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APPLICATION FILED AUG. 16, 1906.

998,629. Patented July 25, 1911.

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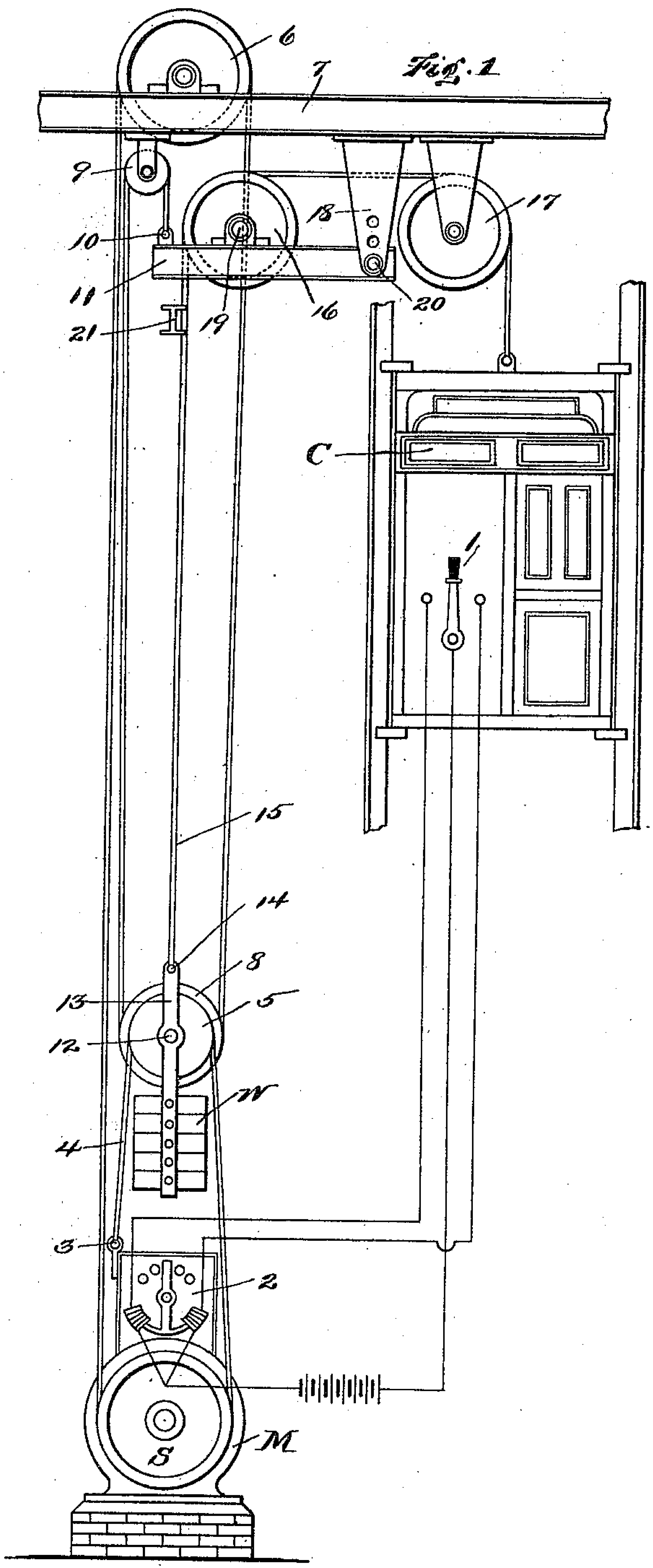

