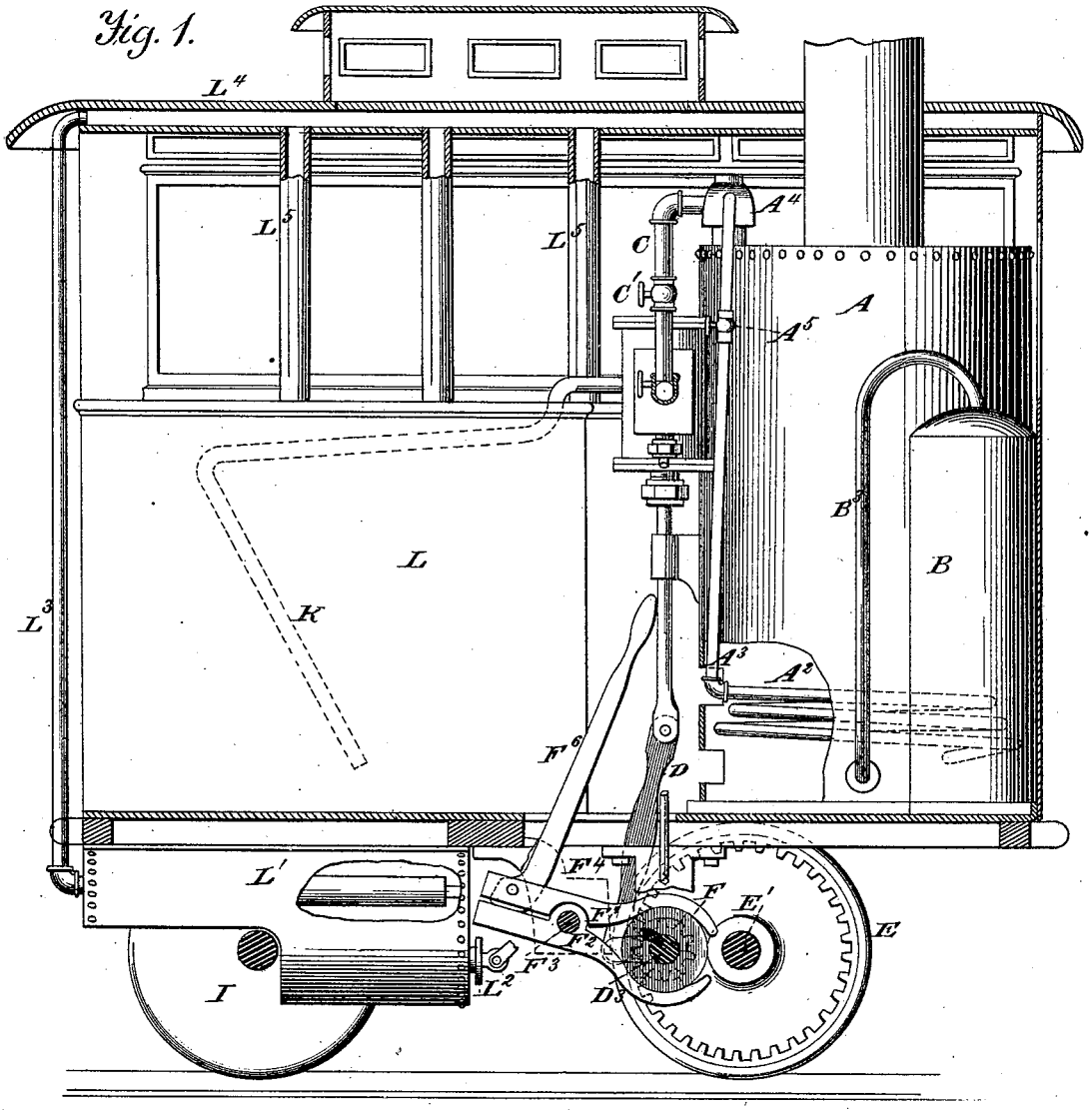
2 Sheets—Sheet 1.

J. T. CORD.

Street-Motor.

No. 212,442. Patented Feb. 18, 1879.

Fig. 1.



