March 18, 1952 C. F. BALL 2,589,217

MINE SHUTTLE CAR

Filed June 5, 1945 4 Sheets-Sheet 1

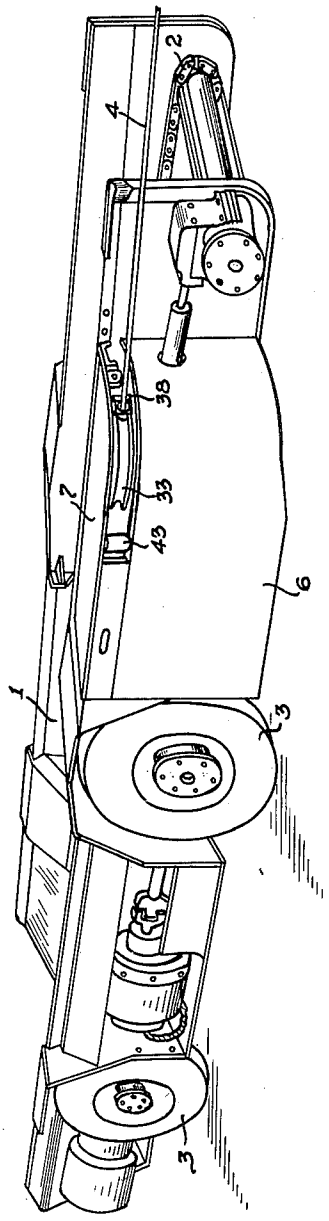


Fig. 1.

WITNESSES:
E. J. Maloney.
V. A. Peckham

INVENTOR
Charles F. Ball

BY
Brown, Critchlow & Flick
his ATTORNEYS.

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MINE SHUTTLE CAR

Filed June 5, 1945 4 Sheets-Sheet 2

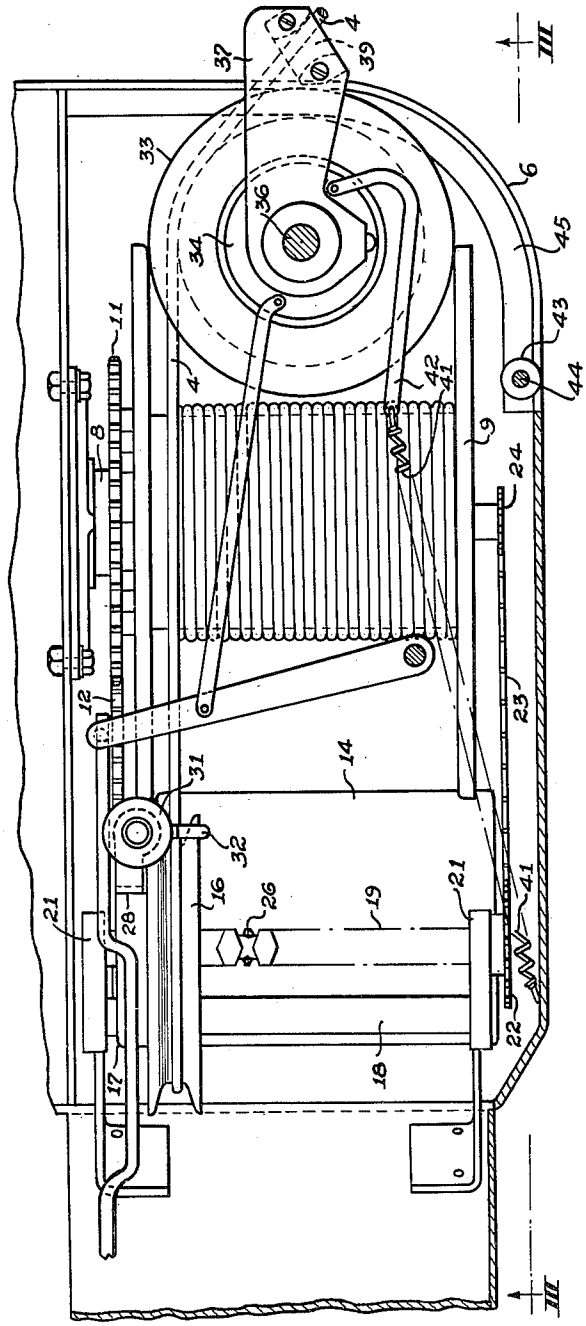


Fig. 2.

