

O. J. DAVY & C. W. DAUBER.
TELPHERAGE SYSTEM.

APPLICATION FILED DEC. 21, 1906. RENEWED MAY 22, 1909.

Patented Oct. 19, 1909.

937,581.

5 SHEETS—SHEET 1.

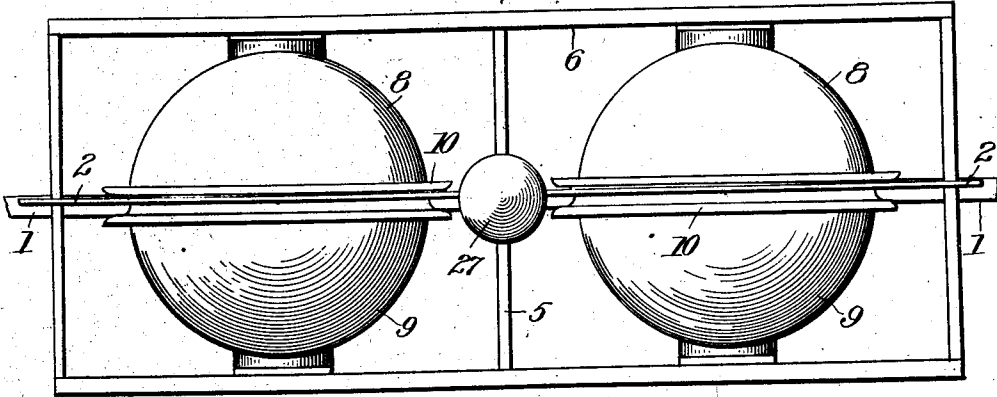


Fig. 1.

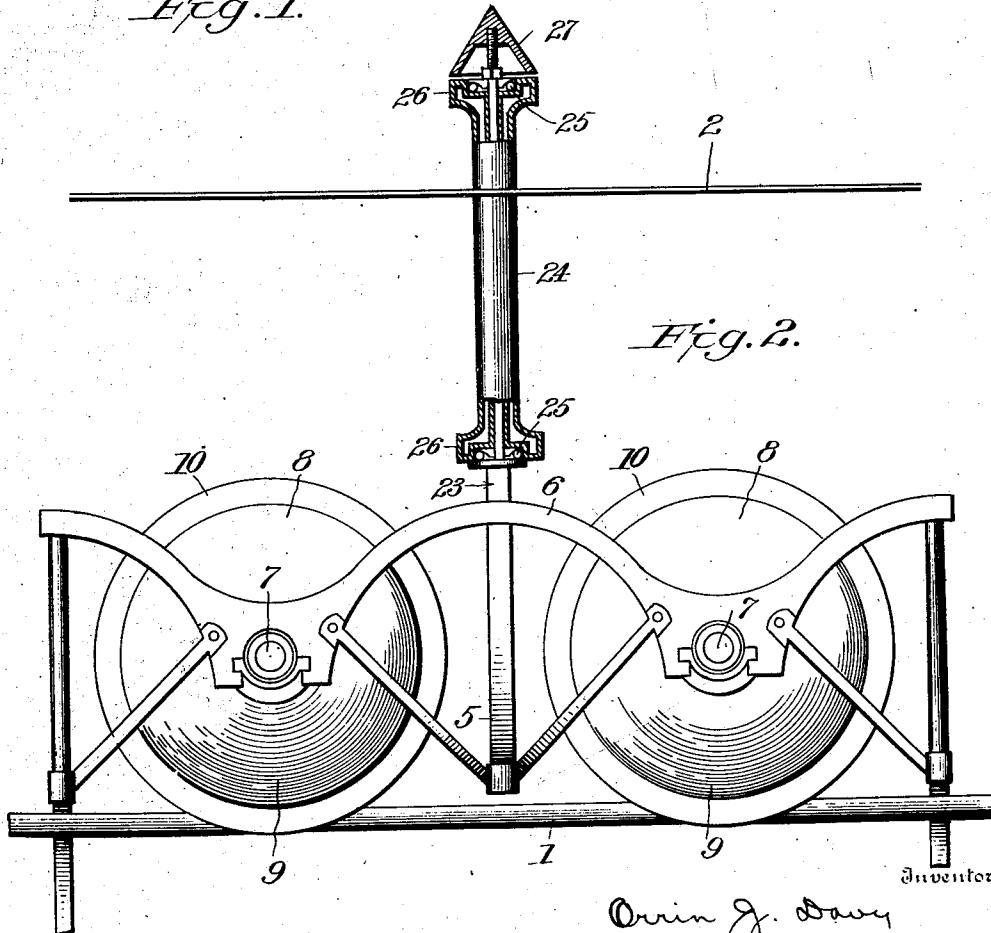


Fig. 2.

