No. 820,464. PATENTED MAY 15, 1906.

O. ADAM.

SELF ACTING ELECTRICAL ROPE STRAINING DEVICE.

APPLICATION FILED FEB. 16, 1905.

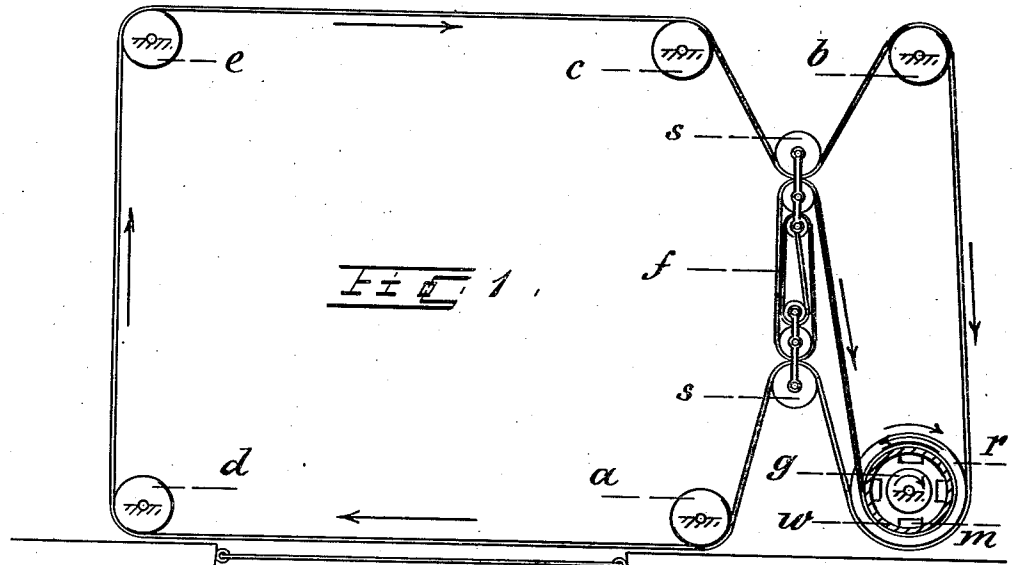

Fig. 1.

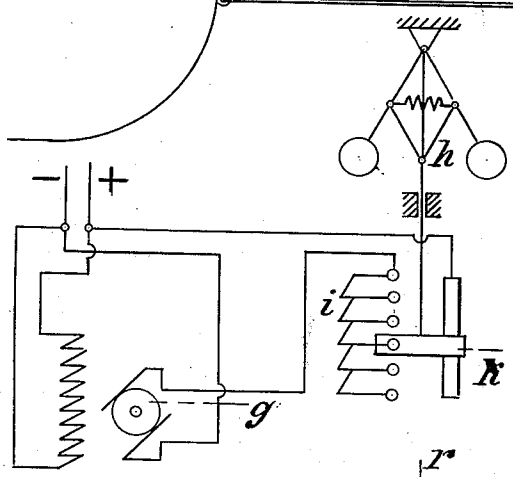

Fig. 3.

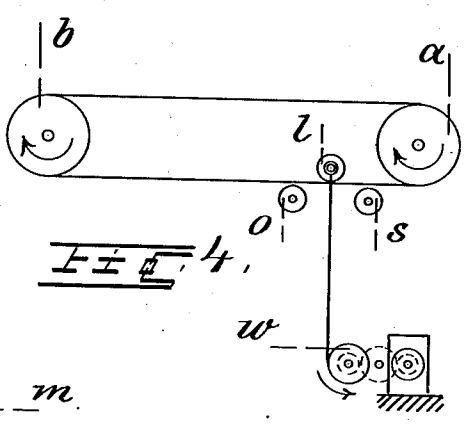

Fig. 4.

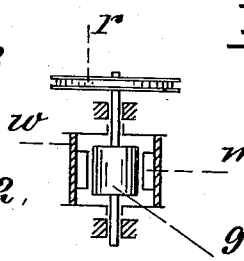

Fig. 2.

Witnesses
H. M. Kuehne
John A. Percival.

Inventor
Otto Adam
By Richards & Co
Attorneys

UNITED STATES PATENT OFFICE.

OTTO ADAM, OF DRESDEN, GERMANY.

SELF-ACTING ELECTRICAL ROPE-STRAINING DEVICE.

