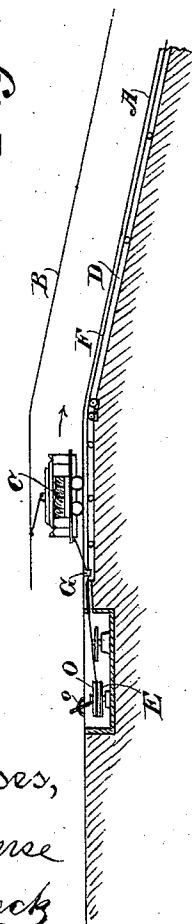


H. H. LYNCH & S. L. FOSTER.
OPERATING CARS ON GRADES.

No. 576,868.

Patented Feb. 9, 1897.

Fig. 1.



Witnesses,
J. H. H. H.
J. B. Aschbeck

Fig. 2.

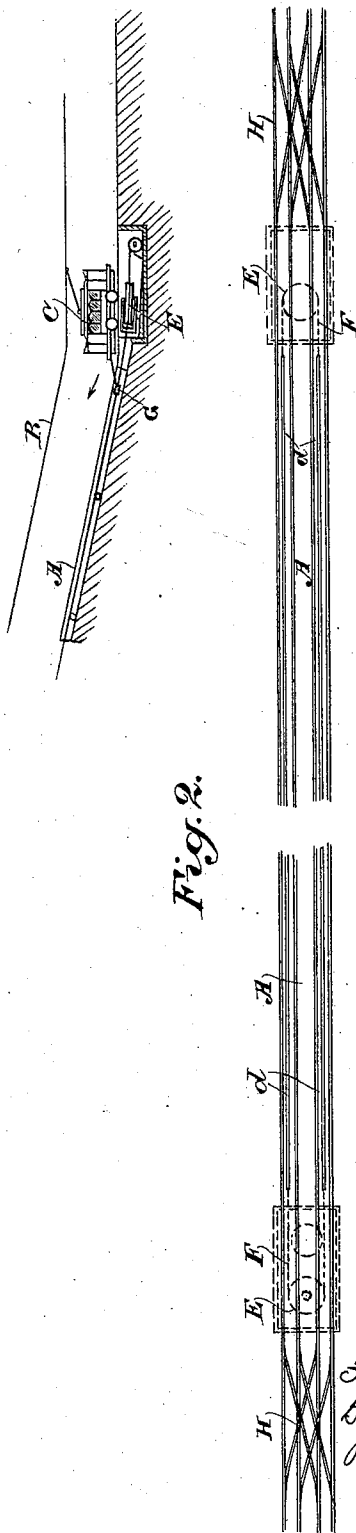
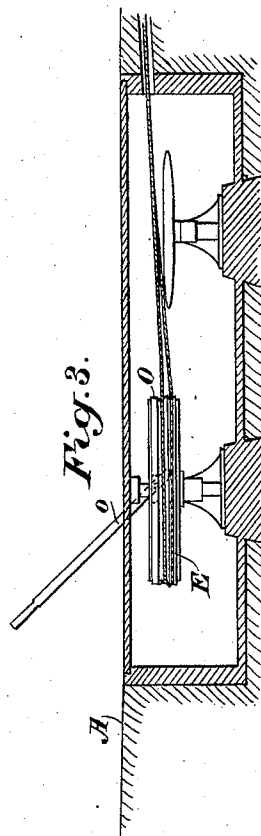


Fig. 3.



Inventors,
Henry H. Lynch
Samuel L. Foster
By D. M. Dwyer Co.
attys

(No Model.)

2 Sheets—Sheet 2.

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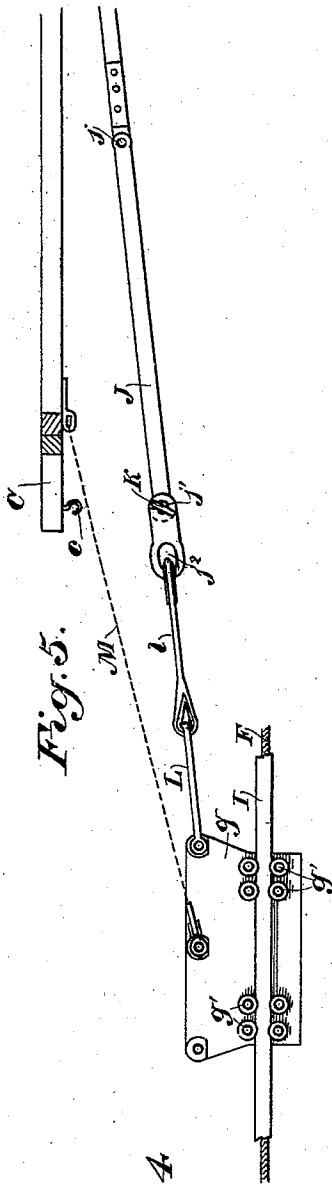


Fig. 5.