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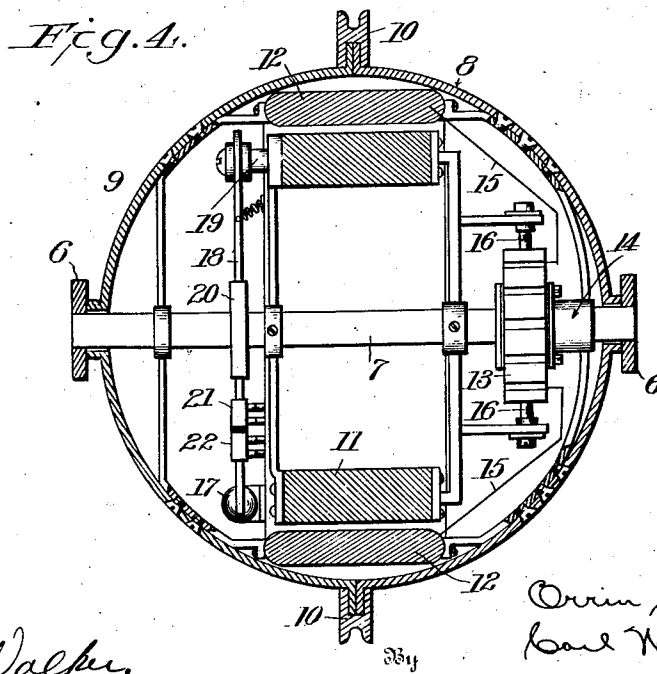
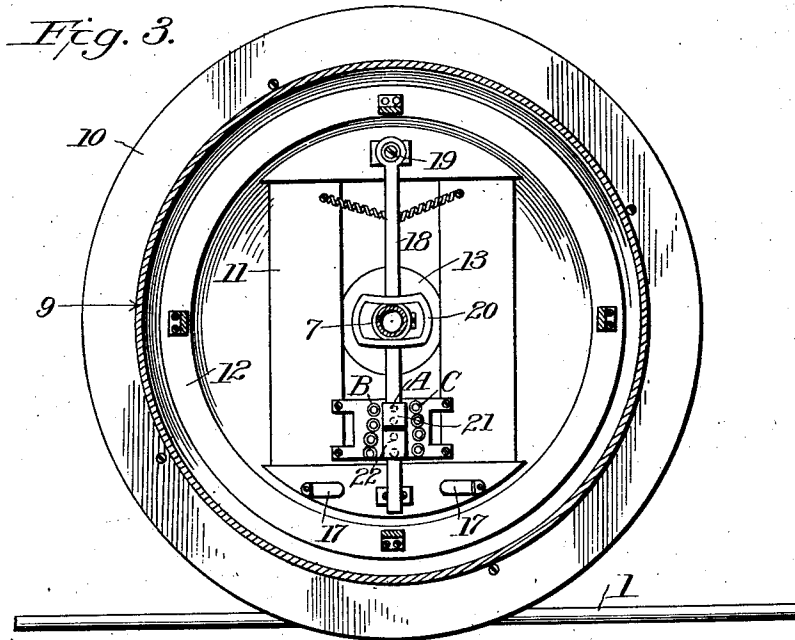
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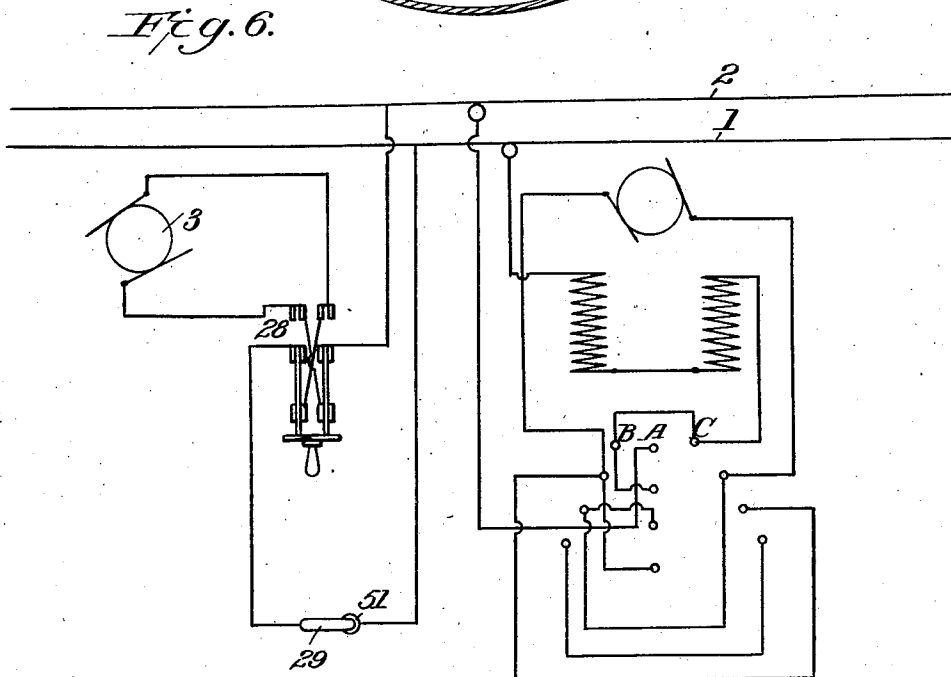
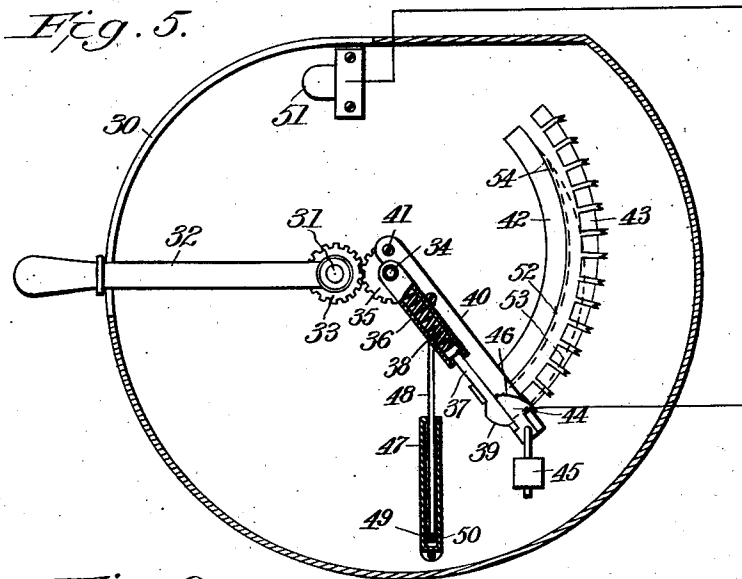
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Fig. 7.

