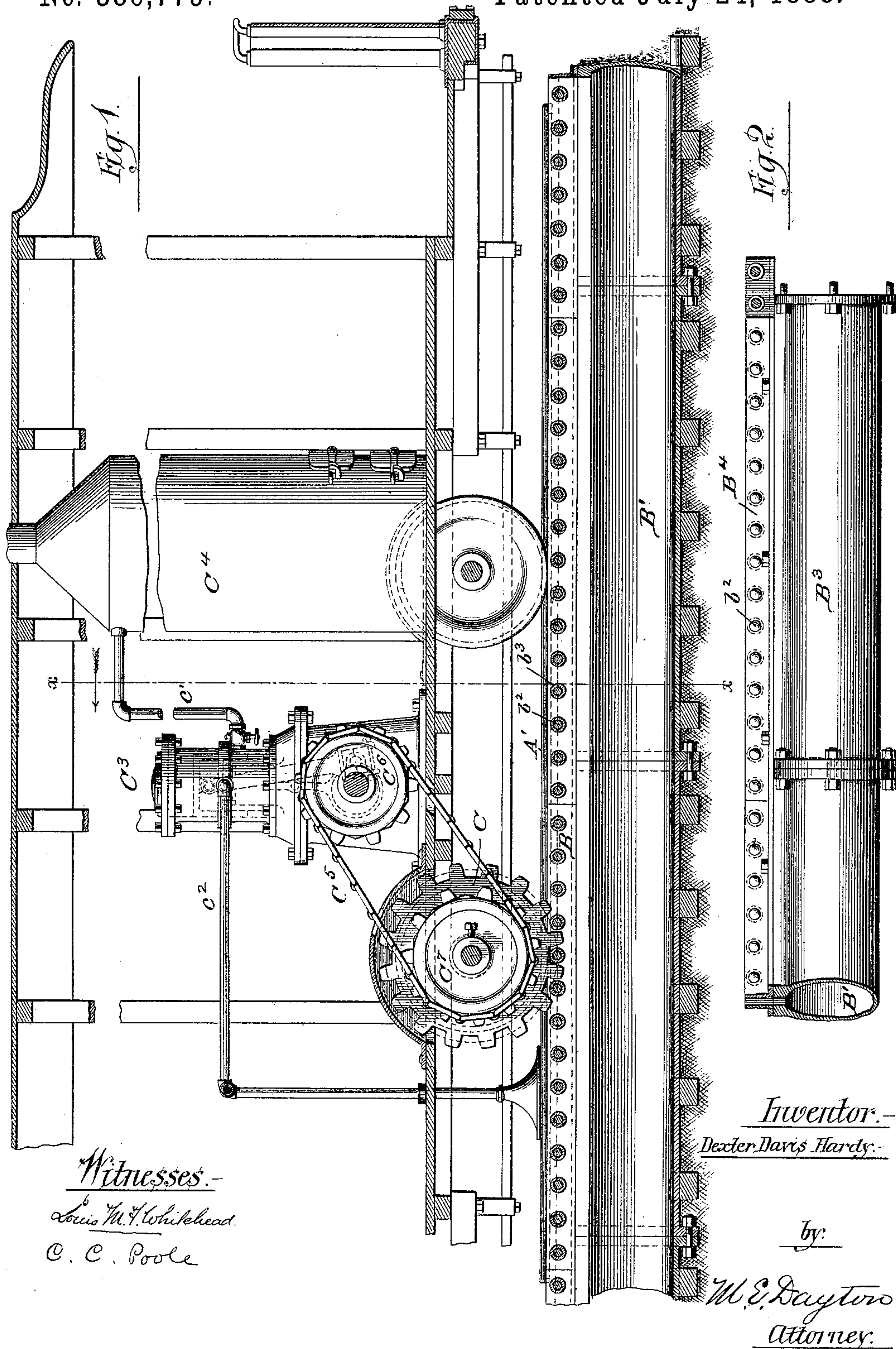


3 Sheets—Sheet 1.

RAILWAY TRACTION DEVICE.

Patented July 24, 1888.



(No Model.)

3 Sheets—Sheet 2.

D. D. HARDY.

RAILWAY TRACTION DEVICE.

No. 386,779.

Patented July 24, 1888.

