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O. D. ORVIS & N. B. ADAMS.

STREET RAILWAY STRUCTURE AND CAR THEREFOR.

No. 285,657. Patented Sept. 25, 1883.

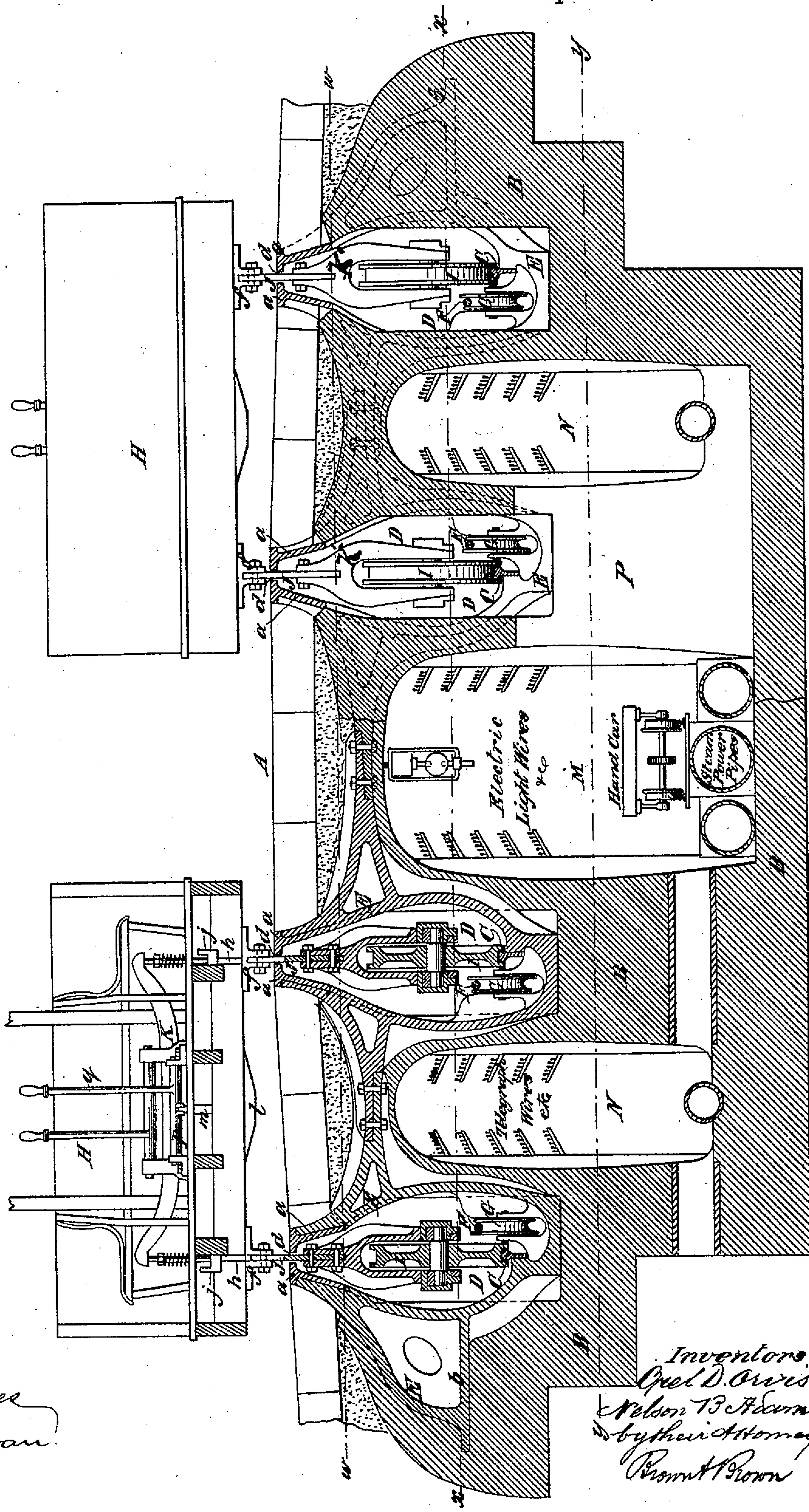

Fig. 1.

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STREET RAILWAY STRUCTURE AND CAR THEREFOR.