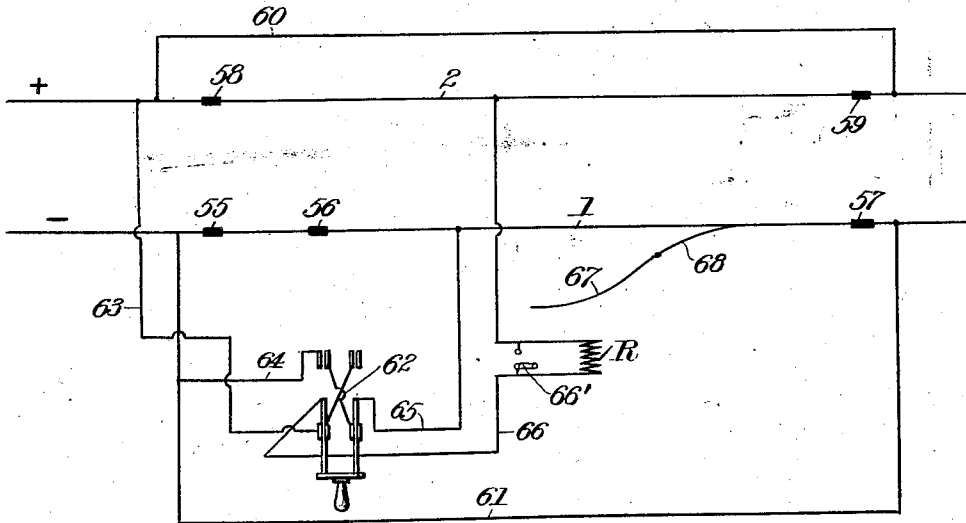


Fig. 9.

Fig. 8.

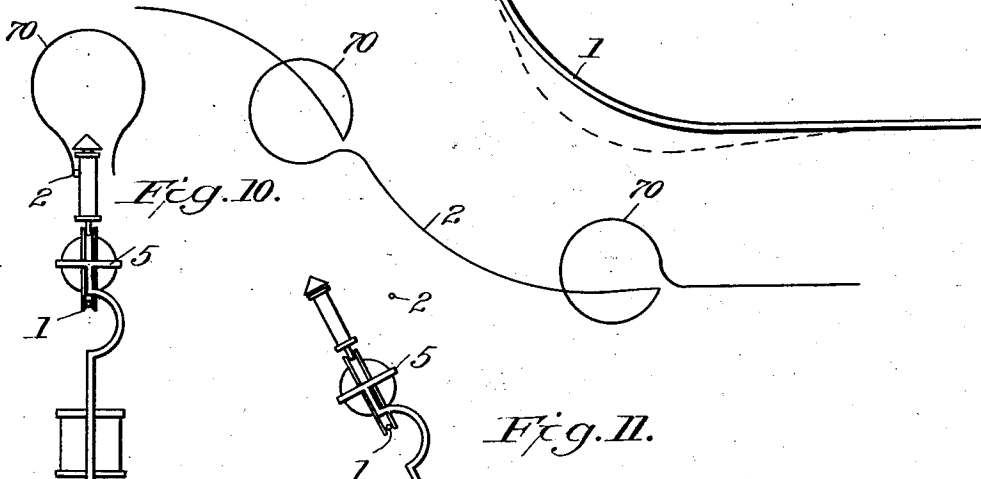


Fig. 10.