Witnesses

Walter C. Strang

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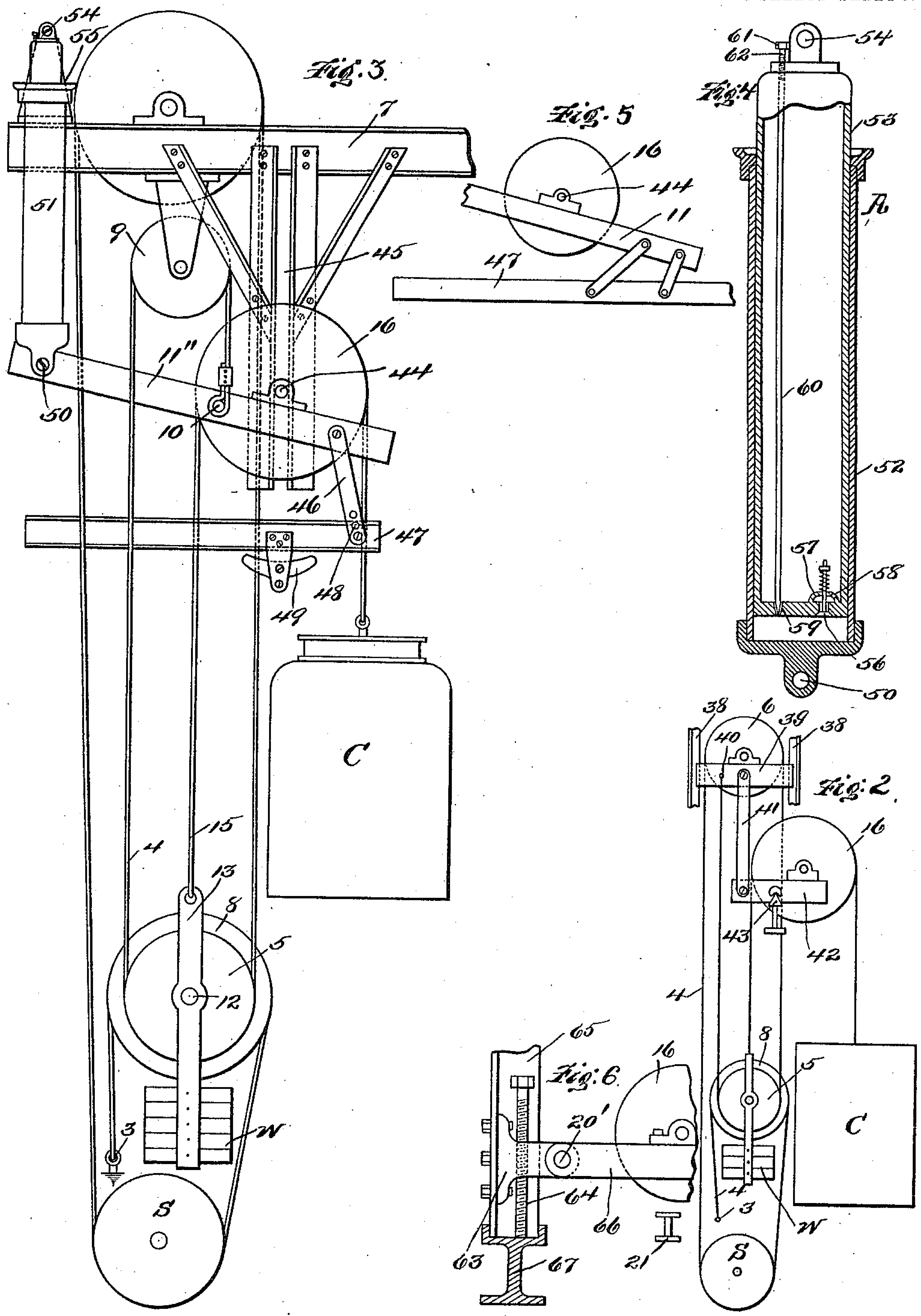

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UNITED STATES PATENT OFFICE.

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TENSION-BEAM FOR FRICTIONAL DRIVING APPARATUS.

998,629. Specification of Letters Patent. Patented July 25, 1911.

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To all whom it may concern:

Be it known that I, MICHAEL E. NEENAN, a citizen of the United States, residing in New York city, in the county of New York and State of New York, have invented a new and useful Improvement in Tension-Beams for Frictional Driving Apparatus, of which the following is a specification.

My invention relates to traction elevator apparatus.

One of the objects of the invention is the provision of a tension beam and connections in a traction elevator system to effect a maintenance of sufficient tension in the power transmitting means to prevent slipping of the latter on the driving apparatus.

A further object of the invention is to provide a pivoted sheave-beam or lever connection, whereby the weight thereof and any additional weight that may be placed thereon, and the weight of the car, the ropes and chains connected thereto and the load, apply tension to the ropes according to the proportion between the distance of the supporting points on said beam or lever and the arrangement of the hoisting gear.

Another object of my invention is the provision of a pivoted beam connected and arranged in a traction elevator system to apply tension to all the leads of the ropes winding respectively on and off the driving apparatus, the tension preferably automatically changing with the load.

It is also the object of the present invention to connect a tension holding device, which may be a dash pot, to a pivoted beam in a traction elevator system to prevent too sudden reaction of the ropes and thereby prevent dancing or teetering of the car.

A further object is the provision of a pivoted beam in an elevator system to resist lateral strain when the path of travel of the car is at a distance from the hoisting gear.