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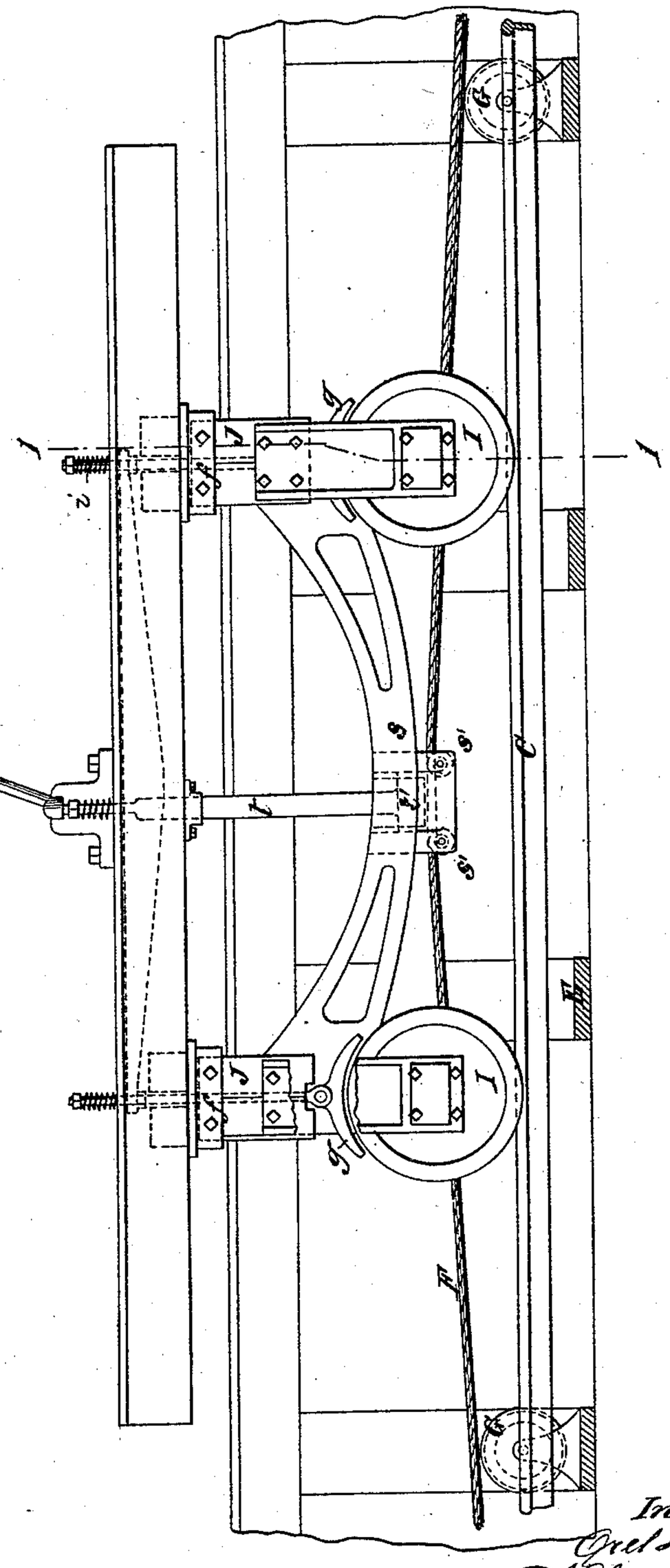

Fig. 2.

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STREET RAILWAY STRUCTURE AND CAR THEREFOR.

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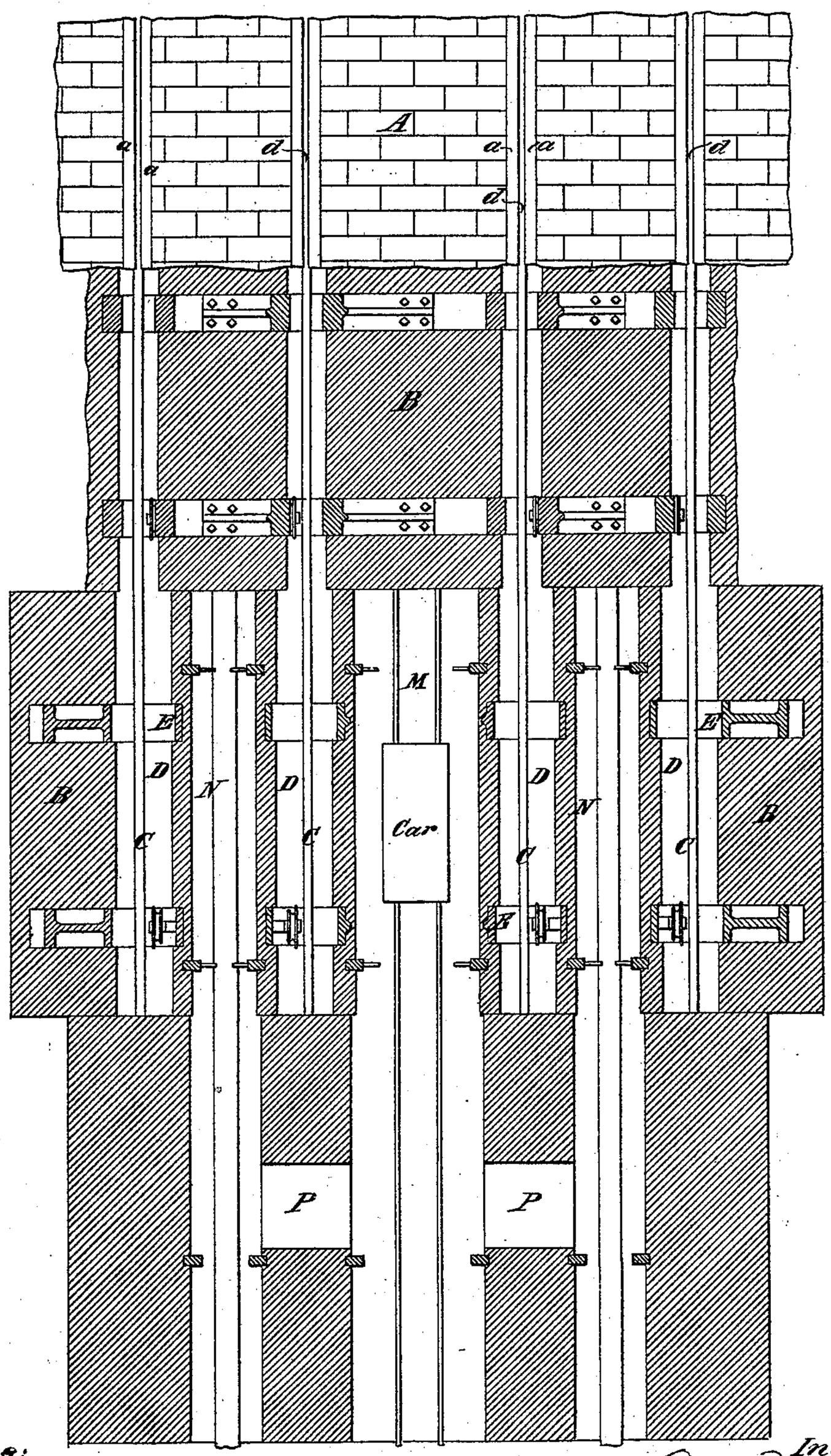
Fig. 3.