WITNESSES:
E. J. Maloney.
V. A. Peckham.

INVENTOR
Charles F. Ball
BY
Brown, Critchlow & Flick
his ATTORNEYS.

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MINE SHUTTLE CAR

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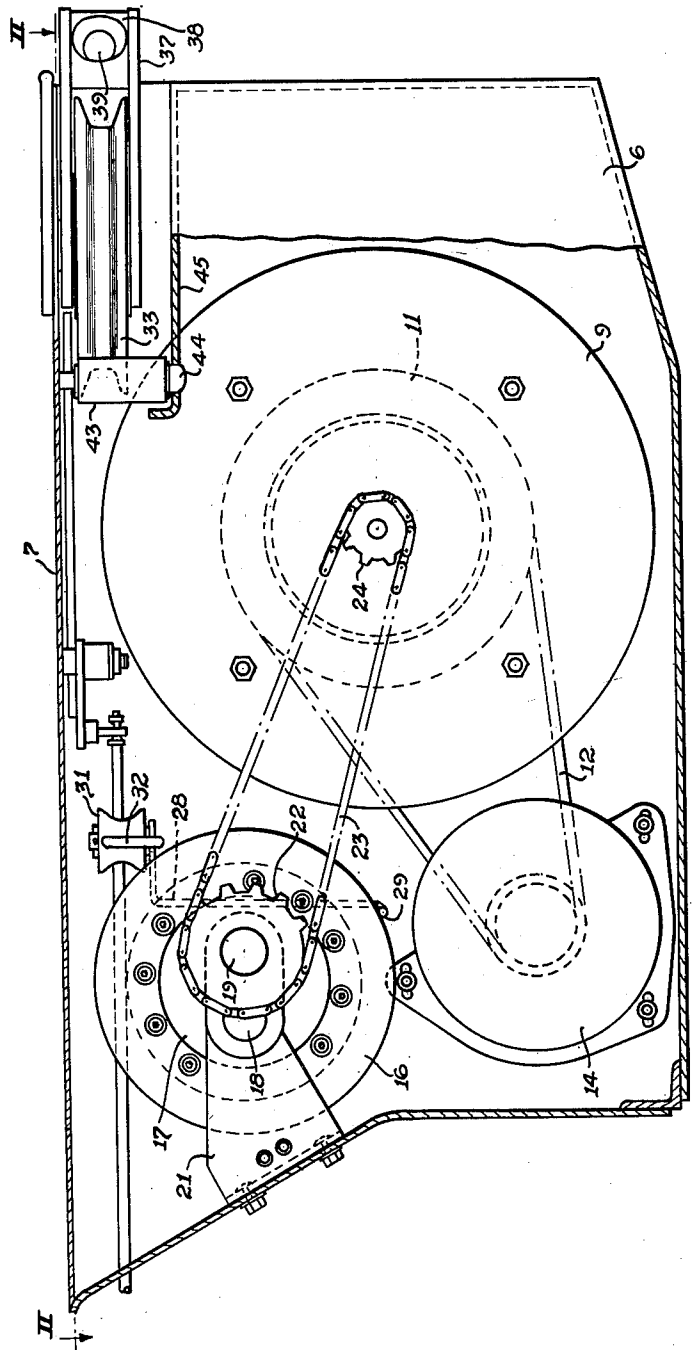


Fig. 3.

WITNESSES:
E. J. Maloney.
V. A. Perkham.

INVENTOR
Charles F. Ball
BY
Brown, Critchlow & Flick
his ATTORNEYS.

