(No Model.)

3 Sheets—Sheet 1.

G. PARDY.

METHOD OF PROPELLING RAILWAY CARS.

No. 326,145. Patented Sept. 15, 1885.

Fig. 1.

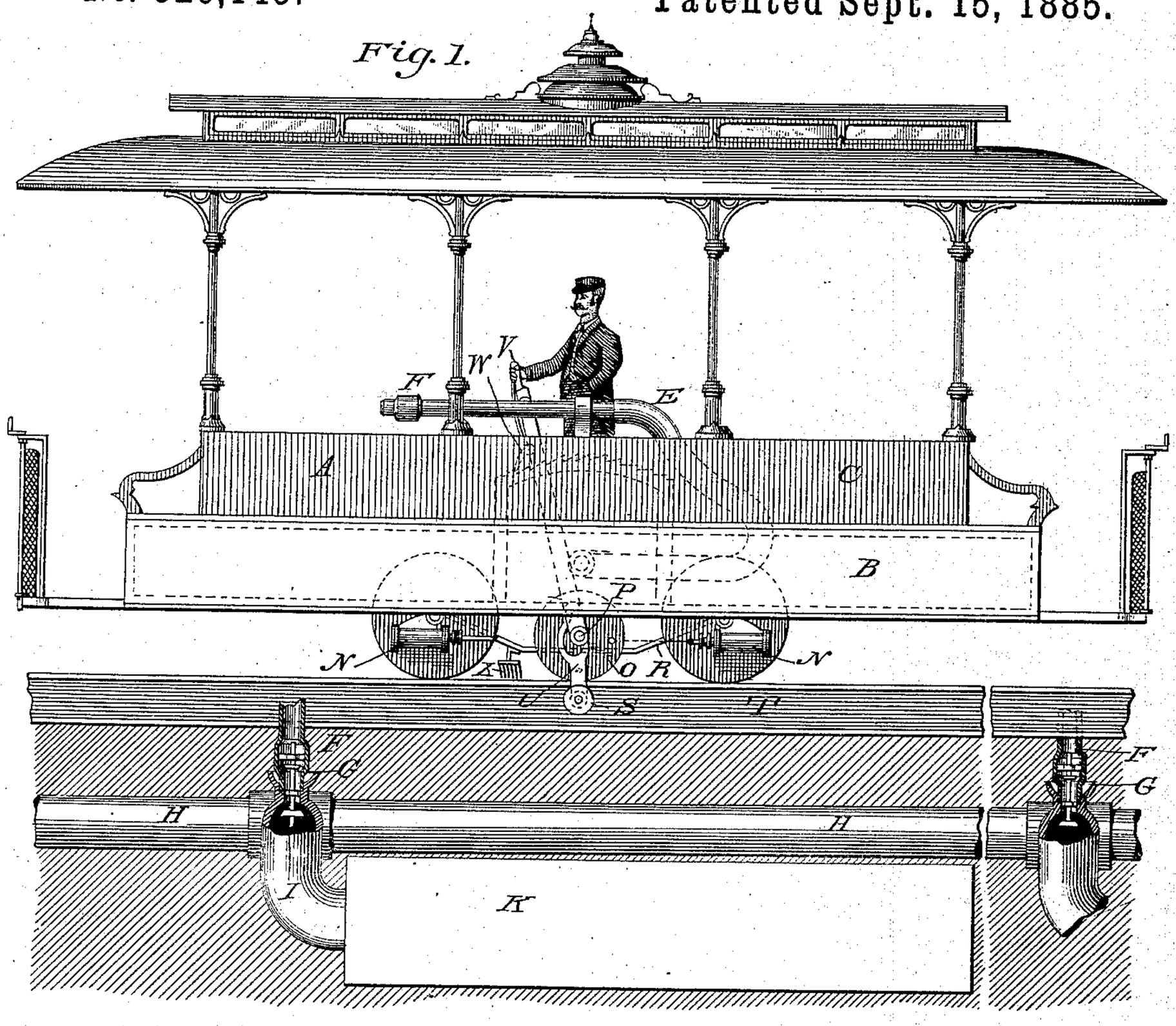
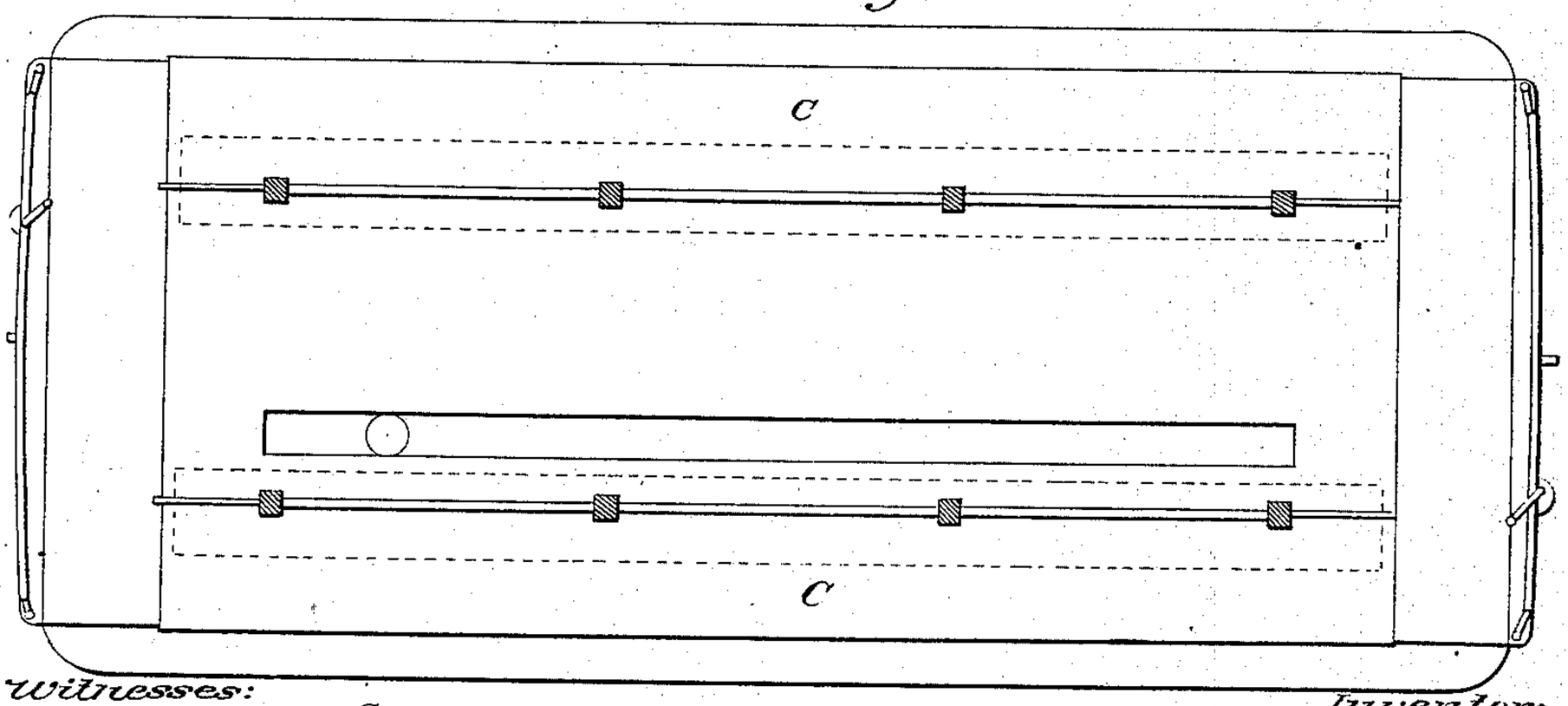


Fig. 2.



Witnesses:
R. P. Hammond, Jr.
Henry Choice.

