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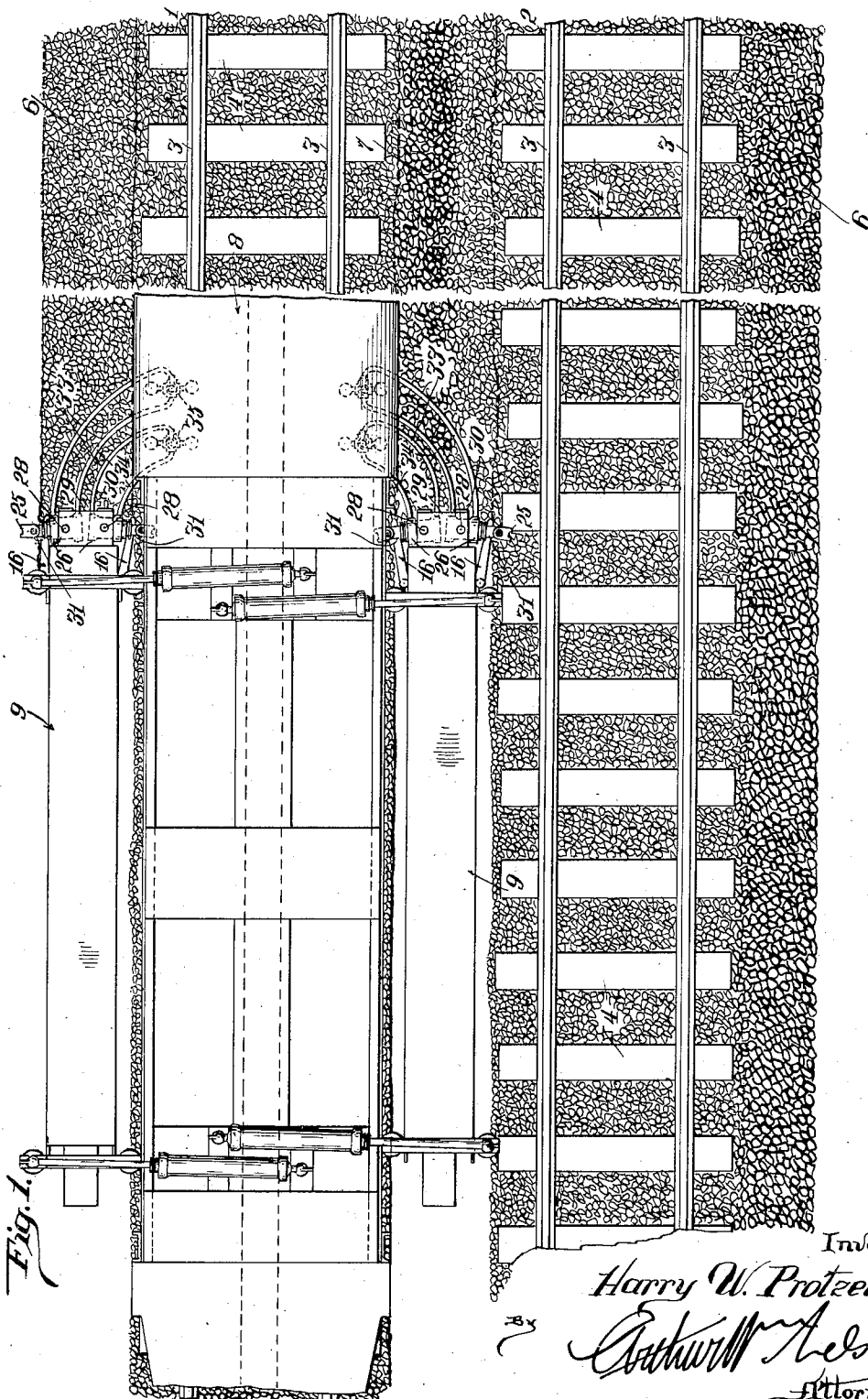
H. W. PROTZELLER