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MINE SHUTTLE CAR

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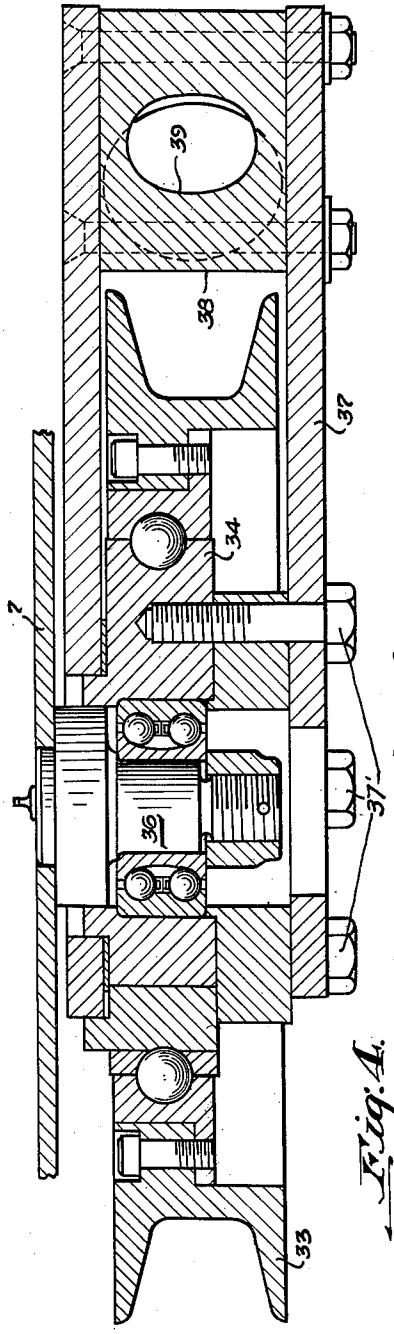


Fig. 4.

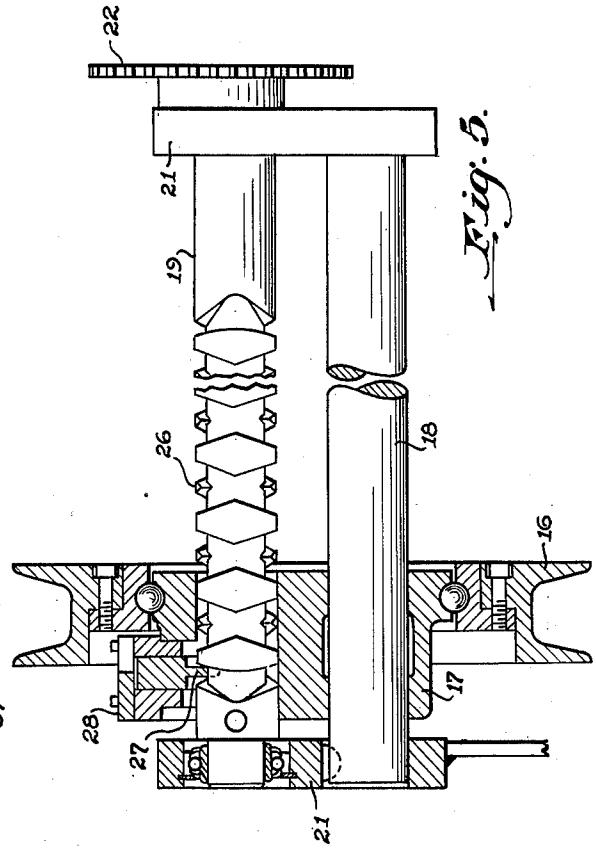


Fig. 5.

WITNESSES:
E. J. Maloney
V. A. Peckham

INVENTOR
Charles F. Ball

BY
Brown, Critchlow & Flick
his ATTORNEYS.

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UNITED STATES PATENT OFFICE

2,589,217

MINE SHUTTLE CAR

Charles F. Ball, Franklin, Pa., assignor to Joy Manufacturing Company, Franklin, Pa., a corporation of Pennsylvania

Application June 5, 1945, Serial No. 597,617

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This invention relates to electrically driven mine shuttle cars, and more particularly to the mechanism carried thereby for reeling in and paying out cables through which electric power is delivered to the cars.

