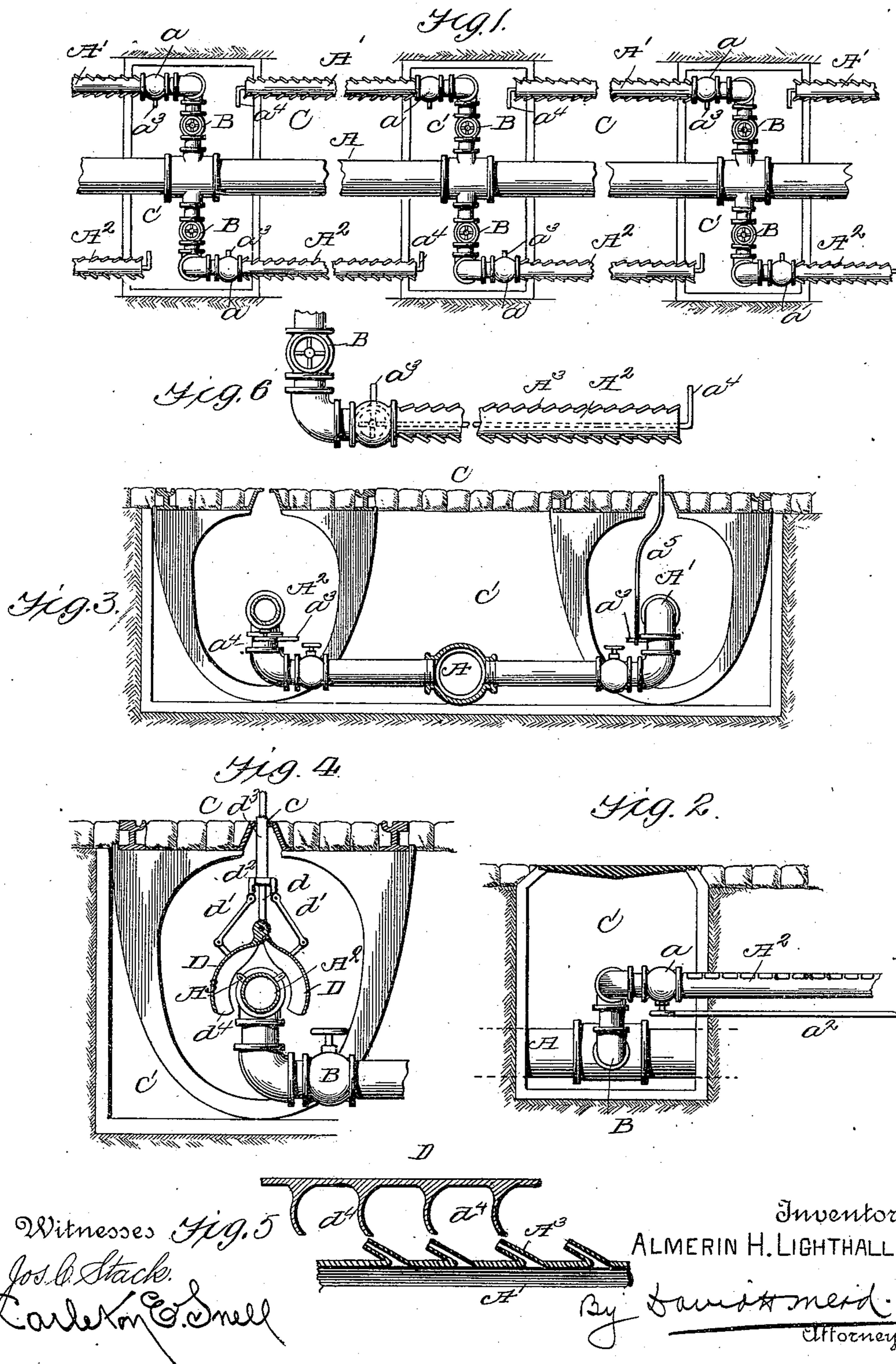


(No Model.)

A. H. LIGHTHALL.
RAILWAY SYSTEM.

No. 553,622.

Patented Jan. 28, 1896.



UNITED STATES PATENT OFFICE.

ALMERIN H. LIGHTHALL, OF NEW YORK, N. Y.

RAILWAY SYSTEM.

SPECIFICATION forming part of Letters Patent No. 553,622, dated January 28, 1896.

Application filed April 12, 1895. Serial No. 545,518. (No model.)

To all whom it may concern:

Be it known that I, ALMERIN H. LIGHTHALL, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Railway Systems; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to the propulsion of cars, and particularly to the propulsion of street-cars in cities.

The object of the invention is to provide means for propelling cars which shall be adapted for moving cars at a uniform speed over a track of varying grades.

Further, the object of the invention is to provide means for propelling cars which shall be adapted for moving cars at a uniform speed over a track of varying grades by regulating the motive power to exert at different points varying forces, according to the grade or the weight of the load.

Further, the object of the invention is to provide means for propelling cars whereby the power employed may be generated at one or at a number of stations at a uniform pressure and may be distributed at different points at varying pressures to correspond to the requirements on account of grades, loads, or other conditions.

Further, the object of the invention is to provide means for propelling cars whereby water or other suitable liquid under pressure may be used with effectiveness as the means for transmitting power to the cars to be driven, and in which the various permanent or incidental requirements as to variations of power at different points on a car-line may be complied with.

With these objects in view the invention consists essentially of means for propelling cars, comprising pipes or conduits arranged adjacent to the path of the cars adapted to contain fluid under pressure, a part connected to the car and movable with respect thereto, and means for directing the fluid against the movable part.