Inventor:
George Pardy

(No Model.) 3 Sheets—Sheet 2.

G. PARDY.

METHOD OF PROPELLING RAILWAY CARS.

No. 326,145. Patented Sept. 15, 1885.

Fig. 3.

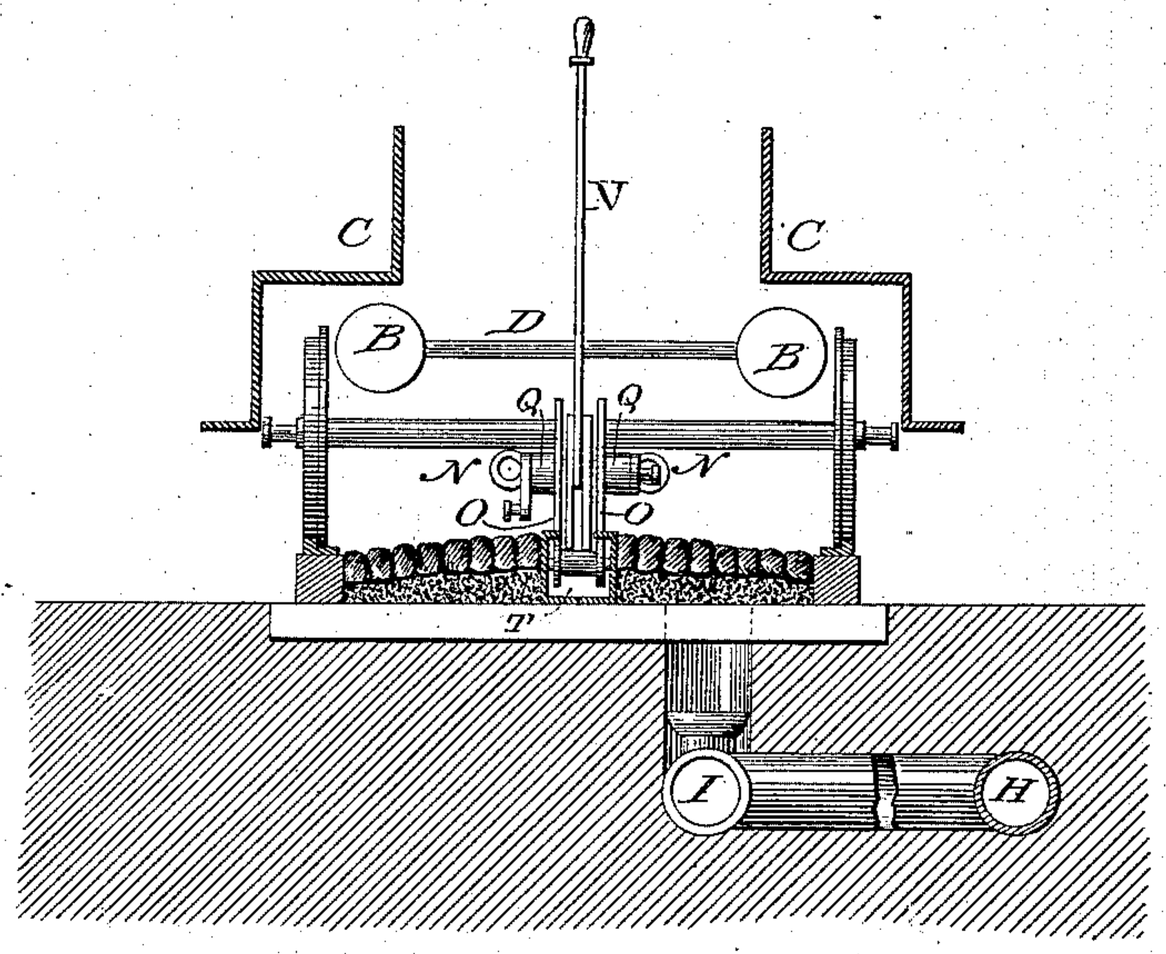


Fig. 4.

