C. J. EASTMAN.

CABLE POWER.

APPLICATION FILED APR. 22, 1907.

900,060.

Patented Sept. 29, 1908.

2 SHEETS—SHEET 1.

Fig. 1.

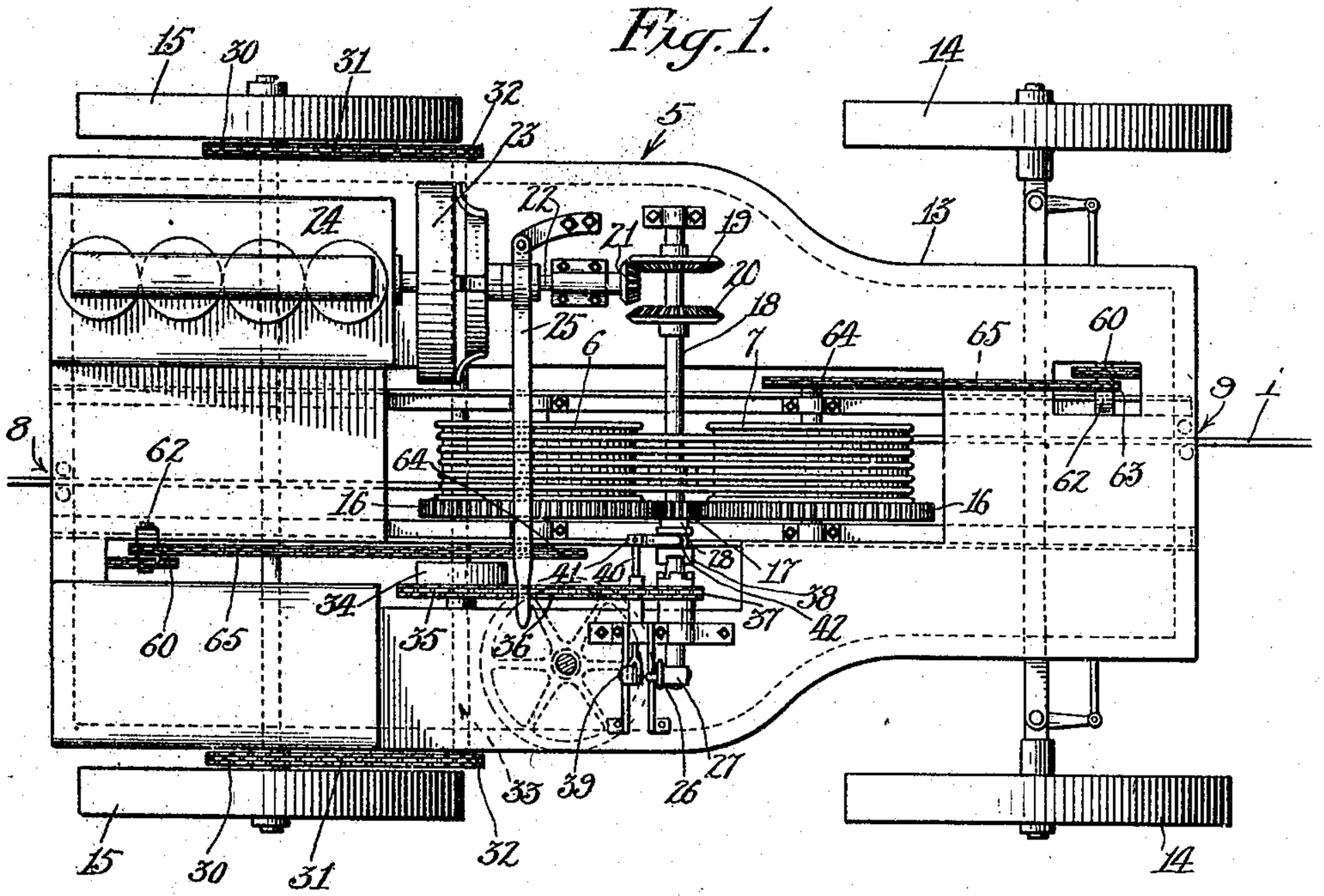


Fig. 3.