Some mine shuttle cars are operated by power obtained from storage batteries which they carry. The electric driving motors of others are driven by current supplied through a long cable the outer end of which is connected to a power line in the mine. To keep this cable from being fouled or run over by the car, the slack in it is kept wound on a reel carried by the car. As the car moves away from the power line the reel pays out the cable, and as the car moves towards the point where its cable is connected to the power line the reel winds up the cable. To insure smooth winding of the cable on the reel it is customary to pass the cable through a spooler before it reaches the reel. In the past some cable reels and spoolers have been mounted on the sides of the shuttle cars between their front and rear wheels, but this restricts the capacity of the coal carrying portion of a car. To overcome this disadvantage some reels have been placed in front of the front wheels of shuttle cars beside the narrow unloading conveyors with which the cars are provided. In such cases a spooler is disposed in front of the reel. This arrangement is not suitable, however, when it is desired to place means in front of the spooler and reel for guiding the cable and for holding it away from the side of the car when the car travels forward past the point at which the cable is connected to the power line. The reason why the old arrangement is not suitable under such conditions is that space limitations require the guiding means to be placed close to the spooler so that at times the cable has to make too sharp an angle between the spooler and guiding means.

It is among the objects of this invention to provide a mine shuttle car in which cable guiding means is combined with a reel and a spooler all located at a front corner of the car, and in which the angle between the cable and the spooler is never too sharp.

In accordance with this invention a cable is rotatably carried by a front corner of an electrically driven mine shuttle car. An electric power cable, the outer or free end of which is adapted to be connected to a source of electric power in a mine, extends from the reel back to a spooler behind the reel and then forward past the reel to cable guiding means mounted in front

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of it. This cable guiding means preferably includes a pulley mounted on a vertical axis with means swingable around the pulley for holding the cable in the pulley groove and also for holding the cable away from the side of car. The spooler preferably comprises a spooling pulley and means for moving it back and forth lengthwise of the reel. With this arrangement there is a considerable distance between the two pulleys so that the cable does not have to pass around sharp corners. Yet, the entire mechanism can be mounted at the front of the car where it does not restrict the coal carrying capacity of the car.

The preferred embodiment of the invention is illustrated in the accompanying drawings in which Fig. 1 is a perspective view of a mine shuttle car; Fig. 2 is an enlarged plan view of the cable reeling apparatus with its housing cover removed; Fig. 3 is a side view of the apparatus, taken on the line III—III of Fig. 2; Fig. 4 is an enlarged vertical section through the cable guiding means; and Fig. 5 is an enlarged fragmentary horizontal section through the spooler.

Referring to Fig. 1 of the drawings, a mine shuttle car has a hopper-like body 1 through which an endless conveyor 2 extends for delivering coal from the car into mine cars or onto a conveyor belt. The body is mounted on a frame supported by four wheels 3 which are driven by electric motors. These motors obtain their power through an electric cable 4 that extends from the car to a main power line in the mine. This cable leaves the front of the car from one side of the narrow delivery end of conveyor 2.

Rigidly mounted on the car frame in front of the front wheel on the cable side of the car is a housing 6 in which there is apparatus for reeling the cable in and out. This housing includes a cover 7 that is hinged along its inner edge so that it can be swung upwardly. Projecting outwardly from the inner wall of the housing, as shown in Fig. 2, is a stub shaft 8 on which a cable reel 9 is rotatably mounted. The inner end of this reel carries a sprocket 11 that is driven by a chain 12 from a sprocket on the inner end of an electric motor 14 likewise mounted on the inner wall of the housing.