2,022,150

METHOD OF AND APPARATUS FOR TREATING BALLAST

Filed Oct. 5, 1933

3 Sheets-Sheet 1



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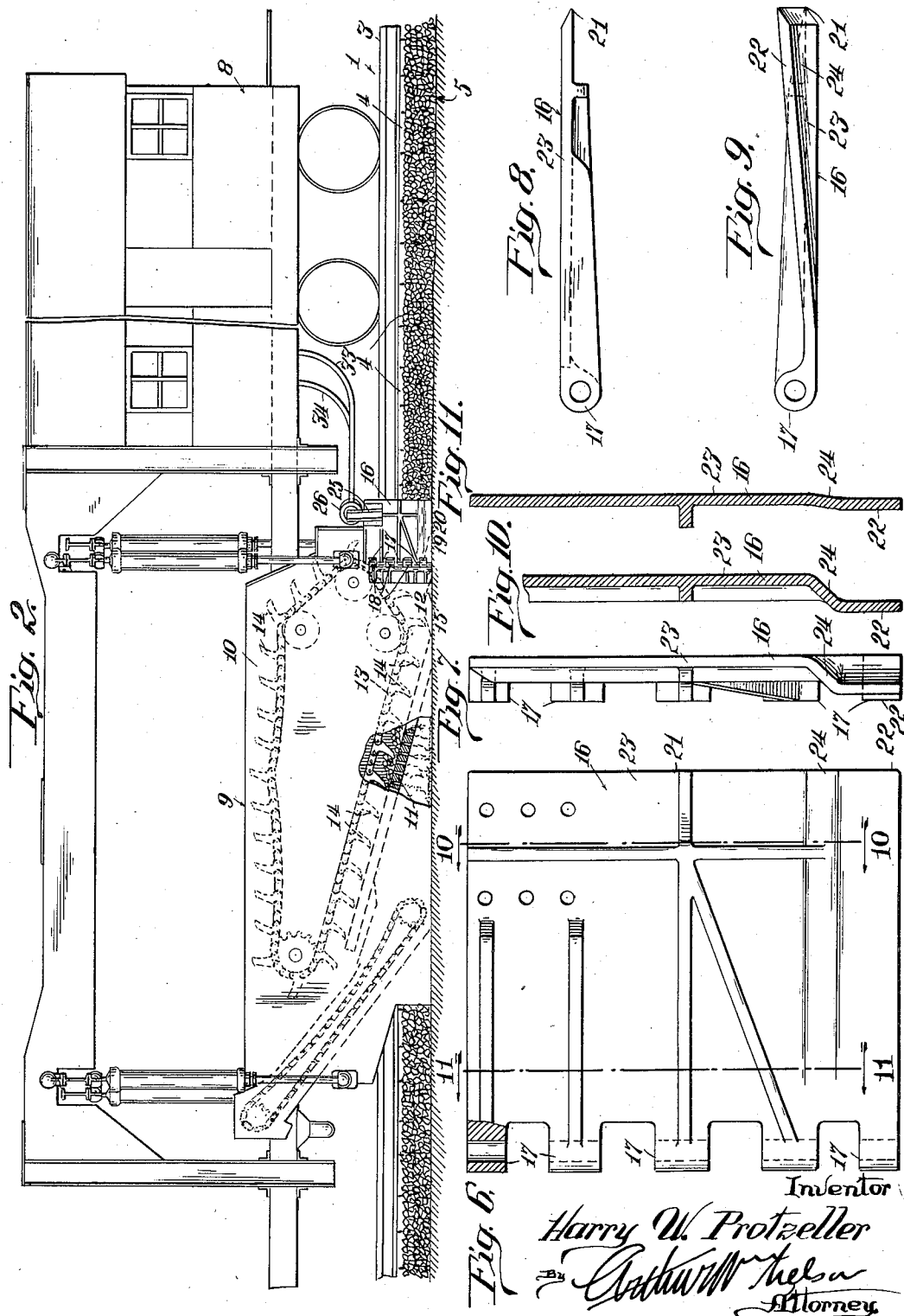
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3 Sheets-Sheet 2



