(No Model.)

J. S. CONNELLY.

STREET CAR MOTOR.

No. 345,279. Patented July 13, 1886.

Fig. 1.

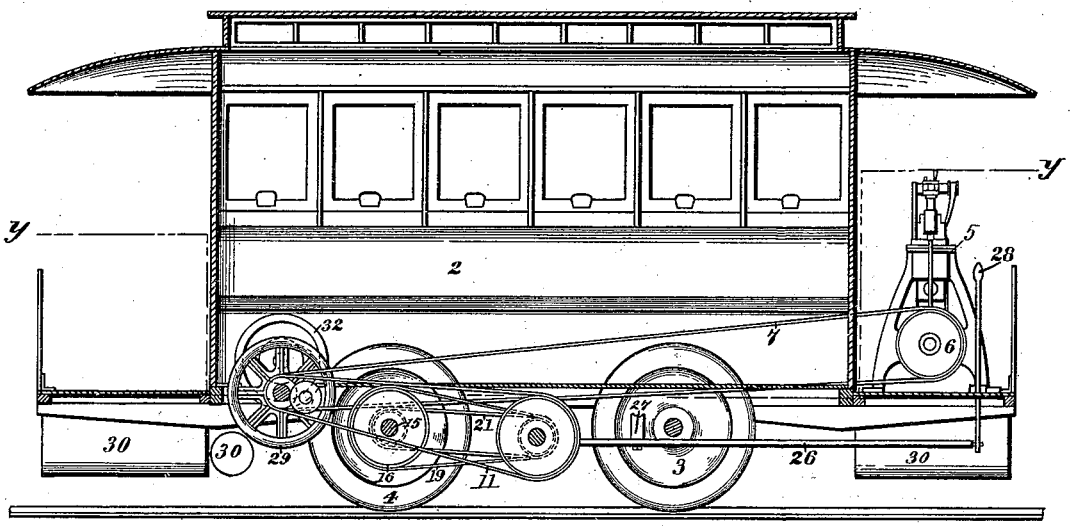


Fig. 2.

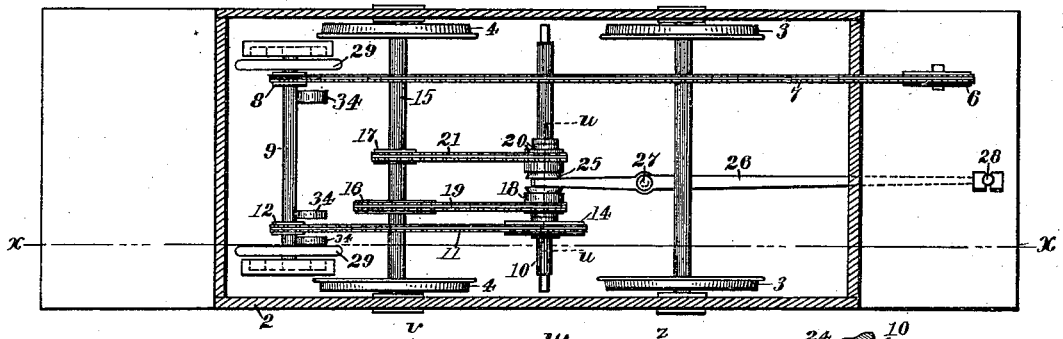


Fig. 3.

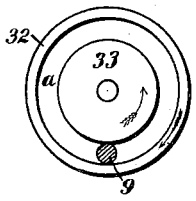


Fig. 4.

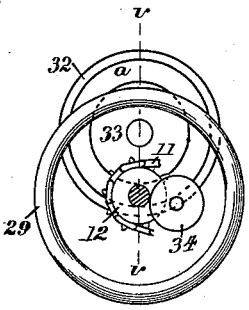


Fig. 5.

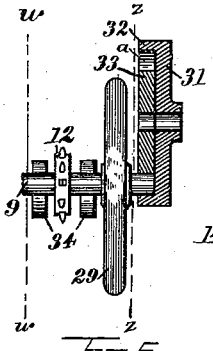
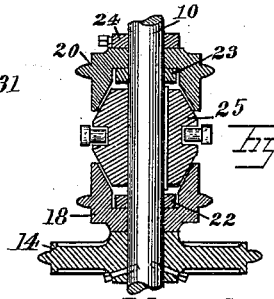


Fig. 6.



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UNITED STATES PATENT OFFICE.

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STREET-CAR MOTOR.

SPECIFICATION forming part of Letters Patent No. 345,279, dated July 13, 1886.

Application filed March 19, 1886. Serial No. 195,791. (No model.)

To all whom it may concern:

Be it known that I, JOHN S. CONNELLY, of Brooklyn, in the county of Kings and State of New York, have invented a new and useful Improvement in Car-Motors; and I do hereby declare the following to be a full, clear, and exact description thereof.