Fig. 11.

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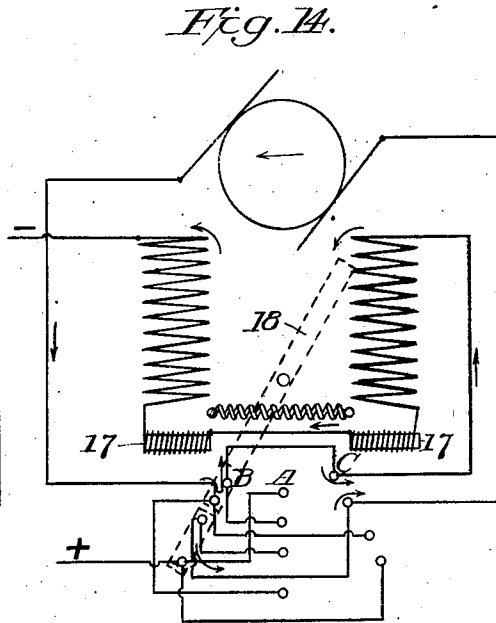
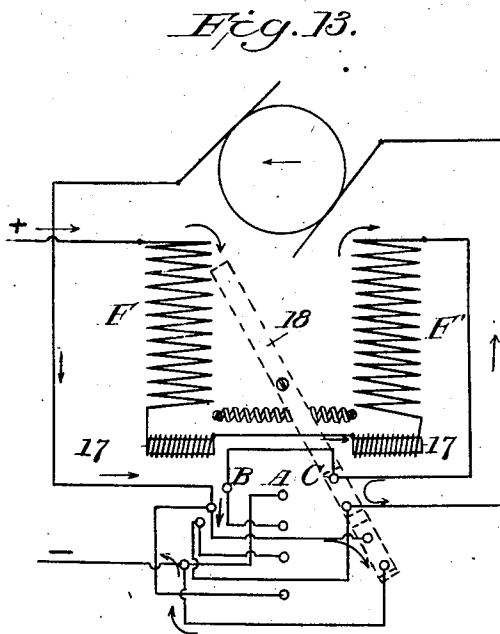
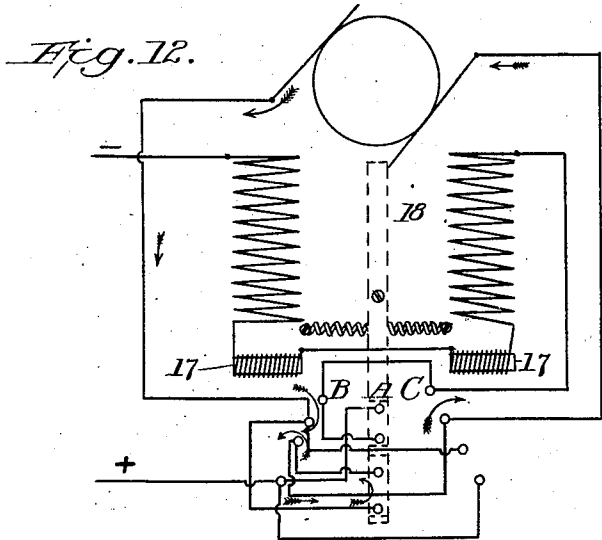
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5 SHEETS—SHEET 5



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UNITED STATES PATENT OFFICE.

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ASSIGNORS, BY MESNE ASSIGNMENTS, TO INDUSTRIAL MOTOR COMPANY, A COR-
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TELPHERAGE SYSTEM.

937,581.

Specification of Letters Patent.

Patented Oct. 19, 1909.

Application filed December 21, 1906, Serial No. 348,975. Renewed May 22, 1909. Serial No. 497,717.

To all whom it may concern:

Be it known that we, ORRIN J. DAVY and CARL W. DAUBER, citizens of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Telpherage Systems, of which the following is a specification.

This invention has relation to telpherage systems; and it consists in the novel construction and arrangement of its parts as hereinafter shown and described.

The object of the invention is to provide a system of the character indicated for automatic aerial transportation by the aid of electricity, especially a system in which carriages having independent motors are run upon a cable which in part serves as a conductor for the current from which motive power is derived. As is the usual practice in such systems a current conducting wire is arranged above the cable and the carriages are provided with trolley arms which have contact with the said current wire.

Heretofore great difficulty has been experienced in keeping the trolley of the carriage in contact with the current wire, especially so when the carriage is traveling at an excessive rate of speed and when going around curves in the load supporting cable. Such separation of the trolley from the current wire entails a vast amount of annoyance and delay and not infrequently accidents of more or less seriousness. This disarrangement of parts may occur and usually does occur at the most inaccessible point along the line, and as the disarranged apparatus is suspended in mid air and is unattended by operators, it is necessary to send out another carriage attended by operators and proper appliances for the purpose of properly arranging the parts of the disabled carriage or for towing the same to a repair terminal. The result of which is that the line is tied up which incurs loss of time and labor. Furthermore when a trolley jumps from a feed wire, the carriage will either stop as above indicated, or if upon an incline in the cable will be actuated by gravity to run at a greater or less rate of speed in the direction of inclination of the cable. Such inclination may be in the opposite direction in which the carriage was traveling

when under control, and consequently it may meet another carriage coming in the same direction and collide with the latter with consequent damage to both apparatus and freight, or should the incline be in the same direction as that in which the carriage was originally traveling, the carriage will continue to run in the same direction, but is absolutely beyond human control and may do damage before its flight is finally arrested.