Another object is the provision of a pivoted tension beam in a traction elevator system and a safety support for said beam.

Other objects of the invention will appear hereinafter, the novel combinations of elements being pointed out in the claims.

In the accompanying drawings, Figure 1 represents a traction elevator system including my invention in the form of a horizontal beam; Fig. 2 shows a modification; Fig. 3 represents a tension retaining dash-pot connected to a pivoted tension beam in a traction elevator system; and Figs. 4, 5 and 6 are detail views.

Referring to Fig. 1, it will be seen that in this instance I have shown an electric motor M adapted to be controlled from the car C for operating the driving sheave S and thus effect transmission of power through the hoisting cables to the car. By throwing the switch 1 in the car in one direction or the other the rheostat 2 may be operated to start the motor in the desired direction. Obviously any kind of suitable motor and controlling apparatus may be used whether electric or otherwise. At some fixed point as that designated 3 adjacent the driving apparatus is connected one end of the cable or rope 4 which passes upwardly over the loose sheave 5 and thence downwardly to the traction driving sheave S. The cable passes around the lower portion of the sheave S and continues upwardly until it reaches the sheave 6 on the overhead beam 7. The cable then leads downwardly around the loose sheave 8 and upwardly again to the fixed sheave 9 and thence downwardly to the point 10 where it is fixed to the outer end of the pivoted tension beam 11.

It should be understood that there may be a plurality of ropes or cables 4 but for the sake of simplicity I have shown a single power transmitting cable. The loose sheaves or pulleys 5 and 8 appear to be separate and are shown as of different diameters to facilitate the tracing of the cable, but the sheaves 5 and 8 may be made integral or fixed to each other and of substantially equal diameter if desired. To prevent tilting of the yoke or sheave block there may be three sheaves; a center sheave with two outside sheaves mounted on the hubs thereof, the center sheave corresponding to sheave 5 and the outer sheaves to sheave 8, or vice versa. The sheaves 5 and 8 are in this instance mounted in bearings at 12 in the yoke 13 to the lower end of which is connected the counterweight W and to the upper end of which is connected at 14 one end of the hoisting rope or cable 15. This latter rope passes upwardly over the movable sheave 16 on the pivoted tension beam 11 and thence over the fixed sheave 17 to the car C to the top of which its other end is secured. The tension beam 11 is pivoted in this instance to a fixed standard 18, at 20, and the sheave 16 is mounted on said beam at a point 19 intermediate the outer end 10 and its pivotal point 20. The bracket 18 may be provided with a plurality of openings 20′ to permit vertical adjustment of the pivotal connection for the beam 11. The length of the beam and the ratio of the distances between the point 19 and the ends of the beam may be varied as desired to secure the requisite tension effect in the power transmission ropes. The latter are so adjusted and connected that the beam 11 will be suspended from the upper end of the cable 4 in a substantially horizontal position.

Assuming the parts to be stationary it will be noticed that the weight of the beam 11 and the resultant downward thrust of the counterweight W acting through the hoisting cable 15 on the sheave 16 will produce a certain tension in the upper portion of the cable 4 which is transmitted to the part of the cable just to the left of the sheave S as viewed in Fig. 1. The tension on the lower portion of the cable to the right of the sheave or drum S is produced by the unbalanced weight of the load. Now it is important that when the load changes in the car either by adding to the weight thereof or when inertia is to be overcome, slipping due to slackening of the lead which is running off should be prevented. This is satisfactorily accomplished in the take-up devices disclosed in my co-pending application hereinbefore referred to and also by the pivoted tension beam shown in the drawings forming a part of this specification.