Further, the invention consists of various other novel features and details of construc-

tion, substantially as hereinafter described, and by which the effectiveness of the means is assured.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 is a plan view of a section of pipes as arranged in propelling cars according to my system, the pipes being broken between the valve-chambers to permit of showing a number of these chambers. Fig. 2 is a side view showing the arrangement of the main and branch pipes. Fig. 3 is a transverse sectional view showing the arrangement of the main and branch pipes in a conduit below the rails of a track. Fig. 4 is a transverse sectional view showing the conduit, and also showing the relative positions of the part attached to the car and which receives the impact of the water, and the branch pipes through which water is directed against the same. Fig. 5 is an enlarged view showing, on a large scale, a convenient and effective form of the discharge-nozzles and the part which depends from the car and receives motion therefrom. Fig. 6 is a view of one of the branch pipes, particularly showing the means by which the admission of fluid to the branch pipes is regulated.

In the drawings, A represents the main supply-pipe of the system, which may extend the entire length of the road upon which the system is operated, or may be composed of divisions formed by cocks placed in the pipe or by separate pipes laid end to end and forming the main supply of the system. The main supply-pipes A are connected with pumps placed at suitable pumping-stations arranged a suitable distance apart, and by which water or other suitable liquid is forced into the pipes under pressure. The average distance apart of the pumping-stations will be about two miles.

The pipes A are placed along the line of the track over which cars are to be propelled in any suitable position to allow ready discharge of the fluid contained in them against a part of the car, and they are preferably arranged in the lower part of a conduit, as shown in the drawings.

At suitable intervals—say of one hundred feet—along the pipes A are connected branch pipes A' A², which extend in opposite direc-

tions from their points of juncture with the main pipes. Each branch pipe $A' A^2$ is provided near its point of juncture with the main pipe with a shut-off valve a operated by a rod a^2 , having projections $a^3 a^4$ arranged in line with a projection a^5 depending from a car. The arrangement of the parts is such that as a car approaches a section the valve is turned to admit the fluid into the branch pipe over which the car is about to pass, and as a car leaves a section it automatically cuts off the flow of water through the branch pipe over which it has passed.

Each branch pipe is provided with a pressure-regulating cock B , by which the pressure of fluid in the branch to which it is applied may be regulated. By thus independently regulating the pressure in each branch pipe the operating-pressure may be obtained at a uniform pressure in the main supply-pipe, and the pressure in each separate branch pipe may be regulated to conform to the requirements arising by reason of grades or loads on the different sections.

The main and branch pipes are preferably arranged along a conduit C , and this conduit is provided at the points of connection of the branch pipes with the main pipe with chambers C' of a size to give access to the cut-off and pressure valves arranged at those points.

Each of the branch pipes $A' A^2$ is provided with a series of discharge-nozzles A^3 , through which when the cocks are turned fluid under pressure is discharged. The nozzles are arranged at angles to the pipes, the direction of the angle of course depending upon the desired direction of movement of the cars to be driven.

D is a sectional apron depending from a car to be propelled and sustained by an arm d designed to travel in a slot c in the upper wall of the conduit. The apron is composed of two sections pivotally connected to the arm d and capable of being moved up and down to bring them into and out of the line of discharge from the nozzles A^3 . The movement up and down of the apron is accomplished through rods $d' d''$, pivotally connected with the respective sections of the apron and to a collar d^2 sliding on the arm d , and the arm d^3 extending to the body of the car to be propelled. Each wing or section of the apron is provided with a series of pockets d^4 , which receive the impact of the fluid discharged from the branch nozzles.

To provide the necessary volume and pressure of water or other fluid employed, the same is preferably maintained in the main supply-pipes at a pressure of about three hundred pounds to the square inch, and thus it will be seen that by discharging the fluid upon the apron an effective means for propelling a car to which the apron is attached is provided. The water after being discharged against the aprons falls to the bottom of the

conduit, whence it is conducted to sewers or the like, or is returned to the pumping-stations, according to the available supply.

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

1. As a means for propelling cars, pipes or conduits arranged adjacent to the path of the cars and adapted to contain fluid under pressure, a part connected to a car and movable with respect thereto, and means for directing the fluid against the movable part, substantially as described.

2. As a means for propelling cars, pipes or conduits having discharge nozzles and adapted to contain water under pressure, a hood, apron or the like depending from a car, and means for moving the hoods, aprons or the like toward or away from the nozzles, substantially as described.

3. As a means for propelling cars, pipes or conduits having discharge nozzles and arranged in a conduit having a slot extending along the same, an arm depending from a car and projecting through the slot, and movable wings attached to the arm and arranged adjacent to the nozzles, substantially as described.

4. As a means for propelling cars, a main pipe or conduit for containing water under pressure, branch pipes connected to the main pipe or conduit and each provided with a series of discharge nozzles, a single shut off cock arranged at the juncture of the main pipe or conduit and each branch pipe, a rod connected to the shut off cock and extending along the branch pipe, and a projection from a car adapted to come into contact with the rod to positively open and close said shut off cock as a car approaches and leaves said branch pipe respectively, substantially as described.

5. As a means for propelling cars a main pipe or conduit for containing water under pressure, branch pipes attached to the main pipe or conduit, the branch pipes being provided with discharge nozzles, a conduit provided with a slot in its upper end, the branch pipes being arranged in the conduit, and extending parallel and to the slot therein, shut off cocks and pressure regulating cocks arranged adjacent to the points of juncture of the main pipe or conduit and the branch pipes, rods connected to the shut off cocks, a hood, apron, or the like depending from a car, and movable with respect thereto, and a projection from a car engaging the rods attached to the shut off cocks, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

ALMERIN H. LIGHTHALL.

Witnesses:

A. LANSING BAIRD,
DAVID C. GRANT.