(No Model.) 3 Sheets—Sheet 1.

A. C. ELLITHORPE.

SAFETY DEVICE FOR ELEVATORS.

No. 376,374. Patented Jan. 10, 1888.

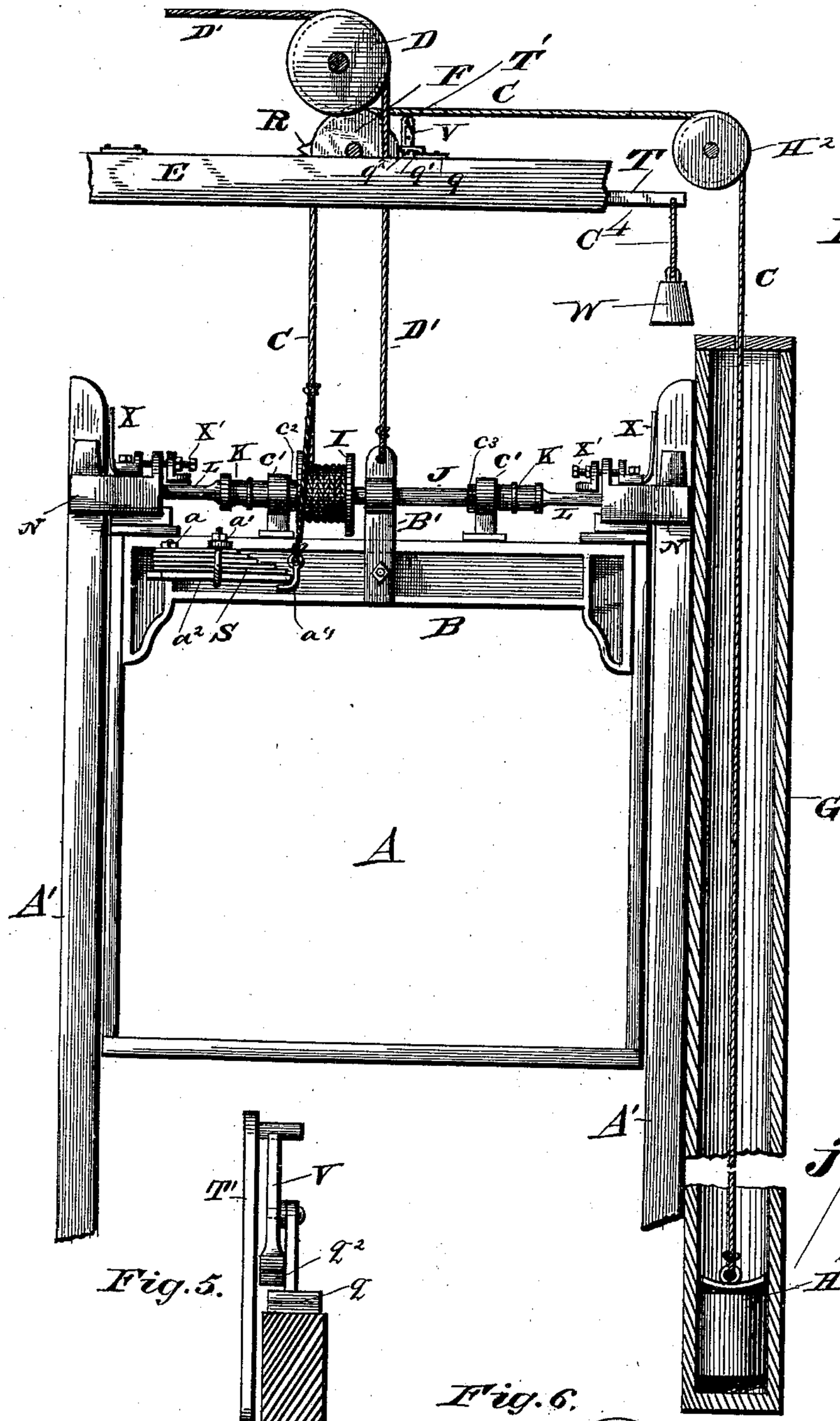


Fig. 1.

