No. 779,612. PATENTED JAN. 10, 1905.

C. W. LARSON.

CABLE REEL.

APPLICATION FILED JUNE 1, 1903.

2 SHEETS—SHEET 1.

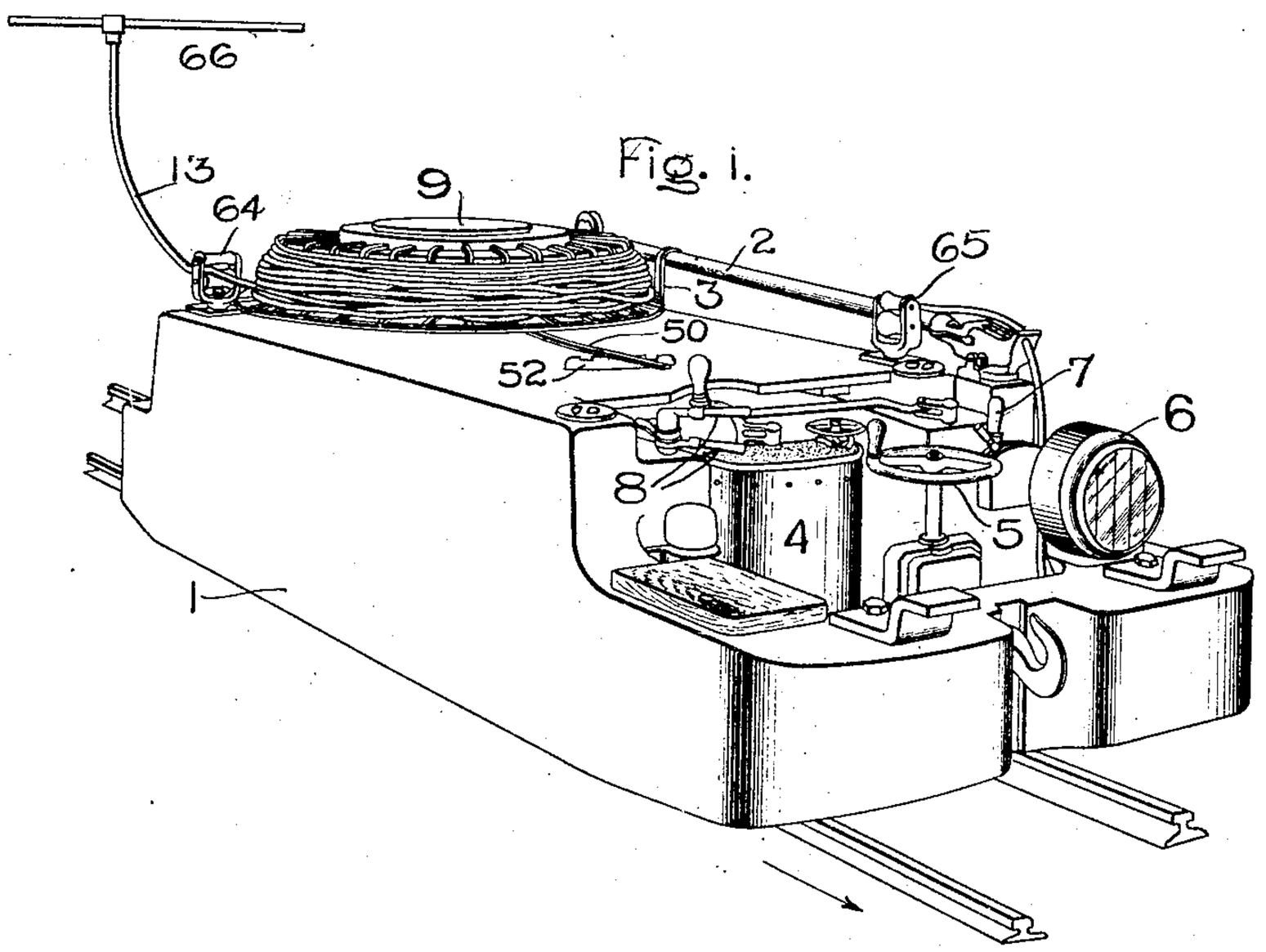

Fig. 1.

