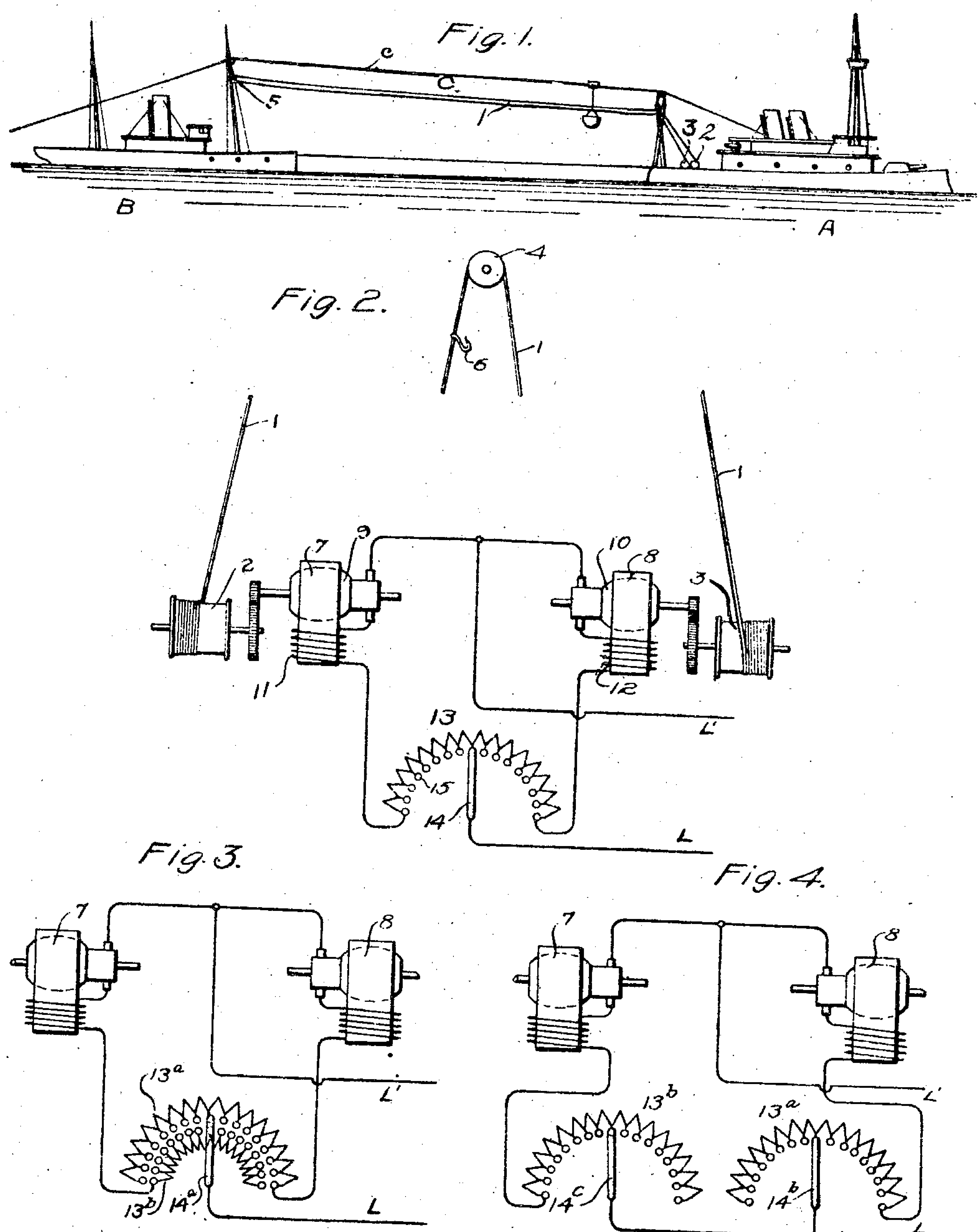
No. 822,250.

PATENTED JUNE 5, 1906.

M. W. DAY.

ELECTRIC CABLEWAY SYSTEM.

APPLICATION FILED JAN. 6, 1905.



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UNITED STATES PATENT OFFICE.

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ELECTRIC CABLEWAY SYSTEM.

No. 822,250. Specification of Letters Patent. Patented June 5, 1906.

Application filed January 6, 1905. Serial No. 239,897.

To all whom it may concern:

Be it known that I, MAXWELL W. DAY, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Electric Cableway Systems, of which the following is a specification.

The present invention relates to cableway systems in which the load or object to be moved along the cableway or track is actuated by means of a traveling cable which connects the sending and receiving stations and which is operated by means of power at one of the stations.

