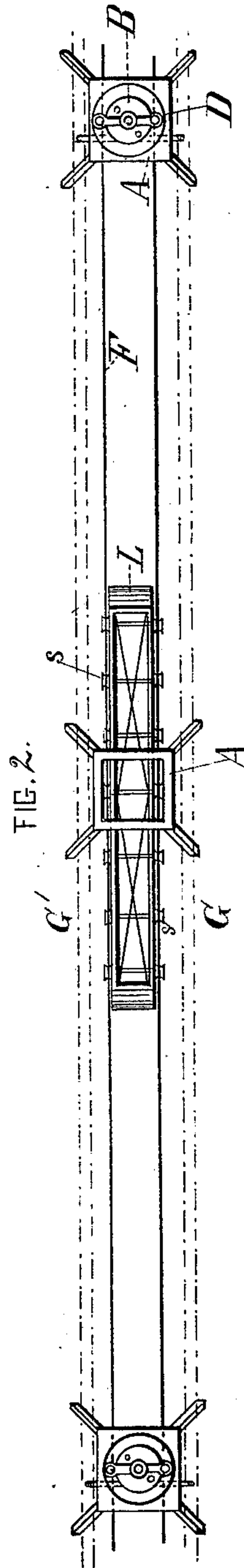
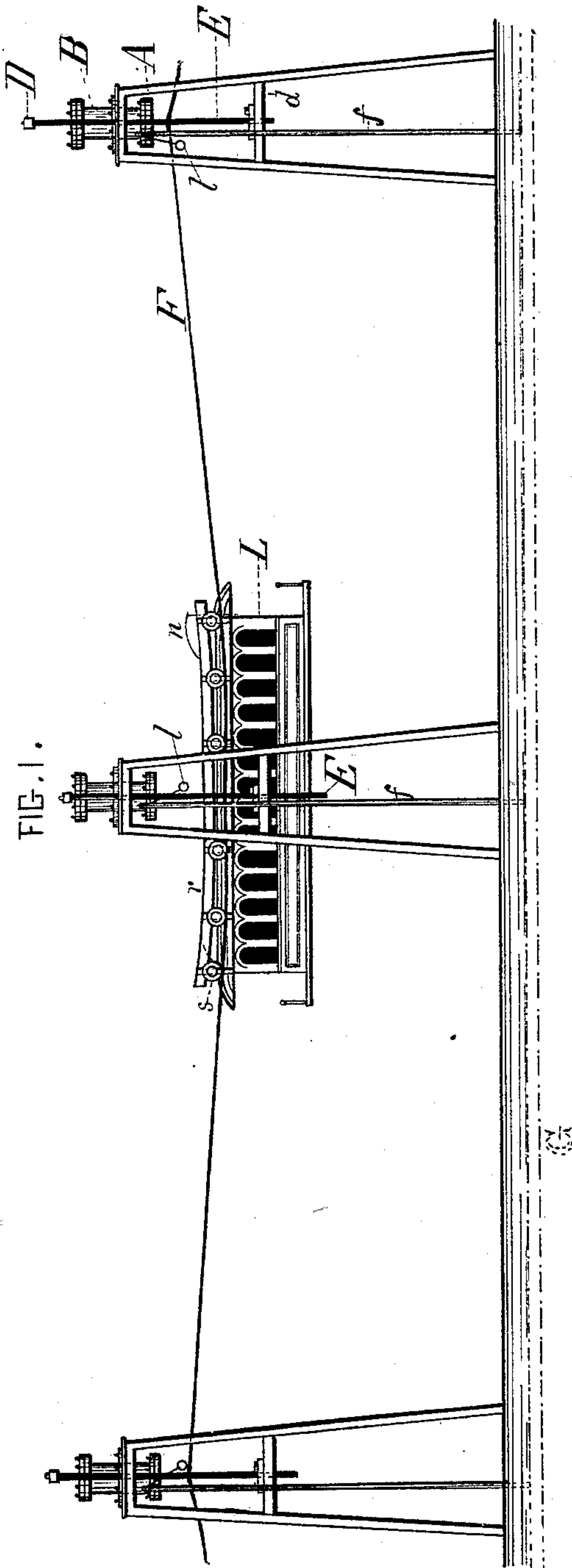


F. M. REAGER.  
Elevated Cable-Railway.  
No. 222,601. Patented Dec. 16, 1879.



WITNESSES:

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A. C. Eader

INVENTOR:

F. M. Reager  
By his Atty  
Chas B. Munn

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FIG. 3.