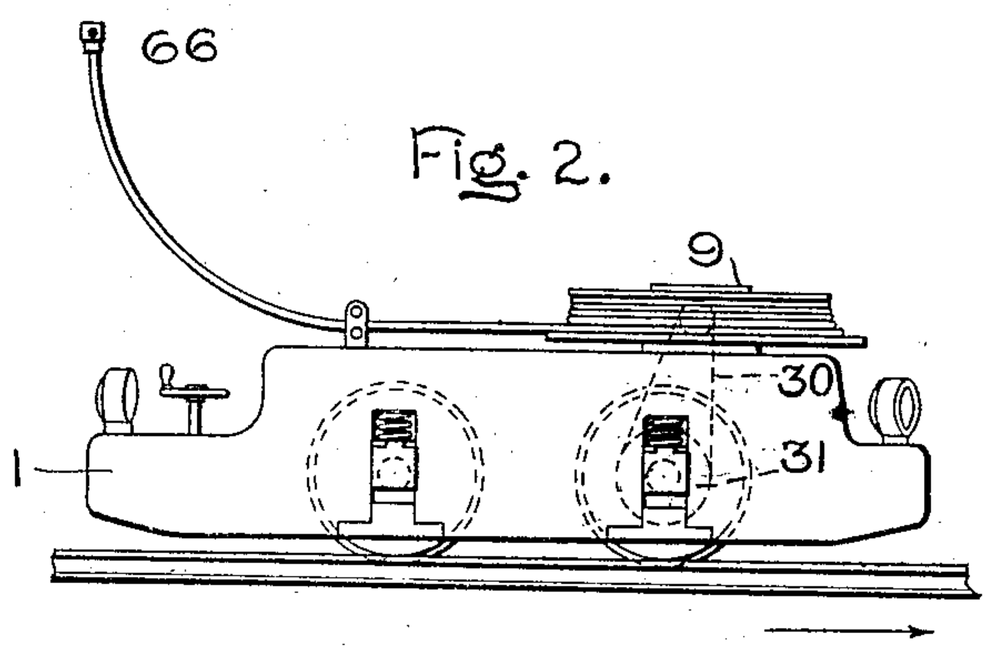

Fig. 2.

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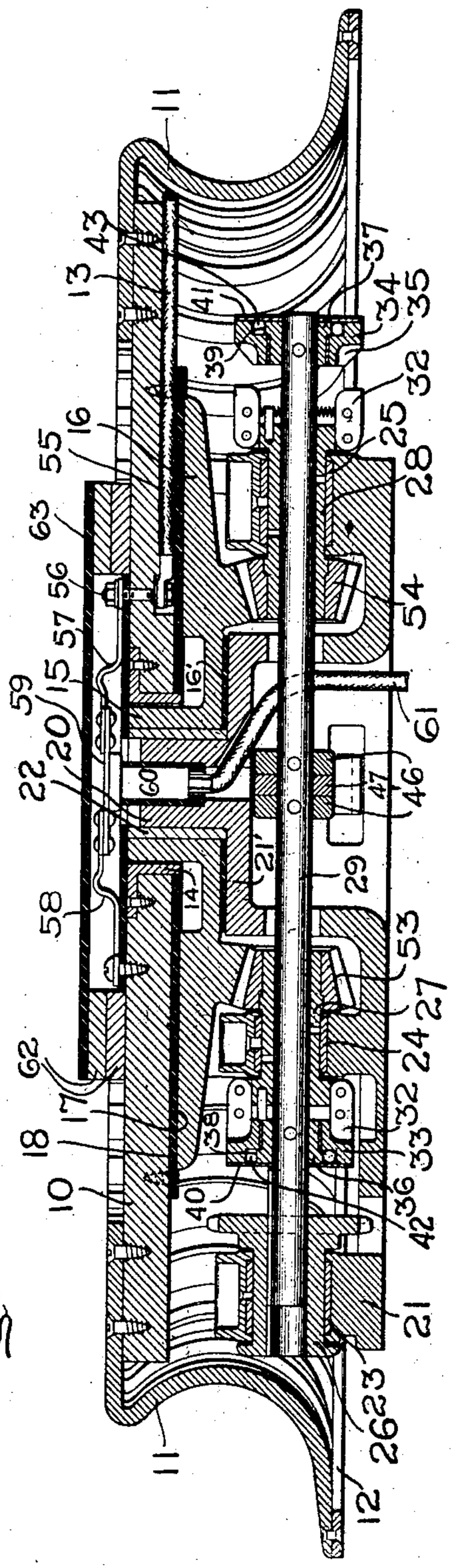

Fig. 3.