In the present system it is impossible for the trolley to separate from the current wire, except at such times and places along the cable, as it is desirable that it should so separate. As such times and places are predetermined the operators may make calculations accordingly. Otherwise the trolley is in constant contact with the current wire and consequently the carriage is at all times practically under electric control.

Primarily the system includes an elevated carrying cable supported upon suitable poles or structure. A current wire is arranged above the said cable. The said cable and wire are connected electrically with an electric generator, and the said connections are provided with starting boxes and pole changers.

Each carriage comprises two motors arranged in tandem and having fixed fields with revolving armatures fixed to the motor shells. Said shells are provided with traction rings which travel upon the cable. A trolley arm of special construction is attached to each carriage. The trolley arm is vertically disposed with relation to the carriage and is provided at its upper portion with a rotatable elongated spool which has lateral contact with the current wire above. Each motor is provided with a relay, the tongue of which may assume three positions, two extreme and one intermediate. When in the extreme positions the tongue controls the course of the current through the motor, and when in the intermediate position the tongue controls the course of the local current generated by the motor. The movement of the tongue to the extreme position is accomplished by changing the polarity of the feed wires, while the movement of the tongue to the intermediate position is accomplished by spring tension. When the said

tongue is in one extreme position the motor armature rotates in one direction, and when the tongue is in the other extreme position the motor armature rotates in the opposite direction. When said tongue assumes the intermediate position, the outside current has been previously shunted through a suitable resistance to supply a reduced current to the motor field, and the local current is short circuited through the motor armature which converts the motor into an electric brake which checks the rotation of the armature thereof.

At curves in the line of the carrying cable a special arrangement of the current wire with relation to the carrying cable is made in order that the speed of the carriage may be automatically checked, and at the same time not diminished unnecessarily. Also provision is made for permitting the load carried by the carriage to continue to a limited degree in the general direction of the course of movement of the carriage while the carriage is making the turn, whereby the carriage is given lateral tilt or inclination. This movement of course disconnects the trolley from the current wire, but the said trolley immediately comes in contact with the same after the carriage has passed around the curve and again assumes a vertical position.

In case the momentum of the carriage in going around a curve is not sufficient to cause the same to tilt laterally as above indicated, the trolley will remain in contact with the current wire during the time that the carriage is passing around the curve.

In the accompanying drawings:—Figure 1, is a top plan view of the carrier. Fig. 2, is a side elevation of the same with parts in section. Fig. 3, is a vertical sectional view of one of the motors of the carrier. Fig. 4, is a transverse sectional view of the same. Fig. 5, is a vertical sectional view of the starting box used in the system. Fig. 6, is a diagrammatic view of a portion of the system and the carrier. Fig. 7, is a diagrammatic view of a system at a station thereof. Fig. 8, is a top plan view of the track cable showing a curve therein. Fig. 9, is a top plan view of the current wire showing a curve therein. Fig. 10, is a transverse sectional view of the cable and current wire at a curve showing a loop in the wire and the relative position of the carrier trolley. Fig. 11, is a transverse sectional view of the cable and current wire at a curve showing the carrier thereon in inclined position. Fig. 12 is a diagrammatic view of the wiring of the motor when the relay tongue (shown in dotted lines) is in one position. Fig. 13, is a diagrammatic view of the wiring of the motor illustrating the current passing therethrough in one direction, and Fig. 14, is a diagrammatic view of the wir-

ing of the motor illustrating the current passing therethrough in the opposite direction.

The system comprises the elevated track or cable 1, above which is arranged the current conducting wire 2. Said track and wire may be mounted upon suitable supports, the pattern or form of which forms no part of the present invention. The said current wire generally extends parallel with the track 1, the exceptions to which occur at curves and switches as will be hereinafter explained. In the present system the cable 1, forms a part of the conductor for the current in completing its circuit, and the said cable is therefore electrically connected with one pole of an electric generator 3, while the current wire 2, is electrically connected with the opposite pole thereof. The carrier 5, is arranged to travel upon the cable 1. Said carrier consists of a frame 6, having the fixed tubular shafts 7, 7. The said shafts pass through the centers of the motors 8, 8. Two motors are provided and arranged in tandem. As the motors are of the same construction and arrangement a description of one will answer for both.