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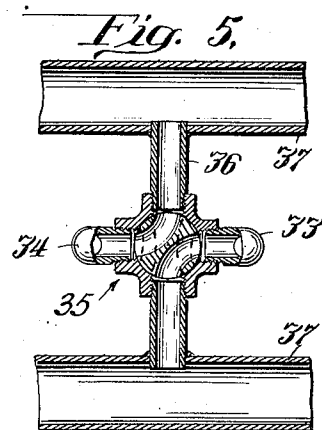
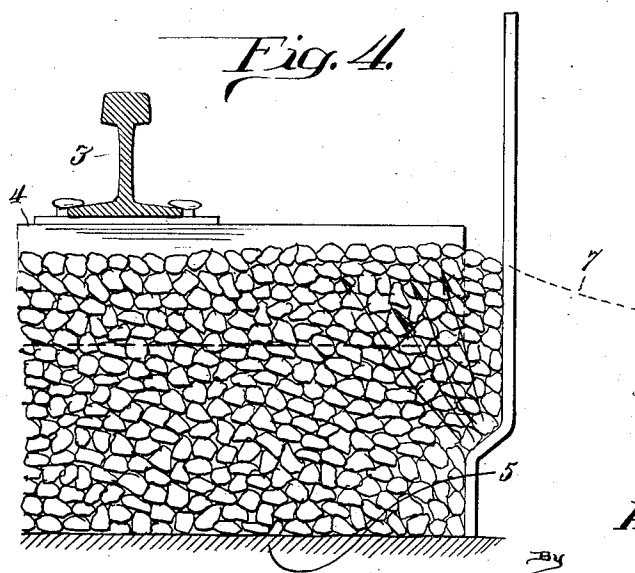
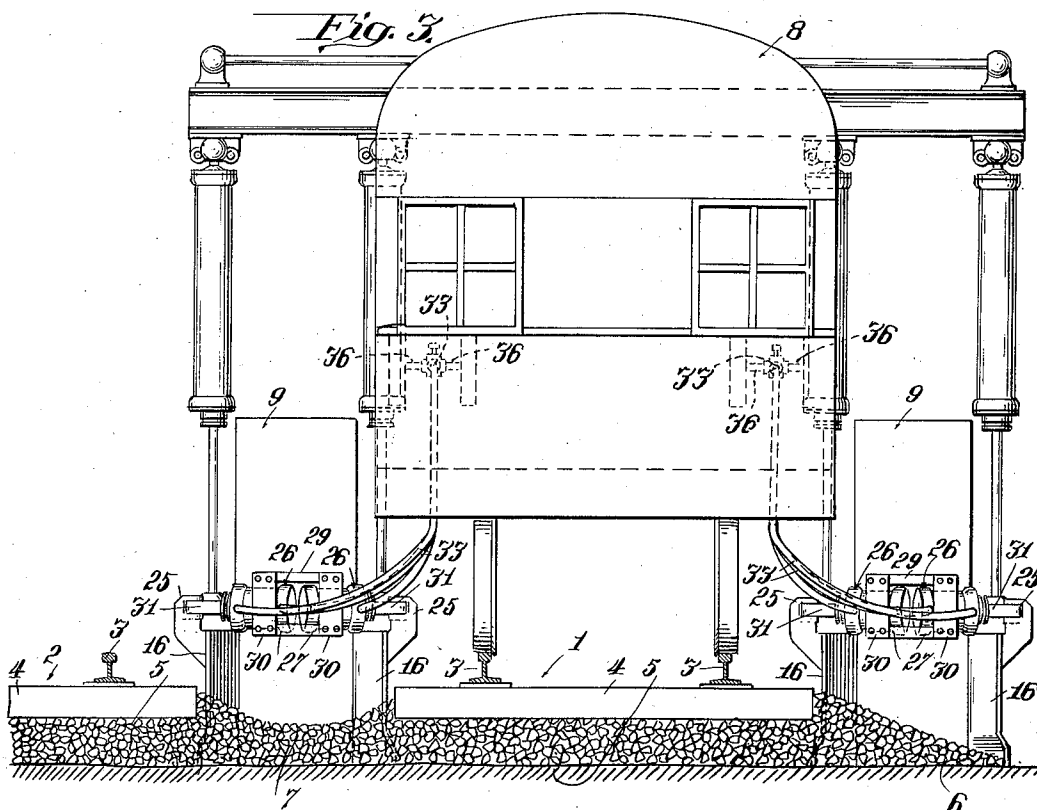
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METHOD OF AND APPARATUS FOR TREATING BALLAST