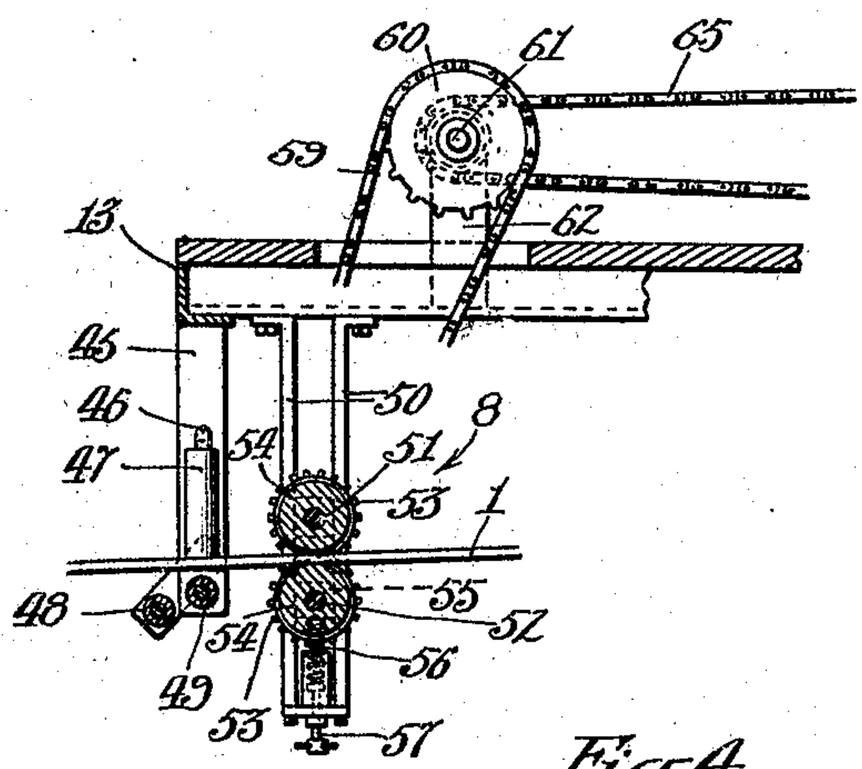


Fig. 4.

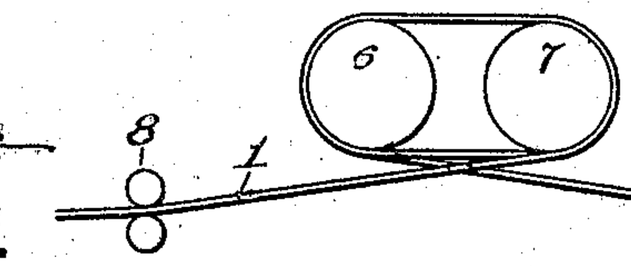
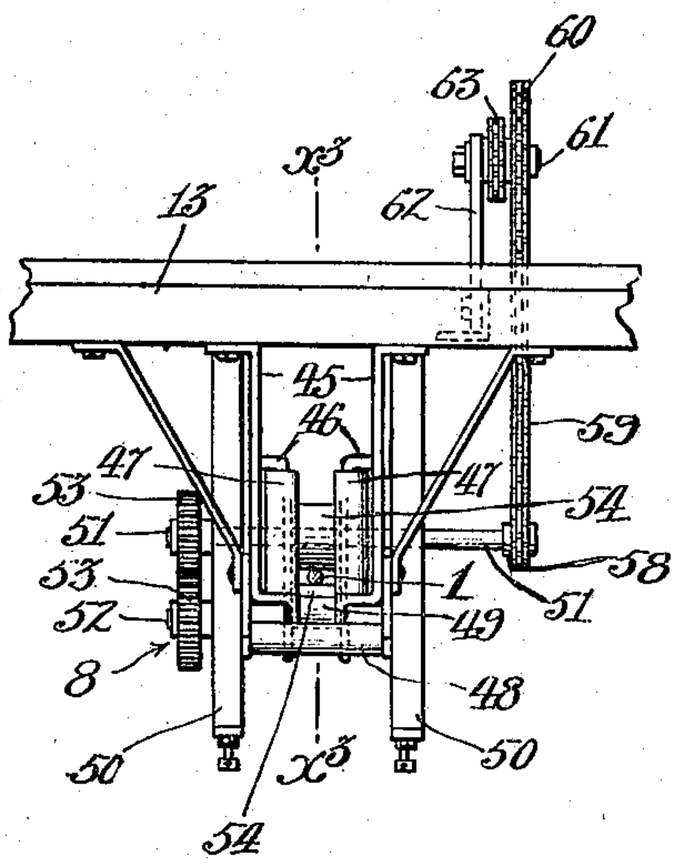


Fig. 2.