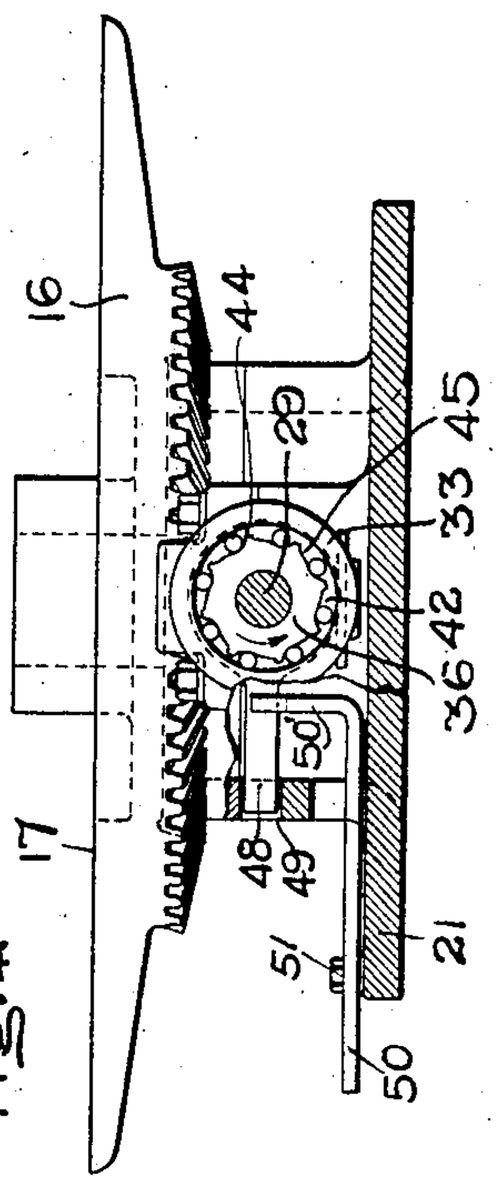

Fig. 4.

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No. 779,612. Patented January 10, 1905

UNITED STATES PATENT OFFICE.

CARL W. LARSON, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

CABLE-REEL.

SPECIFICATION forming part of Letters Patent No. 779,612, dated January 10, 1905.

Application filed June 1, 1903. Serial No. 159,421.

To all whom it may concern:

Be it known that I, CARL W. LARSON, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Cable-Reels, of which the following is a specification.

My invention relates to the construction of an improved form of mechanism for reeling and unreeling cable or the like.

In the particular embodiment of my invention which I have hereinafter illustrated and described my invention is applied to an electric mine-locomotive, although it will be obvious that all of the features of my invention are not limited to such application.

As is well known, the use of electric locomotives provided with some form of the familiar overhead underrunning trolley for the hauling of coal or the like in the main entries or branch headings of mines is quite extensive. These locomotives are not generally employed, however, for the "gathering" of cars from the working faces of the rooms of mines, owing to the difficulty and expense involved in the provision of suitable means for supplying current to the locomotives in these rooms.

One of the objects of my invention is the construction of suitable mechanism carried by the locomotive for reeling and unreeling a flexible conductor which is adapted to have one end connected to the controller-terminal and the other end to the trolley-wire or the like in the main entry or branch heading from which the room is an offshoot.

My invention consists of certain features of construction and arrangement pointed out in the claims annexed to and forming part of this specification.

For a better understanding of my invention reference may be had to the accompanying drawings, in which I have illustrated one embodiment of it.

Of the drawings, Figure 1 is a perspective view, and Fig. 2 is a side elevation, showing a mining-locomotive equipped with my cable-reel. Fig. 3 is a sectional elevation, showing details of the reel mechanism, and Fig. 4 is an elevation showing a portion of the reel mechanism with parts broken away and in section.

In the drawings I have conventionally illustrated a mining-locomotive 1 equipped with a trolley 2, which is shown as held in an inoperative position by a hook 3, a controller 4, a brake-wheel 5, headlight 6, circuit-breaker 7, and sand-box valve-levers 8. On the top of the locomotive and at its front end is placed a cable-reel or winding device 9.