The length of cable not wound on the reel extends back around a spooler by which the cable is spooled onto the reel while being reeled in. The spooler includes a vertical spooling pulley 16 around which the cable extends. As

shown in Fig. 5, this pulley is rotatably mounted on a support 17 which is slidably mounted on a pair of laterally spaced shafts 18 and 19 parallel to the axis of the reel. The shafts are mounted in brackets 21 supported by the rear wall of the housing, one shaft 18 being stationary while the other is rotatably mounted in the brackets. The outer end of the rotatable shaft is provided with a sprocket 22 driven by a chain 23 from a sprocket 24 mounted on the outer end of the reel. This shaft 19 is provided with a diamond thread 26 engaged by an arcuate tooth 27 carried by the pulley support. Consequently, when the shaft is rotated the pulley support and the pulley carried thereby are moved back and forth along it like a shuttle. Support 17, which projects from one side of the pulley, carries an upright bar 28 that has a lateral projection 29 (Fig. 3) on its lower end and a spool 31 and hook 32 at its upper end for holding the cable in the pulley groove.

From the top of spooling pulley 16 the cable extends forward over the reel to the inner side of a horizontal guide pulley 33 rotatably mounted on a ring 34 which in turn, as shown in Fig. 4, is rotatably mounted on a vertical pin 36 whose upper end is connected to the housing cover 7. Fastened to ring 34 as by screws 37' is a bifurcated arm 37 that straddles the pulley and extends through a horizontal slot in the housing formed by omitting a part of the cover flange. The outer ends of the two parts of the arm are rigidly connected by a block 38 provided with a passage 39 through which the cable extends. The inner end of the arm is bolted to ring 34. The outer end of the arm is urged to swing toward the side of the car by means of a spring 41 (Fig. 2) connected to the outer wall of housing 6 and to a link 42 pivotally connected to ring 34. The cable supporting block 38 at the outer end of arm 37 therefore serves the double purpose of holding the cable in the groove of the guide pulley and of keeping the cable away from the side of the housing 6 at the point where the cable enters the housing. When the cable extends along the side of the housing, as is the case when the point of connection of the cable to the power line is behind the car, the cable may run across a vertical roller 43 rotatably mounted on a pin 44 extending downwardly from cover 7 adjacent the outer end of the cable slot in the housing. The lower end of this pin projects into a hole in a horizontal flange 45 on the inside of the outer wall of the housing, as shown in Fig. 3.

With the reeling apparatus disclosed herein it will be seen that the front guide pulley is spaced from the spooler by the intervening cable reel, so that even when the spooling pulley has traveled to the outer ends of its supporting shafts, the angle between the pulley and the portion of the cable leading to the guide pulley is not excessive. The spooling pulley keeps the cable from being bent too sharply in passing through the spooler wherein the cable has to make a reverse bend due to both the reel and the guide pulley being located in front of the spooler. It will be observed that the axis of rotation of the guide pulley 33 is in a plane perpendicular to the drum axis about midway between the ends of the latter, and that, in the interest of economy of space, the front edges of the drum flanges lie about below the middle of the guide pulley—substantially forward of the rearmost edge of the latter. Moreover, though the pulleys and the drum portion of the reel are of comparable diameters, still the rearmost point on the spooling pulley 16 is much less distant from the foremost point in the cable guiding pulley than the sum of the overall diameters of the drum and the two pulleys. Nearly half of the cable guide pulley is to the rear of a vertical plane tangent to the front points in the reel flanges, and this, with the closeness of the spooler pulley to the reel in the rear enables the cable-saving but also limited space-accommodating construction of my invention. Because each of the pulleys and the reel drum are of similar diameters bending of the cable on a materially shorter radius at one of the same than at the others is avoided.

According to the provisions of the patent statutes, I have explained the principle and construction of my invention and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. The combination with an electrically driven mine shuttle car having an electric power cable connected thereto, of a cable reel rotatably carried by a front corner of the car, cable guiding means mounted in front of the reel, and a spooler mounted behind the reel, said cable extending from the reel back to the spooler and then forward past the reel to said guiding means with the free end of the cable adapted to be connected to a source of electric power, and said reel and said guiding means so arranged on said car that the forwardmost point in the reel is substantially forward of the rear of said guiding means.

