H. O. ADAM.

CABLEWAY.

APPLICATION FILED JAN. 14, 1911.

1,003,083.

Patented Sept. 12, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

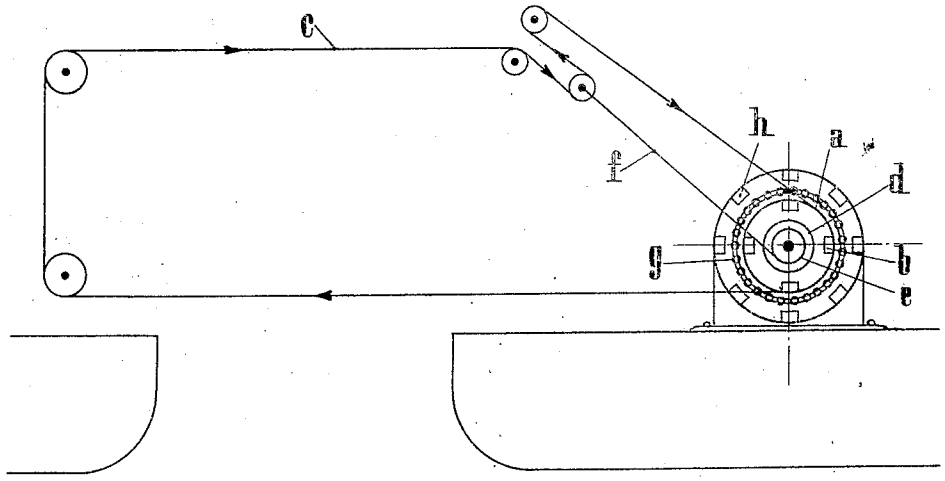


Fig. 2.

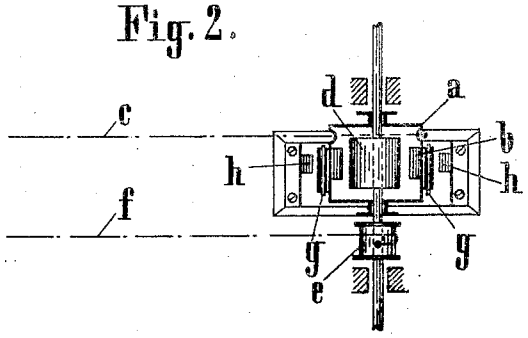
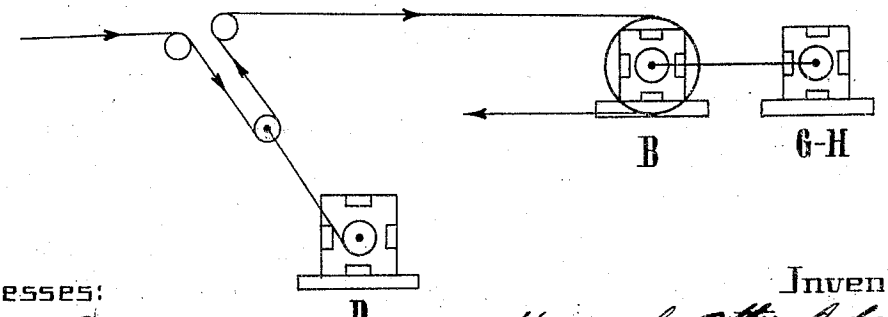


Fig. 3.



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2 SHEETS—SHEET 2.

Fig. 4.

