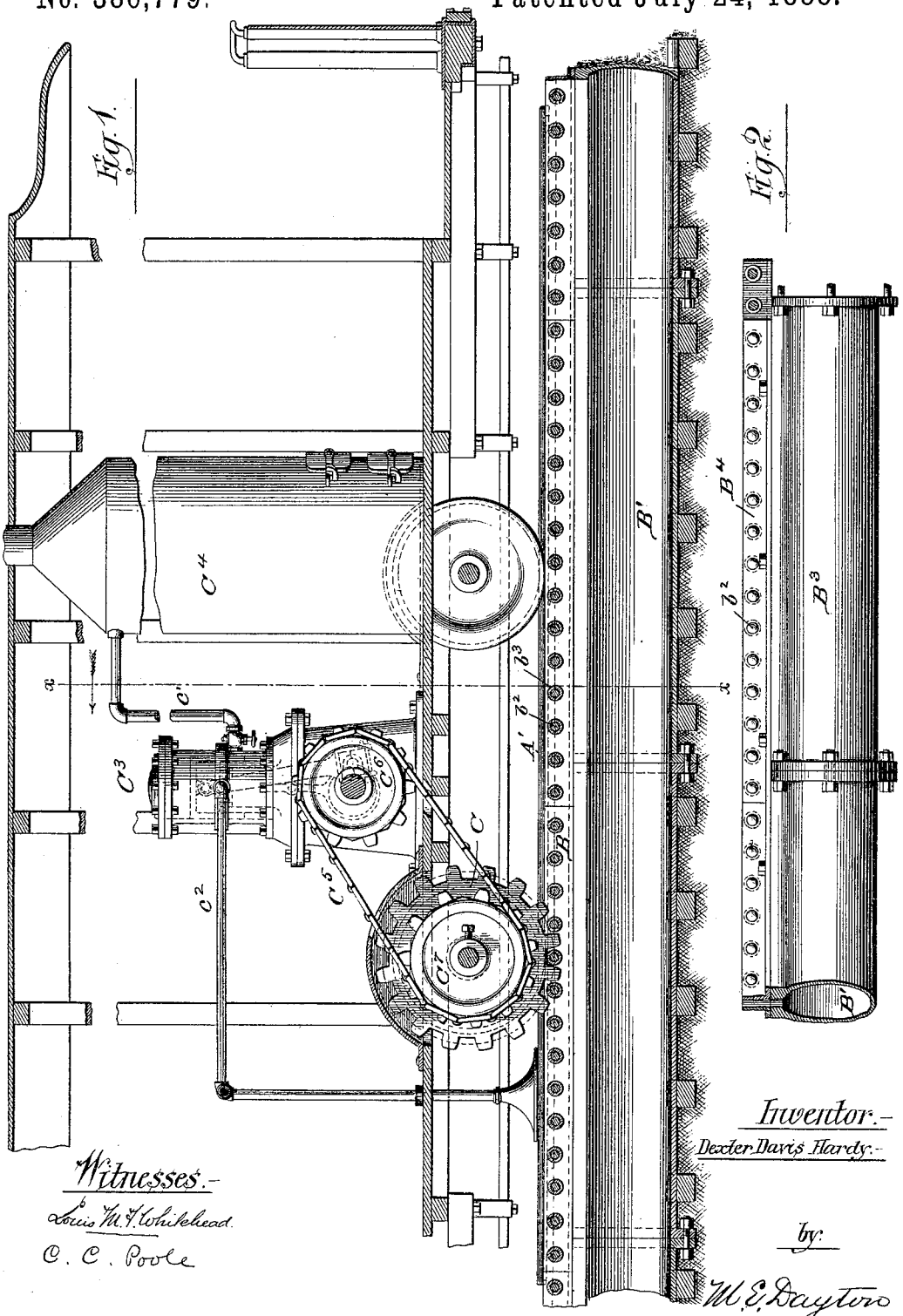
(No Model.) 3 Sheets—Sheet 1.

D. D. HARDY.

RAILWAY TRACTION DEVICE.

No. 386,779. Patented July 24, 1888.



Witnesses.-
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(No Model.) 3 Sheets—Sheet 2.