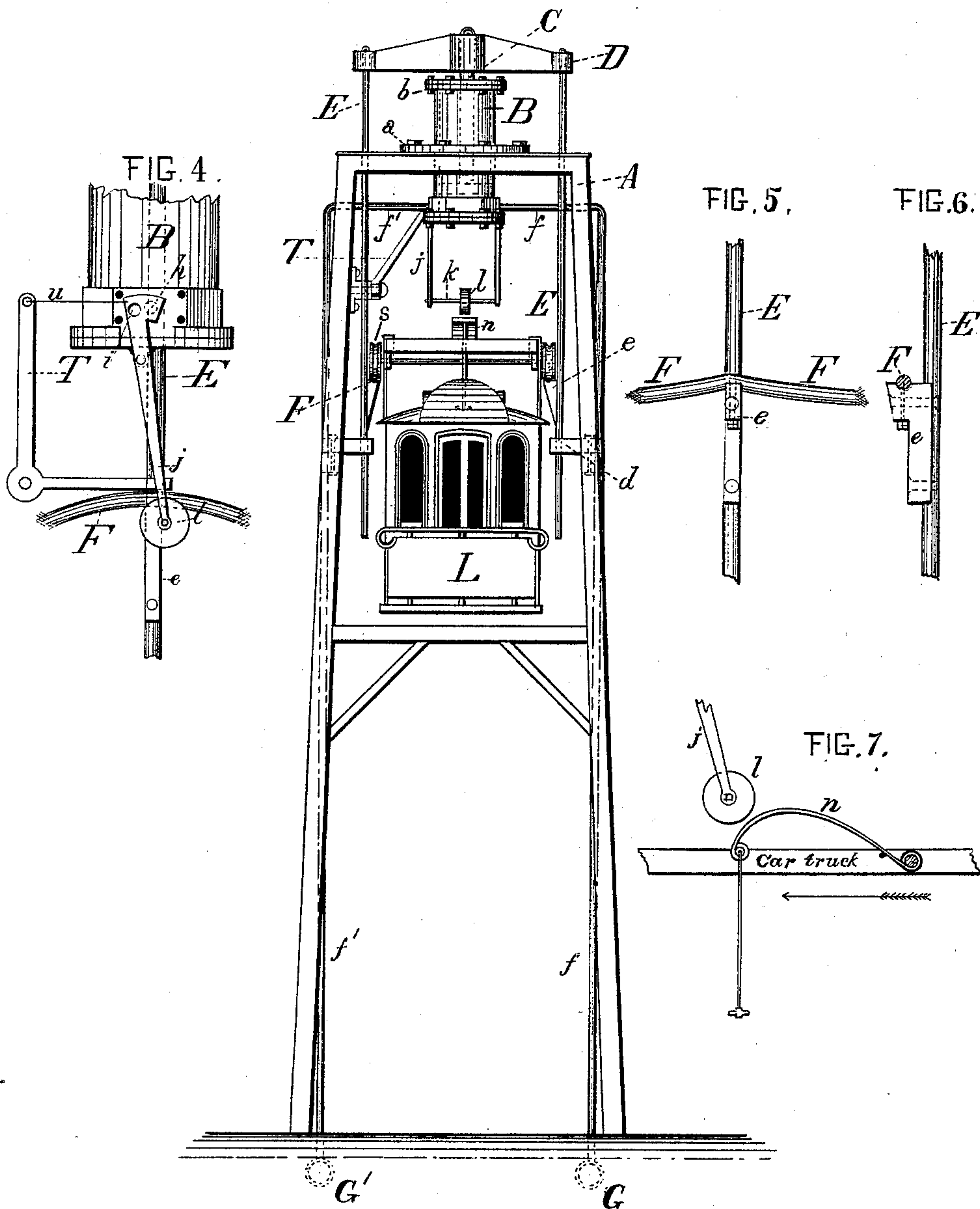


FIG. 4.

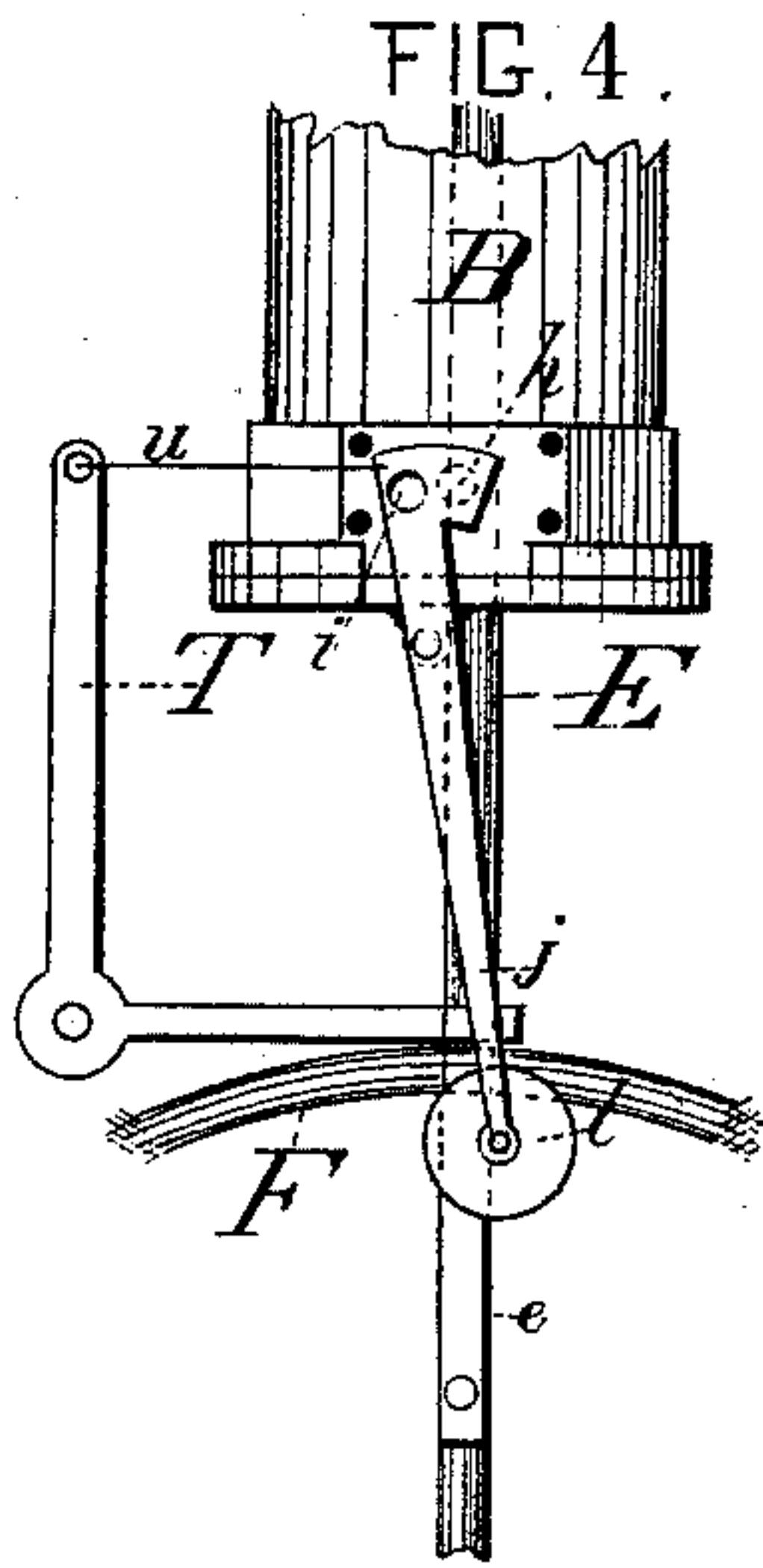


FIG. 5.