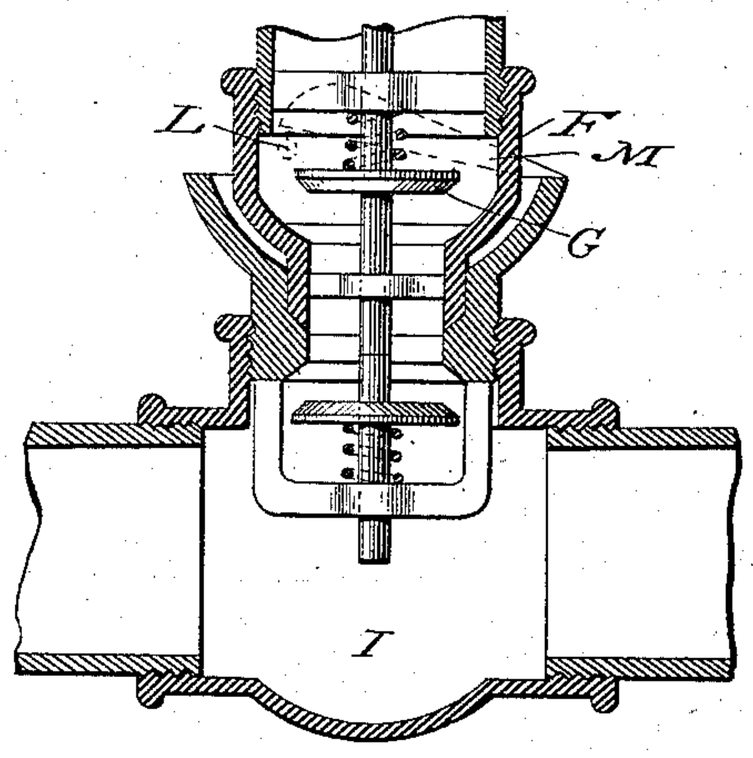


Fig. 5.

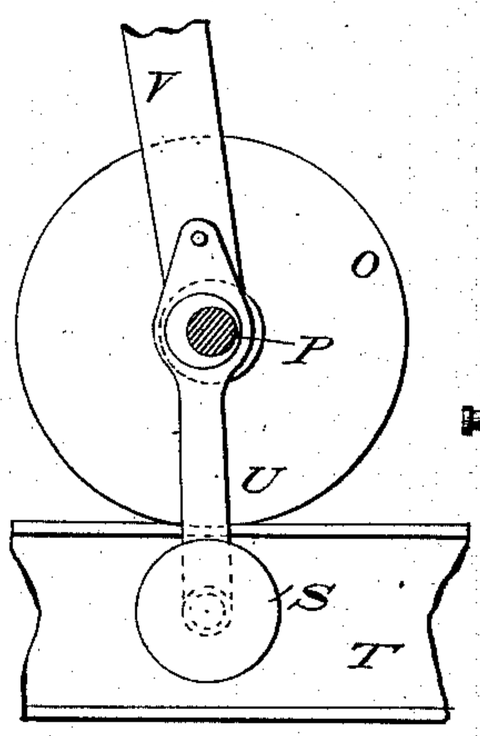
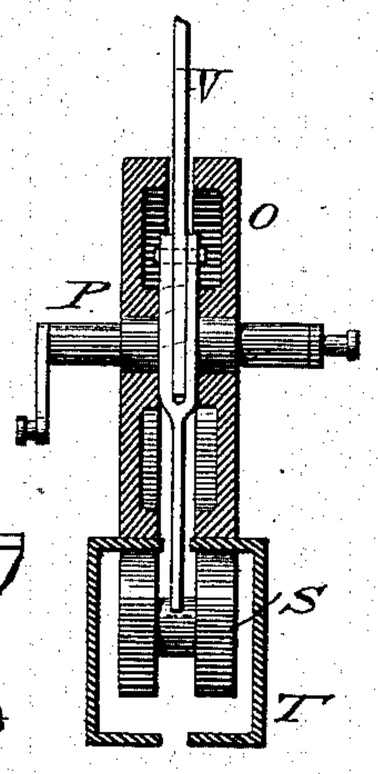