Fig. 3.

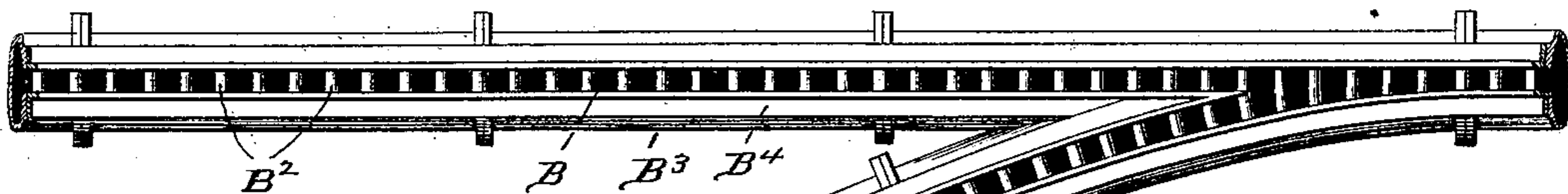
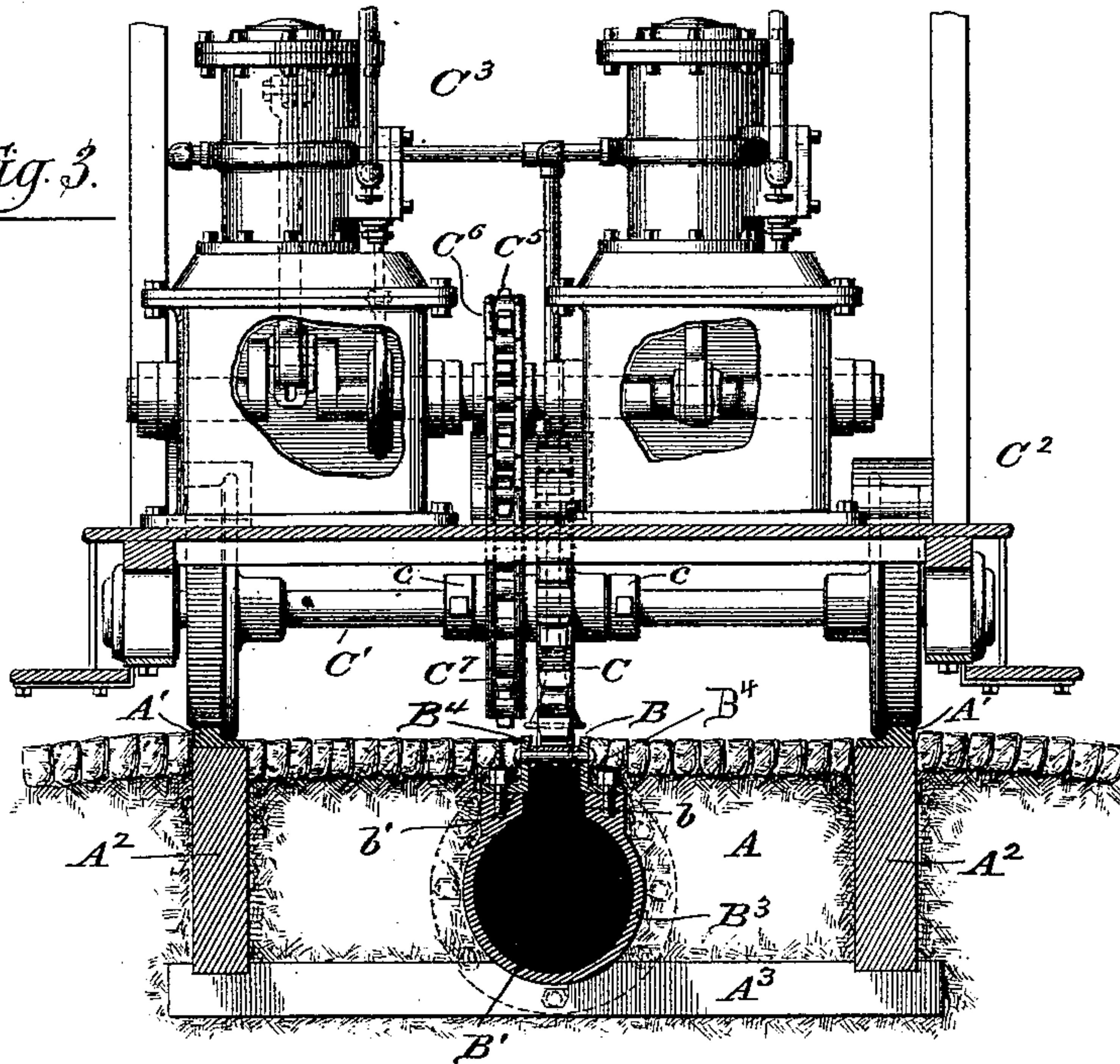