Witnesses.
A. Ruppert.
W. Frederick.

Inventor.
John T. Cord

2 Sheets—Sheet 2.

J. T. CORD.

Street-Motor.

No. 212,442. Patented Feb. 18, 1879.

Fig. 2.

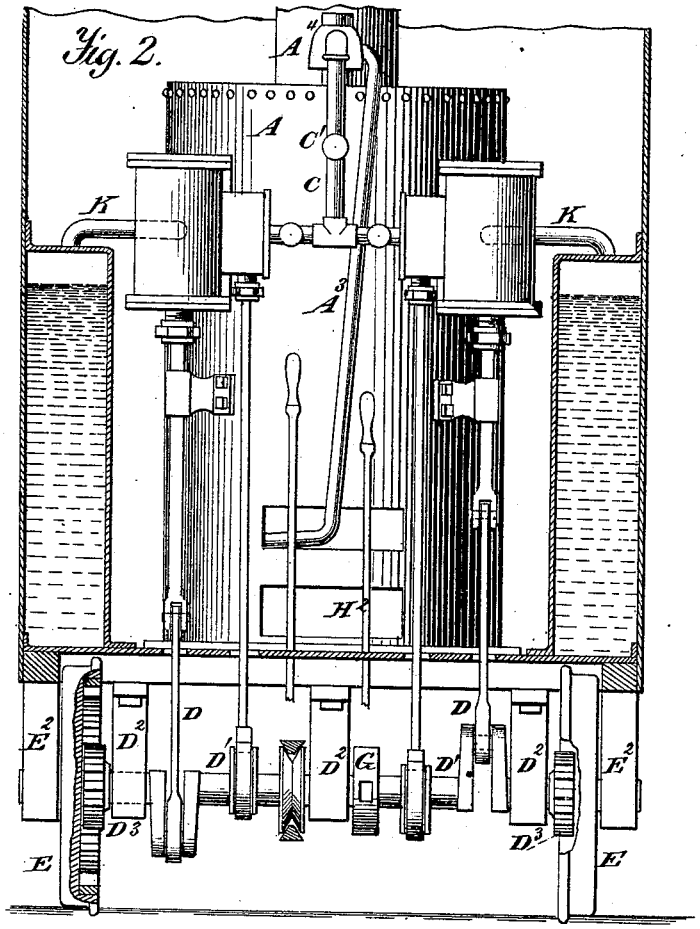
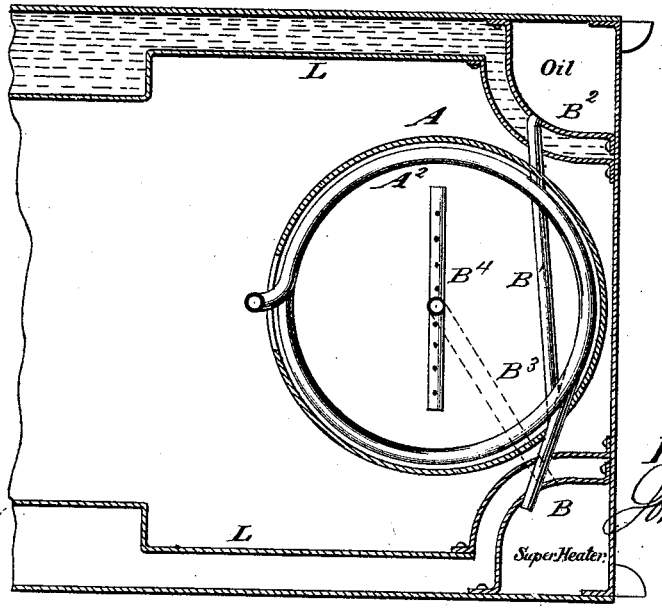


Fig. 3.



Witnesses.
A. Ruppert,
W. Frederick.

Inventor.
John T. Cord

UNITED STATES PATENT OFFICE.

JOHN T. CORD, OF BALTIMORE, MARYLAND, ASSIGNOR OF ONE-FOURTH HIS RIGHT TO JOHN S. FREDERICK AND ONE-FOURTH TO THOS. ROBERTS, ALL OF SAME PLACE.