Fig. 6



Witnesses:
R. P. Hammond, Jr.
Henry Choice

Inventor:
George Pardy

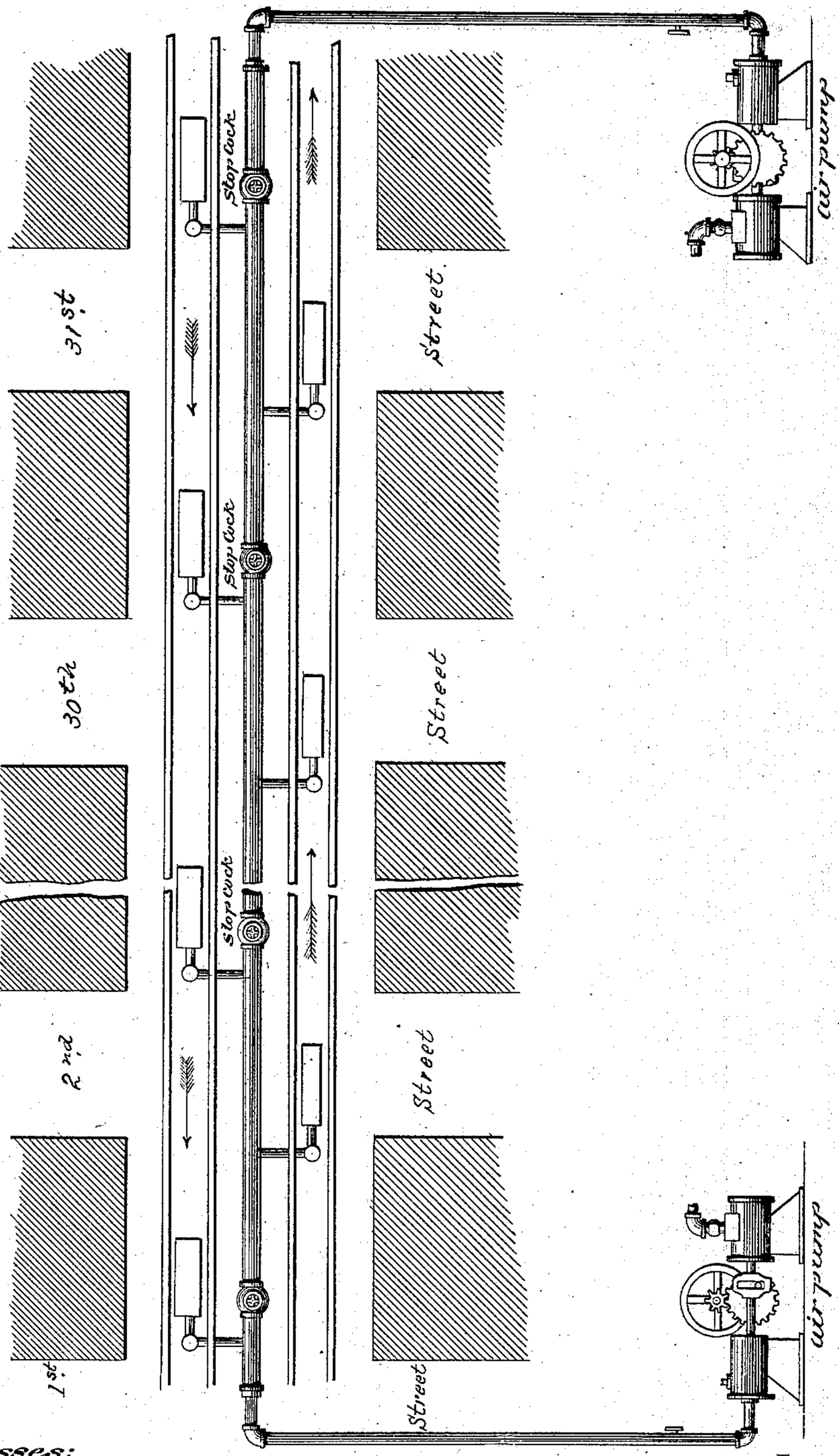
(No Model.) 3 Sheets—Sheet 3.