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Fig. 3.

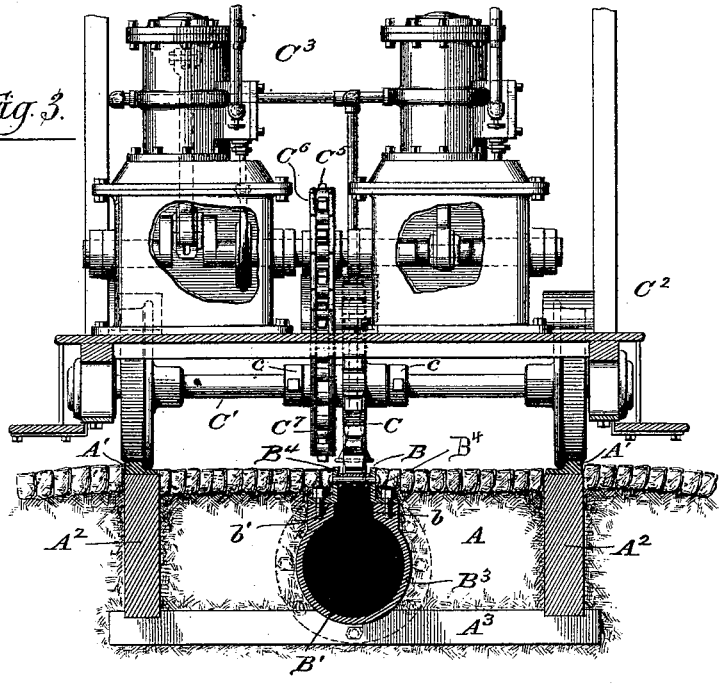


Fig. 4.

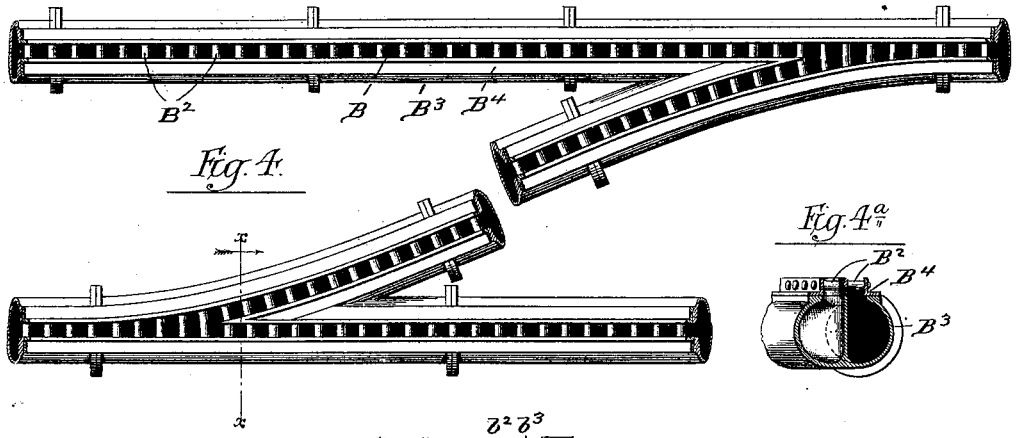
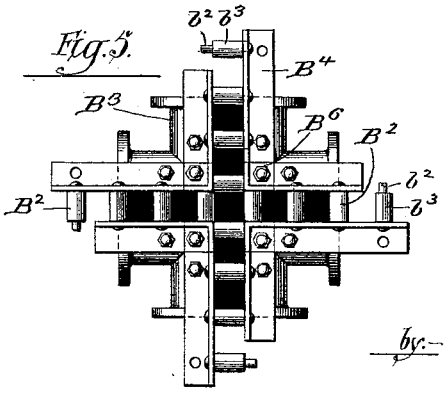


Fig. 4a

Fig. 5.



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(No Model.) 3 Sheets—Sheet 3.

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Fig. 6.