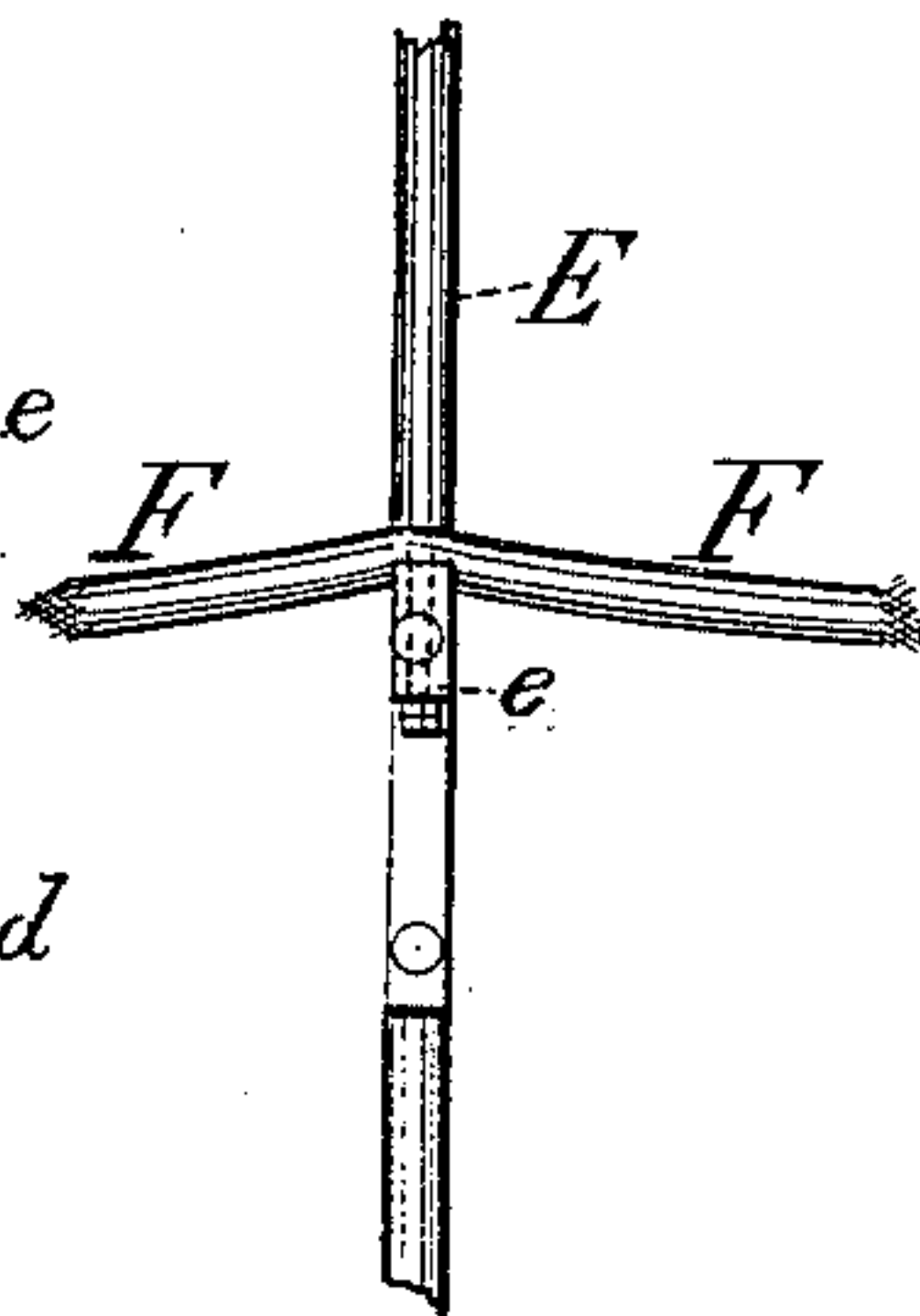


FIG. 6.