The operation of the system shown in Fig. 1 is as follows. Assuming the car switch 1 to be operated to start the motor so that the car will begin to travel upwardly, it is evident that by reason of the inertia to be overcome there will be a tendency of the traction drum or sheave S to slip on the lower portion of the rope 4 and of the rope winding off the drum to slacken. It is therefore necessary to obtain more friction between the rope 4 and sheave S than after the car is under way. This is accomplished by automatically taking up the slack of that part of the rope winding off the drum and tightening the same in proportion to the load to be moved. Now it may be said that when the motor revolves the sheave S in a clockwise direction the sheave 5 will roll onto that portion of the rope 4 adjacent the fixed point 3 and the sheave 8 will roll off of that portion of the rope 4 connected to the outer end of the beam 11. A downward movement of the yoke 13 being thus obtained the car will be moved upwardly. But it should be noted that just as soon as there is a downward pull on the yoke 13 the rope 15 will exert a downward thrust on the sheave 16 which is pivoted to the tension beam 11. This downward thrust is transmitted to the upper portion of the rope 4 and thence to the portion of the same rope winding off the drum S. The greater the inertia to be overcome the greater will be this downward thrust and therefore the slack will be taken up or the rope winding off the drum S tightened in proportion to the load to be lifted. As the load gets under way this tightening effect is automatically eased off; the result accomplished therefore is that the tension throughout the leads or ropes of the power transmission gear is varied in direct proportion to variations or changes of load. In other words the tension through the power transmitting ropes tends to be automatically equalized under varying conditions of the load to be moved, the consequence being that slipping is prevented and a much more efficient traction elevator system obtained. If the car and load happens to be well counterbalanced the tendency to slipping will be small but the tension beam will still be effective. If the car is under balanced so that the counterweight W tends to drive the car, slipping of the rope 4 on the drum S is prevented by the same downward thrust on the beam 11 to the requisite degree. Now on stopping the sheave S the inertia of the counterweight W will tend to slacken the lower portion of the rope winding on the drum S and therefore tend to cause said rope to slip on the drum and the car to travel beyond the desired point. The inertia of the counterweight, however, will effect a thrust on the beam sheave 16 and therefore cause the beam to pull up on the rope 4 winding off the sheave 8 and thus counteract said inertia and tend to produce a back action on the sheave 5 to pull up on the same and prevent the rope winding on the drum S from being slackened. On lifting the counterweight by rotating the drum S in an anticlockwise direction the portion of the rope winding off tends to slacken but this is immediately taken up by the upward pull on the beam 11 in addition to rolling the sheave 8 on the upper portion of the rope 4. If the weight of the load to be moved is so great as to move of itself the descent may still be controlled by the motor and sheave S by maintaining the requisite frictional contact of the rope 4 with the latter. In such case there is a downward thrust in the sheave 16 to exert tension in the rope winding on to the drum and the upward pull on the yoke 13 keeps the rope 4 winding off the drum taut. In case the transmission rope should break or become slackened the beam 11 will come against the fixed stop 21 thus preventing the beam from falling and maintaining the sheave 16 and hoisting rope 15 in substantially the same position as before. Furthermore, by the use of a pivoted beam the car may be moved to any point distant from the hoisting apparatus the side thrust being taken up by the beam and its support 18, the downward thrust on the sheave 16 being adjusted to secure the requisite automatic change in tension as hereinbefore described. If desired the bearings for the sheave 16 may be made adjustable along the beam 11.

In Fig. 2 the tension beam 42 is pivotally mounted at 43 at an intermediate point and supports the sheave 16 at one end and is connected at its other end by the link 41 to the cross bar 39. This cross bar is vertically movable on the guides 38, 38 and supports the sheave 6 over which passes the rope 4 the upper end of the latter being connected to the cross bar 39 at 40. It will be evident that with this arrangement when the right-hand end of the beam 42 is tilted downwardly there will be a direct thrust upwardly on the sheave 6 to a corresponding degree but depending on the lengths of the lever arms of said beam, to effect a tightening of rope 4 whenever there is a tendency for it to become slackened.

In Fig. 3, as in Fig. 2, the car is suspended directly beneath the overhead sheave 16 and is not carried off to one side as in Fig. 1. In such case, however, to obviate the tendency of the car to have any lateral motion I connect a parallel motion device to the beam so as to secure a practically vertical motion of the sheave 16. Any desired parallel motion may be used and I have shown one type in Fig. 3 and another in Fig. 5 by way of illustration. In Fig. 3 an extension of the shaft 44 moves in a vertical guideway 45 and a link 46 connects the tension beam 11″ to the fixed overhead beam 47. The length of this link 46 may be varied by connecting the same at different openings 48 to the beam 47. Should the rope 4 break or the sheave 16 descend too far downward due to slackening of said rope, the car will be held by the engagement of the sheave 16 with the brake shoe 49 secured to the beam 47. The shoe 49 is preferably arranged between the beams 47 and in the plane of the sheave 16. Pivotally connected at 50 to the outer end of the beam 11″ is a tension holding device, which in this case is in the form of a dash pot to prevent the car from dancing or teetering particularly in coming to a stop. The inner part or cylinder 53 of this dash pot is pivotally connected at 54 to a standard 55 on the overhead beam 7.