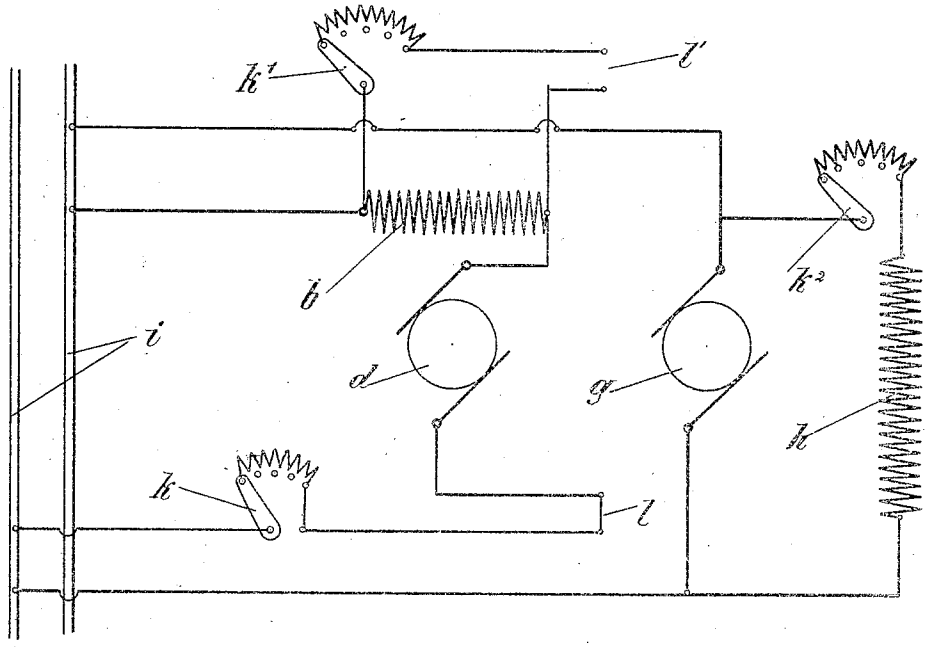
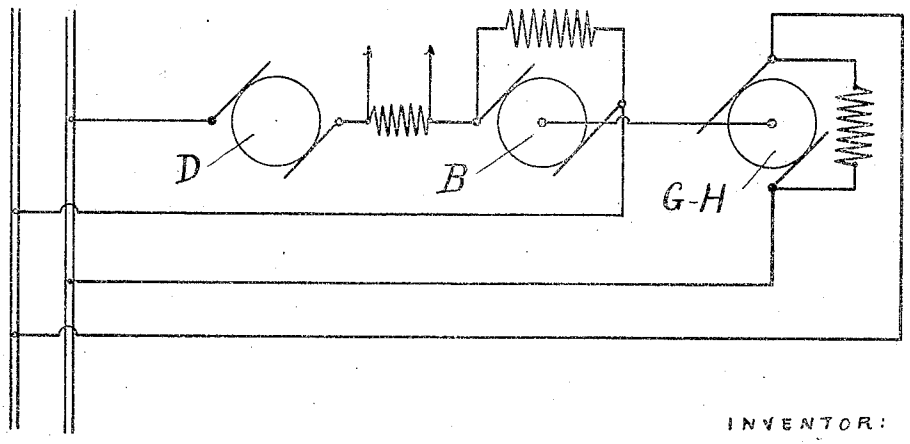


Fig. 5.



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UNITED STATES PATENT OFFICE.

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CABLEWAY.

1,003,083. Specification of Letters Patent. Patented Sept. 12, 1911.

Application filed January 14, 1911. Serial No. 602,705.

To all whom it may concern:

Be it known that I, HEINRICH OTTO ADAM, a citizen of the German Empire, residing at 37 Uhlandstrasse, Dresden, in the German Empire, have invented certain new and useful Improvements in Cableways, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to improvements in electrically actuated cableways such as are described in my prior specifications of Letters Patent of the United States Nos. 820464 and 943509. According to the system described in these prior specifications the motor consists of two rotary parts, one of which actuates the conveying cable while the other is normally at rest and is put in motion only for the purpose of regulating the tension of the conveying cable whenever the relative movement of the points of support of the conveying cable necessitates the tightening or slackening of the conveying cable. When both parts of the motor rotate the energy supplied by each will depend mainly on the relative speed of these two parts, and it is consequently obvious without further explanation that according to the speed of that part of the motor which is normally at rest there exist an infinite number of states of equilibrium for the motor system. Now it is most important that the tightening or slackening of the cable should be effected as promptly as possible, that is to say, it is necessary to select from the infinite number of states of equilibrium existing between the two rotary parts of the motor that which enables the tension of the cable to be adjusted in the least possible time. In the construction described in my specification of United States Letters Patent No. 943509, I have attempted to attain this result by putting into circuit with the motor referred to a compensating dynamo which is designed to influence the field of the motor. It has, however, been found impracticable by this means to adjust the tension of the cable with sufficient promptitude.

Now this invention relates to a novel arrangement for obviating the disadvantage just referred to, according to which the equilibrium of the electric system of the motor, consisting, for instance, of an armature and a casing both adapted to rotate and consequently preserving an infinite number of states of equilibrium, is secured in such manner that the torque available for operating the tensioning device can be artificially increased. By this means it becomes practicable to employ for the operation of the conveying cable proper, that is to say, for the forward movement when tightened up, a portion only of the motor torque, with the result that a temporary variation in the output of the driving motor exerts no influence on the actual motor torque. By this means the driving of the cable is rendered uniform with the result that the tightening and slackening of the conveying cable can be effected in the shortest possible time.

In the accompanying drawings, which illustrate apparatus in accordance with this invention, Figure 1 shows in elevation, and Fig. 2 in plan a constructional form of said apparatus, while Fig. 3 illustrates a modification wherein ordinary motors are employed. Figs. 4 and 5 are diagrammatic representations of the wiring and circuits of the apparatus shown in Figs. 1 and 3 respectively.

In the various figures the same reference letters indicate the same parts.

The manner in which the uniform running of the motor system is brought about is immaterial with respect to the scope of the claims. The description relates to an example wherein the uniformity is attained by electrical means, use being made also of mechanical effects.

