

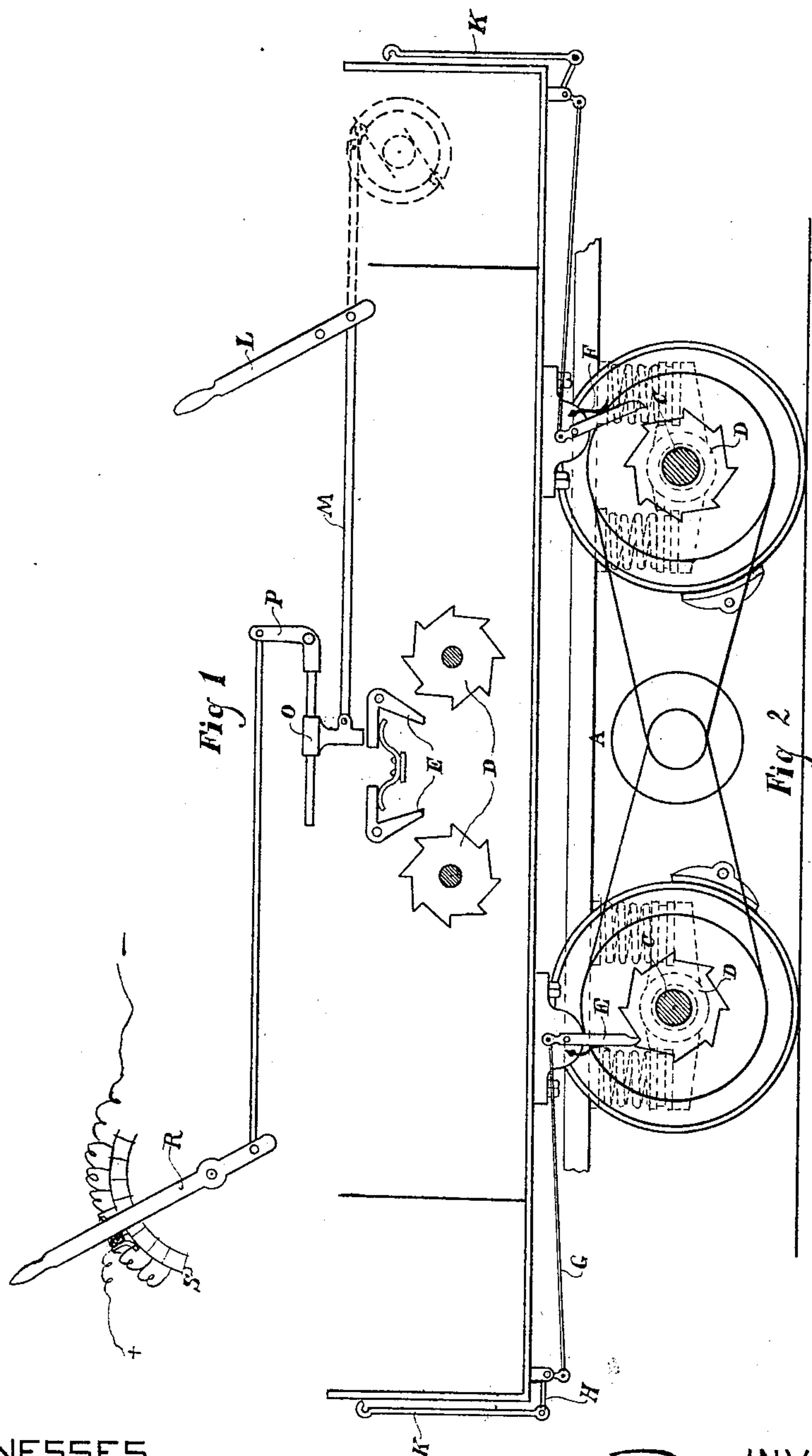
(No Model.)

W. H. KNIGHT.

ELECTRICALLY PROPELLED VEHICLE.

No. 389,229.

Patented Sept. 11, 1888.



WITNESSES

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ELECTRICALLY-PROPELLED VEHICLE.

SPECIFICATION forming part of Letters Patent No. 389,229, dated September 11, 1888.

Application filed June 21, 1888. Serial No. 277,783. (No model.)