Witnesses:—

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2 SHEETS—SHEET 2.

Fig. 5.

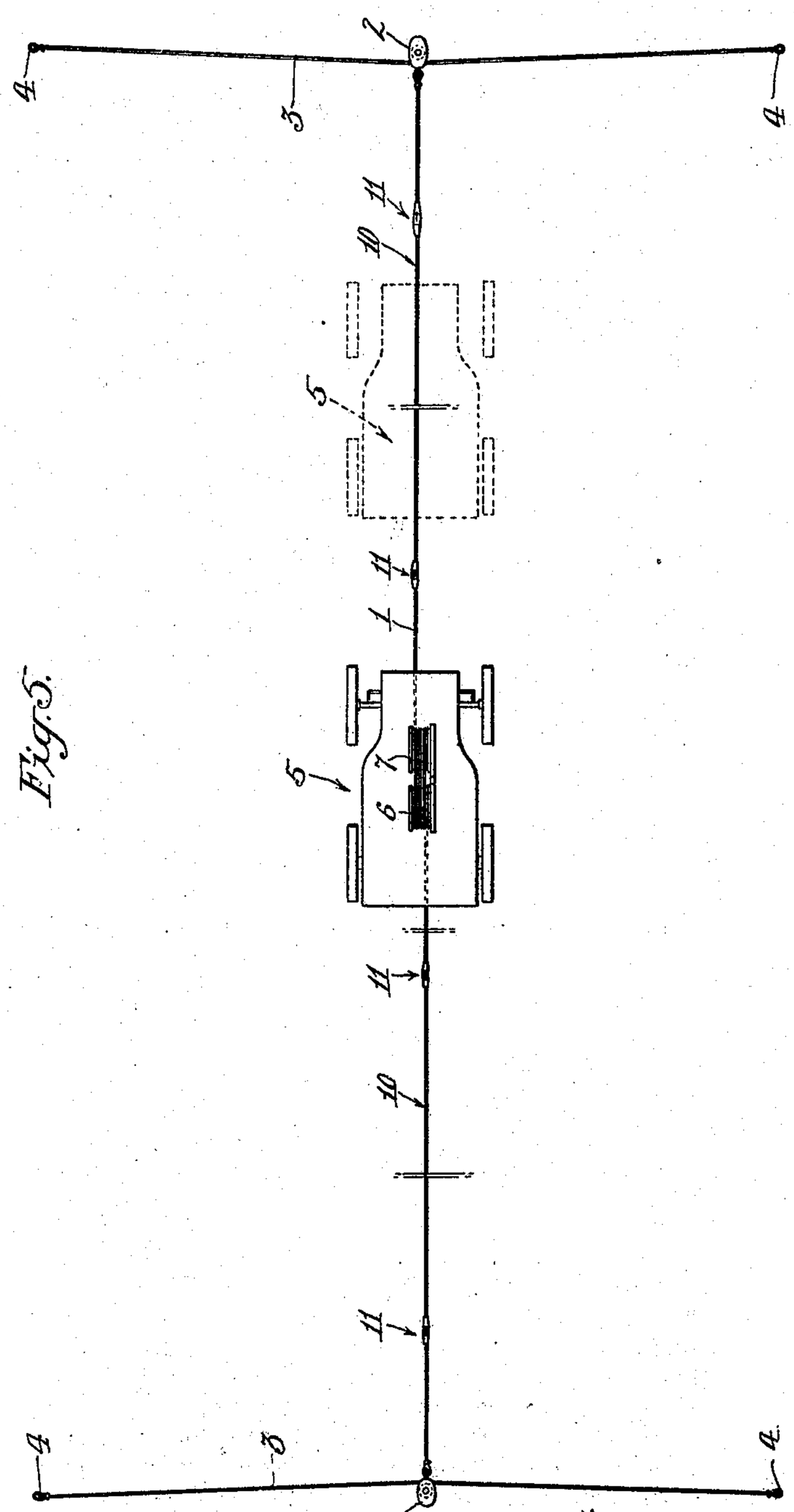


Fig. 6.