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STREET RAILWAY STRUCTURE AND CAR THEREFOR.

No. 285,657. Patented Sept. 25, 1883.

Fig. 4.

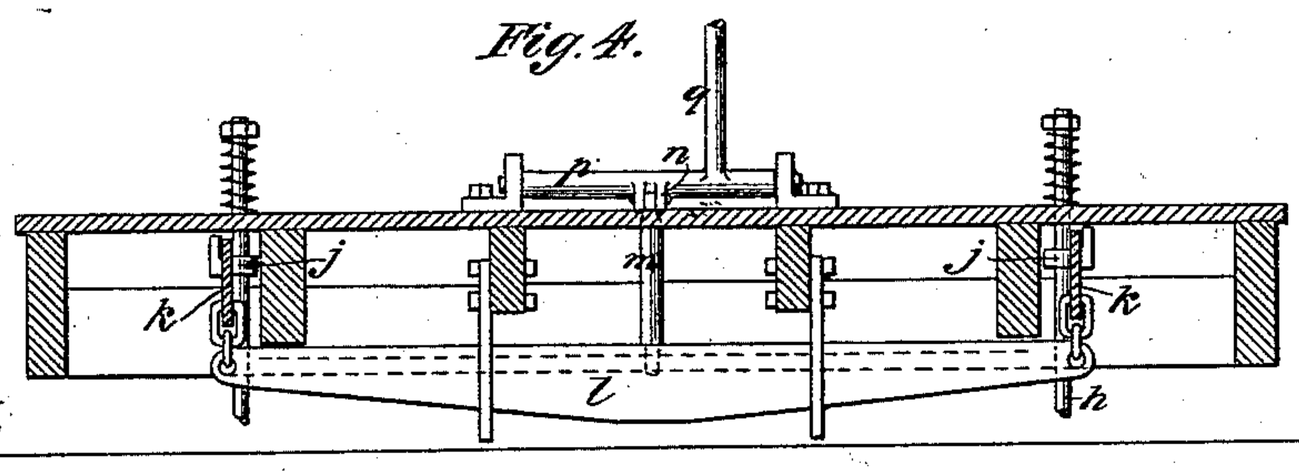


Fig. 5.