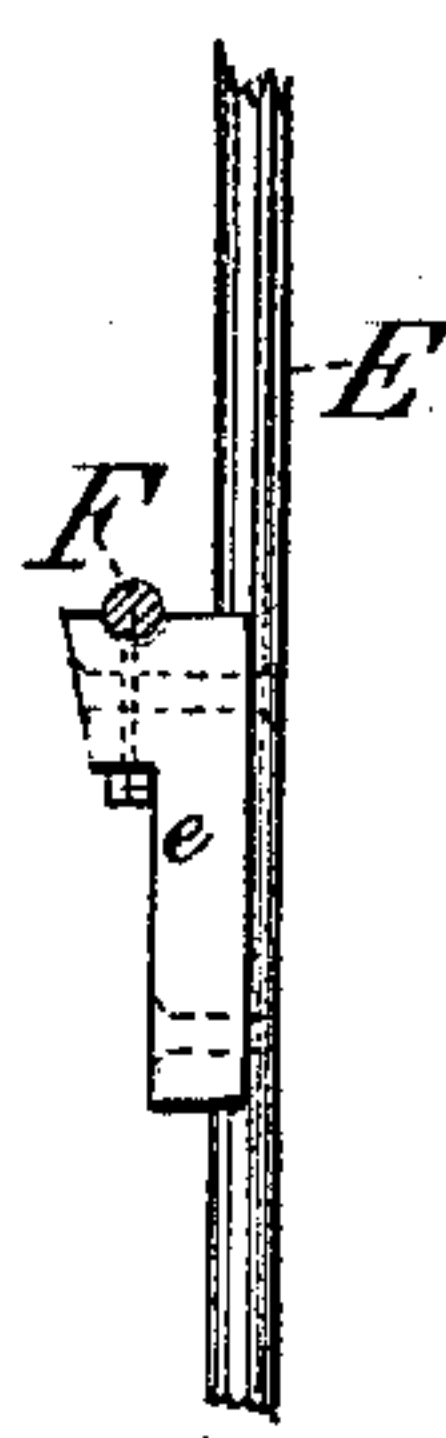
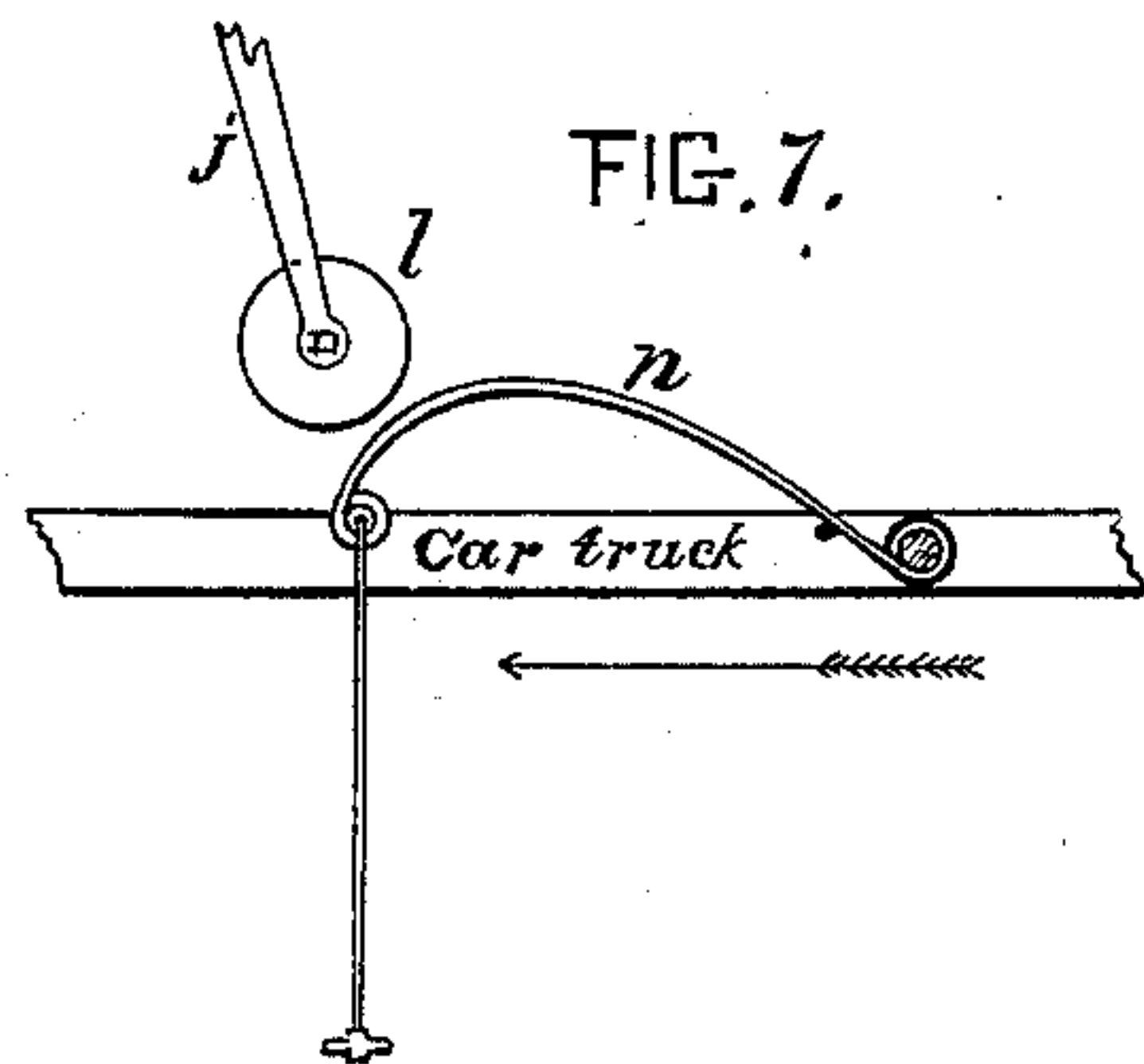


FIG. 7.