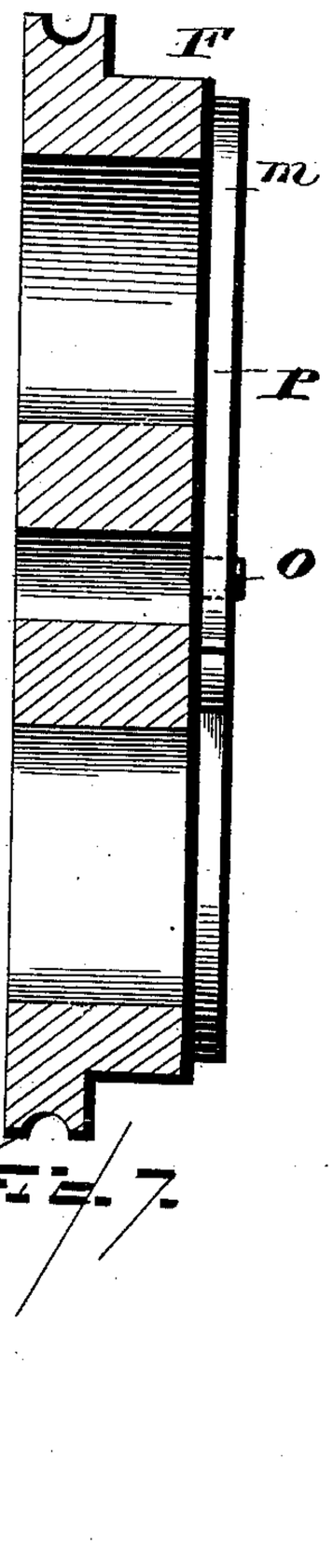
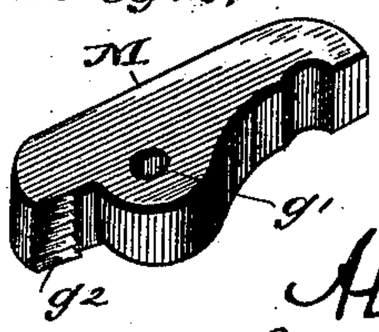


Fig. 7.

Fig. 5.

Fig. 6.



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(No Model.) 3 Sheets—Sheet 2.

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Fig. 2.