Each motor consists of a shell 9, which is journaled for rotation upon the shaft 7, and is provided about its periphery with a traction ring 10, which is adapted to travel upon the track 1. The field 11, is fixed to the shaft 7, and consequently is retained against rotation, while the armature 12 is fixed to the shell 9, and rotates with the same. The commutator 13, is mounted upon the shaft 7, but is connected by means of the collar 14, with the shell 9, and rotates with the latter. The wires 15 electrically connect the commutator with the armature 12.

Located within the shell 9 of each motor is a relay which preferably consists of the magnet cores 17 connected with the field coils, and a tongue 18 located between said cores. The said tongue is preferably formed of a flat bar of metal pivotally mounted at one end and free to swing as a pendulum between the cores 17, said bar being permanently magnetized.

As shown in Fig. 3, of the drawings the tongue is pivoted to the post 19, and is provided at an intermediate portion with the elongated loop 20, which receives the shaft 7. The lower portion of the said tongue is provided with the bands or strips 21, and 22, which are insulated from each other. Three sets of points A, B, and C, are arranged within the path of the lower portion of the said tongue, and are connected with the various parts as will be hereinafter fully described in connection with the diagrammatic view of the drawings showing the courses of the electric current through the motors.

The trolley arm 23, is vertically mounted

upon the motor frame 6. The elongated spool 24 is journaled for rotation at the upper portion of the said arm, and is provided with the upper and lower ball bearings 25, 25, and the upper and lower peripheral flanges 26, 26. The conical hood 27 is mounted upon the upper end of the arm 24, and protects the bearings 25, 25, from the weather.

10 The pole changing switch 28, is connected with the electrical connections between the cable 1, and the wire 2. As said switch may be of any approved pattern, detail description of the same is not necessary here. The starting box 29, is also connected to said electrical connections. Said box is of special construction and is described as follows: It consists of a casing 30, within which is journaled a shaft 31. The inner end of the handle 32, is fixed to the said shaft 31, as is also the gear wheel 33. The shaft 34 is also journaled in the casing 30, and the gear wheel 35 is fixed to the said shaft 34. The gear wheels 33, and 35, are in mesh with each other. The tube 36, is pivoted upon the shaft 34, and is insulated from the same. The finger 37, is slidably mounted in the end of the tube 36, and the coil spring 38 is housed within the said tube and bears against the end of the finger 37. The tension of the said spring 38, is such as to hold the said finger in an extended position with relation to the said tube. The outer end of the finger 37, is provided with the beveled end 39. The bar 40, is pivoted within the casing 30, at the point 41. Said bar lies over the strip 42, and the resistance points 43, which are arranged in an arc parallel with the strip 42. The end of the bar 40, is provided with a lug 44, which lies in the path of the end of the pin 37. The bar 40 is also provided with a weight 45, and the upper face of the lug 44 is beveled as at 46. The dash pot 47, is pivotally mounted within the casing 30, and the piston rod 48 is pivotally connected at one end with the bar 40, and at its other end with the piston 49, which is slidably located in the dash pot 47. The piston 49, is provided with an orifice 50, through which air or other fluid may pass when the said piston is in motion. The socket 51, is located in the path of the handle 32, and the said handle when in its uppermost position enters the said socket. The said socket is electrically connected with either the current wire 2, or the cable 1, according to the position of the switch of the pole changer as is also the resistance points 43.

60 The object of providing a starting box as above described is to prevent the car or carrier from being started with a sudden jerk. The operator grasps the handle 32 and swings the said handle into the socket 51. At the same time the gear wheel 33, turns

upon the shaft 31, and the gear wheel 35 in mesh with the first said gear wheel also turns. Thus the tube 36, and the finger 37, are partially rotated about an axis. The end of the finger is under the lug 44, of the bar 40, and the said bar is consequently moved up along the strip 42, and the resistance points 43. As the tube 36, and the bar 40, are journaled upon different centers, the end of the finger 39 will describe an arc as indicated by the dotted line 53, while the end of the lug 44 will describe an arc as indicated by the dotted line 52. At or about the point 54, the end of the finger 39 will escape the end of the lug 44, and the weight 45 will come into play, and the bar 40 will move gradually down along the resistance points 43 and assume its lowermost position. In the meantime the handle 32 has entered the socket 51, and electric connection is made from the said socket along the handle 32, through the bar 40 with the electric connection connected with the resistance points 43. Thus the motor is started. When the handle 32 is swung away from the socket 51, the current is of course interrupted and the car or carrier will come to a stand-still. As the said handle 32 is carried down the beveled end 39 of the finger 37, will come in contact with the beveled face 46 of the lug 44, and the said finger 37 will be pushed back against the tension of the spring 38, until the end of the finger has passed below the lower edge of the lug 44, when the said spring will force the end of the said finger out under the lug 44, when the parts are in position to repeat the operation above described.