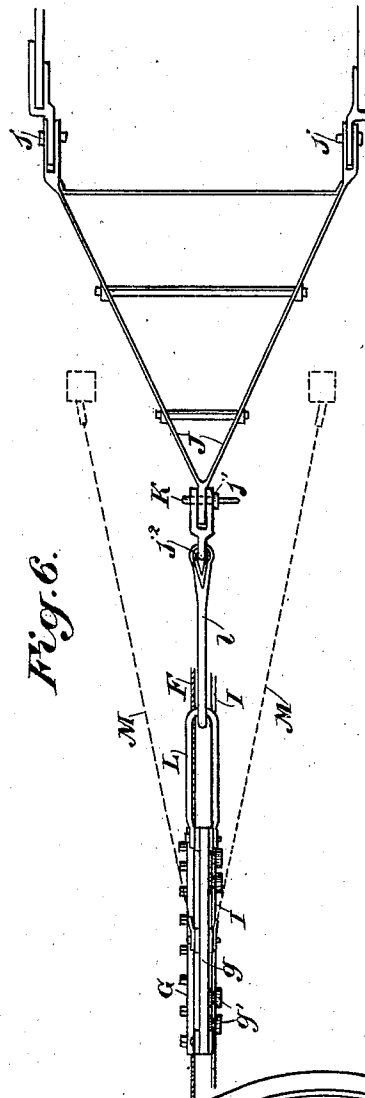


Fig. 6.

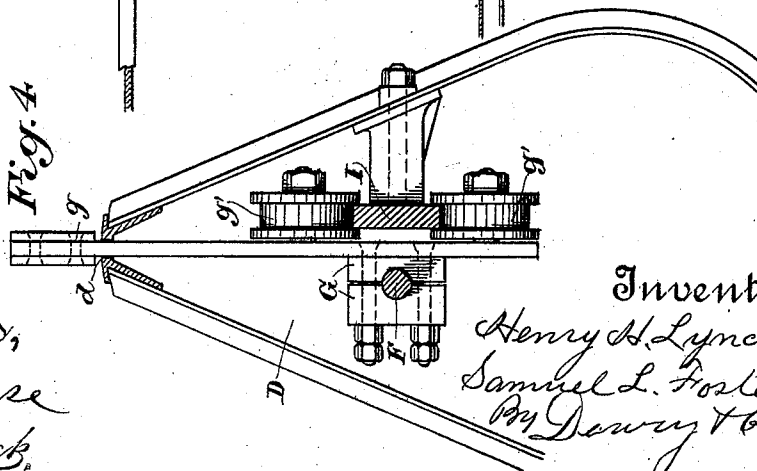


Fig. 4.

Witnesses,
J. F. Oscheck,

Inventors,
Henry H. Lynch,
Samuel L. Foster,
By Dewey & Co. atty

UNITED STATES PATENT OFFICE.

HENRY H. LYNCH AND SAMUEL L. FOSTER, OF SAN FRANCISCO, CALIFORNIA,
ASSIGNORS TO THE MARKET STREET RAILWAY COMPANY, OF SAME
PLACE.

OPERATING CARS ON GRADES.

SPECIFICATION forming part of Letters Patent No. 576,868, dated February 9, 1897.

Application filed September 30, 1896. Serial No. 607,383. (No model.)

To all whom it may concern:

Be it known that we, HENRY H. LYNCH and SAMUEL L. FOSTER, citizens of the United States, residing in the city and county of San Francisco, State of California, have invented an Improvement in Operating Cars on Grades; and we hereby declare the following to be a full, clear, and exact description of the same.

Our invention relates to the general class of car-propelling mechanisms; and it has for its object the economical and effective operation of cars (particularly those propelled by individual motors, such as electric cars or steam, vapor, hot-air, gas, or other like cars) when in their course of travel such cars have to meet and overcome grades too great for their propelling power as exercised through traction.

Our invention contemplates what may be termed generally "a combination of the cable-road with an electric or other road the cars of which are provided with individual motors," whereby when grades are met the cars are successively caused to ascend and descend said grades by the help of the cable.

Under our invention in using the cable as an auxiliary power at these points no independent power is used to operate the cable, but only such as may be obtained by the gravity of the descending car assisted by the exercise of the propelling power of either, or both, of the ascending and descending cars, which results in the movement of the otherwise dead cable and the ascent of another car attached thereto, at the same time controlling the descent of the operating-car.

With these objects in view our invention consists in the parts and the constructions and combinations hereinafter described and claimed.

Figure 1 is a general side view showing the operation of the cars on the grade. Fig. 2 is a general plan view. Fig. 3 is a view of one of the terminal pits and the sheaves therein. Fig. 4 is a cross-section of the conduit to show the grip. Fig. 5 is a side view of the coupling devices for attaching the car to the grip. Fig. 6 is a top view of same.

A is a road-bed at the grade to be overcome, and B represents an electric conductor of an

ordinary overhead electric railway, which said railway stands in the present instance as an illustration of any system in which the cars are propelled by individual motors.