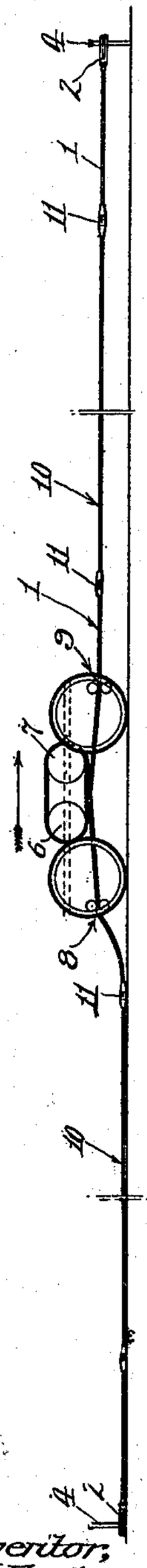
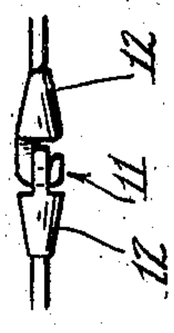


Fig. 7.



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UNITED STATES PATENT OFFICE.

CLYDE J. EASTMAN, OF LOS ANGELES, CALIFORNIA.

CABLE-POWER.

No. 900,060. Specification of Letters Patent. Patented Sept. 29, 1908.

Application filed April 22, 1907. Serial No. 369,709.

To all whom it may concern:

Be it known that I, CLYDE J. EASTMAN, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Cable-Power, of which the following is a specification.

This invention relates to propulsion of a car or vehicle obtained by means of a drum carried on the car or vehicle which has a winding engagement with an inert cable. In a previous patent of mine No. 681,632 of August 27, 1901, is shown a device of this character, and the object of the present invention is to provide improvements in the same, the main object being to provide means whereby the car or vehicle may be turned around near each cable terminal and propelled back over the cable and permit the front end of the car to always be in the lead when the car is traveling over the cable in either direction, thus enabling the steering to be easily performed. In the patent referred to, the machine is propelled forward in going over the cable in one direction and the machine is propelled backward in going over the cable in the opposite direction, and in the reverse movement of the machine the steering of the machine is difficult of performance.

Another object is to provide means for maintaining that portion of the cable which is in the car under a steady tension, so that the coils of cable on the drums are kept in place and slippage or rearrangement of coils is avoided.

Referring to the drawings:—Figure 1 is a plan view of the machine. Fig. 2 is an enlarged end elevation of one tension device and the adjacent portion of the machine. Fig. 3 is a section on line x^3—x^3 Fig. 2. Fig. 4 is a diagrammatical view illustrating the circuit of the power cable over the drums and through the tension devices, and illustrates the taut connection of the cable between the tension devices and drums. Fig. 5 is a plan view of the stay cables and power cable, showing the arrangement thereof as in practical operation, the machine being shown diagrammatically in position. In this view the length of the power cable is greatly reduced to bring the stay cables into the view. Fig. 6 is a side elevation of the feature shown in Fig. 5. Fig. 7 is an enlarged side elevation in detail of a coupling for the separable links.

Referring to Fig. 5, 1 designates the power cable along which the machine, about to be described, is adapted to travel. The power cable 1 is an inert cable, *i. e.*, it has no active linear movement, but is capable of being moved laterally automatically to permit of the machine traversing the field in different paths, each end of the cable 1 having a trolley 2 which rides along its associated stay cable 3, there being a stay cable arranged at each end of the field at right angles to the general direction of the power cable 1. Each stay 2 is stretched between stakes 4. In the drawings there are but two stakes shown for each stay cable, but in practice each end of the field will be provided with a series of permanent stakes 4, so that the stay cables 3 can be shifted along to enable the operation to extend over a wide area of field without necessitating the employment of long stay cables, which otherwise would be required to stretch over the extreme width of the field and would be liable to sag. Each stay cable is located, for example, about a foot from the ground.

5 designates the machine in general, which is provided with power drums 6 and 7 over which the power cable is wound. Near each end of the machine are tension devices 8 and 9, the latter being located at the front end of the machine, but both tension devices are similar in construction. Near each terminal of the power cable 1 a separable section or cable link 10 is provided, each link being coupled at each end to the power cable by a hook and eye connection 11 shown in detail in Fig. 7. Each member of the hook and eye has a conical shank 12 which joins the cable so that the enlargement in the cable, formed by the coupling, tapers gradually to the cable. This enables smooth working of the tension devices and drums along the cable.