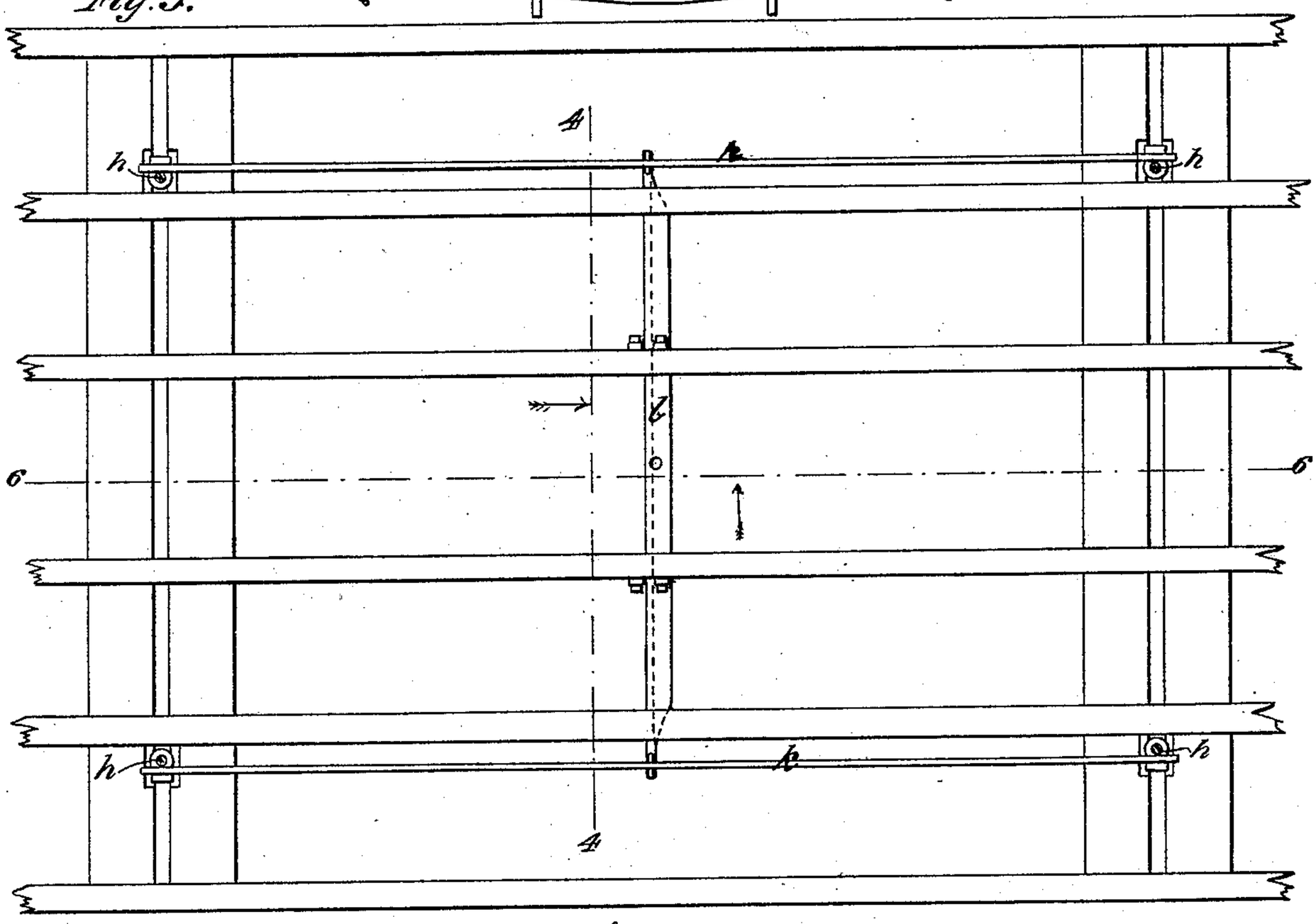
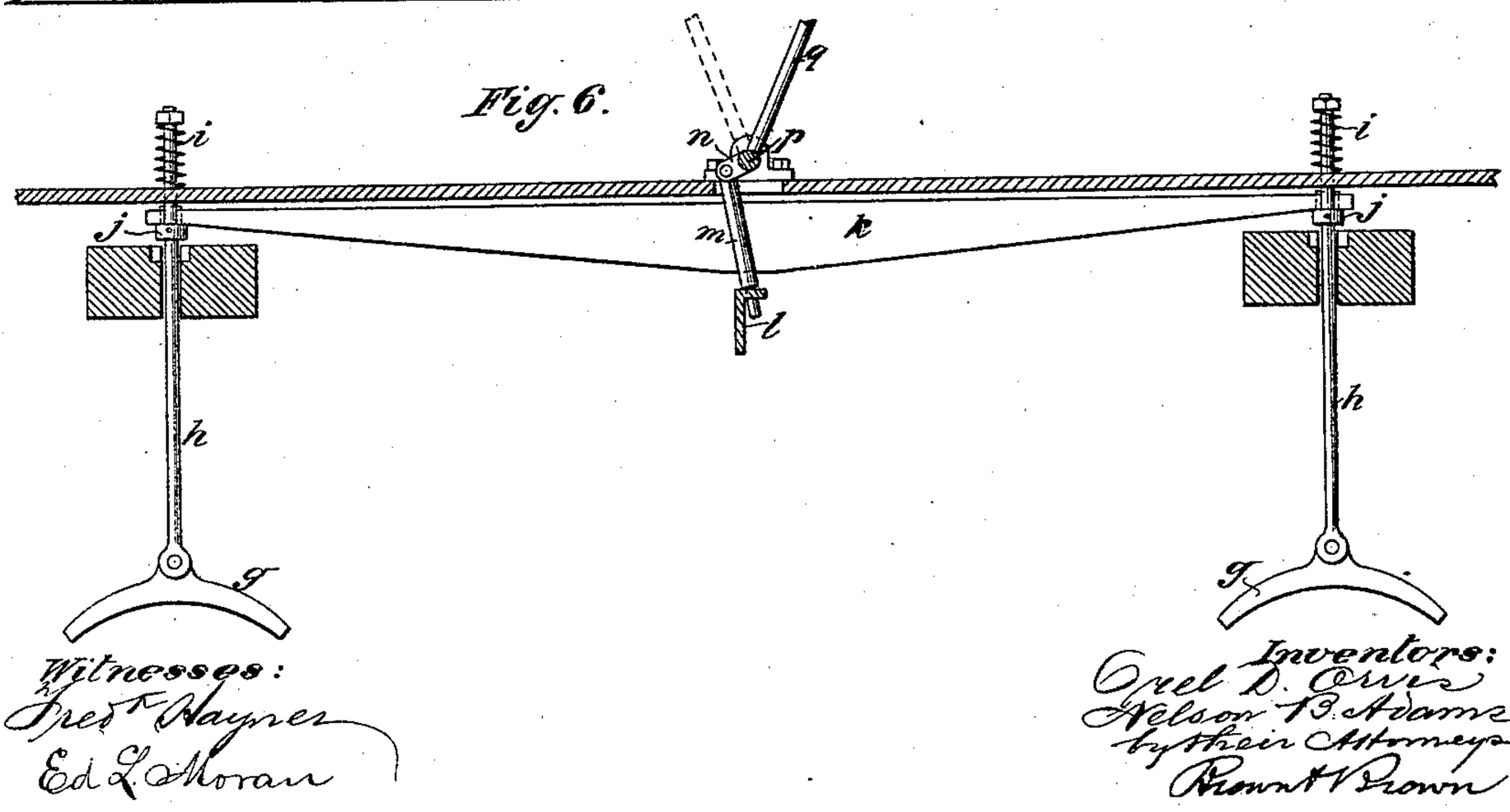


Fig. 6.



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STREET RAILWAY STRUCTURE AND CAR THEREFOR.

No. 285,657. Patented Sept. 25, 1883.

Fig. 10.