2. The combination with an electrically driven mine shuttle car having an electric power cable connected thereto, of a cable reel rotatably carried by a front corner of the car, cable guiding means mounted in front of the reel, and a spooler mounted behind the reel, said cable extending from the reel back to the spooler and then forward past the reel to said guiding means with the free end of the cable adapted to be connected to a source of electric power, and said reel and said guiding means so proportioned and so arranged on said car that the guiding means is substantially bisected by a plane midway of and perpendicular to the reel axis and that said guiding means lies in substantial part to the rear of a transverse vertical plane extending at right angles to the longitudinal center line of said car and tangent to the forwardmost points in said cable reel.

3. The combination with an electrically driven mine shuttle car having an electric power cable connected thereto, said car having a cable side, of a cable reel rotatably carried by the front corner of the car at the cable side of the latter, cable guiding means mounted in front of the reel including a cable guiding pulley rotatable on an upright axis and with its periphery close to said cable side of the car for guiding said cable as it is passed back along such cable side as well as when said cable passes forwards, a spooling pulley mounted behind the reel, and means for moving the spooling pulley back and forth lengthwise of the reel, said cable extending from the reel back around said spooling pulley and then forward past the reel to the side of said guiding pulley more remote from the cable side of the car, with the free end of the cable adapted to be connected to a source of electric power, each of said

pulleys and said reel being of similar diameters whereby bending of the cable an a materially shorter radius at one of the same than at the others is avoided.

4. The combination with an electrically driven mine shuttle car having an electric power cable connected thereto, of a cable reel rotatably carried by a front corner of the car for turning on an axis transverse to the longitudinal center line of the car, cable guiding means mounted in front of the reel including a cable guiding pulley rotatable on an upright axis, a spooling pulley mounted behind the reel, and means for moving the spooling pulley back and forth lengthwise of the reel, said cable extending from the reel back around said spooling pulley and then forward past the reel to said guiding pulley with the free end of the cable adapted to be connected to a source of electric power, said reel and pulleys so arranged upon said car that the rearmost point in said spooling pulley is nearer the foremost point in said cable guiding pulley than the sum of the overall diameters of said drum and said pulleys.

5. The combination with an electrically driven mine shuttle car having an electric power cable connected thereto, of a cable reel rotatably carried by a front corner of the car, cable guiding means mounted in front of the reel including a pulley rotatable on an upright axis, a spooling pulley mounted behind the reel and on a horizontal axis higher than the axis of said reel, said first pulley having its axis, as regards position crosswise of said car, near the longitudinal center of said reel, means for moving the spooling pulley back and forth lengthwise of the reel and, when so moving, bodily relatively to said cable guiding means, said cable extending from the reel back around said spooling pulley and then forward above and past the reel to said guiding means with the free end of the cable adapted to be connected to a source of electric power, and means movable with the spooling pulley for holding the cable in the pulley groove, said last mentioned means including a spool also rotating on an upright axis and from which the cable extends directly to said cable guiding means.

6. The combination with an electrically driven mine shuttle car having an electric power cable connected thereto, or of a cable reel in the form of a flanged drum and rotatably carried by a front corner of the car, cable guiding means mounted in front of the reel including a guide pulley rotating on a vertical axis substantially midway of the length of the reel, a spooling pulley mounted behind the reel, means for moving the spooling pulley back and forth lengthwise of the reel, said cable extending from the reel back around said spooling pulley and then forward past the reel to said guiding means with the free end of the cable adapted to be connected to a source of electric power, and means movable with the spooling pulley for holding the cable in the pulley groove, each of said pulleys and said reel drum being of similar diameters whereby bending of the cable on a materially shorter radius at one of the same than at the other is avoided.

7. The combination with an electrically driven mine shuttle car having an electric power cable connected thereto, of a cable reel in the form of a flanged drum rotatably carried by a front corner of the car, a cable guiding pulley mounted in front of the reel to rotate on a vertical axis and so disposed that the reel flanges extend substantially forwardly of the rearward edge of said cable guiding pulley, a guide shaft mounted behind the reel substantially parallel to its axis, a pulley support slidably mounted on said shaft, means for moving said support back and forth along the shaft, and a spooling pulley rotatably mounted on said support and movable therewith, said cable extending from the reel back around said spooling pulley and then forward past the reel to said guiding pulley with the free end of the cable adapted to be connected to a source of electric power.