The cable-reel proper consists of a disk 10, which may be formed of wood or other suitable material, and has secured to it at its periphery one end of each of a plurality of curved metal bars 11. The other end of each bar 11 is secured to a metal ring 12. The bars 11 are shaped to form a curved pulley-face, upon which the cable 13 is wound, as is clearly shown in the drawings. A metal bushing 14 passes centrally through the disk 10, and by means of it the disk 10 is swiveled about a tubular hub or boss 15, projecting from a driving member 16. The member 16 has an annular bearing-surface 17, against which the under side of the disk 10 rests. A friction-disk 18, of fiber or other suitable material, may be secured to the under side of the disk 10 in a position to bear against the surface 17 for a purpose hereinafter described. A tubular boss or hub 20, extending upward from a base or support 21, secured to the locomotive, forms a pivot upon which the member 16 is swiveled. The base or support 21 is also formed with an annular-shaped bearing-surface 21′, on which the driving member 16 rests. An annular friction member 16′, of fibrous or other suitable material, may be placed between the driving member and the surface 21′, as shown, for a purpose hereinafter described. A bushing 22, which may be formed of wood or other suitable material, is placed between the outer surface of the boss 20 and the inner surface of the collar 15.

Bearings 23, 24, and 25 are formed in suitable bosses or pillow-blocks carried by the base 21. Within these bearings tubular sleeves or members 26 27 28, respectively, are journaled. A shaft 29 passes interiorly through the mem-

bers 26 27 28. This shaft is adapted to move longitudinally through the tubular members and to turn loosely in the members 27 and 28. The member 26, however, is splined to the shaft. The member 26 carries at its inner end a series of sprocket-teeth which coöperate with a sprocket-chain 30, passing over a sprocket-wheel 31, carried by one of the axles of the locomotive, to rotate the member 26, and through it the shaft 29, when the locomotive moves. The members 27 and 28 each carry at their outer ends a set of flexible fingers 32. Each set of these fingers forms one member of a coupling device. Disks 33 and 34, respectively, are provided on their inner sides with pockets 35, into which the fingers 32, carried by the members 27 and 28, respectively, may alternately enter to make a positive coupling between the members 33 and 27 and 34 and 28, respectively. The disks 33 and 34, respectively, are journaled on collars 36 and 37, which in turn are pinned to the shaft 29. The collars 36 and 37 carry at their outer ends flanges 38 and 39, respectively, which prevent outward movement of the disks 33 and 34. Plates 40 and 41, secured to the outer faces of the disks 33 and 34, respectively, prevent movement in an inward direction of the disk.

The disks 33 and 34 and the collars 36 and 37 are shaped to form annular channels 42 and 43, which are clearly shown in Fig. 3 of the drawings. The flange 38 on the collar 36 is provided with a series of teeth 44, which project into the annular space 42. The periphery of the flange between adjacent teeth 44 is shaped to form curved pockets 45. In each of these pockets a steel ball is placed. The pockets 45 are so shaped that when the shaft 29 is rotated in the direction indicated by the arrow in Fig. 4 the balls which move to the rear of the pocket do not have a working engagement with the disk 33; but when the shaft rotates in the opposite direction the balls are wedged into the opposite end of the pocket and lock the disk 33 and the collar together.

The collar 39 differs from the collar 38 only in the fact that the pockets are shaped so that a rotation of the shaft 29 in the direction indicated by the arrow in Fig. 4 will cause a locking engagement between the disk 34 and the collar, while a rotation of the shaft in the opposite direction will not cause a rotation of the disk 34.

As is clearly shown in Fig. 3, the collars 36 and 37 are positioned on the shaft 29 so that only one of the tubular members 27 and 28 can be connected to the shaft at one time. A pair of washers 46 are secured to the shaft 29. A member 47, loosely mounted on the shaft 29 between the washers 46, has a projecting arm 48, which rests in a slot 49 in the support 21. A lever 50, pivoted at 51 to the support 21, having an inner upturned bifurcated end 50', the bifurcations of which straddle the arm 48, forms a means for shifting the arm 48 and through it the shaft 29. A bar 52, secured to the upper side of the locomotive, is formed with notches in which the projecting end of the lever 50 may rest to hold the shaft 29 in the position shown in Fig. 3 or in the position in which the member 28 is coupled to the disk 34 or in an intermediate position, in which neither of the disks 33 or 34 engage coupling-fingers 32. The inner ends of the tubular members 27 and 28 have secured to them bevel-gears 53 and 54, respectively, which mesh with bevel-teeth formed on the under side or the member 16, so that a positive rotation of either of the members 27 and 28 will cause a rotation of the member 16.

