driving-pulley M and the counter-pulley N.

O is an endless rope, one part of which passes inside the well and the other outside. This rope passes over the pulley M and is directed by the pulley N into the axis of the well.

m are counter-pulleys.

m' is a movable pulley.

p is a balance-weight suspended to the movable pulley.

n is any suitable motor.

P is a beveled pinion keyed on the shaft of the main driving-pulley M.

S is a solid shaft fixed by means of bearings to the bottom of the car.

Q is a beveled pinion loose on the solid shaft S and gearing with the pinion P.

R is a beveled pinion loose on the hollow shaft T and also gearing with the pinion P.

U is an endless screw keyed on the hollow shaft T and gearing with the spiral wheel G.

V and X are friction-cones keyed on the solid shaft and the hollow shaft, respectively, but movable along such shafts.

Y is a beveled pinion fixed on the solid shaft S and gearing with the pinion Z, which is keyed on the same shaft as the pinion Z',

which gears with the wheel F, keyed on the truck-frame.

a and *a'*, Fig. 5, are the two arms of a fork fixed below the car upon one axis, about which they are movable.

b and *b'* are the two arms of another jointed fork.

The arms *a* and *b'* are jointed at their extremities with nuts, while *a'* and *b* are fitted with sleeves. The friction-cone V has a groove in which the arm *a* fits. The arm *a'* fits in the groove of a collar keyed on the solid shaft. The two arms of the second fork fit similarly in the grooves of the cone X and of another collar also keyed on the shaft.

c and *c'* are spiral springs surrounding the shaft S and placed between the arms of the two forks.

f is a rod running through the nuts and sleeves of both forks. This rod is screwed where it runs through the nuts.

g is a pinion keyed on the end of the rod *f* and made to gear with an endless chain. *g'*, Fig. 2, is another similar pinion fast on the top of the car H.

h is an endless chain running through the two pinions *g* and *g'*. *u'* is a pin projecting from such endless chain.

Having now described the various parts of my apparatus, I shall proceed to explain the manner in which the same is to be performed.

Motion is imparted to the machinery by the endless rope O, which is driven continuously in the same direction. The requisite tension of the rope is maintained by the movable pulley *m'*, furnished with a balance-weight, *p*, or in any other suitable manner. This rope is driven by the motor *n*. It transmits its motion to the pulley M, and, passing over the intermediate pulley, N, comes back to the machine. The motion of the pulley M is transmitted by means of the pinion P to the pinions Q and R. As long as these two pinions remain loose on their shafts the motion of the rope will not affect the apparatus; but on gearing the friction-cone V with the pinion Q the latter is made fast to the solid shaft S. The motion of this shaft will then, by means of the pinions Y, Z, and Z', be transmitted to the truck. If the friction-cone X is geared with the pinion R, the hollow shaft T will be set in motion. The endless screw keyed on this shaft and gearing with the spiral wheel will cause the truck to rotate, but in the opposite direction to that just described.

When the truck is set in rotation, it will ascend or descend the spiral track, according to the direction of its rotation. The car will take part in the ascent or descent of the truck-frame without taking part in the rotation of the latter, inasmuch as it slides along the guideways K, which prevent its turning round.

The gearing of the friction-cones is effected by the action of the springs *c* and *c'*, held in place by the two forks, the arms *a a'* and *b b'* of which are governed by the screwed rod *f*. These forks allow, first, of the compression of both springs at the same time, and this puts them out of gear with the two friction-cones, thus bringing the apparatus to a stop, and, second, of the compression of one of the springs and of the expansion of the other, the latter moving one of the cones, and thus causing the ascent or the descent.

The rod *f*, which governs the forks, is worked by the endless chain *h*, motion being imparted to the latter either by hand (when it is required to stop at any point of the ascent or descent) or by a self-acting contrivance. The automatic or self-acting stoppage is effected by the meeting of the projecting pin *u'*, fixed upon the endless chain, and the stops or projections fixed at the various places where the car is to stop. These stops or projections are not coincident in the horizontal plane. It is only necessary to place the projecting pin in position to stop at the desired point. This pin may be so placed at starting or during the ascent or descent.

Instead of the stops or projections above described, platforms at the highest and lowest points, to assure the stoppage at the extreme limits of the journey, may be used in order to stop the apparatus in whatever position the projecting pin *u'* may be placed.

The spiral track may obviously be inclined at any angle within certain limits. As a rule, an angle of from ten to twenty degrees will be found most suitable.

The apparatus left to itself would naturally tend to descend the spiral track with an accelerating speed; but in order to avoid such a contingency I have introduced the endless screw U, the inclination of whose thread is calculated to prevent the spiral wheel from turning the screw, which would allow the apparatus to descend. The screw acts, therefore, as a permanent brake, obliging the apparatus to remain in *statu quo* when the motion is stopped from any accidental or voluntary cause. This screw might have been made to govern the ascent, but it would have caused considerable friction. I have consequently effected the ascending motion from another source and made the spiral wheel loose in the direction of the ascent.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. The combination of a well consisting of the standards or frame, a continuous spiral track, and interrupted guides or ways, with a truck-frame having rollers traveling on the spiral track, and a car guided vertically in said standards and supported in such manner upon the truck-frame that it shall partake in its ascending movement without partaking in its rotation.

2. The combination, with the pinions Q R, shafts S T, and friction-cones V X between the pinions, of the two jointed forks engaging the cones, a spring located between the arms of each fork, the screw-rod *f*, for operating

the forks and compressing the springs, and the endless cable *h*, for turning the screw-rod, substantially as described.

3. The combination, with the pinions Q R, driving-wheel M, and rotating horizontal shafts S T, of the friction-cones V X between the pinions and engaging the cones, the two pairs of jointed forks, a spring between the arms of each fork, a screw-rod, *f*, for operating the forks and compressing the springs, and means, substantially as described, for rotating the screw-rod.

4. The combination, with the truck-frame and its core, of the spiral wheel G on the core, free to rotate in the ascent of the truck-frame, but held from rotation in the descent of the truck-frame, and a horizontal shaft carrying an endless screw, U, engaging the spiral wheel and serving as a permanent brake, substantially as described.

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

PER GUNNAR BACKMAN.

Witnesses:
W. BONNEVILLE,
G. LOMBARD.