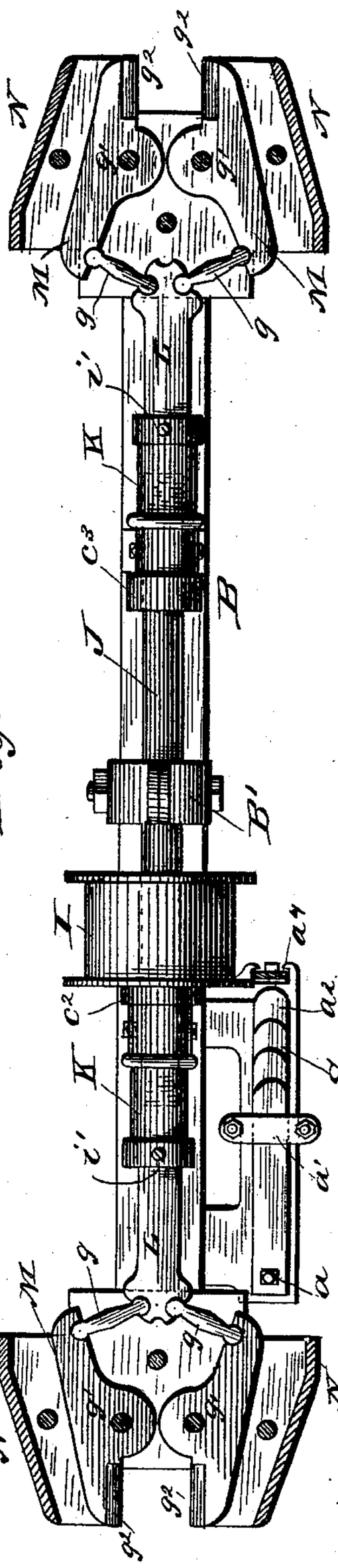
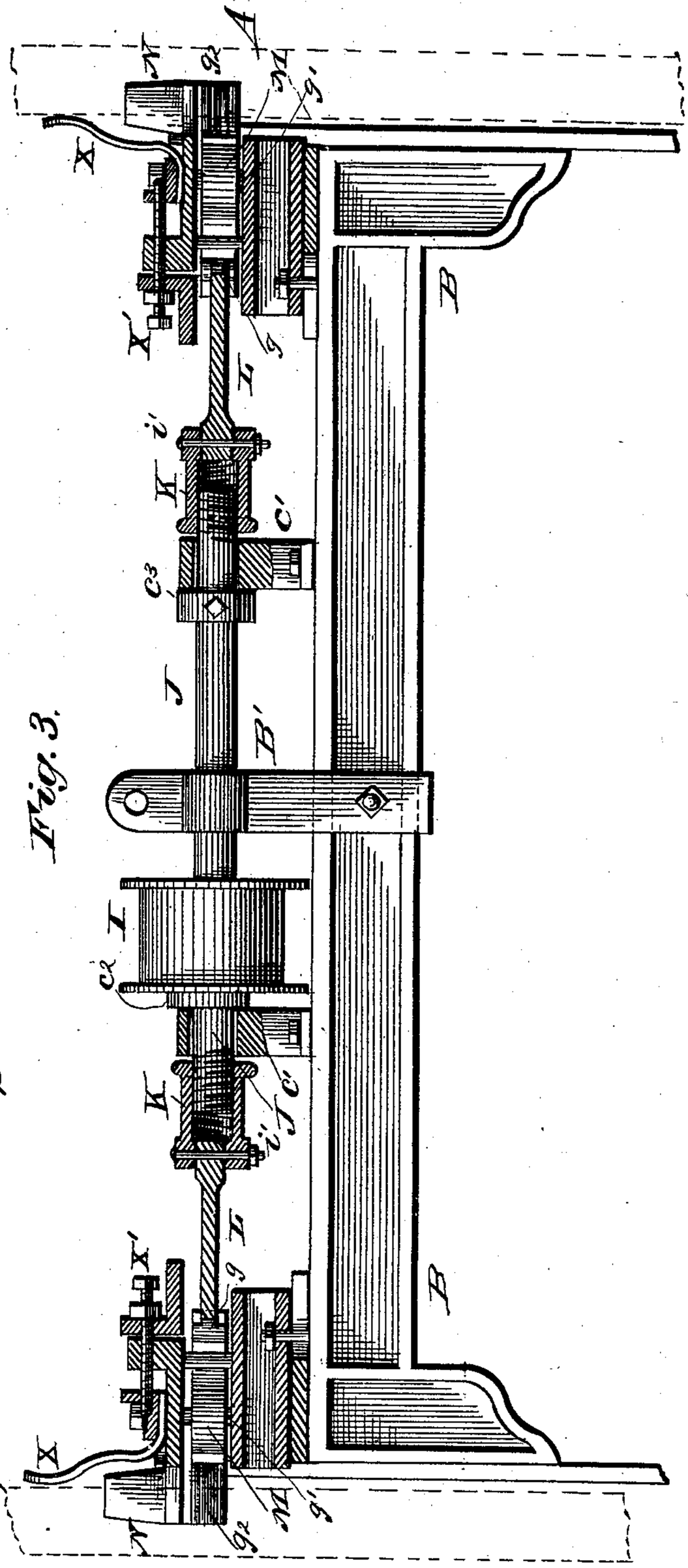


Fig. 3.