The inner end of the conductor 13 passes through the space existing between a pair of the bars 11 into a pocket 55, formed in the under side of the disk 10. At the inner end of this pocket the conductor is secured in place by a bolt 56, passing upward through the disk 10. This bolt also secures in place one end of a spring or finger 57, which may be formed of copper, brass, or the like. The spring or finger 57 and a plurality of similar springs or fingers 58, the outer ends of which are secured to the disk 10, carry at their inner ends a suitable contact plate or member 59, which may be formed of copper or other good conducting material. The under surface of the contact-plate 59 is held against the head of a contact member 60, formed of copper, brass, or the like, which is secured in and insulated from the tubular boss 20. A conductor or cable 61 extends from the contact member 60 to one of the terminals of the controller on the locomotive.

Annular pieces of wood 62 are placed on the upper side of the disk 10 in a position to surround the springs 58 and contact mechanism. A disk 63, formed of suitable insulating material, is placed on the upper side of the upper annular member 62 and coöperates therewith to inclose the contact mechanism.

Suitable guides 64 and 65 are placed on top of the locomotive at the front and rear, respectively, to receive the cable when it is paid out in one direction or the other.

Assuming that the locomotive is traveling away from one of the main passages of the mine toward a room in the direction indicated by the arrow, Fig. 1, the outer ends of the cable 13 will be secured or fixed to the trolley-wire or other conductor located in the main passage of the mine, as indicated at 66 in Figs. 1 and 2, and the lever 50 will be operated to connect the disk 33 with the member 27. When so connected, a rotation of the shaft 29, operated by the movement of the locomotive in the direction of the arrow, will not cause a rotation of the member 27. As a result the only thing resisting the rotation of the reel 9 as the locomotive moves along will be the friction between the disk 10 and the support 21,

and the parts can be so proportioned and so constructed that this friction will be just sufficient to give the proper amount of tension to the cable 13. As soon, however, as the locomotive starts to move in the opposite direction from that indicated by the arrow in Fig. 1 the member 27 will begin to rotate and will turn the member 16 and the disk 10 in the proper direction to wind up the cable 13. In order to obtain the proper amount of tension on the cable 13 as it is being wound up, the member 16 is geared to have a speed somewhat higher than would be necessary if the disk 10 and the member 16 were to turn together. This difference in speed may be as much as twenty-five per cent. As a result of this difference of speed a slipping takes place between the member 16 and the disk 10, and the tension on the cable 13 is regulated by the friction resisting this slipping between the member 16 and the disk 10. It will be observed that the frictional engagement between the member 16 and disk 10, which regulates the tension on the cable 13 as it is being wound up, is constant and not intermittent in action. The frictional engagement is gravity controlled, as it depends upon the weight of the disk 10 and parts carried thereby. This insures that the tension on the cable is substantially constant during the winding-up operation and not intermittent or dependent upon the flexibility of the cable.

When it is desired to move away from the fixed conductor in the direction indicated by the arrow in Fig. 2, in which case the opposite end of the locomotive is in advance from that in Fig. 1, the member 50 should be operated to move the shaft 29 in such manner as to cause an engagement between the fingers 32 and the sleeve 34. When so connected, the rotation of the shaft 29 produced by a movement of the locomotive in a direction indicated by the arrow in Fig. 2 will have no effect on the driving member 16, and the tension on the cable paid out will be regulated by the frictional resistance to the movement of the disk 10. When, however, the locomotive starts in the opposite direction from that indicated by the arrow in Fig. 2, the shaft 29 will rotate the member 16 in the direction to wind up the cable. It will be observed in this connection that the clutch mechanisms are arranged to cause a rotation of the member 16 in one direction only—namely, the direction necessary to give a winding movement to the disk 10.