G. PARDY

METHOD OF PROPELLING RAILWAY CARS.

No. 326,145. Patented Sept. 15, 1885.

Fig. 7.



Witnesses:
R. P. Hammond, Jr.
Henry Choice

Inventor:
George Pardy

UNITED STATES PATENT OFFICE.

GEORGE PARDY, OF SAN FRANCISCO, CALIFORNIA.

METHOD OF PROPELLING RAILWAY-CARS.

SPECIFICATION forming part of Letters Patent No. 326,145, dated September 15, 1885.

Application filed February 19, 1885. (No model.)

To all whom it may concern:

Be it known that I, GEORGE PARDY, a resident of San Francisco, State of California, have invented Improvements in the Methods of Propelling Railway-Cars, of which the following is a specification.

My invention relates to a new and useful system of operating street-railroads with compressed air; and it has for its object, first, to provide a practical method by which the air may be used at lower pressures than heretofore, so as to acquire all the advantages of economy, safety, convenience, the non-formation of ice in exhausting, and increased efficiency generally; second, to provide for the reduction of the weight and bulkiness of the motor, so as to make practical the application of compressed air as a motive power to operate engines on roads having light traffic, but frequent trips, and which could not be run with profit with such heavy and cumbersome machinery as is required when the motors are charged to run long distances.

My invention consists, mainly, in the application of a storage and charging pipe, which carries the air below the surface of the roadbed all along the route contiguous to the track, and which, through a system of valves attached to this pipe, closely set together within or near the track, is made practically, and absolutely, if needed, available for tapping to take a supply therefrom to replenish the receivers upon the car at any and all points in the route; or, in other words, the system is so arranged that the car is never removed from its source of supply, and has no determined distance to travel with each charge, and may therefore be constructed so as to have the minimum capacity, both as to storage room and pressure of the air, instead of the maximum, as when the length of the journey to the charge is absolute and fixed.

Compressed-air motors have been run a definite distance without replenishing, as from end to end of the route and back, and suggestions have been made to run from station to station, using a pipe-connection between; but in all cases provisions had to be made for carrying the heaviest possible load of passengers under the most adverse circumstances likely to occur—such as those arising from very frequent stoppages, bad condition of the track, accidental delays, &c. The definite points or stations were not to be passed without refilling the receivers, and as the apparatus connected with refilling was inconvenient and required much time to operate, it followed that the operation could not in practice be frequently repeated, and that the refilling-stations should be far apart, the stored air maintained at a high pressure, and the motor given so large a storage capacity as to be cumbersome and unwieldy, and costly to operate and maintain, making the difficulties surrounding the use of compressed air as a motive power for street-railways prevent its general adoption.

No practical system has ever been devised, so far as I am aware, by which the motor could be resupplied with air at any and all points in the route by which the comparatively low pressure of air were made effectual, and by which the great bulkiness of the motor was so sensibly reduced.

In the present invention the maximum weight of the load and the contingencies of the trip do not control, but have only the effect of limiting the distance the motor will be capable of traveling without having recourse to the supply-pipe constantly at hand. No definite stopping places are ordinarily necessary. In fact those stoppages only which are of necessity caused by taking on and letting off passengers or loading or unloading freight are the only ones which I propose to make, it being calculated that these will be ample in most cases to give the required opportunity to replenish the receivers.