Where the system is employed for coaling ships at sea, one end of the system being supported upon the ship which is being supplied with coal and the other end being mounted upon the collier or sending station, the lurching of the ship or the ship and collier will cause the track and propelling-cable to sag sufficiently to bring them in contact with the water unless some preventive means is provided. In such cases the cable which forms the track or support is usually secured at one end to the towing vessel, while the other end passes over the towed vessel and is attached to a sea-anchor, so that the track is maintained fairly taut even though the ships may lurch or roll. It is not possible, however, to prevent the propelling-cable from sagging by means similar to that employed in connection with the supporting-cable, for the reason that the propelling-cable must be free to travel, so as to move the load between the two stations. Although a sagging of the propelling-cable does not cause the load to drop into the water, it nevertheless may bring the cable itself into contact with the water and may cause it to become fouled either with itself or with some part of the vessel or tow-rope. Various expedients have been adopted or suggested for maintaining a proper tension upon the propelling-cable, among them being the introduction of friction-clutches between the drums at the ends of the cables and the driving-motors. It has also been proposed to control the tension of the cable electrically by connecting a dynamo-electric machine to each end of the cable, one of the machines operating as a motor through energy received from a source of current-supply and the other machine operating as a generator driven by the motor and supplying energy to the motor.

The object of the present invention is to so construct and arrange the parts of a cableway system that a tension may at all times be maintained upon the propelling-cable in a simple and effective manner and without the use of clutches or complex control apparatus of any character.

To the above ends I have associated with the cable of an ordinary cableway a pair of motors, which are connected to drums upon which the ends of the cable are wound. The motors are so connected to the source of current-supply that they have a constant tendency to wind up the cable ends upon the respective drums. The controlling means for the motors is so organized that the efforts of one or both of the motors may be varied at will, whereby one motor is caused to overcome the other, winding up the cable at one end and unwinding it at the other end at which the motor exerting the least pull is situated. In this manner there is at all times a definite tension upon the cable, both when in motion and when at rest.

Further objects of the present invention will appear in connection with the following description of one embodiment thereof, which is illustrated in the accompanying drawings, wherein—

Figure 1 illustrates two ships and a cableway spanning the space between them. Fig. 2 illustrates a cableway system arranged in accordance with the present invention, and Figs. 3 and 4 are details showing further modifications of the operating means for the cable.

Similar reference characters will be used throughout the specification and drawings to denote like parts.

Reference being had to the drawings, A represents a ship, B a collier, and C a cableway extending between the ship and collier. The cableway consists of the usual track or supporting-cable *c* and the cable 1, the ends of which are secured to drums or hoists 2 and 3, and which is supported at an intermediate point upon a sheave 4, suitably mounted, as at 5, upon the collier or other sending-station. If desired, the drums may be placed upon the collier and the sheave 4 upon the ship or receiving-station. 6 indicates a hook which engages a bucket or other carrier to move it along the track. These parts may be of any usual or preferred type, since they in themselves form no part of the present invention. The drums 2 and 3 are geared or otherwise connected to electric motors 7 and 8, respectively, these connections being preferably permanent in character, since no clutches or other loose driving means is required. 9 and 10 are the motor-armatures, and 11 and 12 the fields of the motors 7 and 8, respectively. The motors may be wound in any of the usual ways, since the particular kind of winding is immaterial, although the series winding, as illustrated, is preferred. The motors are connected in parallel across the lines L and L'. Between the motors and the line L, I have arranged a rheostat or rheostats, the system illustrated in Fig. 2 having a single rheostat 13 common to both motors. The arm 14 of the rheostat is electrically connected to line L and is adapted to pass over and engage with the contacts 15, associated with the sections of the rheostat. When the arm 14 is in the position shown, an equal portion of the rheostat is in series with each of the armatures, and therefore if the parts are properly constructed and arranged the motors will be supplied with proper currents to give equal torques. The arrangement of parts is such that the current in passing through the motors tends at all times to drive them in the direction to wind up the ends of the cables on the drums or hoists 2 and 3.

It is evident that when the arm 14 of the rheostat is in a neutral position the tendency of both motors will be to wind up the ends of the cable upon their respective drums; but since the torques of the two motors are equal no movement of the cable will result unless the tension of the cable is less than the pull exerted by the motors, and if the cable tension is less than such pull then the ends of the cable will be wound upon the drum until the pull of the motors is just balanced.

It is further evident that if the ships lurch or if for any reason the distance between the sheave and the drums decreases the motors, although normally at rest, will immediately take up the slack in the cable until the proper tension is obtained. Similarly, if the lurching of the vessels is such that the distance between the sheave and the winding-drum increases the ends of the cable simply unwind themselves from their respective drums, pulling the motors with them. In this manner perfect control is obtained over the cable when it is at rest—that is, when it is not traveling with its load.