The length of the link 10 is somewhat greater than the linear length of the cable required to pass through the circuit in the machine from one tension device around the drums to the other tension device, so that when the machine is wholly on a link 10, as indicated in dotted lines in Fig. 5, no part of the main portion of the power cable 1 is in engagement with the machine. With the machine in this position, by uncoupling the link 10 at both ends the machine may be turned around carrying the link with it and headed in the other direction ready to traverse the field again, the reversed link having first been coupled into place in the power cable. It

will be seen that this feature enables the machine to be propelled head on when traversing the field in either direction, the separable links permitting the machine to be readily turned around and obviating the rearward propulsion of the machine in which steering is difficult, or the alternative of swinging the entire power cable around end for end as the machine is turned around, which reversal of the entire power cable would be impracticable and consume much time.

It will be noted from Fig. 6 that the portion of the cable which is in front of the machine is under tension, as the machine moves ahead, while that portion of the cable behind the machine is slack and lies on the ground. In actual use where there is a long length of cable ahead of the machine, a considerable portion of the tension end of the cable will sag to the ground, as the tension produced on it by the machine is not sufficient to swing the cable taut on account of the weight of the cable, but as the machine approaches the stay cable and the intermediate part of the power cable which is under tension becomes shorter, less of it will rest on the ground, and when the machine approaches sufficiently close to the stay cable, as indicated in Fig. 6, the tension will be sufficient to lift the cable clear of the ground.

The machine is steered independently of the power cable, not being restricted to follow an absolutely straight line, and when the machine is steered to the right or left of the line of the power cable it will result in gradually swinging the head portion of the power cable laterally, the trolley of that section sliding along the stay cable. This rolling action of the trolley may not take place for a slight deviation of the machine where there is a long length of cable between the trolley and the machine, but when the tension between the trolley and cable is sufficient and when the deviation of the machine is sufficiently great the trolley will shift automatically. In all cases, however, the machine can be steered within a wide latitude, the trolley permitting the cable to automatically shift to suit the position of the machine.

While only two links have been shown, one being arranged at each end of the field, it is obvious that other similar links may be inserted in the power cable at various points which will enable the machine to be turned around at points other than at the extreme ends of the field. In fact the entire power cable might consist of these links to enable the machine to be reversed at practically any point on the power cable, one of the main objects in reversing the machine being to facilitate the steering.

Referring to Fig. 1, 13 designates the frame of the machine equipped with front wheels 14 and rear wheels 15 suitably mounted. The drums 6 and 7 are provided with grooves around which the cable is wound, and each drum has a gear 16 which meshes with a pinion 17 on the shaft 18 arranged transversely of the car. The shaft 18 carries a pair of bevel gears 19 and 20, either of which is adapted to mesh with a driving pinion 21 mounted on a shaft 22 and connected by a clutch 23 with the engine 24. 25 is a lever for controlling the clutch 23, whereby the shaft 22 may be driven from the engine or the engine allowed to run without driving the same. When the gear 19 is in mesh with gear 21, the drums 6 and 7 are operated through the medium of gears 16 and pinion 17, and the machine is propelled along the power cable 1. The shaft 18 may be shifted to throw the gear 20 into mesh with pinion 21 by means of a lever 26 which operates a head 27, in which the end of the shaft 18 revolves, and when gear 20 meshes with pinion 21 the drums 6 and 7 are revolved in opposite directions and will propel the machine backward, although such operation is not ordinarily employed when utilizing the power cable, but is useful at other times in turning the machine around, as will be seen.

The machine may be driven through the medium of its rear wheels 15, if desired, the latter having sprockets 30 which are connected by chains 31 with sprockets 32 on a counter-shaft 33, the latter being divided and having a differential gear 34, the differential gear having a sprocket 35 which is connected by a chain 36 with a smaller sprocket 37 mounted loosely on the shaft 18. The sprocket 37 is adapted to be engaged by a clutch 38 formed on sleeve 28, the sleeve also carrying pinion 17, and by operating hand lever 39 the clutch 38 may be shifted to engage with sprocket 37 to cause the sprocket to rotate with shaft 18, the hand lever 39 being connected by link 40 with a forked arm 41 which engages a grooved collar 42 splined on shaft 18. When the clutch 38 is thus shifted the pinion 17 is drawn out of mesh with gears 16.