To all whom it may concern:

Be it known that I, WALTER H. KNIGHT, a citizen of the United States, residing at New York, in the county of New York, State of New York, have invented certain new and useful Improvements in Electrically-Propelled Vehicles, of which the following is a specification.

My invention relates to electrically-propelled vehicles; and it consists in certain devices whereby the starting of vehicles by an electric motor on a grade is facilitated. It is illustrated in the accompanying drawings, wherein—

Figure 1 is a diagram, and Fig. 2 an elevation partly in section, of my invention.

My invention consists in placing upon an axle of a vehicle a toothed wheel, and providing a dog or pawl, preferably attached to the spring-supported body of the vehicle, which is adapted to be thrown into engagement with the toothed wheel when the brakes are applied or the motor stopped by shutting off the current therefrom. In order to provide for the case where there are hills to be ascended in each direction, I provide two sets of wheels and pawls and connect the actuating mechanism thereof with the reversing-lever of the motor, so that the proper pawl for the direction in which the car is proceeding may be brought into operation.

In Fig. 2, A represents the propelling-motor of the vehicle, geared to the axles C. D is a ratchet-wheel securely fastened to axle C. E is a pivoted pawl normally held out of engagement with wheel D by a spring, F. From the upper end of this pawl a connecting-rod, G, extends to the front platform of the vehicle, where it is connected by bell-crank lever H with the operating-handle K.

It has been found in practice that when an electrically-propelled vehicle is brought to a standstill on a grade there is on starting again a tendency of the car to fall back and rotate the motor, which is geared to the wheels in an opposite direction to the tendency to rotation set up by the current. This so reduces the counter electro-motive force of the motor that there is at starting a heavy flow of current, which injures the motor or melts the safety-fuses. This result follows from the nature of the electric motor, which is itself a generator, setting up an electro-motive force counter to the direct electro-motive force. As the econ-

omy in the conversion of energy by the motor depends upon the ratio between the direct and the counter electro-motive forces, the latter in practice approaches quite closely to the former, and the current which actually passes through the motor when in operation is due to the small surplus of the direct over the counter electro-motive force.

No motor of a practical form can stand any material reduction of its counter electro-motive force by being prevented from turning, and still less can it stand reversal of its normal direction of movement, so that its electro-motive force will be added to that of the direct electro-motive force. On account of this peculiarity it may be said that an electric motor has no elastic limit like a steam-engine, where its force will stop without injury to the machine. The limit to the electric motor is the destruction of the machine. Therefore it is impracticable in an electrically-propelled vehicle to apply the current before the brakes are released; and, on the other hand, if the brakes are first released the vehicle acquires a backward movement before the current can be turned on. A back-stop such as is provided by my invention permits a much smaller motor for the same grade than would be possible without it, not because a larger motor is necessary to propel the vehicle, but to withstand the excess of current which would ensue if the circuit were closed before the brakes were released, or if the vehicle were allowed to acquire a downward momentum. By the use of my device the operator brings the car to a stop by shutting off the current and working the brake, and then by lifting on handle K and gradually releasing the brake the car settles back until stopped by the engagement of pawl E with wheel D.

The pawl E is pivoted to the body of the car, so that the weight of the car rests downward upon D, tending to rotate the driving-wheel forward. There is thus, at the moment of starting, added to the power of the motor the whole weight of the car. The load of the motor at starting is thus very materially reduced. There is no backward start on the motor and the weight of the car is utilized to assist the start.

In Fig. 2 I have shown toothed wheels D upon each axle, with corresponding pawls E, adapted, respectively, for the two opposite di-

rections of movement of the car. These two
pawls in Fig. 2 are independent of each other,
each having a separate lever, K, and the two
may be used alternately. In Fig. 1, however,
5 I have shown but a single operating-lever for
the two pawls. To determine which one shall
be actuated, I have connected to lever L, which
is used for reversing the connections to deter-
mine the direction of the car, a connecting-
10 rod, M, which has at its opposite end a piece,
O, sliding on one end of bell-crank lever P.
This bell-crank lever is operated by lever R,
and, according to the direction in which lever
L is thrown, the piece O is thrown down upon
15 one or the other of the two pawls E. In this
case both wheels D may be, if desired, placed
upon the same axle, and although there is but
one actuating-lever, R, the proper wheel and
pawl for the direction in which the car is pro-
ceeding will be brought into engagement. The
20 lever R may also be the controlling-lever of
the car, which throws in, for example, a re-
sistance, S, the pawl being in engagement when
the resistance is all in and the motor stopped
25 and being thrown out of engagement when the
resistance is withdrawn and the motor started.