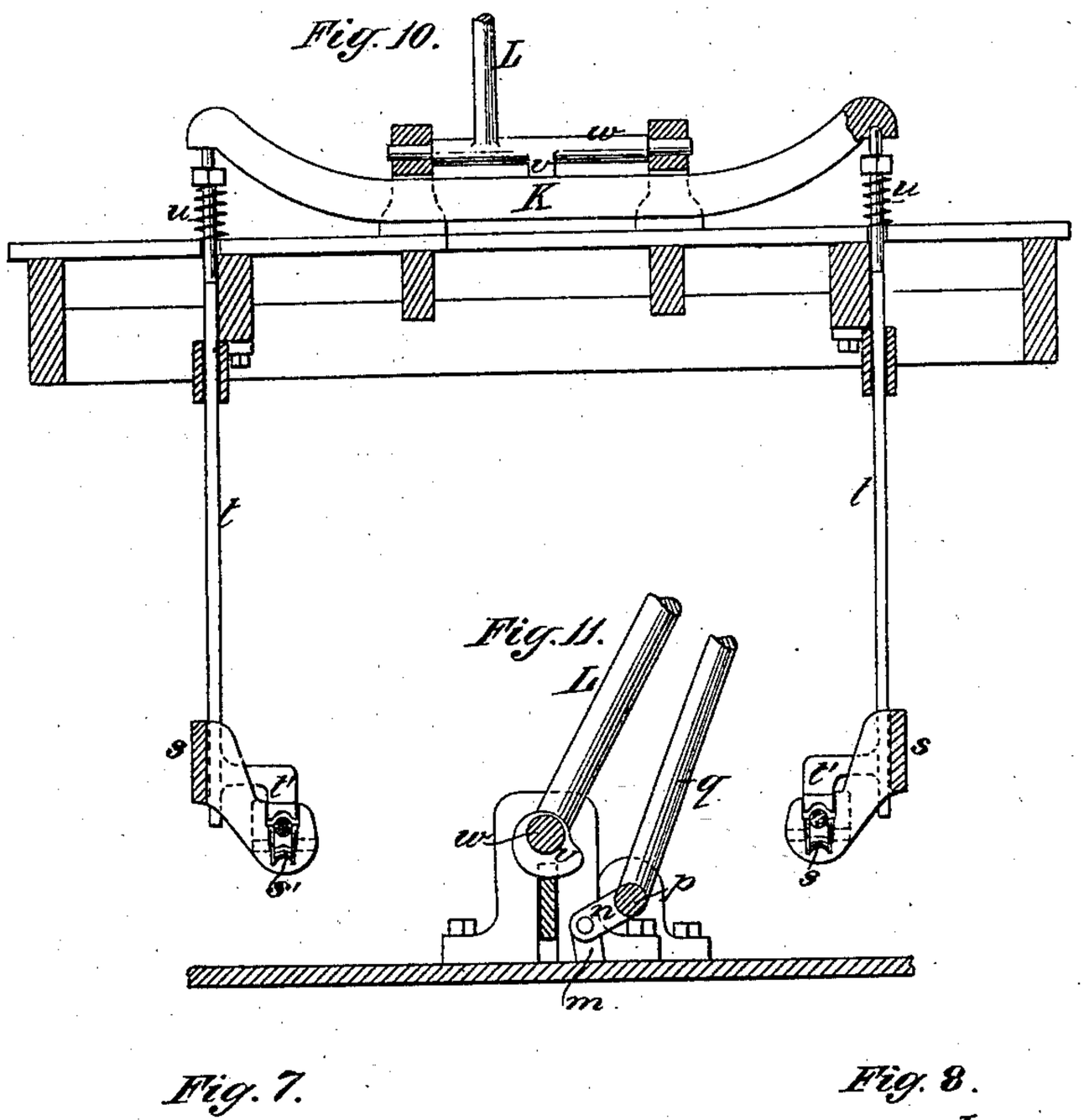


Fig. 11.

Fig. 7.

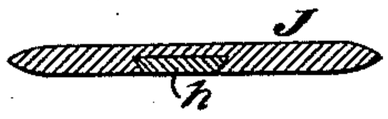


Fig. 8.

Fig. 12.

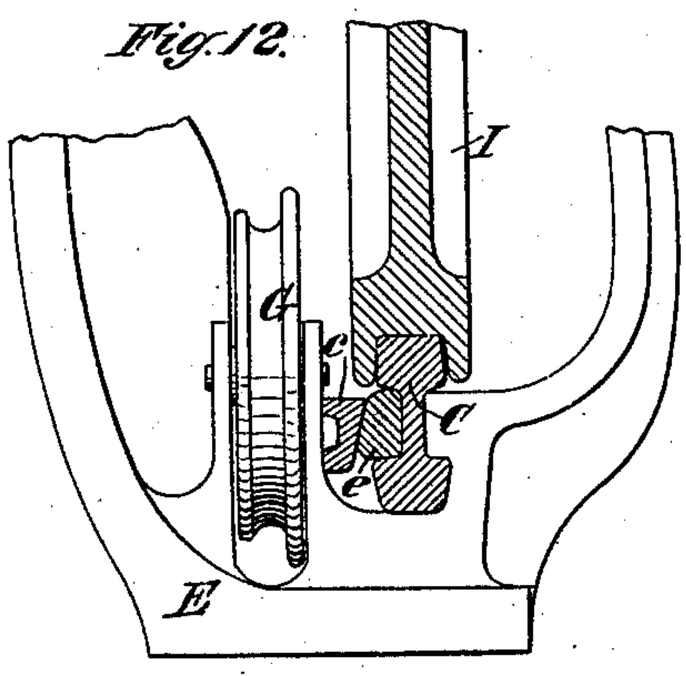


Fig. 13.