Fig. 4.

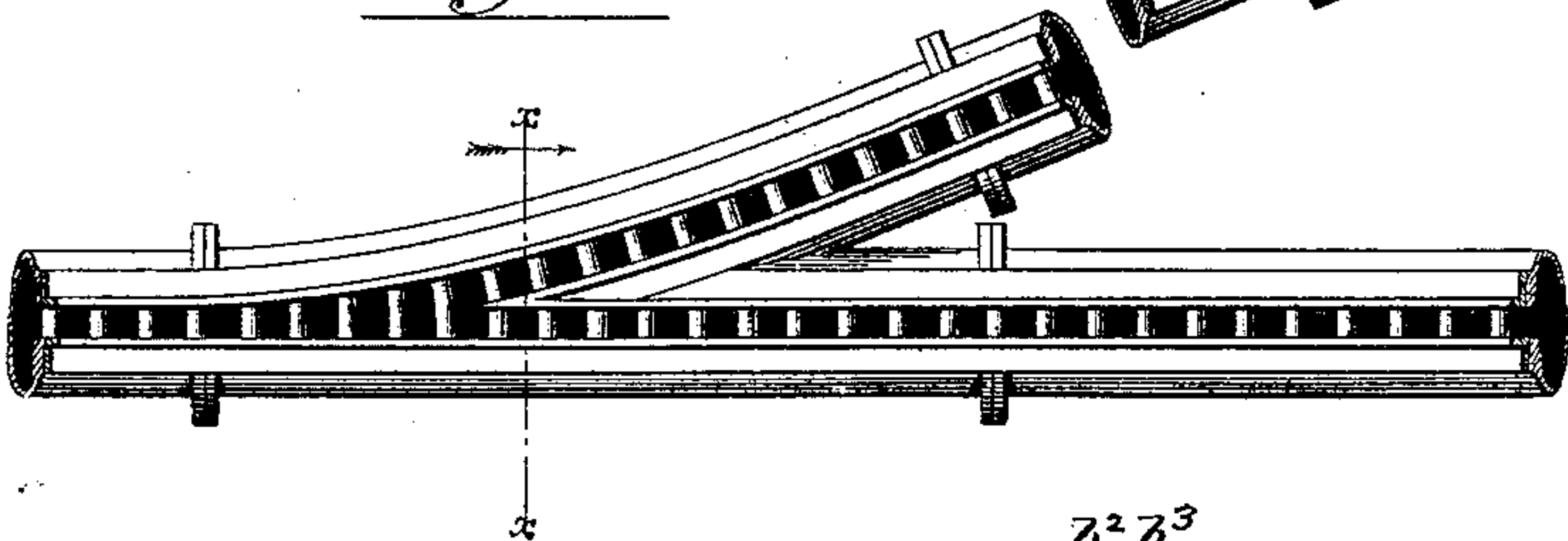


Fig. 4a.