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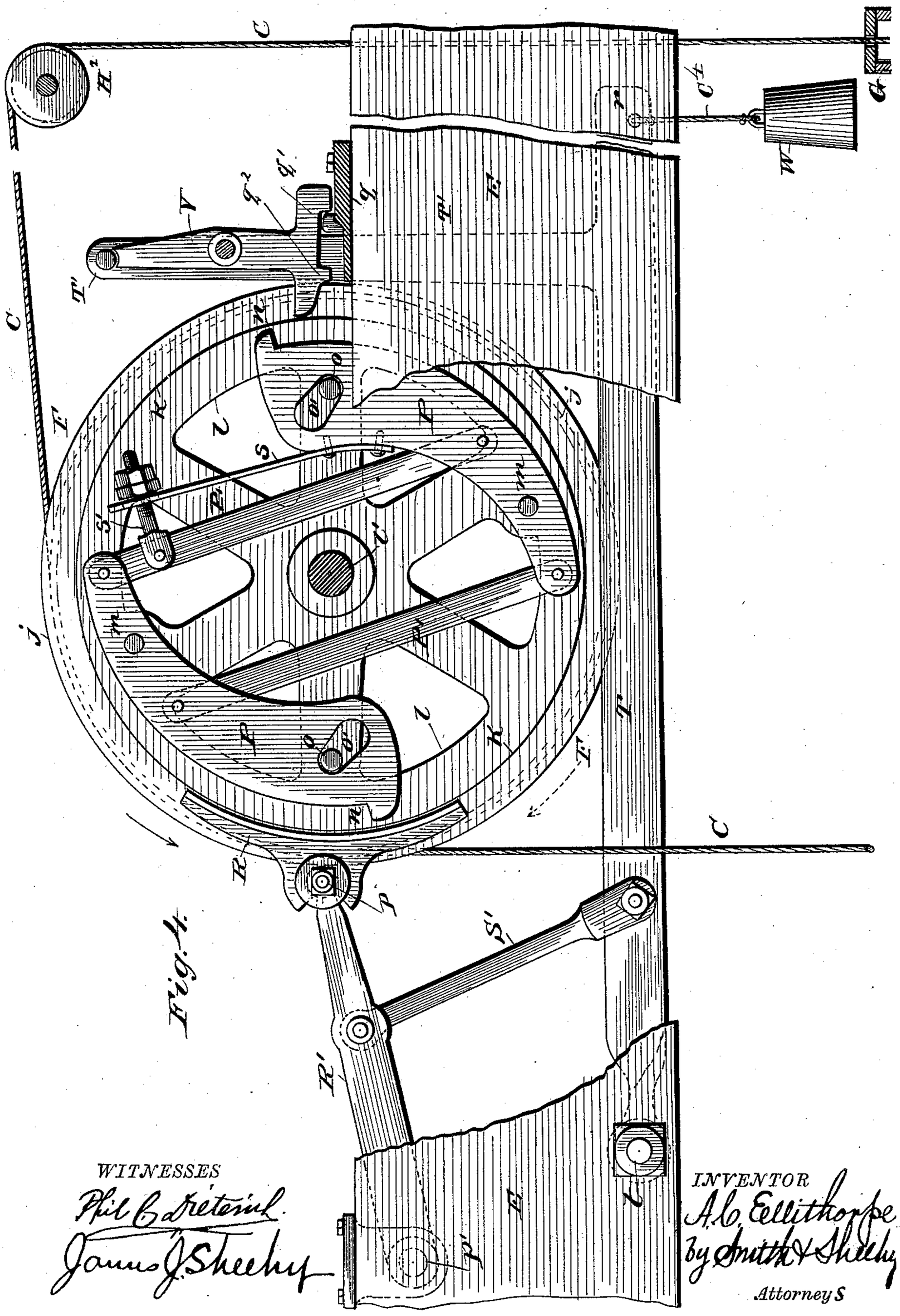

Fig. 1.

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UNITED STATES PATENT OFFICE.