C represents cars having the ordinary trolleys and other propelling mechanism of this class of railways, and these cars stand for similar cars having individual motors. Within the road-bed of each track and throughout the entire length of the grade is made a conduit D of the usual type, having a slot *d* in its top after the manner of ordinary cable-railways. At each end of this conduit is made a suitable pit, in each of which are located terminal sheaves, such as E, and connected guide-sheaves and tighteners unnecessary to describe, and over these sheaves passes in endless course down through the conduit of one track and up through the conduit of the adjacent track a cable F. Secured permanently to this cable at proper points on opposite sides are grips G, the shanks *g* of which extend upwardly through the slot *d* of the conduit and are adapted to be coupled to the cars.

The general operation of the system as far as described is as follows: A car approaching the foot of the grade couples to the grip which is found at that point, and another car approaching the head of the grade couples to a grip above. The downcoming car now proceeds down the grade and by its weight, assisted by the propelling power of either or both cars, will, through the cable to which both are connected, cause the lower car to ascend the grade.

In practice it is found best to entirely cut off the motive power of the upgoing car and depend upon the gravity of the downgoing car assisted by its motive power, which in practice has been found ample to effect the operation even of drawing up the grade two or more cars or of drawing up a heavily-laden car by means of a descending empty one. The cable, normally inactive or dead, is thus called into operation only at the time when the two cars are connected with it and by means of them alone. The ascending grip is left by the ascending car at the top of the grade, and the descending grip is left by the

descending car at the foot of the grade ready for coupling onto succeeding cars for a repetition of the operation.

It is obvious that provision must be made for causing alternate cars to cross from one track to another, in order to reach the proper grips, for when an ascending car going up on the right-hand track leaves its grip it will leave it on said right-hand track at the head of the grade, and the downcoming car on the right-hand track coming down must cross over to the other or right-hand track going up, in order to reach the grip which has been left by the previous car, and then at the foot of the grade said car must be crossed back again to the right-hand track to continue on its journey. In doing so it will leave the grip in position for a succeeding car going up on the right-hand track to take it. Then a succeeding car coming to the head of the grade will find its grip on its own side, and will come down with it and leave it on the side, which is the left, to a succeeding upgoing car, and consequently said upgoing car must cross over to the left to take the grip and go up on the left-hand track going up and cross over to the right at the head of the grade. Thus the alternately-succeeding cars cross from track to track to take the grips, and for this purpose we have shown the tracks at the foot and at the head of the grade, as represented at H, crossing each other, and they will be provided with suitable switches to effect the necessary changes.

The grip is to be permanently attached to the cable, by which we mean not that it cannot be removed, but that in operation instead of letting go and taking hold of the cable, as in ordinary cable-roads, it is made fast to the cable.

Any suitable means of attaching the grip to the cable may be employed, and we have here shown two jaws set upon the cable by bolts.

The grip must also be carried accurately in the conduit, as unlike an ordinary cable-road it is not supported from the car, and it must therefore be supported within the conduit. To this end we secure by suitable means within the conduit a bar I, which forms a track, and to the grip we secure rollers g' , which travel upon this track above and below, and thus the grip is supported within the conduit.

The couplings by which the cars are readily made fast to and are detached from the grips are as follows: Under the car is pivoted at j a forwardly-converging bail or link J, having at its end an eye j' , by which it may be readily caught up on a hook c under the car and be held out of the way when not in use. Its forward extremity is also provided with a coupling-eye j^2 , and to this, by means of an insertible and removable pin K, is connected the head-link l of the coupling-links L, which are connected with the upper end of the shank

of the grip G. Safety-ropes M extend also from the shank of the grip to suitable fastenings under the car, which said fastenings are readily attachable and detachable. The operator simply makes the coupling by inserting the pin K, and breaks it again by removing the pin.

Around one of the terminal sheaves of the cable is fitted a band-brake O, having suitable connections o to the surface of the road, whereby the operator may control the cable at any moment.

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

1. A means for operating on grades, cars having individual motors, said means comprising a movable cable passing down one track and up the other, and having no driving mechanism or device of its own, grips attached to opposite sides to said cable, and adapted one to pass down one track while the other is passing up the other track, coupling devices adapting the cars to be attached to and detached from said grips, and crossings or switches in the tracks from one to the other, to enable the cars to successively connect with the waiting grips.

2. A means for operating on grades, cars having individual motors said means comprising conduits in the road-beds of the tracks at the grade, a movable cable mounted in said conduits, grips having means by which they are attached to the cable, said grips being attached to the cable at opposite sides thereof, a fixed track in the conduits upon which the grips travel and are supported, and coupling devices for attaching the cars to and detaching them from the grips, on opposite sides of the cable and at the head and foot of the grade respectively.

3. In a means for operating cars at grades, the combination of a movable cable extending in suitable conduits up and down the grade, a fixed track-rail within said conduits, and the grips having means for attaching them to the cable on opposite sides thereof, and provided with rollers traveling on the fixed track whereby the grips are guided and supported in their travel through the conduits.

4. In a means for operating cars on grades, and in combination with the traveling grips connected with a cable operating in conduits on the grade, the coupling devices for the cars consisting of the pivoted bails attached to them, and the coupling-links attached to the grips and adapted to be coupled to the bails of the cars.

In witness whereof we have hereunto set our hands.

HENRY H. LYNCH.
SAML. L. FOSTER.

Witnesses:

GEO. B. WILLCUTT,
W. GREGG.