At stations the track 1, is provided with an insulation 55, and at a point a little farther on with an insulation 56, and at a point still farther on with an insulation 57. The current wire 2, is provided with an insulation 58, which is located over the insulation 55, and at a point over the insulation 57, with an insulation 59. The bridge wire 60, connects with the line wire 2, at points beyond the ends of the insulations 58, and 59, and the bridge wire 61, connects with the cable 1, at points beyond the ends of the insulations 55, and 57. A pole changing switch 62, is located at the station, and the wire 63 connects the line wire 2, at a point in advance of the insulation 58 with the said terminal of the said switch 62. The wire 64, connects the bridge wire 61 with one of the terminals of the switch 62. The wire 65 connects one of the terminals of the said switch 62, with the cable 1, at a point between the insulations 56 and 57, and the wire 66 also connects one of the terminals of the switch 62, with the line wire 2, at a point between the insulations 58 and 59 thereof. The wire 66 is provided with a resistance R and the terminals of said resistance are so arranged that they may be bridged by a

suitable switch 66'. The pole changing switch 62 is of any approved pattern, and as it forms no part of this invention its construction will not be described in detail here.

5 The track switch 67 leads away from the cable 1, and is provided with a pivoted tongue 68, which may be swung against the cable 1, for the purpose of running a carrier from the said cable upon the said switch. 10 It will be observed that at stations the current will be entirely cut off from the carrier between the insulations 55, and 56, and that between the insulations 56 and 57 the current may be sent to the motors of the carrier so that they may be operated in a forward or a rearward direction according to the manipulation of the pole changing switch 62. 15

As the load carried by the carrier is pend- 20 ent, the said carrier has a tendency to sway laterally when going around curves (as indicated by the dotted line in Fig. 8). For instance, if the trolley spool is engaging the left hand side of the wire and reaches a curve turning to the right, the weight of the 25 load tends to carry the latter in the straight direction, causing the carrier to swing out to the left and pressing the spool against the current wire with sufficient force to break the same. On the other hand, if the 30 trolley spool is engaging the right side of the wire and reaches a curve to the right the spool is caused to swing away from the wire and thereby interrupt the current passing to the motors, resulting in a reduction 35 of speed. Consequently at such curves the current wire is provided with loops 70, which pass transversely over the track 1 and permit the trolley spool to pass through, 40 whereby said spool is transferred from one side of the current wire to the other so that it will be free to swing away from the wire. Should the carrier come to a stop or slow down, the weight of the load thereof will 45 bring the trolley arm into an upright position, and the spool will again come in contact with the current wire, whereupon the current will be restored to the motors.

It is well known that the field coils possess magnetic power and this property of 50 the coils is taken advantage of in the operation of our improved motor. For instance, when the current is passing in the direction indicated in Fig. 13, the upper end of the 55 coil F has the same effect as the north pole of a magnet, and the lower end as the south pole. At the same time the upper end of coil F' corresponds to the south pole and the lower end to the north pole. Thus one of the 60 coils attracts and the other repels the arm 18 with the result that said arm is moved to the position indicated in said figure. In this position the lower portion of the said tongue will be in contact with the points C, 65 and the current will follow the course

through the motor as indicated in the arrows in the said figure. While it is perfectly obvious that the coils alone will possess sufficient magnetism to operate the arm 18, we prefer to connect the magnet cores 17 with 70 the field coils as shown in the drawings. When the current is reversed (by throwing the switch of the pole changer) the current passes through the coils in a direction opposite to that just described, changing the 75 poles of the magnets. As a result tongue 18 will assume the opposite position as shown in the dotted lines in Fig. 14, of the drawing. Thus the lower end of the said tongue is in contact with the points B, and the current is reversed through the fields of the motor as indicated by the arrows in the said figure. 80

When the carrier approaches a station, for instance, assume that it is passing from 85 left to right on the line as illustrated in Fig. 7, the current is cut off as the trolley passes between the points 55 and 56, and the fields being temporarily dead, the bar 18 will drop to the vertical position under the influence 90 of its springs. The momentum of the carrier, however, will convey it beyond the point 56, and if it is not intended to arrest the movement thereof, the switch 62 is swung so as to supply current between the 95 points 56 and 57, the resistance R being bridged by the switch 66', whereupon the fields are again energized and the arm 18 attracted to the position that will cause the motor to continue on its journey. If it is 100 desired to stop the carrier, however, switch 66' is shifted to shunt the current through the resistance R, with the result that the magnetic power of the coils F, F' is reduced sufficiently to be overcome by the spring acting 105 on arm 18, and the latter will assume the vertical position as shown in Fig. 12. The reduced current, nevertheless, is sufficient to have some effect upon the field coils, and the continued rotation of the armature converts 110 the motor into a generator. The arm 18 and its contacts short circuits the local current through the armature as indicated by the feathered arrows, Fig. 12, causing said armature to act as an electric brake, thus hav- 115 ing a tendency to bring the car quickly to a standstill.

Having described our invention, what we claim as new and desire to secure by Letters Patent is:— 120

1. In a system of the character described, a carrier having a depending portion, a motor for said carrier, a vertically arranged shaft, and a trolley spool axially mounted on said shaft and held in lateral contact with 125 a current wire by the action of said depending portion.