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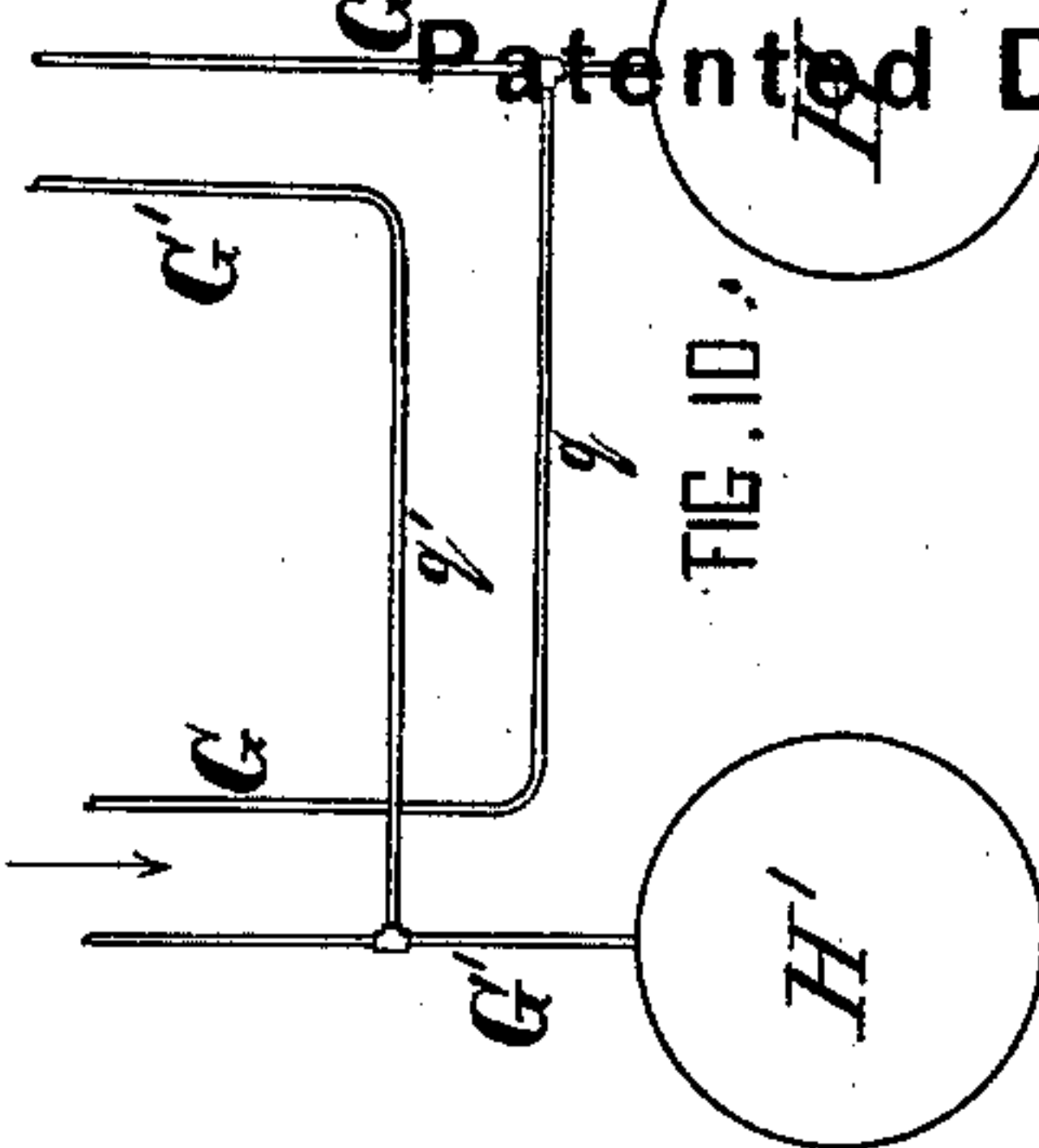
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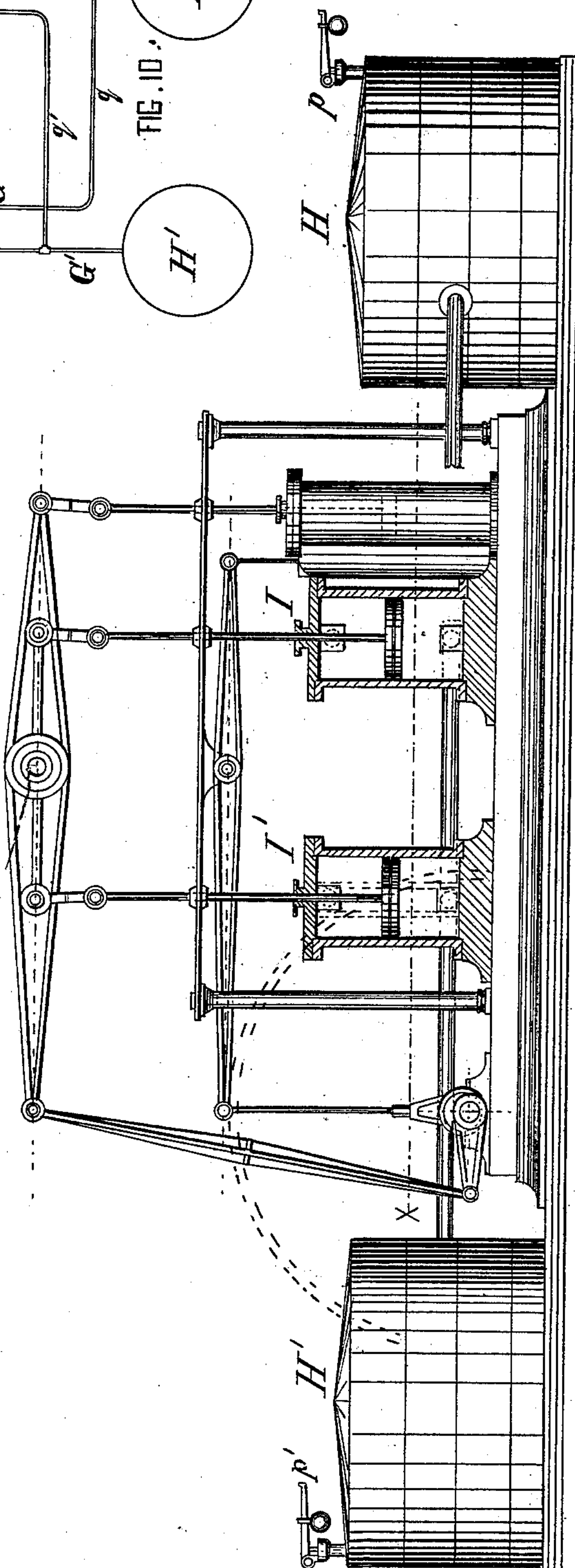
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No. 222,601.