If the arm 14 of the rheostat is moved slightly to the left, the resistance in the circuit which includes motor 7 is less than that in the circuit which includes motor 8, and therefore a greater amount of current will be supplied to the motor 7, causing motor 7 to exert a greater pull upon the adjacent end of the cable than that which motor 8 is able to exert upon the other end of the cable. As a result the cable will be wound upon drum 2 and will be unwound from drum 3, the motor 7 pulling the motor 8 backward against the tendency of the latter motor to rotate in a forward direction—that is, in a direction to wind up the cable upon the drum 3. In this way a definite tension may be placed upon the cable and maintained notwithstanding lurching of the ships, for the reason that if ships lurch toward each other, slackening the cable, the motor 8 will immediately follow its normal tendency and will wind up the cable upon the drum 3 until the normal tension is again reached, whereupon the pull of the motor 7 again comes upon the other motor and unwinds the cable from drum 3. As the arm 14 is moved toward its extreme position on the left-hand side the speed of the motors is increased; but the tension upon the cable does not necessarily increase, since the current supplied to motor 8 is weakened, due to the cutting in of the additional resistance.

Assuming that the movement of the cable upon turning the rheostat-arm to the left draws in the bucket or load, it is clear that a movement of the rheostat-arm to the right produces a reverse movement of the cable by reason of the motor 8 pulling the motor 7 backward, and thereby causing the bucket or load to be moved in the opposite direction. Upon returning the rheostat-arm to the neutral position the bucket or load may be stopped at either the sending or receiving stations or at any intermediate point. Main switches may of course be employed for shutting off the current entirely when the apparatus is not in use.

The present system consequently affords means for controlling the movement and the tension of the cable in a simple and effective manner and in a manner which requires little attention or manipulation on the part of the operator, since it is only necessary in order to start the load in one direction or the other to move the rheostat-arm to the right or to the left and to bring it again to the neutral position when it is desired to bring the load to rest.

In Fig. 3 I have shown a motor provided with a separate rheostat, the rheostat 13^a being associated with the motor 8 and the rheostat 13^b being associated with the motor 7. The contacts of these two rheostats may be arranged concentrically or in any other symmetrical manner, so that a single arm 14^a, corresponding to the arm 14 of Fig. 2, serves to cut resistance into one motor-circuit and simultaneously remove resistance from the circuit of the other motor.

In Fig. 4 the rheostats 13^a and 13^b are shown as arranged independently of each other, each having its own arm 14^b and 14^c, respectively, these arms being either connected to each other or independent of each other, and if they are independent then a wider range of variations may be obtained than in the other modifications, for the reason that the current supplied to one motor need not be decreased as the current passing through the other motor is increased. Even if the arms 14^b and 14^c are entirely independent of each other the controlling mechanism does not become objectionably complex, since it is only necessary for the operator to actuate two handles which operation does not require particular care or skill and but little time.

In all the forms of the present invention illustrated clutches and complex mechanisms of all kinds are dispensed with, and the arrangement of the parts is such that there is very little mechanism which is apt to get out of order or which requires delicate adjustment and careful attention in order to enable it to perform its proper functions.

While I have described the present invention with great particularity as embodied in some of its various forms, I do not desire to limit the present invention to the particular form illustrated and described, since in its broader aspects many other modifications may be made in addition to those illustrated without departing from the spirit and scope of the invention as set forth in the appended claims.

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

1. In a cableway system, a cable, means for driving the cable, and means for maintaining a tension upon said cable both when moving and when at rest.

2. In a cableway system, a cable, and electrical means for driving the cable and for maintaining a tension thereon both when the cable is moving and when at rest.

3. In a cableway system, a cable, a pair of motors associated therewith and permanently connected to a source of current-supply in such a manner that the motors tend to wind up the ends of the cable, and means for varying the proportion of the whole current which each motor receives.

4. In a cableway system, a cable, a pair of motors associated with the ends of the cable for winding up the same, means for supplying said motors continuously with current tending to rotate the motors to wind the cable, and means for varying the relative strength of the currents supplied to each motor.

5. In a cableway system, a cable, a pair of motors connected in parallel to a source of current-supply and connected to the ends of the cable for winding up the same, resistances located in the connection between the motors and said source of current-supply, and means for varying the proportion of the resistance which is in series with each motor.

6. In a cableway system, a cable, a pair of motors one terminal of each of which is connected to a corresponding terminal of a series of resistance-sections and the other terminals of which are connected to one terminal of a source of current-supply, and a movable member coöperating with contacts associated with said resistance-sections and electrically connected to the other terminal of said source of current-supply, said motors being connected to the ends of the cable for winding up the same when the motors are operated.

7. In a cableway system, a cable, a pair of motors associated with opposite ends of the cable and arranged to pull in opposite directions upon the cable, and means for varying the pull which one of the motors exerts.

8. In a cableway system, a cable, a pair of motors associated with opposite ends of the cable and arranged to pull in opposite directions upon the cable, and means for varying the effective pull of each motor.

9. In a cableway system, a cable, a pair of motors connected with opposite ends of the cable, and a controller constructed and arranged to supply current to the motors so as to cause the motors to operate similarly at each end of the cable.

In witness whereof I have hereunto set my hand this 4th day of January, 1905.

MAXWELL W. DAY.

Witnesses:
BENJAMIN B. HULL,
HELEN ORFORD.