Preferably the parts are so proportioned that the frictional forces tending to prevent slippage between the support 21 and the member 16 are about balanced by the frictional forces tending to prevent relative movement between the member 16 and the disk 10. This is due to the fact that the frictional forces tending to prevent relative movement between the support 21 and the member 16 must be at least great enough to insure a proper tension on the flexible member when it is being unwound, and any excess of such frictional forces requires an unnecessary waste of power in winding the cable up. The friction members 18 and 21 and the bushing 22 are employed to insure constant coefficients of friction between the various members. These parts are preferably made of fibrous material, as the necessity for lubrication, which tends to alter the frictional relations between the parts, is thereby avoided. By this construction a proper amount of tension is put upon the cable both on the paying out and winding up of the cable, and as the lever 50 is set to the proper position while starting into the room the motorman need pay no further attention to the cable-reeling mechanism upon starting back, since the mechanism takes care of itself automatically. It will of course be understood that with the construction described the rails on which the locomotive runs are intended to be the return-conductor of the system. This, however, is not an objectionable feature, since in practically all mines in which locomotives are employed iron or steel rails are now used instead of the wooden rails formerly in use. When, however, my cable-reel is to be employed upon a vehicle which does not use a ground or rail return, only slight modifications in the construction described are necessary to adapt it for the simultaneous manipulation of two or more conductors.

While I have described the best form of my invention which is now known to me, it is obvious that modifications in construction and arrangement may be made in the form of my invention without departing from the spirit thereof.

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

1. In combination, a movable vehicle, a winding device carried thereby, a flexible member having one end connected to the winding device and the other one secured at a fixed point, a driving member frictionally connected to said reel, means for causing a positive rotation of said driving member when the vehicle moves in a predetermined direction, and a frictional device resisting the movement of the driving member when the vehicle moves in the opposite direction.

2. In combination, a support, a driving member swiveled thereon, frictional means tending to prevent relative movement of the support and driving member, a winding member also swiveled on said support, and frictional means tending to prevent relative movement between the winding member and the driving member.

3. In combination, a movable vehicle, a reel or winding device carried thereby, said reel or winding device comprising a support fixed to the vehicle, a shaft mounted in said support,

means for causing a movement of the vehicle to rotate the shaft, a driving member mounted on said support, a winding member also mounted on said support, frictional connections between said support and said driving member and between said driving member and said winding member, and means by which a movement of the shaft in either direction can be made to cause a rotation of the driving member in a single direction.

4. In a device for winding up and unwinding a flexible conductor, a reel or winding member, a support upon which said reel or winding member is rotatably mounted, a contact or terminal carried by said support, a plurality of spring-fingers carried by said winding member, a contact plate or member pressed against said contact device by said flexible fingers, and means for electrically connecting one end of the flexible conductor with said contact plate or member.

5. In combination, a vehicle, a winding device carried thereby, gearing connecting one of the axles of the vehicle with the winding device, and means for changing said gearing so that a predetermined movement of the vehicle in either direction will cause a winding movement of the winding device.

6. In combination, a vehicle moving toward or away from a fixed point, a reel carried by the vehicle, a flexible conductor having one end attached to the reel and the other at the fixed point, a driving member in frictional engagement with the reel, means for operating the driving member when the vehicle moves toward the fixed point, and frictional means resisting the movement of the driving member in the opposite direction.

7. In combination, a vehicle, a reel carried thereby, a flexible conductor having one end secured to the reel and the other end adapted to be secured to a fixed conductor, a driving member in frictional engagement with the reel, and means for operating said driving member when the vehicle moves toward the point at which the end of the conductor is secured, the direction of movement of said driving member being independent of which end of the vehicle is pointed toward the point at which the end of the conductor is secured.

8. In combination, a pivoted cable-reel provided with a bearing-surface, a driving member pivoted concentrically with said reel and having a bearing-surface in frictional engagement with the bearing-surface of the reel, a support on which the driving member is mounted, means for producing a comparatively large amount of friction between the driving member and the support, a shaft, and means for connecting the shaft and the driving member so that a rotation of the shaft in one direction will cause a rotation of the driving member while a rotation of the shaft in the opposite direction will not cause a rotation of the driving member.

9. In combination, a support, a driving member pivoted thereon, means for producing a comparatively large amount of friction between the support and the driving member, a pivotally-mounted reel in frictional engagement with said driving member, and a cable having one end secured to said reel and the other end secured to a fixed support.