Patented Dec. 16, 1879.



051



WITNESSES:

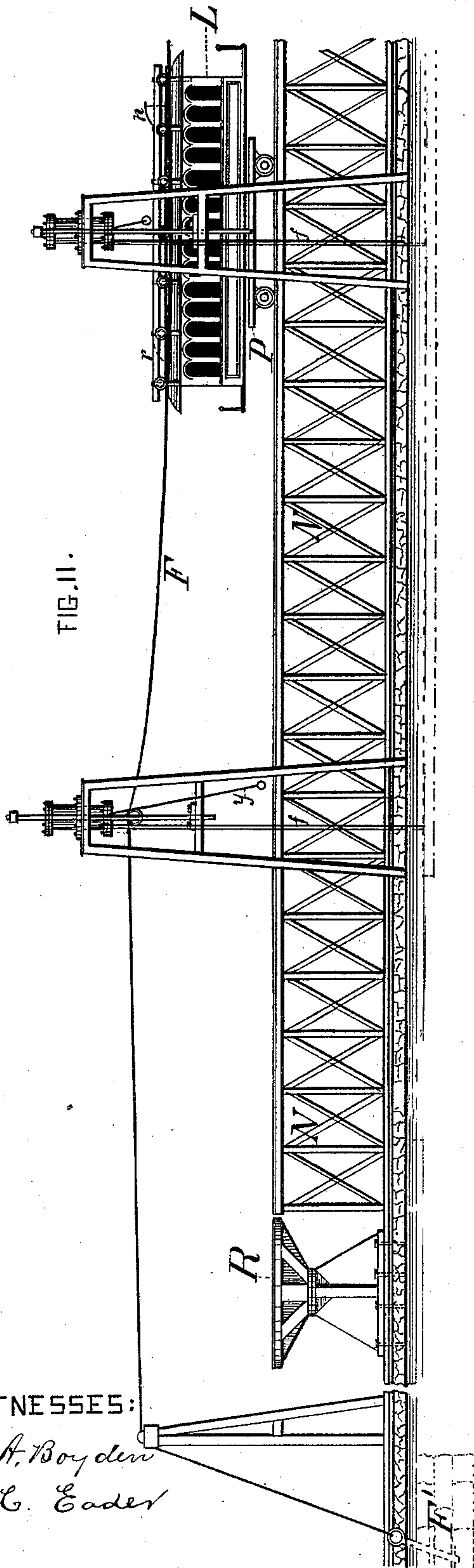
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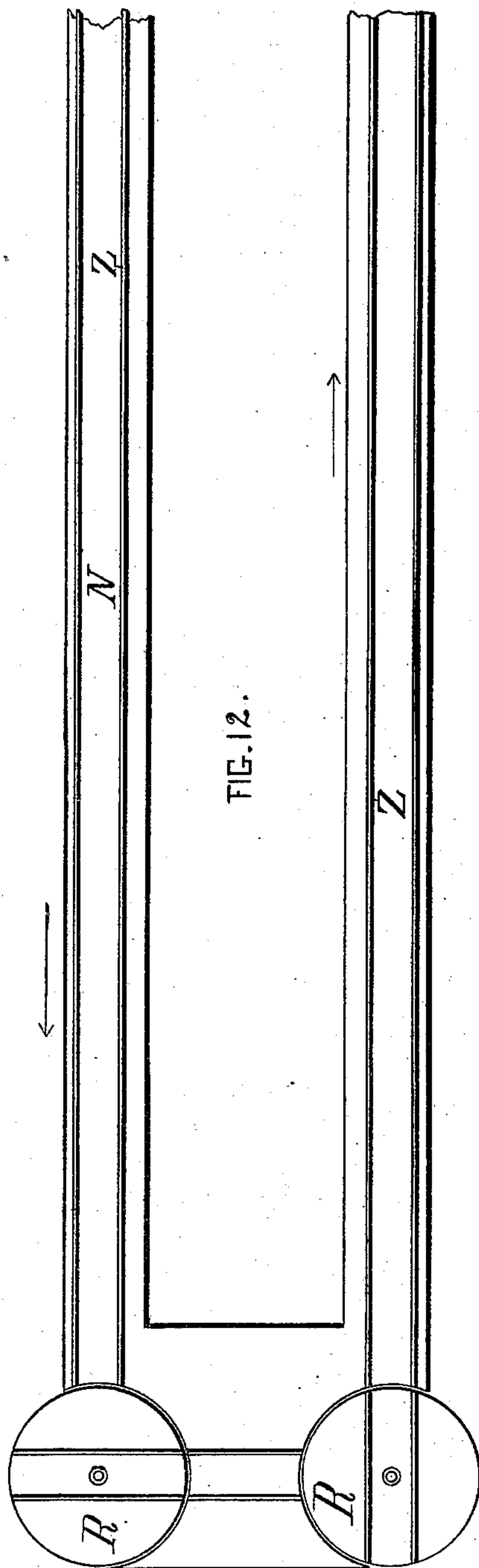
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Elevated Cable-Railway.  
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WITNESSES:  
Geo. A. Boyden  
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INVENTOR:  
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# UNITED STATES PATENT OFFICE.

FRANCIS M. REAGER, OF COLUMBUS, TEXAS.