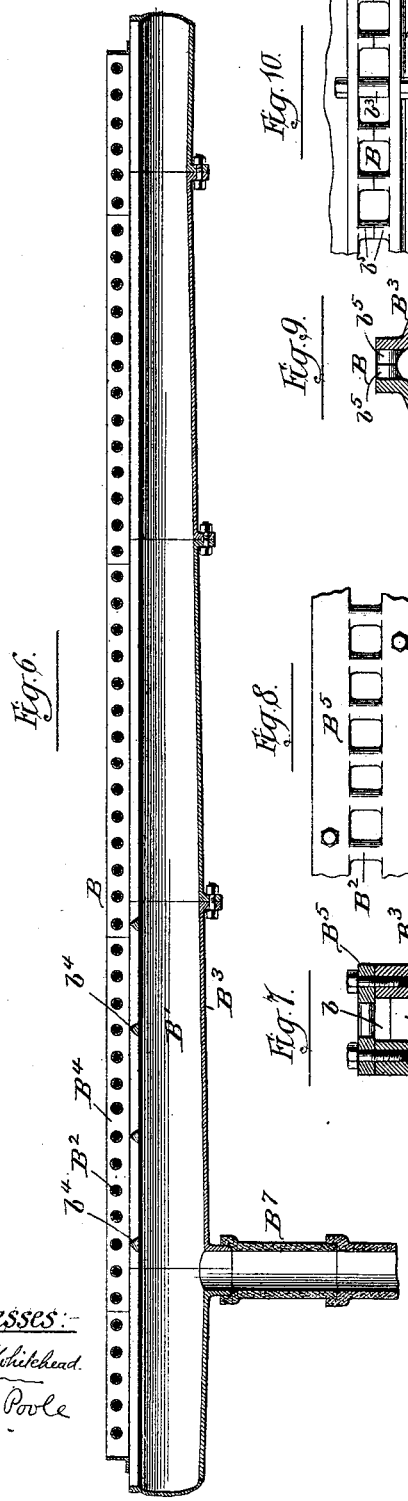


Fig. 10.

Fig. 9.

Fig. 8.

Fig. 7.

Fig. 12.

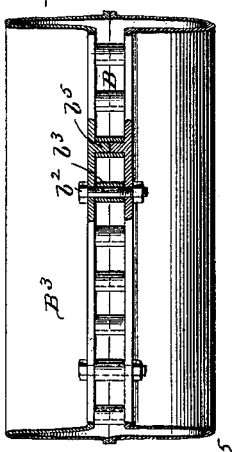


Fig. 8a.

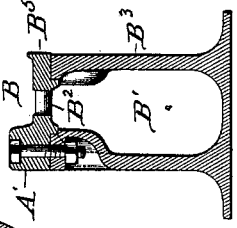
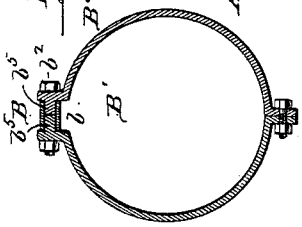


Fig. 11.



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Attorney.

UNITED STATES PATENT OFFICE.

DEXTER D. HARDY, OF LAKE VIEW, ASSIGNOR OF ONE-FOURTH TO MELVILLE E. DAYTON, OF CHICAGO, ILLINOIS.

RAILWAY TRACTION DEVICE.

SPECIFICATION forming part of Letters Patent No. 386,779, dated July 24, 1888.

Application filed April 17, 1886. Serial No. 199,184. (No model.)

To all whom it may concern:

Be it known that I, DEXTER D. HARDY, of Lake View, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Railway Traction Devices; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention has for its primary object to adapt for use on street-railways and in similar situations that form of device for car-propulsion, which consists of a permanent rack forming part of the road-structure, and a spur or pinion mounted on the car and driven by a suitable motor also on the car.

The especial object had in view in making this invention is to obviate the obstruction of the rack by the accumulation of dirt therein.

To this end the invention consists, broadly, in a rack, the spaces between the teeth or cogs of which are in open communication with a lower channel or conduit, into which the dirt or substances, which would otherwise tend to fill up and obstruct the rack, may pass.

The invention further relates to various subordinate features and matters, substantially as hereinafter set forth, and pointed out in the appended claims.