10. In combination, a movable vehicle, a cable-reel carried thereby, a flexible conductor on said reel, means for securing the outer end of said conductor to a fixed conductor, and means independent of the flexibility of the flexible conductor and operated by the vehicle for rotating the reel when the vehicle moves toward the fixed conductor, said means tending to run the reel at a higher rate of speed than is necessary to wind up the flexible conductor.

11. In combination, a movable vehicle, a reel carried thereby, a flexible conductor on said reel, the outer end of which is adapted to be secured at a point, the cable being wound up or unwound as the vehicle moves toward or away from the point, a driving device frictionally coupled to the reel, and means for operating said reel to cause the cable to be wound up as the vehicle moves toward the point, said means working at a speed which tends to turn the reel faster than is necessary to wind up the cable, and mechanism for preventing movement of the driving member when the vehicle moves in the opposite direction whereby a substantially constant tension is maintained on the flexible conductor when winding up and unwinding it.

12. In combination, a movable vehicle, a winding device carried thereby, and means by which a movement of the vehicle can be made to drive the winding device, said means including a clutch mechanism having two operative positions, said clutch mechanism operating in one of said operative positions to cause a movement of the vehicle in one direction only to exert a driving force on the driving device and in the other operative position to cause a movement of the vehicle in the opposite direction only to exert a driving force on the winding device.

13. In combination, a movable vehicle, a winding device carried thereby, and means by which a movement of the vehicle can be made to drive the winding device, said means including a clutch mechanism having two operative positions, said clutch mechanism operating in one of said operative positions to cause a movement of the vehicle in one direction only to exert a driving force on the driving device and in the other operative position to cause a movement of the vehicle in the opposite direction only to exert a driving force on the winding-device, the driving force in each case tending to operate the winding device in the same direction.

14. In combination, a support provided with

an annular bearing-surface and a cylindrical boss, a driving member journaled on said boss and resting against said bearing-surface, said driving member being also provided with an annular bearing-surface, and a winding member pivoted concentrically with said driving device and resting on the bearing-surface of said driving member.

15. In combination, a support provided with an annular bearing-surface, a cylindrical boss, a driving member journaled on said boss and resting against said bearing-surface, said driving member being also provided with an annular bearing-surface, a winding member pivoted concentrically with said driving device and resting on the bearing-surface of said driving member, a contact member carried by said boss, and another contact member carried by said winding member engaging the first-mentioned contact device.

16. In combination, a winding member, a driving member, a shaft member, a pair of alternately-operative clutch devices, and means connecting the clutch devices and the driving device to cause a rotation of the shaft so that when one of the clutch devices is operative a rotation of the shaft in one direction only will operate the driving member, the other clutch device when operative being arranged to cause a movement of the shaft in the opposite direction only to operate the driving member.

17. In combination, a rotatable shaft, a movable member, a pair of clutch devices, means for moving the shaft longitudinally to cause one or the other of the clutch devices to engage the driving member, one of said clutch devices being so arranged that when in the engaging position a movement of the shaft in one direction will cause a movement of the driving member and a movement of the shaft in the other will not cause a movement of the driving member, the other of said clutch devices being so arranged that when in the engaging position a movement of the shaft in the opposite direction will cause a movement of the driving member.

18. In combination, a support provided with a vertical boss, a horizontal bearing-surface, a driving member journaled on said boss and resting against said bearing-surface, a rotatable horizontal shaft journaled in said support and arranged to have longitudinal movement, a pair of sleeves mounted on said shaft, gearing connecting said sleeves and said driving member, and a means for connecting one or the other of said sleeves with the shaft as the shaft is moved from one longitudinal position to another longitudinal position.

19. In combination, a support, a driving member mounted on said support, frictional means tending to prevent relative movement between the driving member and the support, a winding member, frictional means tending to prevent relative movement of the winding member and the driving member, a shaft, and positive means for causing a rotation of the shaft in a predetermined direction to move the driving member, said means being inoperative to limit the movement of the driving member when the shaft rotates in the opposite direction.

20. In combination, a winding member, a driving member, a frictional connection between the two, positive means for causing a movement of the driving member in one direction, and frictional means resisting the movement of the driving member in the opposite direction.

21. In combination, a movable vehicle, a reel carried thereby, a flexible member having one end fixed and the other one secured to the reel, means for driving the reel in the direction to wind up the flexible member when the vehicle moves in one direction, said means tending to rotate the reel faster than is necessary to wind up the flexible member, and a frictional connection between said means and said reel.