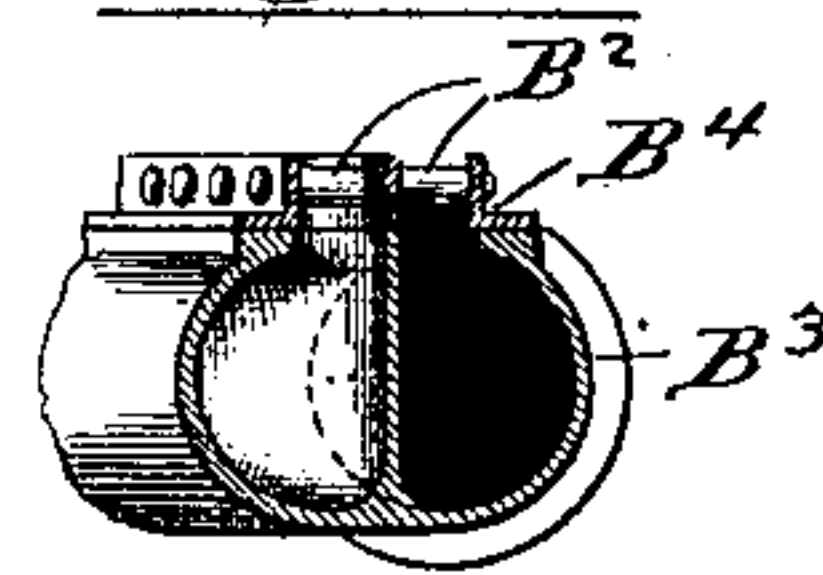
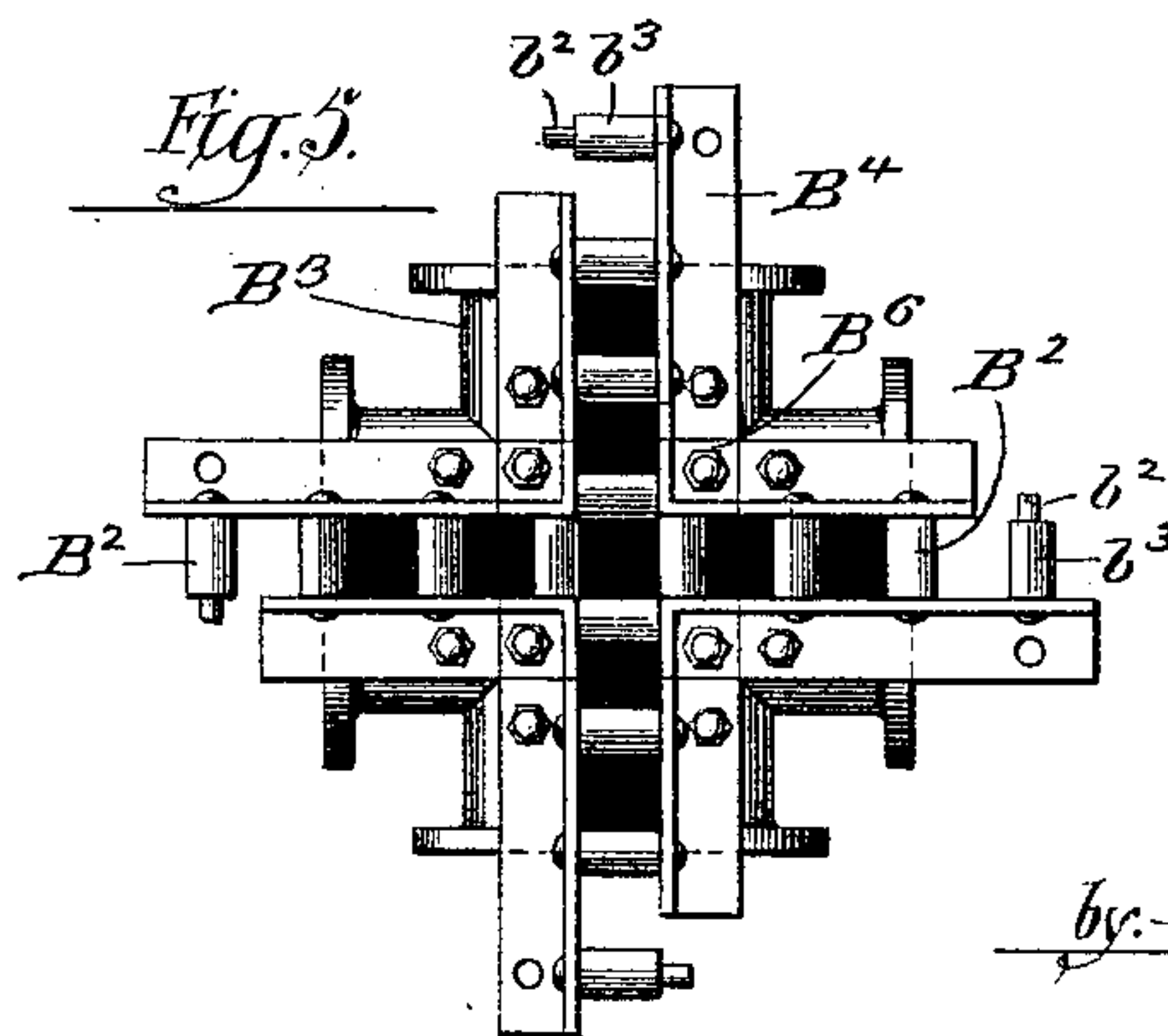


Fig. 5.