2. In a system of the character described, a carrier having a depending portion, a motor for said carrier, a vertically arranged 130

shaft, and an elongated trolley spool axially mounted on said shaft and held in lateral contact with a current wire by the action of said depending portion.

5 3. In a system of the character described, a carrier adapted to support a pendent load, a motor for said carrier, a vertically arranged shaft, a trolley spool axially mounted on said shaft, and a hood secured to the
10 free end of said shaft and disposed over the end of said spool, said spool being adapted for lateral contact with a current wire.

4. In a system of the character described, a carrier adapted to support a pendent load,
15 a motor for said carrier, a vertically arranged shaft, a trolley spool axially mounted on said shaft and adapted for lateral contact with a current wire, and a conical hood on the free end of said shaft and disposed
20 over the end of said spool.

5. In a system of the character described, a carrier, an electric motor for propelling the same, a tongue mounted to oscillate between the field coils of said motor for controlling the current of the same, and means
25 including the field coils of said motor for oscillating said tongue.

6. In a system of the character described a carrier, an electric motor for propelling
30 the same, a tongue mounted to oscillate between the field coils of said motor for controlling the current of the same, and means including the field coils of said motor for oscillating said tongue, and mechanical
35 means on said tongue and normally resisting the influence of said coils.

7. In a system of the character described, a carrier, an electric motor for propelling the same, a trolley mounted upon the carrier
40 for contact with the current wire, a relay mounted on the carrier and including an oscillating tongue, and means including the field coils of the motor for electrically moving the tongue of the relay to cause the
45 carrier to travel in opposite directions.

8. In a system of the character described, a carrier, an electric motor for propelling the same, a trolley mounted on the carrier for contact with the current wire, a relay
50 mounted upon the carrier and including an oscillating tongue, and means including the field coils of the motor for moving the tongue of the relay to extreme positions, and mechanical means for retaining the said
55 tongue in an intermediate position.

9. In a system of the character described, a carrier, an electric motor therefor, means for supplying current to said motor, a relay mounted on said carrier, means for reducing
60 the current passing to said motor, and means for operating the relay upon a reduction of the current to short circuit the armature of the motor upon itself, whereby a braking action is secured.

65 10. In a system of the character described,

a carrier, an electric motor therefor, means for supplying current to said motor, a relay mounted on the carrier, means for moving the relay to various positions whereby the motor is propelled forward or backward, 70 means for reducing the current passing to said motor, and means for operating the relay upon a reduction of the current to short circuit the armature of the motor upon itself, whereby a braking action is secured. 75

11. In a system such as described, a carrier, an incased motor for propelling the same, a trolley mounted upon the carrier for contact with a current wire, a relay housed within the motor casing and including an oscillating tongue and means for electrically moving the tongue of the relay to cause the motor to operate in opposite directions. 80

12. In a system such as described, a carrier, an incased motor for propelling the same, a trolley mounted upon the carrier for contact with a current wire, a relay housed within the motor casing and including an oscillating tongue and means for electrically moving the tongue of the relay to extreme positions, and mechanical means also within the motor casing for retaining the relay tongue in an intermediate position. 85

13. In a system of the character described, a carrier, an electric motor therefor, means for supplying current to said motor, a relay mounted on the carrier and including an oscillating tongue, means for reducing the current passing to said motor, and means for operating the tongue upon a reduction of the current to short circuit the armature of the motor upon itself, whereby a braking action is secured. 90

14. In a system of the character described, a carrier, an electric motor therefor, means for supplying current to said motor, a relay mounted on the carrier and including an oscillating tongue, means for moving said tongue to various positions, whereby the motor is propelled forward and backward, means for reducing the current passing to said motor, and means for operating said tongue upon a reduction of the current to short circuit the armature of the motor upon itself, whereby a braking action is secured. 115

15. In a system of the character described, a track, a carrier arranged to travel thereon and provided with a vertically arranged trolley, and a current wire extended along said track and provided with means for shifting the contact of said trolley from one side to the other of said conductor. 120

16. In a system of the character described, a track, a carrier arranged to travel thereon and provided with a trolley, and a current wire extended along said track and provided with loop portions to shift the trolley from one side of said wire to the other. 125

17. In a system of the character described, a track having a curve, a carrier arranged 130

to travel thereon and provided with a trolley, a current wire extending along the track and provided with means at said curves to shift the trolley from one side of said wire to the other.

18. In a system of the character described, a track, a carrier mounted to travel thereon and adapted to carry a pendent load, a vertically arranged trolley for said carrier, and a current wire extended along said track and provided with means for shifting said trolley from one side of said wire to the other.

19. In a system of the character described, a track having a curve, a carrier mounted to

travel thereon and provided with a trolley, a current wire extending parallel with the straight portion of said track and at the curve being out of parallel therewith, and means at said curves for shifting said trolley from one side of the current wire to the other.

In testimony whereof we affix our signatures, in presence of two witnesses.

ORRIN J. DAVY.
CARL W. DAUBER.

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