ALBERT C. ELLITHORPE, OF CHICAGO, ILLINOIS.

SAFETY DEVICE FOR ELEVATORS.

SPECIFICATION forming part of Letters Patent No. 376,374, dated January 10, 1888.

Application filed April 25, 1887. Serial No. 236,080. (No model.)

To all whom it may concern:

Be it known that I, ALBERT C. ELLITHORPE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Safety Devices for Elevators; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to safety devices for elevators which are adapted to be operated by hydraulic power, steam, air, or other convenient power; and the improvements which I have made are designed to guard against the fall of the cage in the event of the elevating-rope breaking.

To this end my invention consists in part in a centrifugal governor combined with an air-cushion, a gripping device, and certain other features, which will be fully understood from the following description, when taken in connection with the annexed drawings, in which—

Figure 1 is a view of an elevator, partly in section, showing in side elevation the automatic locking device and the gripping devices, and also the air-tube and its piston. Fig. 2 is a top view, enlarged, of the compound automatic gripping device shown in side view in Fig. 1, adapted to grip the ribs of the vertical upright guides should the elevating-rope of the cab or cage break, or when the speed has become accelerated to threaten danger. Fig. 3 is a side elevation of Fig. 2, partly in section, showing the lateral gripping devices. Fig. 4 is a vertical section illustrating the interior construction of the automatic centrifugal governor-pulley and its link-motion in detail, and showing the gravitating toe and the main lever of said motion free from the hooking ends of the centrifugal dogs. Fig. 5 is a cross-sectional view in detail of the beam E and the lever T, showing the dog V and its fulcrum; and Fig. 6 is a perspective view of one of the gripping-levers. Fig. 7 is a face view of pulley F.

Referring to the annexed drawings by letter, A designates the cage of an elevator, which is guided in its vertical movements by vertical ribs secured to or forming parts of standards A A'. The roof B of the cab is constructed and adapted to receive a compound leaf-spring, S, composed of a number of flat springs riveted at their fixed ends, as indicated at *a*, Fig. 3, and clamped by a clip, *a'*, also shown in the same figure. The lower spring-plate, a^2, is designed to receive the hooked end of a link, a^4, which is attached to the rope which is wound on a drum, I. This spring S is designed to hold the hook in engagement therewith as long as the lifting rope or cable remains unbroken, and when such cable parts and the weight of the cab overcomes the power of the spring the said hook will slip its hold therefrom, and, through the medium of the rope C and the shaft J, will bring into action the gripping-levers.

It will be observed that the cage is suspended from the rope D', which passes over the pulley D, and that this rope or cable or chain may be applied to a windlass controlled in its rotative movements in any suitable manner. The rope or cable C' is attached to the rope of the cage by a central strong clip-brace, B', as shown in Fig. 1.

The pulley D and the pulley H^2 have their axle-bearings in suitable supports. The cable or rope C passes from the drum I over a governor, F, which is journaled in a strong overhead beam, E, thence passes over said pulley H^2, and is continued down through the head of the air-tube G and connected to a piston, H. This tube and its piston are practically well known. The object is to afford a long safety air-cushion which is connected to the cage, as will be hereinafter fully explained.

E designates the head-beam above referred to. This beam is or may be located directly below the beam, in the journals of which the pulley or sheave D has its bearings.

The flanged drum I, about which rope or cable C is wound, is keyed on a shaft, J, which is journaled in the bearings B' *c' c'*. The ends of this shaft J are male-screw-threaded, right and left, and for the purpose of preventing endwise movement of said shaft it is provided with collars c^2 c^3, the latter one of which is secured to its shaft by a set-screw for nice adjustment and compensation of wear. This shaft J is prevented from undue vibration by the employment of the three journal-bearings B' *c' c'*, which are rigidly secured to the strong metal roof-girder or bracketed roof-head of the cage A. The right-and-left-screw-threaded