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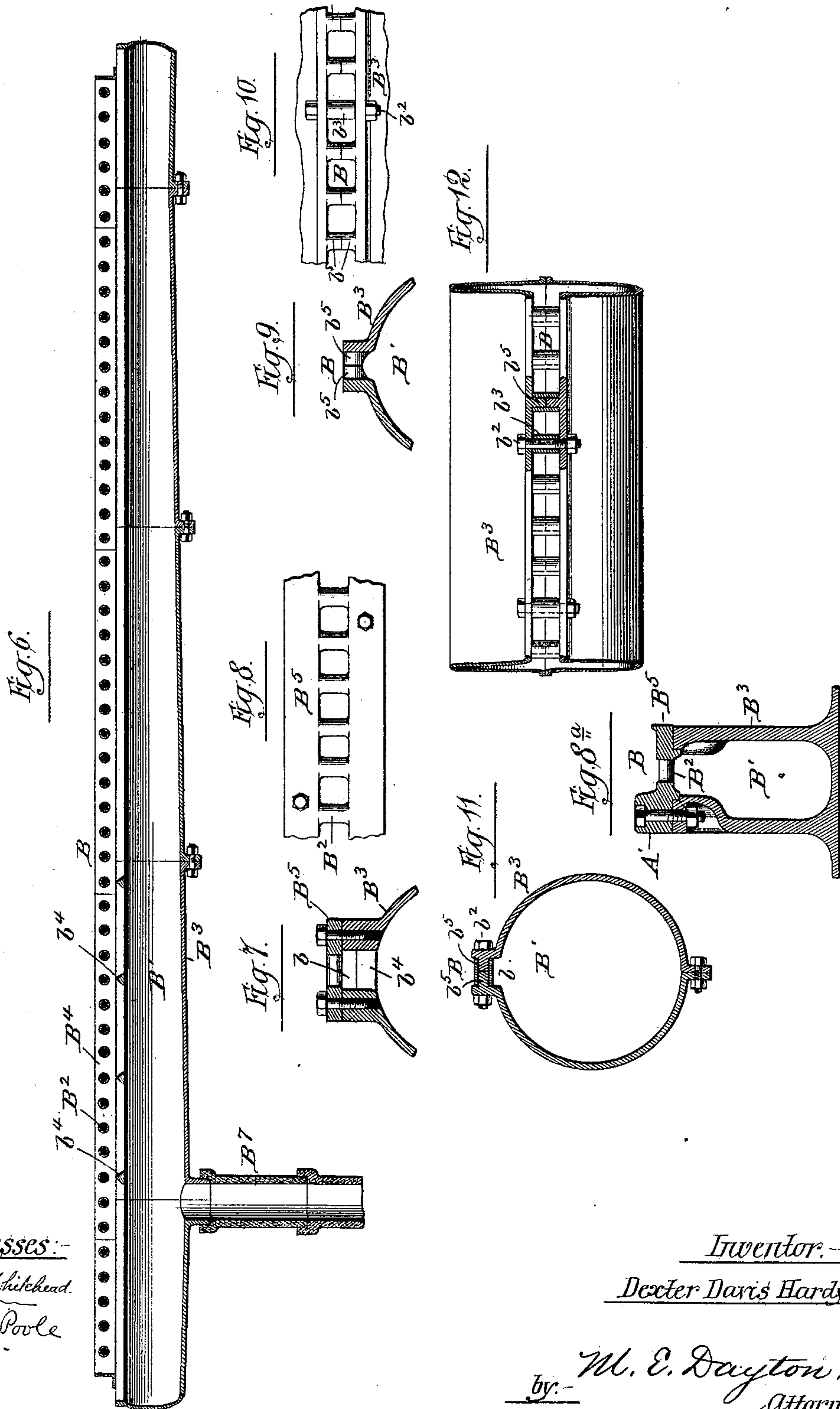
(No Model.)