No. 820,464. Specification of Letters Patent. Patented May 15, 1906.

Application filed February 16, 1905. Serial No. 245,871.

To all whom it may concern:

Be it known that I, OTTO ADAM, graduated engineer, a subject of the German Emperor, residing at 37 Uhlandstrasse, Dresden, Germany, have invented a certain new and useful Self-Acting Electrical Rope-Straining Device, of which the following is a specification.

This invention is intended to devise means for effecting the straining or tightening of a feeding-rope arranged in a circuit or of any tight rope along which a trolley or the like is moved by automatic means, while allowing of varying the distance of the stationary rollers around which the rope is taken or the distance of the fixed points between which the rope is to be kept taut. This is especially of importance in the case of loading coal or the like from a boat or trailer towed by a ship and into the latter or, inversely, from the towing-boat into the towed boat or other conveyance, inasmuch as in this operation the distances of the fixed points are changing in consequence of the undulating movement of the water or in consequence of differences in the speed of both vessels or boats.

On the accompanying drawings, Figures 1 and 2 represent diagrammatically an endless rope of this kind, the movement of the rope, as well as the constant uniform tension of the same, being effected by one and the same electric motor. Figs. 3 and 4 illustrate a modified form of construction, where the movement of the rope and the tension of the rope are effected by different motors.

The two ships are connected to each other by means of a trailing or dragging tow, the guide-rollers *a c* being arranged on one and the guide-rollers *d e* on the other ship in the well-known manner, so that the endless feed is represented by a rope taken around the said rollers. This rope, however, is not guided directly around the sheaf or pulley *r* of the electric motor; but it is first taken around two tension-rollers *s s*, which are connected to each other by a system of compound pulleys, so that the endless rope is guided over the guide-roller *a*, the tension-roller *s*, the motor-pulley *r*, the guide-roller *b*, tension-roller *s*, and over the guide-rollers *c e d* back to *a*. That extremity of the rope which leads off from the system of compound pulleys *f* is secured to the winding-drum *w* of the same electric motor which rotates the pulley *r*. For the purpose of enabling the electric motor to perform this double function it is provided with rotatably-journaled armature and with a system of rotatable magnets, which are not positively connected to each other.

The armature *g* operates the pulley *r*, Fig. 2, which drives the endless rope, while the system of magnets *m*, Fig. 1, actuates the thereto-connected winding-drum *w* for the rope of the system of compound pulleys *f*. The pulley *r*, which is moved by the armature *g*, is thus rotated in one direction, while the winding-drum *w*, which is driven by the system of magnets *m*, is driven in the other (the opposite) direction, as shown by the arrows in Fig. 1, the rotation of the winding-drum *w* and the consequent actuation of the system of compound pulleys *f* taking place only until the tension between the tension-rollers *e c* has attained the desired value, so that the endless rope is correctly strained. The resistance to tension will then be too great to allow the system of magnets to overcome said resistance, while the armature *g* is not interfered with thereby and continues to operate the endless rope, which is independent of the rope of the system of compound pulleys. Instead of the winding-drum a windlass or the like may be used, and the transmission of movement from the system of magnets and from the rotating armature to the ropes, belts, chains, or the like may be effected by suitable intermediate means, such as rope-pulleys, gear-wheels, or the like. In the same manner I may use instead of the system of compound pulleys any other tension-producing device which is actuated by the system of magnets *m m*.

By suitably arranging the windings of the motor and by suitably proportioning the tension in the endless-rope circuit, and in the winding-up cord an approximately constant number of revolutions may be obtained for the rope-pulley *r*, even at the maximum number of retrograde revolutions of the systems of magnets and of the winding-drum in consequence thereof. Hence in the normal position of the parts the winding-drum *w* is not moved and the endless-rope circuit has the correct tension, while the cord of the system of compound pulleys *f* is wound up at the same moment where the tension is released

in the endless-rope circuit. Now if thereupon the distance is again increased between the guide-rollers *a* and *d* or *e* and *c* the endless-rope circuit pulls the tension-rollers *s s* away from each other, the winding-up rope or cord of the system of compound pulleys *f* being drawn off from the drum *w*, which at the same time performs a retrograde movement. The winding-drum is capable of performing this kind of movement, in view of the oppositely-directed rotating capacity of the system of magnets corresponding only to the definite tensional resistance of the rope. Thus the winding-up rope or cord is pulled in the direction of rotation of the armature *g*, and consequently also of the pulley *r*, until the tension of the rope in the endless circuit has again arrived at the value which is fixed by the power working at the periphery of the armature of the motor.