In order to guide the cable to and from the drums 6 and 7 and to keep the cable under proper tension and in place thereon, the friction devices 8 and 9 are employed. These are shown in detail in Figs. 2 and 3. Projecting down from each end of the frame 13 is a pair of arms 45, each of which has a stationary vertical shaft 46. Upon each shaft 46 is an idle roller 47. A horizontal roller 48, (see Fig. 3) is arranged below and in front of the lower ends of rollers 47, while roller 49 is located back of the roller 48 and below the lower ends of rollers 47. The cable 1 is guided between the rollers 47, and the rollers 48 and 49 serve to lift the cable to the rollers 47, the roller 48 particularly coming into play in dropping the cable at the rear of the

machine, as shown in Fig. 6, or when picking up a slack cable in front, after starting.

A pair of vertical arms 50 are arranged back of the arms 45, and mounted in arms 50 is an upper shaft 51 and a lower shaft 52, each shaft having gears 53 which are in mesh with each other, both shafts also carrying flanged rollers 54 between which the cable 1 passes, the cable being under pressure between the two rollers by means of the lower rollers being yieldingly pressed forward, the shaft 52 being mounted in blocks 55 which are slidable in arms 50, there being springs 56 underneath the blocks 55, and the tension of the springs being regulated by an adjusting screw 57. Each shaft 51 carries a sprocket 58 which is connected by a chain 59 with a sprocket 60 mounted on a stub shaft 61 supported by a bracket 62. A sprocket 63 rotates with the sprocket 60. Each drum shaft has a sprocket 64, and the sprockets of the respective drums are connected by chains 65 with the respective sprockets 63. The rollers 54 are thus positively driven and at a speed slightly differential to the cable, so that the cable is under constant tension between the tension devices and drums, and the slip between the cable and tension rollers being extremely slight but just sufficient to produce this taut condition of the cable.

What I claim is:—

1. In a cable power apparatus, a carriage, one or more drums on the carriage, means for driving the drums, a cable wound over the drums, and a detachable section in the cable permitting the carriage to be turned around without turning around the whole cable or disengaging it from the drums.

2. In a cable power apparatus, a carriage, one or more drums on the carriage, means for driving the drums, a cable wound over the drums, and a detachable section in the cable having a length at least as great as the linear circuit of the cable through the carriage.

3. In a cable power apparatus, a carriage, cable engaging mechanism on the carriage including one or more drums and tension devices, a cable wound over the drums and engaging the tension devices, and a detachable section in the cable having a length at least as great as the linear circuit of the cable through the cable engaging mechanism on the carriage.

4. In a cable power apparatus, a carriage, one or more drums on the carriage, a cable wound over the drums, means for driving the drums to propel the carriage along the cable, and relatively short sections detachably connected in the cable near both ends of the cable.

5. In a cable power apparatus, a carriage one or more drums on the carriage, a cable wound over the drums, means for driving said drums to propel the carriage along the cable, tension devices on the carriage, and means for driving the tension devices to keep the cable taut between the tension devices and drums.

6. In a cable power apparatus, a carriage, one or more drums on the carriage, a cable wound over the drums, means for driving the drums to propel the carriage along the cable, tension devices on the carriage, each tension device comprising a pair of rollers between which the cable passes snugly, and means for driving the rollers at a speed which holds the cable taut between each tension device and drums.

7. In a cable power apparatus, a carriage, one or more drums on the carriage, a cable wound over the drums, means for driving the drums to propel the carriage along the cable, tension devices on the carriage, each tension device comprising a pair of rollers between which the cable passes, means for yieldingly pressing one roller toward the other to cause the rollers to bear strongly against the cable, and means for positively driving the rollers to keep the cable taut between each tension device and drums.

8. A traction engine having a gripping device for a cable, combined with a cable made in three sections, the end sections being made long enough to extend through the engine and provided with couplings.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 16th day of April 1907.

CLYDE J. EASTMAN.

In presence of—

GEORGE T. HACKLEY,
FRANK L. A. GRAHAM.