3 Sheets—Sheet 3.

D. D. HARDY.
RAILWAY TRACTION DEVICE.

No. 386,779.

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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
5 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
10 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
15 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
20 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
25 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
30 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
35 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
40 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.
45 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 $x x$
50 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. 55
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
60 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. 65
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
70 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
75 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
80 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
85 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 enclosed by thimbles. Fig. 12 is a plan view of
90 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
95 just referred to.

A represents a road-bed.

A' A' are parallel tracks laid on longitudinal bed-pieces A², which rest on cross-ties A³.

B is an open rack set in the road-bed, preferably, as shown, centrally between the tracks A', but allowably otherwise placed, if desired. 100

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 B² of said rack.

5 C is a spur-wheel mounted on a suitable axis, which is allowably one of the wheel-axles C' of the car C², said spur being engaged with the rack B. The spur C, if on the wheel axle C', is preferably loose thereon, but may prac-
10 tically 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
15 be employed to retain the spur laterally in place.

C³ represents any suitable motor on the car for the rotation of the spur C and the resulting propulsion of the car. In this instance
20 said motor is illustrated as a steam-engine, in which C⁴ is a steam-generator, c' being the supply-pipe, and c² the exhaust terminating in a bell, c³, beneath the car. In this instance also the spur C is shown as being driven by
25 means of a sprocket-chain, C⁵, leading from a sprocket-wheel, C⁶, on the engine-shaft to a similar sprocket, C⁷, on the hub of the spur-wheel C.

The manner of mounting and rotating the
30 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 en-
35 gineer 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 espe-
40 cially 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', be-
45 low the open rack B, is shown as a passage within a cast-metal pipe, B³, 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
50 bodies of metal affording a horizontal upper surface, b', on which are bolted angle-plates B⁴. These angle-plates, as desirably constructed, if employed at all, are of wrought
55 metal, punctured at short intervals to receive horizontal bolts or rivets b², which pass from one vertical flange to the other of said angle-plates across the opening between them. Sur-
60 rounding each of these bolts, between the angle-plates, is a thimble, b³, which serves as a strut to keep said plates apart, while the rivets or
65 bolts b², 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 b² and their thimbles b³ constitute one form of cogs or teeth B² of the open rack B, some other forms of which will be here-

inafter 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
70 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 be-
75 tween 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
80 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 re-
85 quire 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 b³ as the bearing-
90 surface of the rack-teeth B² 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 B³ is similar to that already described; but the rack
95 consists of a metal plate, B⁵, punched or otherwise perforated to leave central cross-bars, which constitute the rack-teeth B², as very plainly shown in Fig. 8. This plate may be
100 secured over the slot b of the pipe B³ in some suitable way, of which the one shown is by vertical bolts. Fig. 8^a illustrates such a rack
105 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, b⁴, such as may be lo-
110 cated at intervals in the slot of the pipe B³ 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
115 from the action of frost or other inward pressure upon it. Similar cross-bars are shown at b⁴ 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 B³ is
115 understood to be cast in two vertically-divided parts, properly bolted together. In each of these figures short studs b⁵ are cast on the inner vertical walls of the slot b, those on one
120 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 B². In Figs. 8 and 9 the opposing studs b⁵ are of the full diameter required for the rack teeth or
125 cogs; but in Figs. 11 and 12 they are smaller and are surrounded by thimbles b³. In both constructions of the teeth B² by use of the cast studs the upper flanges of the parts of the
130 pipe B³ are at suitable intervals shown to be bolted together by bolts b², 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 .

5 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 at-
10 tachment 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
15 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
20 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 correspond-
25 ingly-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
30 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 xx 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
35 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
40 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
45 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
50 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
55 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
60 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
65 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
70 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
75 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 be-
80 neath 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 communi-
85 cate 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
90 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 engag-
95 ing 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
100 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
105 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 slot-
110 ted pipe located beneath the surface of the roadway and supporting the rack, substantially as described.

6. The combination, with an embedded slot-
115 ted 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
120 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,
125 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
130 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
5 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.