I refer to the accompanying drawings as an illustration of one form in which my invention may be advantageously embodied and reduced to practice, and as showing certain modifications of some of the details of construction by which the builder will be enabled to better understand how to proceed, and by which I wish to make plain that I am not limited with respect to mere details of construction.

In said drawings, Figure 1 is a longitudinal central and vertical section of a car and of an open rack and channel in the roadway. Fig. 2 is a side elevation of a structure embracing the open rack and subjacent channel. Fig. 3 is a transverse section of a car carrying a motor and of a subjacent roadway having an open rack and channel embedded in the roadway, the section being taken on the line *x x* of Fig. 1. Fig. 4 is a plan view of a rack for two parallel lines of track and an oblique branch rack connecting the main racks, and intended to accompany a track-switch, whereby the car may pass from one track to the other. Fig. 4^a is a section in the line *x x* of Fig. 4. Fig. 5 is a plan view of intersecting racks, such as may be employed at the intersection of railway-tracks. Fig. 6 is a longitudinal central section through the openings of the rack and subjacent conduit or pipe, showing also an inclination of the lower wall of the conduit, together with an outlet at one of the low points, such as may be provided for discharging the accumulations within the conduit into a sewer or other receptacle therefor. Fig. 7 is a transverse section of a metal pipe or conduit provided with a continuous slot in its upper surface, together with an open rack-plate bolted across the slot or opening of said pipe. Fig. 8 is a plan of the rack-plate shown in Fig. 7. Fig. 8^a shows the rack as formed in the carriage-tread of the track-rail and a channel beneath it. Fig. 9 illustrates in transverse section the upper portion of a pipe made in two vertically-joined parts, each part having a series of studs, each forming one-half of each rack-tooth, cast or otherwise formed thereon. Fig. 10 is a fragmentary top view of the construction shown in Fig. 9, said Fig. 10 also showing one of the transverse bolts which unite the upper edges of the two-part pipe. Fig. 11 is a transverse section of a two-part vertically and longitudinally divided pipe on which short studs are cast at the points where rack-teeth are required, the studs on opposite parts of the pipe meeting or opposing each other, and the meeting or opposing pairs of studs being severally inclosed by thimbles. Fig. 12 is a plan view of the kind of structure shown in Fig. 11, the connection of the upper edges of the two parts forming the rack, and subjacent channel being made by bolts located at suitable intervals, which bolts take the place of the studs just referred to.

A represents a road-bed.

A′ A′ are parallel tracks laid on longitudinal bed-pieces A^2, which rest on cross-ties A^3.

B is an open rack set in the road-bed, preferably, as shown, centrally between the tracks A′, but allowably otherwise placed, if desired.

B′ is a channel or conduit in the road-bed beneath the open rack B, adapted to receive dirt and substances which fall between the teeth or cogs B^2 of said rack.

C is a spur-wheel mounted on a suitable axis, which is allowably one of the wheel-axles C′ of the car C^2, said spur being engaged with the rack B. The spur C, if on the wheel axle C′, is preferably loose thereon, but may practically be keyed thereon by proper adjustment of the diameter of the car-track wheels to the diameter of the spur within the pitch-line of its cogs. When the spur is loose on the axle, fixed collars *c c*, or an equivalent device, may be employed to retain the spur laterally in place.

C^3 represents any suitable motor on the car for the rotation of the spur C and the resulting propulsion of the car. In this instance said motor is illustrated as a steam-engine, in which C^4 is a steam-generator, c' being the supply-pipe, and c^2 the exhaust terminating in a bell, c^3, beneath the car. In this instance also the spur C is shown as being driven by means of a sprocket-chain, C^5, leading from a sprocket-wheel, C^6, on the engine-shaft to a similar sprocket, C^7, on the hub of the spur-wheel C.

The manner of mounting and rotating the spur-wheel C, which travels with the car, may be varied in numerous ways, by some of which the spur may be vertically movable, so as to be elevated clear of the rack and thrown into engagement therewith at the will of the engineer or operator. These matters and the construction of the motor are not made subjects of this particular application, which, on the other hand, relates, as stated, more especially to the rack and its adjunctive channel or conduit, by which any suitably-driven spur on the car may be practically employed for propelling the car.