The expense attending the maintenance of horse street-car lines has led to many attempts to substitute in place of horse-power some suitable motor to be carried by and to drive the cars; but none of such devices have come into general use. Among the reasons for this is, that the power required to start a heavily-laden street-car or to drive it up a grade has been thought to necessitate the use of a powerful engine, much more powerful than necessary to drive the car after it has been started on a level track; hence the engines heretofore used for the work have been too heavy, and have entailed too much expense to render their adoption desirable.

It is the object of my invention to so improve the construction of locomotive street-cars that engines of small capacity may be used successfully, and with a saving of expense and labor, as compared with the present use of horse-power. I propose to accomplish this by the use on the car of a continuously-running engine and a fly wheel or wheels geared thereto, together with devices for throwing the engine and fly-wheel into and out of gear with the driving-axle of the car, and thus starting or stopping it. The continuous revolution of the fly-wheel while the car is stopped stores sufficient energy to overcome the inertia of the car and to start it with ease.

My invention further consists in certain other co-ordinate devices, which I will indicate hereinafter.

I will now describe my invention, so that others skilled in the art may manufacture and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a vertical longitudinal section of a street-railway car provided with my improved device, the section being on the line *x x* of Fig. 2. Fig. 2 is a horizontal section of the car on the line *y y* of Fig. 1, the machinery being shown in full lines, the engine on the front platform of the car being omitted for clearness of illustration. Fig. 3 is a vertical section on the line *z z* of Fig. 5. Fig. 4 is a diagram detail view, and is a section on the line *w w* of Fig. 5. Fig. 5 is a detail view, a part of which is shown in section on the line *v v* of Fig. 4. Fig. 6 is a longitudinal section on the line *u u* of Fig. 2. The last-named four figures are drawn on a larger scale than are Figs. 1 and 2.

Like symbols of reference indicate like parts in each.

In the drawings, 2 is the car to which my improvement is applied, and 3 and 4 are the front and rear wheels, respectively.

On the front platform of the car is a driving-engine, 5, preferably a gas-engine, on whose shaft is a sprocket-wheel, 6, connected by a chain, 7, with a sprocket-wheel, 8, on a shaft, 9, which is journaled transversely under and at the rear of the car. The journal-bearings of the shaft 9 are peculiar, and will be described by me hereinafter.

10 is an intermediate power-shaft journaled under the car-body, and connected with the shaft 9 by a sprocket-chain, 11, which passes around a sprocket-wheel, 12, keyed to the shaft 9, and a second sprocket-wheel, 14, of larger diameter, on the shaft 10, Fig. 2. The latter shaft is thus driven by the rotation of the power-shaft 9.

15 is the rear axle of the car, and is the driving-axle. It is provided with two sprocket-wheels, 16 and 17, of which the wheel 16 is geared by a chain, 19, with a sprocket-wheel, 18, of smaller diameter, loosely mounted on the shaft 10, while the wheel 17 is connected by a chain, 21, with a sprocket-wheel, 20, also loosely mounted on the shaft 10, and of about the same diameter as its driven sprocket 17. The shaft 10 and its sprockets are shown in Fig. 6. The outer side of the sprocket 18 abuts against the larger sprocket-wheel, 14, and it is held in place on the shaft by a collar, 22, keyed to the shaft, and bearing against its inner side. In like manner the sprocket-wheel 20 is held in position by means of two collars, 23 and 24, keyed to the shaft 10, and bearing against the inner and outer sides of the sprocket-wheel, respectively. The adja-

cent sides of the sprockets 18 and 20 are conically concave, and between them is a double friction cone or clutch, 25, mounted on the shaft 10 by a keyway and spline, so as to be capable of longitudinal motion into contact with either of the sprockets 18 or 20, as will be readily understood. The clutch is thus moved by a lever, 26, fulcrumed at 27 to the car-body, attached to the clutch at one end, and at the other end pivotally connected with a hand-lever, 28, which extends up above the front platform, so as to be under the control of the driver. At the end of the shaft 9 are fly-wheels 29, which are of considerable diameter and weight, and are designed for storing power or momentum.