IMPROVEMENT IN STREET-MOTORS.

Specification forming part of Letters Patent No. **212,442**, dated February 18, 1879; application filed August 13, 1878.

To all whom it may concern:

Be it known that I, JOHN T. CORD, of Baltimore, in the county of Baltimore and State of Maryland, have invented certain new and useful Improvements in Street-Motors; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification—

Figure 1 being a side elevation of my improved motor, showing a portion of the cab and frame-work, the boiler, the superheating-pipe, the gas-generator, the engine, the condenser, air pipes and pump, the brake, and the driving-gearing. Fig. 2 is a transverse sectional elevation, showing the boiler, the engines, the water-tanks, the driving mechanism, the brake-wheel, and the disk for stopping the movement of the motor. Fig. 3 is a plan view, showing the boiler, the superheating device, portions of the water-tanks, the oil-reservoir, the superheater or gas-generator, and the burners.

Corresponding letters denote like parts in all of the figures.

This invention relates to that class of motors which are used to propel cars upon street-railroads or tramways; and it consists in providing such motors with a reservoir for containing liquid fuel, said reservoir being surrounded, or nearly surrounded, with water, for the purpose of preventing the formation of explosive gas therein; and, further, in the combination and arrangement of certain of the parts of which the motor is composed, as will be more fully explained hereinafter.

In constructing a motor to which to apply my improvements, I may use any of the well-known forms of boilers, engines, pumps, or injectors, connecting-rods, and other operating parts; but I prefer to use the form of boiler and engine shown, and to locate them as near one end of the carriage as convenient, in order that their weight may rest mainly upon the driving-wheels.

As shown, A represents a vertical boiler, to the upper end of which a pipe is attached for the purpose of conveying away the gases arising from the furnace. This boiler may be of the usual tubular type, or of any other approved form of construction internally, and it has in its lower end a coil, A^2, which has one of its ends attached to a vertical pipe, A^3, the upper end of which is connected to a steam-dome, A^4, upon the top of the boiler. This pipe is supplied with a cock or valve, A^5, in order that the amount of steam passing through it may be regulated, such steam flowing therefrom to the superheating-coil A^2, and from thence to the superheater or gas-generator B; and in order that a quantity of oil may be carried with it and converted into gas in said superheater or generator, a pipe, B^1, is connected to the coil at a point near it where it emerges from the furnace of the boiler, and at such an angle as to cause the outgoing steam to carry with it the requisite amount of oil from the oil-tank B^2, said pipe being provided with a valve for regulating the amount of oil carried forward, which should be just sufficient to furnish the amount of gas required for generating the quantity of steam necessary for propelling the motor.

It will be observed that the oil-tank B^2 is located in one corner of the cab, and that it is partially surrounded with water, the object of which is to prevent the oil from becoming so much heated as to cause the generation of an explosive gas. It may, however, be located at any other convenient point, and, if desired, entirely within the water-tank; and as a further precaution against the injurious effects that would possibly arise from the generation of explosive gas in the oil-tank, a pipe may be attached to its upper end and be carried up through the roof of the cab, and thus, should any gas be generated, it would be delivered into the atmosphere.

It will be understood that the gas to be burned for the generation of steam in the boiler is generated in the superheater B, and by the agency of the steam entering it from the coil A^2, and this gas is taken from the up-

per end of the superheater by a pipe, B^3, also to be supplied with a valve or cock for regulating the amount allowed to pass through it, through which it is conducted into the furnace of the boiler and into a pipe, B^4, which is supplied with the requisite number of burners, where it is burned, and thus made to superheat the steam in the coil A^2 as well as to generate steam in the boiler.

When a sufficient amount of steam has been generated it is taken from the dome A^4 through a pipe or pipes, C, which are furnished with a valve or valves, C′, and conducted to the steam chest or chests of the engine or engines, said engines being attached to the boiler at such a point as to cause the centers of their cylinders to be as nearly as possible in line with the axis of a driving-shaft.