By reference to Fig. 4, which shows a form of dash pot that may be used, it will be seen that in this instance a spring-pressed check valve 56 is placed in the bottom of the inner cylinder or receptacle 53. This check valve opens downwardly into the space between the inner and outer cylinders and is mounted in a frame 57 provided with an opening 58. The outer cylinder is necessarily open at the top and closed at the bottom while the inner cylinder is closed with the exception of the check valve opening, the adjustable opening 59, and the screw threaded opening. The lower conical end of the valve rod 60 fits into the opening 59 so as to partially close the same. The upper end of this rod is provided with a thumb piece 61 so that its screw-threaded portion 62 which passes through a screw-threaded opening in the upper end of the cylinder 53 may be turned to effect a slight longitudinal movement of the valve rod 60 and thus vary the size of the opening 59. The receptacle is filled with a fluid preferably a liquid such as oil and the cylinder 52 is partially filled with the same substance so that all the inclosed space is filled when the two parts of the dash pot occupy the relative positions shown in Fig. 4. It should be noted that the dash pot is so constructed as to resist upward movement of the beam 11″ but allows a comparative free downward movement thereof. To illustrate the action of the dash pot as a tension holding device, let it be assumed that the sheave S is stopped while the car is traveling downwardly. In such event the beam 11″ will be moved downwardly by the inertia of the car and the outer cylinder 52 slipped partly off from the inner cylinder 53 causing the oil to flow freely past the check valve into the outer cylinder at its bottom and when the beam starts to move in the opposite direction it is prevented from doing so suddenly, by reason of the closure of the check valve. The oil can return only slowly through the opening 59. It is therefore evident that when the tension take-up device acts to produce sufficient tension in accordance with change of load to prevent slipping the dash pot holds such tension and does not give until the inertia has been sufficiently overcome. Any load can thus apply corresponding tension and such tension will be held to prevent dancing or teetering of the car.

In Fig. 6 I have shown an adjustable pivotal point for the tension beam in that the pivot block 63 may be moved up or down on the support 65 by means of the screw 64 bearing against the fixed I-beam 67. The tension beam 66 is pivoted at 20′ to the block 63 and carries at its outer end the sheave 16. The fixed stop 21 in this figure is shown in the path of the said sheave so that it will act as a brake on the latter as well as to prevent the falling of the beam 66.

Obviously those skilled in the art may make various changes in the details and arrangement of parts without departing from the spirit and scope of my invention and I desire therefore not to be limited to the precise construction herein disclosed.

Having thus described my invention, what I claim and desire to have protected by Letters Patent of the United States is:—

1. The combination with frictional driv-

ing apparatus, of a load carrying device, flexible power transmission means, a movable tension beam connected to one end of said flexible means and maintaining tension thereon, and a stop for limiting the downward movement of said beam.

2. The combination with frictional driving apparatus, of a load carrying device, flexible power transmission means, a pivoted tension beam, and an adjustable support for the pivotal portion of said beam.

3. The combination with frictional driving apparatus, of a load carrying device, flexible power transmitting means, a pivoted tension beam, and means for restricting the movement of a predetermined point on said beam to a predetermined path.

4. The combination with frictional driving apparatus, of a load carrying device, a pivoted tension beam, a sheave mounted on said beam, and having its bodily movement restricted to a substantially vertical plane, and flexible connections between the said load carrying device and beam and the said driving apparatus.

5. The combination with a frictional driving apparatus, of an elevator car, a pivoted tension beam, a sheave mounted on said beam, parallel motion apparatus for said sheave, a connection between the beam and the driving apparatus, a counterweight for the car, and a flexible connection between the counterweight and car, and passing over said sheave.

6. The combination with frictional driving apparatus, of a car and a counterweight, a plurality of sheaves movable with the counterweight, a pivoted tension beam, a sheave connected to said beam, a rope connecting the car and counterweight and passing over said last-named sheave, and connections between the beam and driving apparatus.

7. The combination with frictional driving apparatus, of a load carrying device, power transmission means, a tension beam, and a tension holding device.

8. The combination with frictional driving apparatus, of a load carrying device, power transmission means, a tension beam, and a dash-pot for permitting said beam to move in one direction freely and to retard the same in the opposite direction.

9. The combination with frictional driving apparatus, of an elevator car, a tension beam, a car suspension sheave connected thereto, a counterweight, a flexible connection between the counterweight and car over said sheave, power transmission connections between said beam and said counterweight, and a dash-pot connected to said beam to retard its movement in one direction, and permit comparatively free movement in the opposite direction.

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

MICHAEL E. NEENAN.

Witnesses:
CHARLES M. NISSEN,
JAMES G. BETHELL.