ends of the drum-shaft J are received into female-screw-threaded socketed portions K K, the outer extremities of which are preferably secured, by bolts *i' i'*, to flattened link-plates L L, having enlarged outer extremities, as clearly shown in Figs. 2 and 3. These outer ends of the link-plates L are connected to the inner ends of gripping-levers M M by pivotal links *g g*, which levers M M have their fulcra at *g'* in strong boxings N, which are securely bolted to the bearer or roof-bridge B of the cage A. The gripping ends of the said jaws M are preferably elongated vertically and roughened or provided with cushioned faces, as indicated by the letter g^2 in Figs. 2 and 3. These jaws are designed to suddenly and securely grip the upright guides A' A' in the event of the rope D' breaking, and thus arrest the cage from descending. The compound spring, which I have above referred to, is secured, as stated, to an offset or flange of the beam B, as shown in Fig. 2.

I have above stated that the rope or cable passes from pulley H^2 over governor sheave or pulley F, and that this pulley has its journals in a stationary overhead beam, E. This pulley is practically a hollow drum having a grooved portion, *j*, in which the cable passes on its way from the piston H in the air-cushioning tube G over the pulley H^2 to the windlass or flanged drum I on shaft J. This pulley is provided with means, which I am about to describe, that render it an automatic governor and an auxiliary security against accident to passengers in the cage A should the cable D' part. This device is fully represented in Fig. 4, and it is constructed as follows: The pulley F is constructed hollow, with an annularly-grooved flange, *j*, a cylindrical drum, *k*, also a head, *l*, and a central shaft, *l'*, to which the pulley is rigidly keyed.

P P designate two segmental dogs, which are pivoted diametrically opposite each other at *m m* to the head *l*, and which are connected together by two links, P' P', so that they move together and always preserve the same distance with respect to each other at all points. The larger ends of these dogs have hooks *n n* on their outer edges, and these ends are guided freely by pins *o o*, which pass through inwardly-flaring slots *o'*. A light spring, *s*, is adjustably secured at one end to a post, *s'*, by a common nut, and which post is connected by a joint to one of the parallel links P'. The end of the spring should be provided with an elongated slot to allow free play. The opposite end of the spring *s* is riveted to one of the dogs P.

It will be observed that when the pulley F is rotated rapidly in the direction indicated by the arrow on Fig. 4 the hooked ends of the two dogs P P will be protruded beyond the periphery of the cylindrical portion of the drum by centrifugal force. The dogs will thereby strike the toe of the gravitating locking-dog V and throw it outwardly. This action will throw the upper branch of the dog V in the direction of the pulley F, and allow the outer end of the beam T to fall and act upon the brake in a manner which will be presently explained. In combination with this device I employ a friction-brake, R, which is adapted to bear against the periphery of the pulley and prevent the cab or cage A from a too rapid descent. This brake is pivoted to an arm, R', at *p*, and properly cushioned, which arm has a fulcrum at *p'*, and at an intermediate point between the ends of the arm R' is pivoted one end of a link, S', the other end of which is pivoted to a long lever, T. This lever T is pivoted at *t* to the beam E, and rising from it and rigid with it is an arm, T', to which is pivotally attached a gravitating locking-dog, V, the object of which is to positively prevent the pulley from turning backward, or in the direction indicated by the arrows in dotted lines, Fig. 4, by the engagement of the two dogs.

It will be observed that there is a jog, *q*, on the beam E, rigidly secured to this beam, and that the lower end of the locking-dog V is notched to form a shoulder at *q'* and also at *q*, the jog forming a stop for the said dog. The free end of the lever T has attached to it at *r* a rope, C', which has attached to it a weight, W, as shown. This weight will cause the free end of the lever T to preponderate in the event of a break of rope D', so as to apply the brake R to the pulley F, through the medium of the devices before described. It will be observed from the foregoing description that I have provided two securities against accident in addition to the compressed-air tube—to wit, the spring and auxiliary hook engagement therewith; also a centrifugal device, which, while it will not stop the cage suddenly, will ease the cage in its descent.