22. In combination, a movable vehicle a, reel carried thereby, a flexible member having one end fixed and the other one secured to the reel, means for driving the reel in the direction to wind up the flexible member when the vehicle moves in one direction, said means tending to rotate the reel faster than is necessary to wind up the flexible member, a frictional connection between said means and said reel, and frictional means tending to prevent a movement of the driving means when the vehicle moves in the opposite direction.

23. In combination, a movable vehicle, a reel carried thereby, a flexible member having one end secured to the reel and the other one fixed at a point, a driving member for the reel, and means for moving it with a speed proportional to the speed of the vehicle as the vehicle moves toward the point at which the flexible member is secured, said driving means being arranged to drive the reel at a higher rate of speed than is necessary to wind up the flexible member, and a constantly-active frictional connection between the driving member and the reel to allow the necessary slippage between the driving member and the reel and to regulate the tension on a flexible member.

24. In combination, a vehicle, a winding device carried thereby, gearing by means of which a movement of the vehicle can be caused to operate the winding device, and means for changing said gearing so that a predetermined movement of the vehicle in either direction will cause a winding movement of the winding device.

25. In combination, a vehicle, a winding device carried thereby, means by which a movement of the vehicle can be made to operate the winding device, and mechanism for altering said means so that a movement of the vehicle in a predetermined direction will cause a wind-

ing movement of the winding device while the movement of the vehicle in the opposite direction will not cause a movement of the winding device.

26. In combination, a movable vehicle, a winding device carried by the vehicle, a driving member for operating the winding device, means for operating the driving member when the vehicle moves in a predetermined direction, and means resisting the movement of the driving member when the vehicle moves in the opposite direction.

27. In combination, a movable vehicle, a winding device carried thereby, a flexible member wound and unwound by said winding device, means tending to operate the winding device at a higher speed than is necessary to wind up the flexible member as the vehicle moves, and a constantly-active frictional operating engagement between the winding device and its operating means.

28. In combination, a movable vehicle, a winding device carried thereby, a flexible member wound up by said winding device as the vehicle moves, and means tending to operate the winding device at a higher speed than is necessary to wind up the flexible member, said means and winding device being so connected that a slippage may take place between them which will insure a proper speed of the winding device, said slippage being independent of the flexibility of the flexible member.

29. In combination, a movable vehicle, a winding device carried thereby, a flexible member on said winding device, means operated by the movement of the vehicle tending to rotate said winding device faster than necessary to wind up the flexible member, and a connection allowing a slippage between said operating means and said winding device, said connection being independent of the tension of the flexible member.

30. In combination, a movable vehicle, a winding device carried thereby, a flexible conductor on said winding device, means for securing the outer end of said conductor to a fixed conductor, and means tending to operate the winding device at a higher rate of speed than is necessary to wind up the flexible conductor when the vehicle moves toward the fixed conductor, said means comprising a frictional clutch, the members of which are forced together with a pressure which is independent of the tension of the conductor.

31. In combination, a movable vehicle, a driving member having a friction-surface mounted on said vehicle, a winding-reel having a friction-surface engaging with the friction-surface of said driving member, the weight of said winding-reel being carried by the driving member, and means for driving the driving member at a speed higher than that is necessary to wind up the conductor.

32. In combination, a movable vehicle, a winding device carried thereby, a flexible conductor on said winding device, means for securing the free end of said conductor to a fixed conductor, and means tending to run the reel faster than necessary to wind up the conductor when the vehicle moves toward the fixed conductor, said means comprising a friction-clutch, the members of which are held together by a substantially unvarying force which allows the slippage necessary to insure a proper feed of the flexible conductor.

33. In combination, a movable vehicle, a winding device carried thereby, a flexible conductor having one end secured to said winding device, means for securing the other end of said conductor to a fixed conductor, and means tending to operate the winding device at a higher rate of speed than is necessary to wind up the flexible conductor when the vehicle moves toward the fixed conductor, said means comprising a pair of members constantly held in frictional engagement with each other during said movement of the vehicle.

In witness whereof I have hereunto set my hand this 28th day of May, 1903.

CARL W. LARSON.

Witnesses:
BENJAMIN B. HULL,
HELEN ORFORD.