In Figs. 1 to 5, inclusive, the channel B′, below the open rack B, is shown as a passage within a cast-metal pipe, B^3, having a longitudinal slot or opening, *b*, in its upper sides, (viewed as it lies horizontally in the road-bed,) the sides of said slot being flanked with suitable bodies of metal affording a horizontal upper surface, *b*′, on which are bolted angle-plates B^4. These angle-plates, as desirably constructed, if employed at all, are of wrought metal, punctured at short intervals to receive horizontal bolts or rivets b^2, which pass from one vertical flange to the other of said angle-plates across the opening between them. Surrounding each of these bolts, between the angle-plates, is a thimble, b^3, which serves as a strut to keep said plates apart, while the rivets or bolts b^2, which pass through said plates, and thimbles serve to bind the angle-plates against the end of the thimbles, and thus to preserve a uniform lateral space between said angle-plates. The bolts b^2 and their thimbles b^3 constitute one form of cogs or teeth B^2 of the open rack B, some other forms of which will be hereinafter explained. The diameter of these cogs as well as the size of the spaces between them are to be established with respect to the strain the cogs are called upon to resist, to the required size for strength in the teeth of the spur C, and to such limitations (as to the spaces between the rack-teeth) as may be imposed by the particular situation of the track.

In the case of a street-railway the space between the vertical flanges which embrace the rack-teeth and that between adjacent rack-teeth themselves should desirably not exceed one inch, and may advantageously be less than that. By making the spur C, or the toothed periphery thereof, of steel, such strength may be given to the teeth of said spur as to permit them to be made small enough to require only such openings in the rack as will be entirely allowable, consistently with the purposes of carriage-travel upon the street where the track is laid.

In the use of the thimbles b^3 as the bearing-surface of the rack-teeth B^2 in contact with the driving spur C such thimbles may be case-hardened and thus made very durable.

In the construction of the rack and channel shown in Figs. 7 and 8 the channel-pipe B^3 is similar to that already described; but the rack consists of a metal plate, B^5, punched or otherwise perforated to leave central cross-bars, which constitute the rack-teeth B^2, as very plainly shown in Fig. 8. This plate may be secured over the slot *b* of the pipe B^3 in some suitable way, of which the one shown is by vertical bolts. Fig. 8^a illustrates such a rack formed in the carriage-tread of the rail A′ and a channel located beneath the track and serving as a support therefor. In Fig. 7 is shown a cross-bar or bridge, b^4, such as may be located at intervals in the slot of the pipe B^3 below the open rack, for the purpose of bracing the opposite sides of the pipe from each other and preventing the collapse of the latter either from the action of frost or other inward pressure upon it. Similar cross-bars are shown at b^4 in Fig. 6, and may be employed in any construction of the pipe in which they may be desirable.

In Figs. 9 to 12, inclusive, the pipe B^3 is understood to be cast in two vertically-divided parts, properly bolted together. In each of these figures short studs b^5 are cast on the inner vertical walls of the slot *b*, those on one part of the pipe meeting or opposing those on the other part, and each pair of the so opposing studs forming one of the rack-cogs B^2. In Figs. 8 and 9 the opposing studs b^5 are of the full diameter required for the rack teeth or cogs; but in Figs. 11 and 12 they are smaller and are surrounded by thimbles b^3. In both constructions of the teeth B^2 by use of the cast studs the upper flanges of the parts of the pipe B^3 are at suitable intervals shown to be bolted together by bolts b^2, which occupy the places and serve the purpose of teeth of the rack, as most plainly illustrated in Figs. 10

and 12—that is to say, the studs are omitted at intervals and holes are cast or drilled in their places to receive the bolts b^2, preferably embraced by thimbles b^3.

While a continuous cast iron sectional pipe is preferred for the channel B′, obviously said channel may be otherwise constructed, and the walls or side bars of the open rack may be secured in place otherwise than by direct attachment to the material forming the wall of said channel. In other words, I do not wish to be limited to either the material, the form, or the construction of the channel which underlies the open rack, nor do I wish to be limited to the particular construction of said rack; and I also do not wish to be limited to the support of the rack directly from the material or body of the channel, as in every case here shown, though I believe this to be the preferable construction.