Of course where, under this system, the great reduction of the weight of the motor brings us into the difficulty of not having sufficient adhesion to the track to give the machine, when the carrying-wheels are used as drivers, sufficient power to go up grades or to haul other cars behind it, some provision must be made to overcome the difficulty; otherwise much of the usefulness of the plan would be destroyed. Therefore, whenever the conditions demand it, I shall provide a central slotted track between the rails, on top of which I will run driving-wheels, and below this track, in a channel-way, other wheels to be drawn up tightly by levers

in such manner as that the track itself will be gripped with more or less force between the faces of the upper and lower wheels, thus acquiring all the adhesion that may be necessary.

In the accompanying drawings, forming part of my specification, Figure 1 is a side elevation of my motor with the near wheels removed, so as to show the engine-cylinders, and including a sectional view of the channel-way and supply-pipe below the track. Fig. 2 is a plan view. Fig. 3 is a cross-section of the channel-way, driving-wheels, and a part of the motor, so as to show its relation to the other parts. Fig. 4 is an enlarged sectional view of the valvular outlet from the main pipe and the valvular end of the refilling-nozzle, both coupled together as in the act of refilling. Fig. 5 is an enlarged side view of the driving and gripping wheels. Fig. 6 is a sectional elevation of the same. Fig. 7 is a diagrammatic plan of the supply-pipe with its cocks and valves and the compressing-engines.

In all the figures like letters of reference represent like parts.

A, Fig. 1, is a motor constructed as an open car after the style of the cable-road dummies. The air-receivers B are placed under the seats C, and are indicated by circles in Fig. 3 and dotted lines, Fig. 1. From these receivers, which are connected together by a pipe, D, a hose-connection, E, is made, which terminates in a metal nozzle, F, in the end of which is fitted a valve, G, opening inwardly and closed by a spring and the pressure in the receivers B. (See Fig. 4.)

H is a pipe, preferably laid underground near the track, large enough to have in itself storage capacity sufficient to insure that the drawing off of each charge for the motors will not greatly decrease the pressure—five to six inches diameter for roads running cars five minutes apart—while it should never be less than four inches diameter. The larger the pipe within the limits the better. This pipe is provided with right-angled branches—say every three hundred feet, more or less—which lead to the center of the track and terminate in valvular outlets I, having an inwardly-opening valve similar to the one on the end of the nozzle, also held closed by the pressure behind it and a spring. When the nozzle is coupled to the outlet of the pipe, the stems of the two valves meet, and are pressed apart by the operator, and the air passes through from the main into the receivers on the motor. In the act of uncoupling the nozzle the two valves spring together again, and both the nozzle and outlet from the main are tightly closed. The nozzle is subject to an upward pressure, tending to blow it out of the chamber I as soon as the valve of the main opens, and to prevent this the nozzle must be locked down when filling.

I show a projection, L, in dotted lines in Fig. 4, attached to the nozzle. This inserts under a lip, M, on the outlet of the main, which lip is slightly inclined, so that by giving the nozzle a slight turn just before the end of the nozzle becomes seated the valves will be spread apart by the action. There is nothing, however, absolutely material and indispensable in the construction of the nozzle or underground valve in the operation of this system. Various devices may be used. All that is necessary is that the connection with the main shall be quickly made in a convenient manner. Where these valvular outlets occur in the main, I propose, if found necessary or desirable, to place reservoirs K, so that a great volume of air may be immediately at hand to draw from, and a quicker operation in replenishing the receivers will be effected.

When the route is a long one, and it is desirable to avoid stopping the entire line when the service-pipe gets out of order, there may be compressing-engines at both ends of the line, so that a leaking portion of the pipe may be cut out by stop-valves until the repairs are done. With this arrangement two pressures may be used—as, for instance, if the grades are heavy at one end of the route the pressure may be, say, one hundred pounds per square inch, while at the other ends, if the grades be lighter, it may be sufficient to carry sixty pounds pressure. A stop-valve will intervene between the two pressures.

Stop-valves should be placed at frequent intervals on the pipe to give facilities for locating leakages.