8. The combination with an electrically driven mine shuttle car having an electric power cable connected thereto, of a cable reel rotatably carried by a front corner of the car, cable guiding means mounted in front of the reel, a guide shaft mounted behind the reel substantially parallel to its axis, a pulley support slidably mounted on said shaft, means for moving said support back and forth along the shaft, and a spooling pulley surrounding said shaft and rotatably mounted on said support upon an axis offset from the axis of said shaft and movable with said support, said cable extending from the reel back around said pulley and then forward past the reel to said guiding means with the free end of the cable adapted to be connected to a source of electric power.

9. The combination with an electrically driven mine shuttle car having an electric power cable connected thereto, of a cable reel rotatably carried by a front corner of the car, cable guiding means mounted in front of the reel, a guide shaft mounted behind the reel substantially parallel to its axis, a pulley support slidably mounted on said shaft, a diamond threaded shaft parallel to said guide shaft and extending through said support in threaded engagement therewith, means for rotating said threaded shaft to move said support back and forth along both shafts, and an annular spooling pulley rotatably mounted on said support and movable therewith and surrounding both of said shafts, said cable extending from the reel back around said pulley and then forward past the reel to said guiding means with the free end of the cable adapted to be connected to a source of electric power.

10. The combination with an electrically driven mine shuttle car having an electric power cable connected thereto, of a cable reel rotatably carried by the car, a guide shaft mounted adjacent the reel substantially parallel to its axis, a pulley support slidably mounted on said shaft, a diamond threaded shaft parallel to said guide shaft and extending through said support in threaded engagement therewith, means for rotating said threaded shaft to move said support back and forth along both shafts, and a spooling pulley rotatably mounted on and movable with said support and having a bearing thereon inside of which both of said shafts extend, said cable extending from the reel around said pulley and having the free end thereof adapted to be connected to a source of electric power.

11. The combination with an electrically driven mine shuttle car having an electric power cable connected thereto, of a cable reel rotatably carried by a front corner of the car, a single cable guide pulley mounted with its axis vertical in front of the reel, a spooler mounted behind the reel, said cable extending from the reel back to the spooler and then forward past the reel to said guide pulley with the free end of the cable adapted to be connected to a source of electric power, and means for holding the cable in the pulley groove.

12. The combination with an electrically driven mine shuttle car having an electric power cable connected thereto, of a cable reel rotatably carried by a front corner of the car, a cable guide pulley mounted with its axis vertical in front of the reel, a spooler mounted behind the reel, said cable extending from the reel back to the spooler and then forward past the reel to said guide pulley with the free end of the cable adapted to be connected to a source of electric power, and means for holding the cable in the pulley groove variably positionable, by the action of the cable thereon, relative to the pulley as the direction at which the cable is led off from the pulley changes.

13. The combination with an electrically driven mine shuttle car having an electric power cable connected thereto, of a cable reel rotatably carried by a front corner of the car, a cable guide pulley mounted with its axis vertical in front of the reel, a spooler mounted behind the reel, said cable extending from the reel back to the spooler and then forward past the reel to said guide pulley with the free end of the cable adapted to be connected to a source of electric power, and an arm rotatably mounted on the axis of the pulley and projecting beyond the periphery thereof, the outer end of the arm being provided with a passage through which the cable extends.

14. The combination with an electrically driven mine shuttle car having an electric power cable connected thereto, of a cable reel rotatably carried by a front corner of the car, a cable guide pulley mounted with its axis vertical in front of the reel, a spooler mounted behind the reel, said cable extending from the reel back to the spooler and then forward past the reel to said guide pulley with the free end of the cable adapted to be connected to a source of electric power, and an arm rotatably mounted on the axis of the pulley and projecting beyond the periphery thereof, the outer end of the arm being provided with a passage through which the cable extends and the length of said arm and the location of the axis of said pulley being such that said passage, when said arm extends substantially at right angles to the side of the shuttle car, is close to the side of said car.

CHARLES F. BALL.

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