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3 Sheets-Sheet 3



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## UNITED STATES PATENT OFFICE

2,022,150

METHOD OF AND APPARATUS FOR  
TREATING BALLAST

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16 Claims. (Cl. 37-104)

This invention relates to improvements in Method of and apparatus for treating ballast and it consists of the matters hereinafter described and more particularly pointed out in the appended claims.

In the maintenance of railroad road beds, the matter of drainage is important and such drainage is affected by the cleanliness of the ballast.

Due to the traffic conditions and certain weather elements fine particles such as coal dust, sand, fine soil and the like are deposited upon the ballast and in time, rains and melting snow carry the same into the interstices between the component parts of the ballast to close said interstices. Hence, the ballast becomes clogged, caked or foul. Such foul ballast becomes sealed against drainage so that the water from rains and snows accumulates as puddles not only to cause tie rotting but also to promote the growth of vegetation, both of which conditions it is desired to avoid in track maintenance.

In the passage of trains over a track on such foul ballast, the rails take on a wave motion which induces an up and down tie movement. In wet weather, such tie movement acts in the manner of a pump to force water away from under the ties and then toward the ties. This action is such as to produce a mud that seals the tie ends against drainage so that track conditions rapidly grow worse.

To overcome such conditions for proper track maintenance, the ballast must be cleaned from time to time to insure drainage down to sub-ballast where it can be carried away.

One of the objects of the present invention is to provide an improved method of treating railway ballast which consists not only in removing shoulder or intertrack ballast preferably for cleaning and relaying but also simultaneously therewith to break up the caked intertie end ballast at some distance inwardly of the tie ends to promote drainage.

Another object of the invention is to provide an improved method of treating railway ballast that is so economical as to cost, as to make it practical and which method can be carried on as a continuous operation.

A further object of the invention is to provide an apparatus whereby the improved method may be expeditiously carried out.

The above mentioned objects of the invention, as well as others, together with the many advantages thereof, will more fully appear as I proceed with my specification.

In the drawings:

Fig. 1 is a view in top plan elevation of a double track railway and illustrates not only the irregularity of the tie end lines but further illustrates diagrammatically, parts of the apparatus for treating simultaneously one shoulder and the intertrack ballast of the railway.

Fig. 2 is a fragmentary view in side elevation of the apparatus whereby the improved method may be readily carried out.

Fig. 3 is a view in front end elevation of the apparatus shown in Fig. 2 with both excavating mechanisms and associated parts in working position.

Fig. 4 is a detail vertical sectional view on an enlarged scale through a portion of one of the railroad tracks, showing the operative relation of an associated wing whereby the same exerts an upward and inward pressure on the intertie end ballast to loosen the same.

Fig. 5 is a detail view showing a typical four-way valve embodied in the apparatus.

Fig. 6 is a detail view in side elevation on an enlarged scale of a certain wing or plate embodied in the apparatus.

Fig. 7 is a view in front end elevation thereof.

Fig. 8 is a top plan view of the same.

Fig. 9 is a bottom plan view of the same.

Figs. 10 and 11 are vertical detail sectional views through parts of the wing shown in Fig. 6, the planes of said sections being taken on the lines 10-10 and 11-11 of said Fig. 6.