## IMPROVEMENT IN ELEVATED CABLE-RAILWAYS.

Specification forming part of Letters Patent No. 222,601, dated December 16, 1879; application filed July 31, 1879.

*To all whom it may concern:*

Be it known that I, FRANCIS M. REAGER, of Columbus, in the county of Colorado and State of Texas, have invented a new and useful improvement which may be designated an "elevated propelling cable-track for the rapid transit of cars in cities;" and I hereby declare the following is a full, clear, and exact description thereof, reference being had to the annexed drawings, in which—

Figure 1 is a side view, showing the general features of my invention. Fig. 2 is a plan of same. Fig. 3 is a view, on a larger scale, of a tower, pneumatic cylinder, and an end of a car. Fig. 4 is a detail view of the cylinder-valve. Fig. 5 is a detail of the track and its supporting-rod. Fig. 6 is a transverse view of track and its supporting-rod. Fig. 7 is a detail view of the valve-projection and valve-shifter. Fig. 8 is a plan of the compressed-air reservoirs and engine. Fig. 9 is an elevation of same. Fig. 10 is a diagram showing the connection of the air-pipes with the reservoirs. Fig. 11 is an elevation of a terminus of the cable-track, showing the turn-table and truck for shifting the cars from one line of cables to another. Fig. 12 is a plan view of the same.

My invention relates to a novel application of compressed air for the purpose of alternately raising and lowering a cable-track for short lengths, so as to produce an incline, down which a car will move by its own gravity, whereby the track itself is made the medium for the propulsion of the cars.

The letter A designates a tower, which, in practice, should be about thirty-five feet above the pavement. These towers may be constructed in any approved manner, and are placed at intervals of about one hundred and eighty feet.

B designates an air-cylinder supported on the tower in a vertical position. In the present example the cylinder is provided midway between the ends with an annular flange, *a*, cast integral with the cylinder, which serves as its support. The cylinder may be of any suitable size; but a bore of two feet, with a piston-stroke of four feet, is deemed to be a proper size and proportion.

The piston C has an upward stroke, and car-

ries a cross-head, D. The upper head, *b*, of the cylinder is provided with holes to permit the air to enter as the piston goes down and to escape as it is raised, this head serving merely as a guide for the piston.

The letter E designates the track-supporting rods, which are attached to the cross-head and extend below, passing through guides *d*. Hooks or brackets *e* are formed on the supporting-rods in such manner as to afford the requisite strength to sustain the track with its load.

The track F consists of two steel-wire cables of suitable size to sustain the required weight—say, not less than one inch. These cables rest on the hooks or brackets *e*, to which they may be rigidly secured by suitable clamps, and at the termini of the cable-way the ends of the cables are firmly anchored, as seen at F', Sheet 4.

The letters G and G' designate air-pipes, which may be either below ground, as shown, or suspended above ground. If below ground, these may be ordinary iron pipes. If above ground, iron, rubber or other material may be used, and the pipes may be suspended by wires attached from tower to tower. In the present instance small tubes *f* and *f'* lead from the pipes and connect to the cylinder by means of the port *h*, of which there is one on each side at the bottom of the cylinder, which ports are opened and closed by valves *i*, having arms *j*, which extend below, and at their extremities are connected by a bar, *k*, at the center of which a wheel or other projection, *l*, is fixed, which is designed to be struck by a suitable device, *n*, which may be called a "valve-shifter," attached to the top of the car-truck. The valves, of which a detail is shown in Fig. 4, are so constructed that when one is opened the one on the opposite side is always closed. Any other form of valve than the one shown in the present instance will answer the purpose if constructed on the principle that when one is opened the other will close.

At one end of the track are two air-reservoirs, H and H', strong enough to contain compressed air or gas at the pressure required—say, eight atmospheres—to operate (raise) the pistons. These reservoirs should be, say,



twelve feet in diameter and seven feet high, or of size to contain at least five hundred cubic feet. The tubes G and G' connect with these reservoirs, as seen in Figs. 8 and 10.

A double-cylindrical injector or pump, I and I', which may be operated by steam-engine or any motive power, serves to force air, which enters at W, into the reservoir H, which is the pressure-reservoir. The pipe G, leading from this reservoir, connects by a tube, *f*, with each air-cylinder B, and the pressure of air must be sufficient to raise all the pistons along the entire line, thereby raising the cable-track. The pipe G', leading from the reservoir H', connects by a tube, *f'*, with each air-cylinder, and when the other reservoir, H, is the pressure-reservoir this is the exhaust-reservoir, as will be more fully explained hereinafter.

Both reservoirs are provided with valves *p* and *p'*, which may be secured so as not to open at all, or may be weighted so as to open automatically whenever a certain desired pressure, as hereinafter explained, has been obtained within the reservoir.

It will be seen the present plan contemplates a double line of cable-way, F. One line is for the movement of cars in one direction, (up-town,) and the other line for cars to move in the opposite direction, (down-town.) In order to enable one set of compressed-air reservoirs and one pump to operate both lines, a pipe-connection, *q*, Fig. 10, is made from the reservoir H or its pipe G to the pipe G of the up-town line, and a similar connection, *q'*, from the reservoir H' or its pipe G' to the pipe G' of the down-town line.

The letter L designates the car, which is suspended from a truck, *r*, having numerous wheels, thereby to bear on the cables at numerous points. This truck is as long as the car, in practice—say forty to fifty feet, or more—and longitudinally is in the shape of a curve, as seen in Fig. 1, in order to give the cable-way at the point whereon it bears a deflected curve that is regular. Instead of effecting this by making the frame of the truck conform to a curve, the same may be done by a straight frame, to which wheels are attached in such manner that the tread of all the wheels forms the desired curve. The wheels S are deeply grooved, so as to keep their position on the cables. Suitable brakes may be provided, to be operated by an attendant from the platform of the car. A valve-shifter, *n*, is attached to the truck, above which it projects, so that when the car passes the cylinder it will come in contact with the wheel or other projection *l* attached to the arms *j* of the cylinder-valves, and by such contact shift the valve, the effect of which is to close the exhaust-valve (tube *f'*) and open the pressure-valve (tube *f*).