In Figs. 4 and 4^a is shown the incidental device of a branch rack connecting two parallel racks intended to accompany a correspondingly-directed track-switch, by which cars may be propelled from one track to the other. I prefer to lay the rack on the same level with the lowest surface of the track, as shown in Fig. 3, so that only the more elevated part of the track need be broken away to allow the spur-wheel to travel across the track in being switched from one line to another. Fig. 4^a is a section taken in the line $x\,x$ of Fig. 4, and illustrates a way in which the entering angle or point formed by the meeting racks may be supported by continuing the meeting walls of the branching channels to the extremity of said point in the rack.

Fig. 5 illustrates an intersecting rack with a subjacent special casting or four-way branch for the subjacent channel. In this figure the four adjacent rack-teeth, B^2, are intended to be shown as cast in one piece with the adjacent corner-pieces at their several extremities, the whole center-piece being marked B^6. This center-piece may be made of cast-steel or forged and held down by bolts, one through each of said several corner-pieces.

These devices of Figs. 4, 4^a, and 5 are intended as illustrations of constructions that may be employed for these particular situations; but they form no part of the principal invention, and may be varied according to circumstances.

In Fig. 6 the pipe B^3, forming the conduit or channel B′ underneath the open rack B, is shown as made of sections of varying vertical diameter, each inclined on its lower surface and together forming an inclined conduit calculated to allow water to flow therein from the more elevated to the lower points, and at one of the lower points is shown a pipe, B^7, which may lead to a sewer or other place of discharge. In this case the upper surface of the pipe is horizontal and immediately supports the rack B. This is also intended as one form of construction by which a desired inclination to permit water-flow may be obtained in the channel when the street or rack is perfectly horizontal or level. Of course the same end may be accomplished by supporting the rack independently of the conduit and making the conduit of uniform diametrical dimension and inclining the same to any extent required.

In streets which are not perfectly level manifestly no special construction will be required to give an inclination to the conduit.

When bridges occur in the railway-line, the subjacent channel B′ need not be used, since the rack may open directly into the space beneath the bridge.

I claim as my invention—

1. The combination, with track-rails, an upwardly-open conduit, and an open rack, the spaces between the teeth of which communicate with the interior of the conduit, of a car provided with wheels fitted to the track, a motor mounted on the car, and a spur-wheel actuated by the motor and engaging the rack, substantially as described.

2. The combination, with track-rails, an open rack, and a subjacent conduit in communication with the spaces between the rack-teeth, of a car provided with opposite track-wheels mounted on an axle, a spur-wheel mounted loosely on the same axle and engaging the rack, and a motor actuating the spur-wheel, substantially as described.

3. In a traction-railway structure, the combination of an open rack and a subjacent conduit communicating with the spaces between the rack-teeth and provided with discharge-passages, substantially as described.

4. The combination, with an open rack, of a pipe below the rack having a longitudinal slot, which affords communication between the spaces between the rack-teeth and the interior of the pipe, substantially as described.

5. The combination, with an open rack set at or near the surface of a roadway, of a slotted pipe located beneath the surface of the roadway and supporting the rack, substantially as described.

6. The combination, with an embedded slotted pipe, of wrought-metal plates or bars secured in place at opposite sides of the slot of said pipe, and cross-bars connecting said wrought-metal plates and forming the teeth of the rack, substantially as described.

7. In an open rack for traction-railways, the combination, with the side plates or bars of said rack, of metal thimbles inserted between the side plates, and interior supports for said thimbles, substantially as described.

8. In a railway structure, the combination, with the separate side plates of an open rack, of metal thimbles inserted as studs between said plates, and bolts or rivets passing through said plates and thimbles, said bolts or rivets serving as ties, binding the opposite plates against the interposed thimbles, substantially as described.

9. The combination, with track-rails, of

an upwardly-open conduit situated below the level of said rails, an open rack applied to the opening of the conduit and situated below the level of the rail-treads, a car fitted to the track and provided with a spur engaging said rack, and a motor rotating the spur mounted on the car, substantially as described.

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

DEXTER D. HARDY.

Witnesses:
M. E. DAYTON,
G. F. LANAGHEN.