In general, the improved method includes the removal of the ballast whether along the shoulder or intertrack space, substantially down to subballast for subsequent cleaning and relaying. The removal of the ballast is best carried out as a continuous operation and simultaneously therewith, the caked intertie end ballast along the shoulder or intertrack space or both has an upward and inward pressure applied thereto, preferably from a plane below the ties which loosens said intertie end ballast, some distance inward of said tie ends.

Referring now in detail to that embodiment of the invention, illustrated in the drawings and especially to Fig. 1 thereof:

1 and 2 indicate the tracks of a double track railway. Each track includes pairs of rails 3 disposed upon associated cross ties 4 which rest upon ballast preferably of crushed rock or stone and which in turn is laid upon a suitably graded subballast 5. The ballast is formed to provide the shoulders 6-6 at the outside of each track and between said tracks is the intertrack space

ballast 7. As is usual in railway construction, the ballast material is also disposed between the ties 4.

The improved apparatus whereby the method may be carried out includes a propellible vehicle here shown in the form of a car 8 having the usual wheels for travel upon the rails of the track. The outline of such a car is best shown in Figs. 2 and 3 respectively.

At each side of the car is operatively supported an excavating mechanism 9 which may be moved from its non-working or transport position on the car, to its working position upon the ballast at the shoulder and intertrack space respectively, of the railway. As the mechanisms 9 at both sides of the car are the same, a description of one will suffice for both.

Each excavator mechanism includes a pair of laterally spaced side plates 10 between which is located at the front end thereof, an upwardly and rearwardly inclined grate or screen 11. At the bottom end of said grate is a shovel or plow 12 which in operation digs substantially down to the subballast 5. Associated with said grate or screen is an excavating or digging chain 13 which is driven in any suitable manner so that its bottom lap travels upwardly of the grate. This chain includes teeth 14 which in the operation of the chain, dig into the ballast from above and excavate successive quantities therefrom and moves the same into the mouth or inlet of the mechanism and then along and upwardly of the grate. At the bottom front end of the mechanism is a subballast grade plow or cutter 15. When the car is moved along the track, each mechanism will remove ballast substantially down to subballast as a continuous stream or mass.

Associated with each mechanism at the front end thereof is a pair of wings which perform several functions. These wings not only define the effective width of the mouth for each mechanism but they also serve to form a line of cleavage along the line of the tie ends. At the same time they exert a pressure upwardly and inwardly of the tie ends from below to cause a slight upheaval of the intertie end ballast. This breaks the ballast so as to loosen the same. In this condition a certain amount of the dirt or foreign matter can be washed away by the rain and drainage improved. These wings are movable inwardly or outwardly so that the line of cleavage may be made to follow the irregularities of line or lines of the tie ends.

Each wing is in the form of a vertically disposed plate 16 provided at its rear ends with bearing sleeves 17 to coact with similar sleeves 18 on brackets 19 secured to the side plates of the mechanism 9, pins 20 extending through said sleeves to provide the pivotal connection between said plates and side members 10. The front end of each plate is provided with a sharpened edge 21, whereby it may more readily cut through the ballast.

The bottom portion 22 of each wing is offset outwardly from the top end portion 23 but is connected thereto by an inclined portion 24. When the mechanism 9 is working in the shoulder or intertrack space, the bottom edge of each wing works substantially in the plane of the grade of the subballast and this brings the inclined portion of each plate a little below the level of the bottom of the ties 4.

Each plate is provided at its top end with an outwardly extending yoke 25 by which a means may be connected to said wing for swinging the

same inwardly or outwardly about its pin 20 whereby the front ends of both wings will effectively define the width of the mouth for the associated excavating mechanism. As shown herein such means is preferably a hydraulic engine 26 and each engine includes cylinders 27 having top and bottom vertically disposed trunnions 28 about midway of their ends as best shown in Fig. 1. These cylinders face in opposite direction. The trunnions of each cylinder are journaled in the brackets 29 secured to a cross member 30 at the upper front ends of the side members 10-10. Each cylinder has a piston rod 31 extending through its outer end and each rod is pivotally connected at its outer end in the yoke 25 carried 15 on the outer face of an associated wing.