The essence of this invention being the adaptation of means whereby a cable-track may be alternately raised and lowered, so as to present to the car, in the direction in which it may be moving, an incline, down which the

car will move by its own gravity, the following description will suffice to make clear the manner of its operation:

Let the reservoirs H and H' be filled with compressed air at the required pressure—that is, in reservoir H at such pressure that when all the cylinder-valves connecting with tubes *f* are open (those connecting with tubes *f'* being closed) the pistons will be forced up and the track raised, (this pressure is attained by operating the air-pump,) and in reservoir H' at such pressure that if the pistons were all up and the exhaust-valves at pipe *f'* were open, the pistons, when not drawn on by a loaded car, would remain up. This pressure is attained also by the pump, but is maintained by means of the valve *p*, which is set to open when there is an excess of the pressure desired.

The car to be started is suspended directly under any one cylinder, and the cables at that point are down, the cylinder above being exhausted of air, while the cylinder next in front and next behind will be about half-exhausted of air. The point which the car then occupies on the cable-track is the middle of a regular curve formed by the deflection of the cables, which curve is tangent to a horizontal plane at that point. The exhaust-valves connecting with the two cylinders next behind the car being closed, and, of course, the pressure-valves (those connecting with tube *f*) being open, air from the pressure-reservoir H enters those two cylinders behind the car, causing the track there to rise; and the car being now on an incline moves forward, its weight causing the track in front to fall, the exhaust-valves there being open.

In passing the cylinder whereat the car was standing the valve-shifter *n* on the car comes in contact with the projection *l*, closing the exhaust-valve of the cylinder and opening the pressure-valve. Thereupon the air enters this cylinder, and at once begins to raise the track behind the car, thus maintaining its movement forward. As the track reaches its highest position by the filling of the cylinder it comes in contact with the horizontal arm of the bell-crank lever T, located just below the cylinder, (see Fig. 4,) the movement of which draws on the wire *u*, connected with the upper part of the valve, whereby the valve is closed to the pressure and opened to the exhaust, thus leaving it, like all others, behind, with the exhaust-valve open, so that upon the approach of another car, following behind the car first named, the weight of the car will bring the track down, the air of the cylinders being forced out and into reservoir H', from whence it escapes by the valve *p* whenever the pressure exceeds that fixed on as the maximum desired.

It will be understood that the car arriving beneath one cylinder, and having entirely depressed the track at that point, will have the effect of depressing the track at the next cylinder in advance about one-half way.



As already stated, two lines of track are contemplated, one for the passage of cars down-town and the other for their return up-town. To this end, Figs. 11 and 12 illustrate a plan for transferring the cars at the terminus bodily from one line to the other. N designates a trestle on which a rail-track, Z, is laid. P is a transfer-truck, and R R are turn-tables.

The truck is run under the car, and by means of a hand-lever, *y*, the air from the last cylinder is exhausted to lower the cable-track, which lets the car L rest on the truck P. The truck with the car on it may now be run onto the first turn-table, then to the next one, and, finally, in a manner readily understood, placed in position on the other line.

Should the exigencies of the road at any time require, as on the occasion of an accident, the down-town line may be converted into the up-town line, or vice versa, by simply adjusting the proper valves, which are denoted by the letter *x* in Fig. 8, and also the valve *p'*, which has hitherto been considered as adjusted for a certain pressure, must be secured, and the valve *p* adjusted for the exhaust. Thus H' may become the pressure-reservoir, and H the exhaust, and in this way a car that has passed partly over the road may be brought back on the same line.

I do not claim herein either the air-pipes G, air-reservoirs provided with the valve and connections, the injector, the car provided with a truck the wheels of which have their tread arranged to form a curve, and the valve-shifter, nor the trestle, turn-table, and truck. These several parts are reserved to form the subject of claims in one or more applications for patents to be made hereafter.

Having described my invention, I claim and desire to secure by United States Letters Patent—

1. The combination, substantially as set forth, of an air-cylinder having pipe-connec-

tions for the admission of air under pressure, vertically-moving rods adapted to support a cable car-track, and a continuous cable car-track.

2. The combination, substantially as set forth, of a tower or other elevated structure, an air-cylinder placed on the tower and having pipe-connections for the admission of air under pressure, vertically-moving rods adapted to support a track, and a car-track.

3. The combination, substantially as set forth, of an air-cylinder provided with inlet and exhaust ports, pipes connecting with the ports adapted for the transmission of air under pressure, valves to control the admission and exhaustion of air, and adapted, by means substantially as described, so that when one is opened the other will close, and a car-track supported by means substantially as described.

4. The combination, substantially as set forth, of an air-cylinder and a track supported therefrom, said cylinder being provided with inlet and exhaust ports, pipes connecting with the ports adapted for the transmission of air under pressure, valves to control the admission and exhaustion of air, having arms which extend below and are connected and adapted to be struck by a passing car, whereby the valves are shifted, leaving the pressure-valve open.

5. The combination, substantially as set forth, of an air-cylinder and a track supported therefrom, said cylinder being provided with inlet and exhaust ports, pipes connecting with the ports adapted for the transmission of air under pressure, valves to control the admission and exhaustion of air, and adapted, by means substantially as described, so that when one is opened the other will close, and means, substantially as described, to reverse the valves and leave the exhaust-valve open.

FRANCIS M. REAGER.

Witnesses:

FRENCH SIMPSON,  
WELLS THOMPSON.