N N are the air-engine cylinders. They connect in ordinary manner with the driving-wheels O O, when these are used; otherwise they will connect directly with the carrying-wheels or their axles.

The wheels O O are supported on a strong axle, P, which is borne in boxes Q, supported on the hanger R, which in turn is carried on the axles of the carrying-wheels. Under these driving-wheels are the grip-wheels S, which run in a channel-way, T, made of channel-irons set edge to edge with a space between at top. (See Figs. 3 and 6.)

On the axle of the grip-wheels, and between them, is a lever, U, which is forked at its upper end and straddles the axle of the drivers, so as to connect above to the hand-lever V. This hand-lever has its fulcrum on the axle of the driving-wheels, as shown, and its forward and backward movement effects, through the lever U, a gripping of or releasing of the wheels S from the channel-irons.

The ordinary notched quadrant and pawl shown at W is used to hold the lever V when set. I do not, however, claim the devices for effecting adhesion to the track, as they are claimed in an application marked "Division C" of even date of filing, Serial No. 156,459.

In front of the drivers may be a wire brush, X, to keep the track clear, for obstructions of any size would cause damage. It may be necessary to provide for some spring in the drivers when obstructions occur—as, for instance, let the drivers have a rubber ring be-

tween periphery and hub. This construction is not shown, for it is not thought to be necessary. If proper attention is paid to obtaining even thickness of channel-iron all along the route, no difficulty will occur.

The system of operating is as follows: The storage and supply pipe being filled with air, say, at a pressure of one hundred pounds per square inch, the motor's receivers are filled therefrom at the depot at full pressure on starting out. As it proceeds on its trip, the air is used in the engine either at full pressure direct from the receivers or may be reduced to, say, thirty pounds, by passing it through the commonly-known reducing-valve. When the conductor strikes the bell to stop, for a passenger to get on or off the car, the engineer stops at just where the next valve of the supply-pipe is located, or, at least, within a few feet thereof. He then takes down his feeding-nozzle and connects it with one of the valved outlets of the supply-pipe, previously removing its cover. (The cover may be made to move automatically, if preferred.) The air rushes through the pipe to fill the receivers until the bells sound again to start, when the nozzle is taken up and replaced on its stand. The valve in the outlet and nozzle closing automatically, the engineer need not wait to get the final few pounds of pressure, but may start again with such pressure as he has obtained. In this way no unnecessary delay occurs. The floor upon which the engineer stands has a narrow slotted hole in it several feet long to allow the nozzle to be passed through to get at the valved outlets below it.

The car or motor need not be required to travel over six or eight blocks, or even a less distance where stops are frequent. Usually, the ordinances of cities and towns require the cars to stop only at crossings. In such cases the valves need only be placed there, though they may be placed every hundred feet (more or less) if the cars are permitted to stop between crossings, for it is desirable to be able to refill the receivers during every stop, so as to have great pressure when starting.

Several suggestions have been made to operate street-railroads with compressed air carried in a pipe near the track. Some of these have been totally impracticable, and none have included within their scope the system herein proposed.

I do not herein claim the mechanical means employed to carry out my invention, having already done so in an application filed June 5, 1884, Serial No. 133,974, of which this is a division under requirement of the office.

What I claim as my invention is—

1. In a low-pressure pneumatic-railway system, the method of maintaining the working pressure in a receiver on the motor which consists in frequently replenishing the receiver with compressed air from a conduit at substantially any point along the route while the car is stopped so as to receive or unload passengers or freight, substantially as described.

2. In pneumatic-railway systems, the method of operating motors, which consists, first, in conducting and storing compressed air at comparatively low pressures in conduits provided with numerous valved outlets contiguous to the track; second, in replenishing the receivers on the motors at substantially any point along the route with compressed air from said outlets while the car is stopped, (as to load or unload,) and, finally, applying the air to the engine, substantially as described.

GEORGE PARDY.

Witnesses:
A. HASLER,
HENRY CHOICE.