Thus constructed, the operation of the motor is as follows: The engine 5 is kept continually in motion, whether the car be moving or temporarily stopped, and by reason of the relative proportions of the sprocket-wheels 6 and 8 the shaft 9 and its fly-wheels 29 are kept in rapid motion—say at the rate of about five hundred revolutions per minute—while the shaft 10 is caused to revolve continuously, though (by reason of the large diameter of the sprocket-wheel 14) at a much slower speed. If the clutch 25 be allowed to remain loosely between the sprockets 18 and 20, as in Fig. 6, the rotation of the shaft 10 will have no effect upon the driving-axle 15; but if the lever 28 be moved so as to throw the clutch 25 into frictional contact with the sprocket 20, it will cause the axle and its wheels to turn, while its contact with the other sprocket, 18, will also rotate the axle and wheels, but with less speed, and consequently greater power. Suppose that the car is at rest, and it is desired to start it, the continued and rapid rotation of the fly-wheels 29 while the car has been stationary will have stored a large amount of power. The driver then moves the lever 28, so as to throw the friction-clutch 25 into contact with the slow-geared sprocket-wheel 18, and the great power thus derived from the fly-wheels and transmitted by the small sprocket-wheel 18 to the larger wheel, 16, will cause the car to start and to move slowly forward. When a proper degree of momentum has been acquired by the car, and less power is therefore needed, the driver throws the clutch 25 away from the sprocket-wheel 18 into contact with the sprocket 20. This gearing causes the axle and wheels to revolve with greater velocity and to drive the car at its normal rate of speed. In this way an engine of little power may be used with economy and to the best advantage. The car may be stopped by throwing the clutch 25 out of contact with both of the sprockets 18 and 20 and applying the usual brake, and it may be slackened in speed by diminishing the frictional contact of the clutch with the sprockets; but in either case the engine is not stopped. It is kept continuously in motion, its speed being kept constant preferably by means of a suitable regulating-governor. The gas or gaseous fluid used to drive the car is stored in suitable tanks, 30, though this is a mere matter of convenience.

I will now describe the anti-frictional devices which I use to prevent friction on the rapidly-revolving journals of the shaft 9. At each end of the shaft 9 a wheel, 31, is journaled with its axis above the axis of the shaft 9. The side of the wheel has an annular projecting flange, 32, upon which the shaft 9 rests and has its bearings. A wheel, 33, of less diameter than the wheel 31, is journaled loosely to the axis of and against the side of the latter, so as to leave an intermediate circular groove or space, *a*, between the outer periphery of the wheel 33 and the inner side of the flange 32, at the base of which is the journal of the shaft 9, which is thus in contact with both the wheels. Then as the shaft 9 rotates it will cause the revolution of the wheels 31 and 33 in opposite directions, as shown by the arrows in Fig. 3, and the friction will thus be reduced to a minimum, as will be readily understood. The shaft 9 is held in place against the forward strain of the sprocket-chains 7 and 11 by friction-rollers 34, which are journaled so as to bear against the forward side of the shaft, as shown in Figs. 2 and 5. These friction devices are of great use on account of the high speed at which the shaft 9 is driven. Indeed it is doubtful whether without some such device my invention would be successful.

It is evident that the sprockets and chains which I have shown in the drawings may be replaced by other known mechanical connecting devices. I will therefore designate them in the following claims by the generic word "gearing." I will also use the words "fast" and "slow" gearing as a convenient mode of designating the devices which I have shown for so connecting the shaft 9 with the axle 15, that a rapid or slow motion relatively to the shaft may be given to the axle. As the engine 5 is continuously driven, it needs little skill to manage the mechanism of the car, the only part requiring attention being the hand-lever 28; hence skilled engineers need not be employed as drivers, and a considerable saving of expense is thus effected.

I disclaim the apparatus shown in Letters Patent Nos. 320,634 and 186,146.

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

1. In a car, the combination of an engine and its shaft, a second shaft mechanically connected with the engine-shaft so as to rotate at a greater rate of speed than the engine-shaft, a fly-wheel on said second shaft, a driven car-axle, gearing connecting the second shaft with the axle, and mechanism, substantially as described, for disconnecting them, as and for the purposes specified.

2. In a car, the combination of an engine and its shaft, a second shaft mechanically con-

nected with the engine-shaft so as to rotate at a greater speed than the engine-shaft, a fly-wheel on said second shaft, a driven car-axle, two sets of gearing (one set a slow and the other set a fast gearing) connecting the second shaft with the axle, and mechanism, substantially as described, for disconnecting either or both of said sets of gearing, as and for the purposes specified.

3. The sets of rotary friction-wheels 31 and 33, the members of each set being journaled concentrically on an axis, and having an intermediate circular space, *a*, in combination with a rotary shaft, 9, whose bearings are in the spaces *a* of said wheels, substantially as and for the purposes described.

4. The sets of rotary friction-wheels 31 and 33, the members of each set being journaled concentrically on an axis, and having an intermediate circular space, *a*, in combination with a rotary shaft, 9, whose bearings are in the said spaces of said wheels, and the friction-rollers 34, bearing against said shaft 9, substantially as and for the purposes described.

In testimony whereof I have hereunto set my hand this 13th day of March, A. D. 1886.

JOHN S. CONNELLY.

Witnesses:
W. B. CORWIN,
THOMAS W. BAKEWELL.