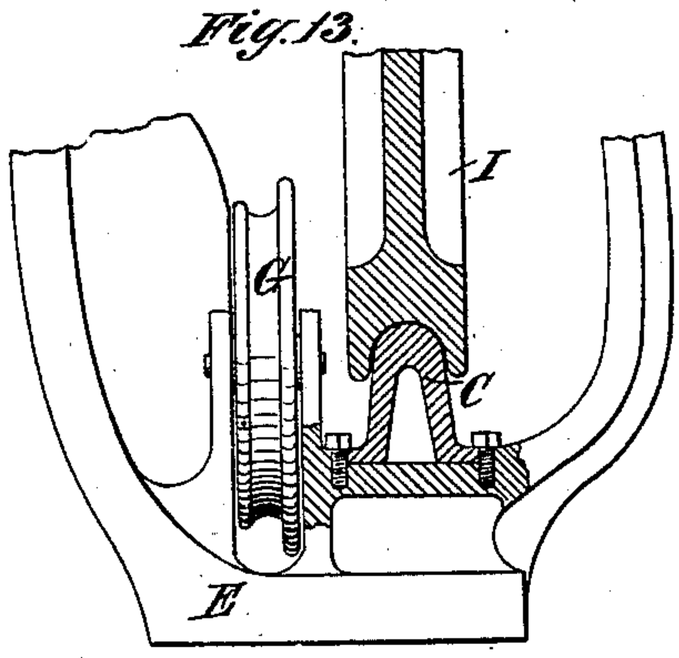
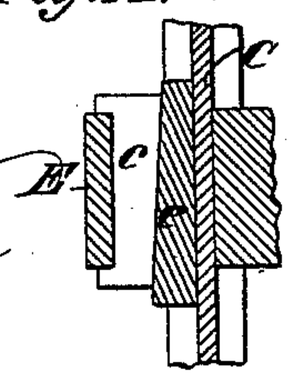


Fig. 14.



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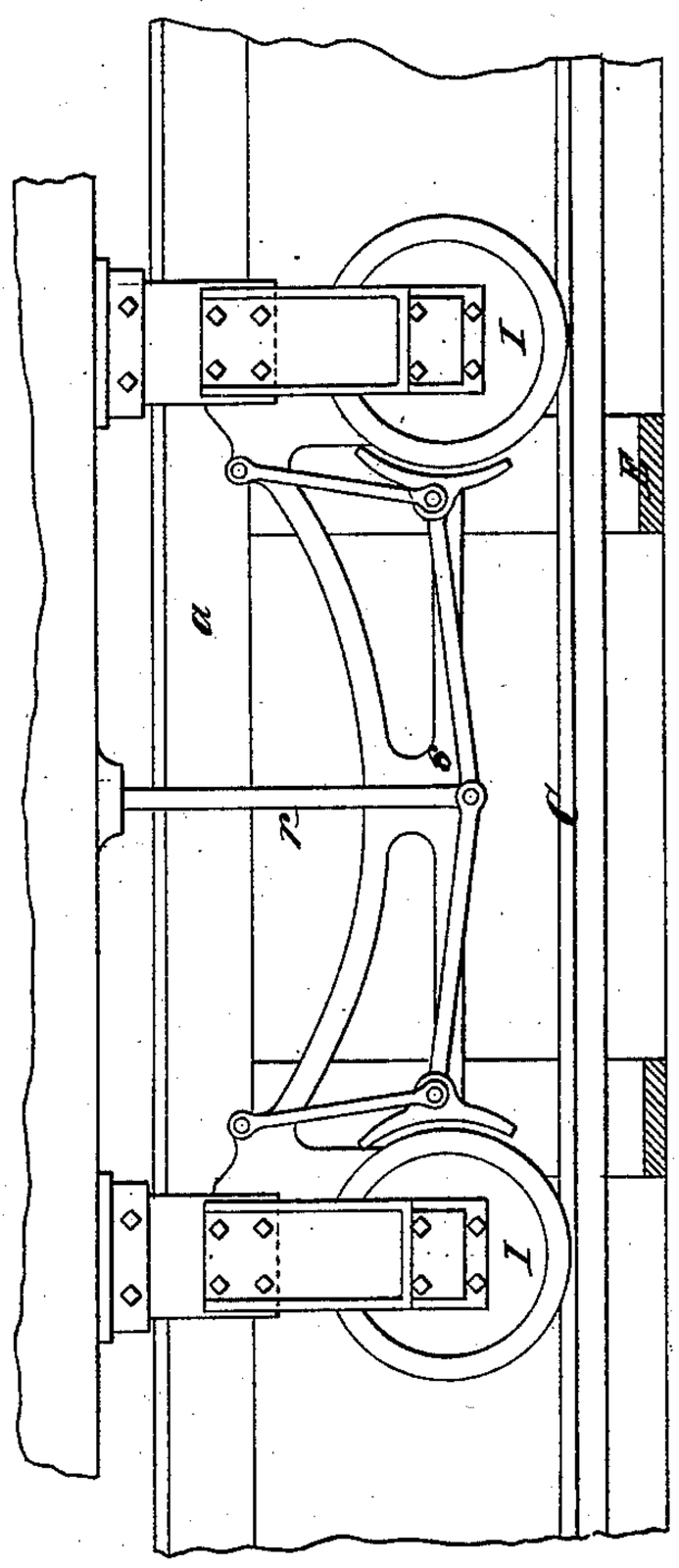
STREET RAILWAY STRUCTURE AND CAR THEREFOR.

No. 285,657. Patented Sept. 25, 1883.

Fig. 9.



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UNITED STATES PATENT OFFICE.

OREL D. ORVIS AND NELSON B. ADAMS, OF NEW YORK, N. Y.

STREET-RAILWAY STRUCTURE AND CAR THEREFOR.

SPECIFICATION forming part of Letters Patent No. 285,657, dated September 25, 1883.

Application filed June 23, 1883. (No model.)

To all whom it may concern:

Be it known that we, OREL D. ORVIS and NELSON B. ADAMS, both citizens of the United States, and residents of the city, county, and State of New York, have jointly invented certain new and useful Improvements in Street-Railway Structures and Cars therefor, of which the following is a specification.