For the purpose of affording at all times a spring frictional contact of the head of the cage with the inner edges of the uprights, I employ curved springs X, which are adjustable, for increasing or diminishing the friction, by means of screws X'.

In operation, should the lifting-cable part or the carriage descend at a dangerous speed, the rotation of the governor-pulley F will become accelerated to such an extent that the centrifugal action will throw out the dogs P of the said pulley until they strike the toe of the dog V, thereby throwing in the upper branch of said dog and disengaging the same from the uprights T' of the beam T, allowing the said beam to fall at its weighted end and apply the brake R, through the medium of the arm R' and the link S'. Simultaneously with the action just described it will be seen that by the rotation of the shaft J the straps L will be driven outwardly and the gripping-levers M forcibly brought to bite on the vertical ribs or standards A', thereby stopping the movement of the carriage.

Having described my invention, I claim—

1. The combination, with an elevator-cage, of a governor-sheave having pivoted dogs, another pivoted dog adapted to be engaged

thereby, and a brake actuated through the medium of levers, the said levers being connected with this last-named dog, substantially as described.

2. In combination with an elevator-cage and its hoisting-rope, a governor-sheave provided with pivoted dogs having hooked ends, the parallel links thereof, and an adjustable tension-spring, substantially as described.

3. The combination, with the governor-sheave having an annular grooved portion and a hollow cylindrical portion, of radially-extending hooked dogs, guided as described, and connected by links and controlled by an adjustable spring, substantially as described.

4. The combination, in an elevator, with the governor-sheave, of a link, R′, a link, S′, a gravitating lever provided with an upper extension, T′, and a locking device attached thereto adapted to engage with the pivoted dogs in the said sheave, substantially as described.

5. In an elevator, the combination of an air-cushioning device, as described, and a governor-sheave provided with centrifugally-acting dogs, substantially as described.

6. In an elevator, the combination, with the cage and elevating-cable, of the governor-sheave carrying dogs, as described, an air-cushioning device, and a spring, as S, engaged by the cable leading from the air-cushioning device, substantially as described.

7. The combination, with the governor-sheave, of the pivoted hooked dogs, their parallel connecting-links and adjustable spring attachment, a gravitating dog adapted to engage the said pivoted hooked dogs, a lever to which said gravitating dog is pivoted, and a brake actuated by said lever, substantially as described.

8. The combination, with the governor-sheave having hooked dogs pivoted to it, of a brake, R, pivoted to an arm, R′, a link, S′, a lever, T, an arm, T′, formed on this lever, a gravitating device, V, for the sheave, and a cable provided with a weight suitably connected to the lever T, substantially as described.

9. In an elevator, the combination, with the head-beam of the cage, of double toggle devices adapted to grip the vertical beams, a shaft having right-and-left screws bearing the winding-drum I, and the screw-threaded socketed portions K, substantially as described.

10. The combination, with the right-and-left-screw-threaded shaft J and suitable bearings upon the head-beam B of the cage therefor, of the socketed portions K, adapted to receive the threads on said shaft, the flat extensions connected to said socketed portions, the links connecting the portions to the rear extensions of gripping-levers, and the boxings for these levers, all substantially as described.

11. The combination of the friction-springs X, the adjusting-screws therefor, the upright guides for the cage, and clamping devices, substantially as described.

12. An elevator comprising the following essential elements, to wit: a cage suspended by a cable, upright guides therefor, clamping devices adapted to engage with said guides, an air-cushion adapted to restrain the rapid descent of the cage should the said cable break, an automatically-actuating governor-sheave, a hooking device, and a spring with which one end of the cable of the cushioning device is adapted to engage for safety, and which will automatically be disengaged should the suspension-cable of the cage break, all constructed and adapted to operate substantially as and for the purposes described.

In testimony whereof I affix my signature in presence of two witnesses.

A. C. ELLITHORPE.

Witnesses:
G. L. MITCHELL,
T. E. TURPIN.