The engines do not constitute any part of my present invention, and hence need not be further described than to say that they are provided with valves, eccentrics, and valve-rods of any approved form, and with connecting-rods D, which connect the piston-rods to the crank or cranks of a driving-shaft, D^1. This shaft is supported in pedestals D^2, attached to the frame-work of the motor, and may be an unbroken one and extend across the machine, as shown in Fig. 2; or it may be divided at its center and each engine made to operate one portion thereof, which will probably be found advantageous when running on level or slightly descending grades.

Upon the outer ends of the driving shaft or shafts there are fixed pinions D^3, the teeth of which mesh into and drive internally-geared wheels attached to or formed upon the inner surfaces of the driving-wheels E E, they being secured to a shaft, E^1, having its bearings in pedestals E^2 E^2, attached to the frame. This shaft may also be divided at its center, if preferred, and have a bearing-point placed there for its support, and thus the use of one only of the engines may be facilitated, and only the outer wheel be used as a driver when passing through curves.

As a means of checking the movement of the motor when necessary, I propose to use a brake constructed and arranged substantially as shown in Fig. 1, for which I propose to apply for a separate patent.

As a matter of economy in motors of this type it is important that the exhaust-steam from the engines should be utilized in heating the feed-water to some extent before it enters the boiler, and it is also important that it should be condensed, so that it may be returned to the boiler in the form of water, and also to prevent it from frightening horses by being exhausted into the atmosphere.

For the accomplishment of these results there is connected to the exhaust-port of each of the cylinders a pipe, K, which extends therefrom into one of the tanks L L, which are located upon the sides of the motor, and, if found desirable, may extend across one of its ends. These pipes terminate in the space occupied by the feed-water in the tanks L L, which has the effect to condense a large portion of the steam; but as such water will become somewhat heated before it is all pumped into the boiler, or before a fresh supply of cold water is taken into the tanks, and thus be caused to give off a vapor which should be condensed and used as feed-water, as well as what of the steam from the engines is not condensed by the water in the tanks, it becomes necessary to provide some further means of condensation; and this is effected by placing a pump, L^2, in the condenser L^1, which is located under the frame-work of the motor, and arranging it in such a manner that, as the motor is moved upon the track, its piston will be given a reciprocating movement, which will cause a current of air to be driven into the condenser L^1, or into an air-vessel placed therein, and from which it is taken through a vertical pipe, L^3, into and through horizontal pipe L^4, in or upon the cab.

Extending from the water-tanks L to the horizontal pipes L^4 there is a series of vertical pipes, L^5, which convey any steam or vapor that may arise from the water in the water-tanks into the pipes L^4, where it comes in contact with the current of cool air from the pump and is at once condensed, the water running down through the vertical pipes into the tanks, from whence it may be taken to the boiler to be reconverted into steam.

The supply of water for the condenser is to be passed through pipes connecting it with the water-tanks, such pipes not being shown in the drawings.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a street-motor, the combination of a cold-water tank and a liquid-fuel reservoir, said reservoir being so arranged with reference to the water in the tank as to be surrounded, or nearly surrounded, therewith, whereby the oil is maintained at so low a temperature as to prevent the formation of explosive gas in its receptacle, as set forth.

2. In a street-motor, the combination of the superheating-coil A^2, arranged in the furnace of the boiler, the fuel-tank having a regulated discharge-aperture, and the superheater or gas-generator, they being arranged to operate substantially as and for the purpose set forth.

3. The combination of the exhaust-pipes K K, the water-tanks L L, and the condenser L^1, the exhaust-pipes terminating in the water-space of the tanks, substantially as and for the purpose set forth.

4. In a street-motor, the combination of a gas-generator, a pipe leading therefrom having in it a regulating-valve, a series of gas-burners, and the furnace of a steam-generator, the parts being arranged with reference to each other and to operate substantially as set forth.

5. The combination of an air-pump communicating with the water-space of one or more condensers, pipes for conducting the air from said pump to its point of delivery, and a series of steam or vapor pipes communicating with the water-tanks and air-pipe, the parts being arranged as herein specified, and to operate as set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

JOHN T. CORD.

Witnesses:
W. C. FREDERICK,
J. S. FREDERICK.