What I claim as new, and desire to secure by
Letters Patent, is—

1. The combination, with a vehicle having
30 an electric motor with variable counter elec-
tro-motive force geared to its wheels, of a
pawl or stop preventing backward movement
of the vehicle against the motor.

2. The combination, with an electrically-
35 propelled vehicle having a driving-motor with
variable counter electro-motive force geared
to its axle, of a pawl or stop for the vehicle
and a manual controlling device therefor, sub-
stantially as described.

3. The combination, with an electrically-
40 propelled vehicle having an electric motor
with variable counter electro-motive force
geared to its axle, of a pivoted pawl for stop-
ping the backward movement of the vehicle
45 and a manual controlling device therefor, sub-
stantially as described.

4. The combination, with an electrically-
propelled vehicle having a driving-motor with
variable counter electro-motive force geared
50 to its axle, of a toothed wheel on the axle, a
pivoted pawl, and a manual controlling device
therefor.

5. The combination, with an electrically-
propelled vehicle, of a driving-motor with va-
55 riable counter electro-motive force geared to
its axle, toothed wheel on the axle, and a piv-
oted pawl engaging with the body of the ve-
hicle, whereby the weight of the vehicle is
brought upon the wheel to turn it.

6. The combination, with an electrically-
60 propelled vehicle, of a driving-motor having
a variable counter electro-motive force geared
to its axle, and a mechanical connection sup-
porting the body of the vehicle upon one side
65 of the axle, whereby the weight of the said
body is applied to the said axle to rotate it.

7. The combination, with an electrically-
propelled vehicle, of a driving-motor with va-
riable counter electro-motive force geared to
the axle, a toothed wheel on the axle, a piv- 70
oted pawl on the body of the vehicle, and a
manual controlling device for throwing said
pawl into engagement with the said wheel.

8. The combination, with an electrically-
propelled vehicle, of a driving-motor with va- 75
riable counter electro-motive force therefor
geared to an axle of the vehicle, a toothed
wheel upon said axle, a pawl adapted to en-
gage therewith, and an actuating device for
said pawl, extending to a point outside of the 80
body of the vehicle.

9. The combination, with an electrically-
propelled vehicle having a driving-motor with
variable counter electro-motive force geared
to its axle, of a toothed wheel upon the axle, 85
a pawl adapted to engage with said toothed
wheel, and a controlling device for said pawl
extending to an end platform of the vehicle.

10. The combination, with an electrically-
propelled vehicle having a driving-motor with 90
variable counter electro-motive force geared
to its axle, of stops for each direction of move-
ment of the vehicle and means for controlling
either of said stops at will.

11. The combination, with an electrically- 95
propelled vehicle having a driving-motor with
variable counter electro-motive force geared
to its axle, of toothed wheels D and pawls
therefor, respectively, forming stops for oppo-
site directions of movement of the vehicle, and 100
means for controlling either of said stops at
will.

12. The combination, with an electrically-
propelled vehicle having a driving-motor with
variable counter electro-motive force geared 105
to its axle, of stops for opposite directions of
movement of the vehicle, an actuating device
for said stops, a reversing device for the mo-
tor, and a connection therefrom determining
the operation of the said actuating device. 110

13. The combination, with an electrically-
propelled vehicle having a driving-motor with
variable counter electro-motive force geared
to its axle, of a controlling device for said mo- 115
tor and a backward stop for the vehicle con-
nected with the said controlling device and
adapted to prevent reverse movement of the
motor.

14. The combination, with a vehicle having
an electric motor with variable counter elec- 120
tro-motive force geared to its wheels, of a
ratchet-wheel on the axle of the said vehicle
and a pawl having a yielding bearing adapted
to engage with said ratchet-wheel and pro-
vided with a manual controlling device, sub- 125
stantially as described.

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Witnesses:

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