Our invention relates to what is commonly known as the "cable-traction railway," examples of which have for a considerable time been in successful use in the cities of San Francisco and Chicago. The system there in use employs a small tunnel under the middle of each track, between the rails, and communicating with the surface of the street by a longitudinal slot, the rails being on the surface of the street. A bar projects downward from the bottom of the car, passes through this slot, and projects into the tunnel, where its lower end is provided with a gripper. The endless wire rope travels in one direction through the tunnel under the uptrack and returns through the tunnel under the downtrack, being driven by a stationary engine suitably located. The rope passes through the gripper, and when the latter is closed upon it the friction is sufficient to start the car, which soon attains the same speed as the rope. To stop the car the gripper is released and the ordinary brakes are applied.

Our construction differs from that just described, in that we provide two tunnels for each track, lay the rails in these tunnels, and arrange the wheels to travel in them, connecting the wheels with the body of the car by thin bars which travel in the slots.

The accompanying drawings illustrate our invention.

Figure 1 is a transverse section of a street laid with our railway, the right and left halves of which are cut in two different planes. Fig. 2 exhibits a side elevation of the running-gear and a longitudinal section of the street through one of the tunnels. Fig. 3 is a plan of the street on a smaller scale, being partly in horizontal section cut in the planes of the lines *w w*, *x x*, and *y y* in Fig. 1. Fig. 4 is a transverse section of the car-body on a larger scale than Fig. 1, and cut in the plane of the line 4 4 in Fig. 5. Fig. 5 is a plan of the floor-frame of the car-body, partly broken away to show the brake and clutch operating mechanism. Fig. 6 is a side elevation of the braking mechanism, partly in section along the line 6 6 in Fig. 5, only part of the car-body being shown. Figs. 7 and 8 are enlarged horizontal sectional views of some of the details of the car. Fig. 9 is a side elevation showing a modified brake. Fig. 10 is a cross-section of the car, showing a gripping mechanism which may be employed. Fig. 11 is a fragmentary longitudinal section, showing the gripping and braking levers; and Figs. 12 and 13 are enlarged fragments of Fig. 1, showing modifications. Fig. 14 is a horizontal section corresponding with Fig. 12.

A is the street-pavement, and B is a structure built beneath it, chiefly of masonry.

Two tracks are shown, the rails C C of which are sunk into tunnels D D, one rail being in each tunnel. The top of each of the four tunnels D communicates with the surface of the street through a continuous slot, *d*, which may be about one-half an inch in width. The opposite sides of each slot are formed by wrought-iron bars *a a*, and against these the paving-stones are laid.

Cross frames, ties, or sleepers E E are arranged at intervals, and to these the rails C C and bars *a a* are fastened. Each cross-frame E curves under each tunnel D, and extends between adjoining tunnels, thus connecting the entire structure together in lateral direction. At the bottom of each tunnel D the frame E has a flat base which rests on solid masonry, thus affording a firm foundation for the upper portion of the structure. In order to give the frame a still more extended bearing, we have shown it as provided with additional base-flanges *b b* at each end.

The frame E may be made in sections bolted or riveted together, and it may be made of cast-iron, as shown, or of wrought-iron or steel, or any other suitable metal, or it may be made of wood or other material.

The rails C C may be of the form shown in Fig. 1, and be bolted through the web or neck transversely to the frames E, or they may be of any of the forms commonly used on surface-railways, whether horse or steam.

In Fig. 12 a reversible H-rail is shown, fastened with a gib, *c*, and wooden key or wedge *e*, in similar manner to the construction adopted on British railways.

Fig. 13 shows a U-rail fastened by bolting down to the frame E.

A wire cable, F, runs in each tunnel D, and is carried on sheaves G G, which have bearings in the frames E E. It is not necessary to provide every frame E with sheaves, it being sufficient to mount them on every second, third, or fourth frame. The two cables F F in the two tunnels belonging to one track are both caused to travel in the same direction, and as nearly as possible at the same speed. Motion is imparted to them by passing them around drums revolved by stationary engines at the termini of the route, or at other points, in the manner common with cable railways.

In Fig. 1 a car, H, is shown on each track, the one at the right being shown in elevation, and that at the left in vertical section cut in the plane of the line 1 1 in Fig. 2. The car is mounted on four wheels, I I, which run in the two tunnels D D, and roll on the rails C C, to which they are confined by flanges on both sides of each wheel, between which flanges the rail is embraced. The wheels are connected to the car through wide plates J J, preferably of steel, thin enough to move easily through the slots. The bearing frame or saddle K′ of each wheel is connected to the plate J by bolting, or by some other strong and rigid connection. This frame should be arched and flanged to give it the requisite strength, and the journal-boxes on opposite sides of the wheel are held in it and fastened to it. The plates J J are connected to the car-body by means of cast-iron plates or frames *f f*, into which they are bolted, or to which they are otherwise connected. These plates *f f* are fastened to the bolsters of the car, or to some other strong portion of the car-body.