In contradistinction to other known constructions, in the construction to which this description relates, the magnetic system b is provided with an additional winding g around which a second magnetic system h is arranged. By this means, as distinguished from the arrangements in other motor systems, in which both motor parts could rotate freely, there is brought about, so to speak, a positive connection between the running parts. The armature winding g acting as a generator winding for instance,

at the normal rate of rotation of the magnetic system *b* supplies energy to the circuit, so that under normal conditions, so long as the tension of the tightening rope *f* remains as it should be, and the part of the motor by which the tightening of the cable is regulated remains stationary, the electro-magnetic torque of the driving motor is increased in accordance with the output of the generator and the transmission actually required between the armature *d* and the winding drum *e* can be correspondingly reduced. When now the distance between the points of support of the conveying cable is decreased, the magnetic system *b* will no longer be able as heretofore to increase its rate of rotation, as the field-winding *g* within this magnetic system will at once exert a strong braking action and will transmit the superfluous energy to the circuit. When, on the contrary, the distance between the supporting points is increased, so that the winding drum *e* has to unwind the tightening rope *f*, the reduction in the rate of rotation of the magnetic system *b*, which hitherto has always taken place, is effectively prevented, as the amount of energy transferred from the armature winding *g* to the circuit decreases considerably, even when the change in the rate of rotation is practically a minimum, and may even fall to zero. Should a further small reduction in the rate of rotation of the magnetic system *b* and of the armature winding *g* arise, this winding will even take up energy from the circuit and running as a motor armature will aid the driving motor hitherto loaded by it, with the result that the latter practically retains its normal speed and the normal relative rate of rotation of the driving motor can now be kept as low as may be desired for the purpose of increasing the torque required for the tightening device.

As in some cases the energy required to keep the rate of rotation of the magnetic system *b* constant is relatively so small, and as consequently the amount of energy taken from the circuit is not large, the armature winding *g* may be caused to work on a resistance instead of returning current to the circuit. In this case uniformity is secured by means of braking by the windings *g* and *h*. This method of securing uniformity may however be replaced by purely mechanical work, in such manner that the temporary increase or decrease of the braking action is effected by hand or automatically for instance by the tension of the tightening rope or of the conveyer cable.

Fig. 4 shows clearly the circuits of the apparatus shown in Figs. 1 and 2 in connection with the main line conductors *i*.

Fig. 3 illustrates the method of securing uniformity in an arrangement wherein there is substituted for an electro-motor comprising a rotary casing and a rotary armature two separate machines B and D preferably connected in series. The electrical machine B actuates the conveying cable and consequently corresponds to the part *b* of the construction illustrated in Figs. 1 and 2. It is coupled with the machine G H which, as in the case of the machine *g* of Fig. 1, renders uniform the driving of the cable. Both the machines B and G H may, under normal conditions, operate as motors, or G H may normally run idly leaving B to do all the work required. In any event, one of the machines effects the positive driving of the conveying cable, the motor B, for instance, driving the cable while the machine G H acts as a generator when the speed of rotation is normal or excessive. When the motors B and D are connected in series, the motor B will rotate while the motor D will remain stationary, so long as the tension of the cable is normal and will maintain the tension by means of its torque. When the supporting points of the conveying cable approach each other the motor D will begin to wind up the tightening rope. Obviously the arrangement shown in Fig. 3 corresponds practically to that shown in Figs 1 and 2, the motor B corresponding to the magnetic system *b*, the motor G H to the magnetic system *h*, with the winding *g*, and the motor D to the armature *d*, and also the object is exactly the same, namely, letting the armature of the motor B choke the tension of the mains before the motor D which is connected up in series to the motor B. Whenever the tightening rope is wound up, the counter E. M. F. of the motor B will decrease as the result of the weakening of its field, for instance by the movement of the regulating resistance of the magnetic field, and consequently the energy available for effecting the running of the motor D will increase, so that it will quickly tighten up the slackened ropes. The machine G H, the field of which is influenced either not at all or oppositely, keeps the speed of rotation of the conveying cable constant, by braking or driving it as may be required. The opposite procedure will occur should the tightening rope forcibly turn the winding drum of the motor D rearward when the tension of the conveying cable is too great. Fig. 5 shows clearly the circuits of the apparatus shown in Fig. 3 in connection with the main line conductors *i*.

What I claim is:—

In apparatus of the class described, in combination, a conveying cable, a tensioning cable, a tension drum, said drum being idle

when the conveying cable is under normal tension, a motor, a rotary driving pulley actuated thereby and means operatively connected to said motor for maintaining the speed constant whereby the tension drum will adjust the tension of the conveying cable.

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

HEINRICH OTTO ADAM.

Witnesses:
PAUL ARRAS,
CLÄRE SIMON.