Instead of a single electric motor operating both the endless-rope circuit as well as the tension device intended for said circuit a separate electric motor may also be used for producing the tension of the rope, as shown in diagram in Figs. 3 and 4 of the drawings. In this form of construction the rotating capacity of the motor is kept constant at any number of revolutions by the centrifugal regulator or governor *h*, the regulating or controlling resistances *i* being included in the electric circuit, the governor *h* acting upon said resistances *i* by the displacement of a sweeping contact *k*, so as to cut out and into circuit more or less resistances *i*, in accordance with the position of its centrifugal weights. The centrifugal regulator or governor is actuated in any suitable manner by the medium of the motor for producing the tension of the rope.

In the position of rest—that is to say, in the normal operation of the motor—a resistance is permanently included in the circuit before the armature, so that there is a continuous flow of current through the armature. The endless rope which is taken over the rollers *a b* passes over the rollers *o s*, which constitute the tension producing device, together with the roller *l*, which rests upon the rope between the said rollers *o s*. From the roller *l* a pulling-rope or the like passes to the winding-drum *w*, which is driven by means of gear-wheels from the armature *g* of the electric motor. The shaft of one of the pulleys—that is to say, the shaft of *a* in the form of construction shown by way of example—is driven by any suitable motor, engine.

The mode of operation of the tension-producing motor in connection with the centrifugal regulator or governor actuated thereby is therefore as follows in accordance with the form of construction shown in Figs. 3 and 4: When the correct tension is imparted to the rope, the weights of the centrifugal regulator *h* and the sweeping contacts *k*, actuated thereby, are in their lowest positions, so that the entire resistance *i* is included in the circuit before the armature *g'* of the tension-producing motor. The total resistance *i* is so adjusted that the current now flowing through the armature produces a rotating capacity which corresponds precisely to the desired tension of the rope without the armature *g'* being capable of rotation. As soon, however, as the tension of the rope is decreased in consequence of the movement of the ships the armature *g'*, and consequently also the centrifugal regulator or governor *h*, are moved, the contact *k* is raised by the regulator and decreases (according to the rotating speed of the armature *g'*) the resistance *i*, which is included in circuit before the armature *g'*. At the same time the winding-drum *w*, Fig. 4, pulls the tension-producing rope with the roller *l*, and the tension of the rope is increased and the armature *g'* rotates slower, the weights of the regulator *h* and the contact *k* are lowered again until the initial position is again attained, the tension of the rope being normal and the armature *g'* being stopped. The procedure is similar when the tension of the rope exceeds the permissible value as fixed by the rotating capacity of the armature *g'* when at rest. The armature *g'* acts then as a dynamo-armature, inasmuch as it is pulled in the opposite direction of rotation by the tension-producing device, and it operates as a current-producer—that is to say, in this case it acts to retard the flow of current in the electric conductors. The centrifugal regulator is then operated as above described, but in the opposite direction, and until the pulling of the armature of the motor is released and until is ceases at last, whereupon the weights of the centrifugal regulator drop back into their initial position. If, instead of an endless-rope circuit a resting (not moving) rope is to be kept automatically at a constant tension, one end of the rope is securely fixed, while the other end of the rope, however, is conducted by way of a guide-roller to the winding-drum of an electric motor, the operating force of which corresponds to the desired tension of rope, so that in the case of a normal tension of rope the winding-drum is stopped, while when the tension is decreased it winds the tension-producing rope up again, and on the tension becoming excessive it pulls the rope off until in this case also the tension of the rope has attained the value fixed by the force acting at the periphery of the armature of the motor.

What I claim, and desire to secure by Letters Patent of the United States, is—

In an automatic electric cable-tightener the combination with the endless band or cable, idle pulleys or drums located in proxim-

ity to each other over which said cable passes, a take-up pulley riding on said cable between said first-mentioned pulleys, and electric means for automatically drawing upon said take-up pulley or releasing it according to whether the tension upon the cable decreases or increases, substantially as described.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

OTTO ADAM.

Witnesses:
PAUL E. SCHILLING,
PAUL ARRAS.