The brake consists of a shoe, *g*, arranged over the top of each wheel, and adapted to be pressed down upon the wheel by a bar, *h*, which passes up through the plate J and is acted on by mechanism in the car. The plate J may be divided vertically through its center, and the bar *h* may be a round or square rod, and may extend between the two portions of the plate, as shown in Fig. 8; or it may be a flat bar and be fitted to slide in a dovetailed or undercut groove in the plate, as shown in Fig. 7. The upper end of each bar *h* may pass above the car-floor and be pressed upward by a coiled spring, *i*, the tension of which is adjustable by turning a nut screwed onto the end of the bar. In order to apply the brake, a downward pressure must be applied to all four of the bars *h h*, and this pressure should be as nearly as possible equally divided among all. To this end the front and rear bars, *h h*, on each side, are connected by a lever, *k*, the ends of which rest on collars or shoulders *j j* on the said bars. The middles of both of these levers are connected, by links or otherwise, with a cross-lever, *l*, and the center of this is acted on by a bar, *m*, which is pressed down by an arm or crank, *n*, on a rock-shaft, *p*, to which is fixed a hand-lever, *q*. In Fig. 6 these parts are shown in their normal position in full lines, the brake-shoes *g g* being elevated by the springs *i i*. When the lever *q* is thrown over into the position shown in dotted lines, the lever *l* is forced down. This draws down equally the levers *k k*, and these divide the pressure equally between the four brake bars and shoes. We are not limited to the use of this precise braking mechanism, although it is well adapted for the purpose. As a substitute, the construction shown in Fig. 9 may be employed, the two brake-shoes being hung between and close to the front and rear wheels and connected by toggles, which are straightened to force the shoes against the wheels by pulling upward on a bar, *r*, which extends up through a slot and is engaged by suitable mechanism on the car.

The clutch or gripper for clamping the cable F may be of the same construction heretofore employed, and operated in the same manner, with this difference, however, that inasmuch as the car is to be connected with two cables in two tunnels two clutches are requisite, and these must both be connected with the same operating-lever, so that they shall be operated simultaneously.

One suitable clutching or gripping mechanism is shown in Figs. 2, 10, and 11. The bar *s*, which may be termed the "fixed gripper-bar," is secured to the two plates J J, on the same side of the car, within the tunnel, and carries two small grooved rollers, *s′ s′*, on which the cable bears, and which constitute the fixed lower jaw of the gripper. A bar, *t*, passes through the slot *d* into the tunnel D. Its lower end is furnished with a shoe, *t′*, capable of bearing on the cable between the rollers *s′ s′*, and constituting the movable jaw. The said bar *t* is confined in a dovetailed groove in the bar *s*, and may be moved up or down therein. The cable F passes between the rollers *s′* and the shoe *t′*, and when the bar *t* is forced down the cable is clamped between the said rollers and shoe and propels the car. It is shown as being thus clamped. Each bar *t* is drawn up by a spring, *u*, and the two bars *t t* are pressed down to clamp the cables by a transverse lever, K, Fig. 10, whose ends bear on the upper ends of the bars, and whose middle is acted on by a cam, *v*, fixed on a cross-shaft, *w*, to which is also fixed a hand-lever, L. When this hand-lever is in the position shown in Fig. 11, the clutches are clamping the cables; but when it is desired to stop the car the lever is thrown over into a position in which the pressure of the cam *v* is removed from the bar K, and the two bars *t t* are allowed to rise and release the cable.

Street-railways as now commonly laid are subject to the objection that the rails, being used by heavy trucks and other vehicles, in addition to the cars, are rapidly worn out, requiring frequent renewal and subjecting the companies to heavy expense. It is well known that the rails of street-railways are worn out

to a far greater extent by the trucks, carts, and wagons that run upon them than by the cars for which they are designed. We overcome this defect by sinking the rails into the tunnels D D, where they cannot be used by other vehicles than the cars H H, and they will consequently endure much longer than heretofore. Our railway is also far safer in its operation than the ordinary surface-road, the liability of persons being run over by the cars being much less, even though our cars run at a greater speed. The wheels being sunk into the tunnels D D, it is manifestly impossible for any one to fall under them, and the floor is so low and so close to the pavement that if a person were struck by the moving car he would be pushed forward or to one side by it, and could not fall under it.

In addition to the tunnels D D, there may be other tunnels, M N N, through which may be carried electric wires and pipes, and which may be adapted for other uses. The tunnels N N are accessible by passages P, and have openings Q at intervals, through which the wires and pipes may be led out; but the said tunnels, passages, and openings need not be further herein described, as they form no part of the present invention, but will form the subject-matter of a separate application for Letters Patent.

We will state, in conclusion, that although we have shown and described our invention thus in detail we do not confine ourselves to the precise construction hereinbefore set forth, as these may be varied in many ways without departing from the essential features of our invention as defined in the claims.

What we claim as our invention, and desire to secure by Letters Patent, is as follows:

1. A street-railway structure consisting of two parallel tunnels having in their upper parts narrow continuous slots for communication with the street-surface, and two rails of a railway-track, laid one in each of said tunnels, substantially as and for the purposes set forth.

2. The combination, with a street-railway structure consisting of two tunnels, D D, having slots *d d*, and each containing one of two track-rails, C C, of a tunnel, N, arranged beneath the said tunnels D D, and transverse ties or frames E E, extending under and around the tunnels D D and arched over the tunnel N, substantially as set forth.

3. The combination of two parallel tunnels provided with slots in their upper parts, rails laid in said tunnels, and a car provided with wheels adapted to run on said rails, and connected to said wheels by plates adapted to travel in said slots, substantially as set forth.

4. The combination of two parallel tunnels provided with slots in their upper parts, rails laid in said tunnels, a car provided with wheels adapted to run on said rails, and connected to said wheels by plates adapted to travel in said slots, brakes applied to said wheels, and brake-operating bars passing through said slots, substantially as herein described.

5. The car H, provided with wheels I I, connected to it by plates J J, in combination with brake-shoes *g g*, bars *h h*, working in said plates, and mechanism for pressing said shoes against the wheels through the medium of said bars, substantially as set forth.

6. The combination of two parallel tunnels provided with slots in their upper parts, and containing both rails and traction-ropes, a car provided with wheels adapted to run on said rails, and connected to said wheels by plates adapted to travel in said slots, rope-gripping devices attached to said car, and operating-bars for said gripping device passing through the said slots, all substantially as herein described.

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