A pair of conduits 33-34 is operatively connected to the opposite ends of each cylinder and lead to opposite sides of a four-way valve 35 on the car. This valve is further connected by pipes 20 36 with associated headers or manifolds 37 which are in turn operatively connected to suitable sources of hydraulic fluid under pressure.

When the valves for these cylinders are properly manipulated, the pistons thereof are projected or retracted to swing the wings outwardly or inwardly about their pivotal connection with the side plates so that their front edges can be made to closely follow the lines of the tie ends.

When the plug of any one or more of the valves 35 is turned to bring its ports into the off or closed position shown in dotted lines in Fig. 5, no fluid can pass through the valve and the associated piston is thus held in the desired position.

When the excavating mechanism is in working position and the said mechanism is moving through the ballast at either the shoulder or intertrack space, the operator, from a convenient position on the car, manipulates the valves 35 so as to swing the wings inwardly or outwardly of the tie ends so that the front ends of the wings miss the tie ends and thus follow the lines thereof, it being borne in mind that this line is not a perfectly straight one as the ties are quite irregular.

As the front edge of the wings cuts through the ballast it forms a line of cleavage that defines the sides of the excavation being made. As these wings cut through the ballast, they will direct the ballast between them inwardly toward the mouth of the excavating mechanism.

Due to the inclined part 24 of each wing, which as before stated works in the ballast below the plane of the ties, an upward and outward pressure is produced thereby, which is manifested as a slight upheaval of the intertie end ballast so as to loosen up the same from its caked condition, some distance inwardly of the tie ends. This breaks up the mud sealed condition existing in the intertie end spaces with the advantages before stated.

The ballast excavated by the mechanism 9 is preferably cleaned and then returned to the subballast so that with loosened intertie end ballast and with clean ballast on the shoulder and intertrack space, a free draining roadbed results.

The method is continuous in its operation and therefore the treating of the ballast for the purpose described is quite rapid. Hence the cost of treating ballast is relatively low and fine results are produced.

While in describing the invention, I have referred in detail to certain steps of the method and the sequence thereof, as well as to certain structure whereby the same may be carried out,

the same description is to be considered only in the illustrative sense so that I do not wish to be limited thereto except as may be specifically set forth in the appended claims.

5 I claim as my invention:

1. An apparatus for treating railway ballast embodying therein propellible means, means movable by the propellible means for removing ballast disposed outwardly from the tie ends; and means also movable by the propellible means for forming a line of cleavage in the ballast along the tie ends; said means including top and bottom substantially vertical portions and an inclined intermediate connection portion for exerting an upward and inward pressure on the intertie end ballast from below for loosening the same some distance inwardly of said tie ends.

2. An apparatus for treating railway ballast embodying therein propellible means, means movable with the propellible means for removing ballast disposed outwardly from the tie ends; and means also movable by the propellible means for forming a line of cleavage along the tie ends, said means including top and bottom substantially vertical portions and an inclined intermediate connecting portion for exerting an upward and inward pressure on the intertie end ballast from below for loosening the same some distance inwardly of said tie ends, said last mentioned means also being movable toward or away from the tie ends so as to follow the line thereof.

3. An apparatus for treating railway ballast embodying therein propellible means, means movable with the propellible means for removing ballast disposed outwardly from the tie ends, and means also movable with the propellible means and formed for producing a line of cleavage in said ballast adjacent the tie ends and also formed with a portion presenting an upwardly inclined surface to the ballast for exerting an upward and inward pressure on the intertie end ballast from below for loosening the same some distance inwardly of said tie ends.

4. An apparatus for treating railway ballast embodying therein propellible means, means movable with the propellible means for removing ballast disposed outwardly from the tie ends, means also movable with the propellible means and formed for producing a line of cleavage in said ballast adjacent the tie ends and also formed with a portion presenting an upwardly inclined surface to the ballast for exerting an upward and inward pressure in the intertie end ballast from below for loosening the same some distance inwardly of said tie ends, and means for moving said last mentioned means laterally whereby the same may be caused to follow the line of said tie ends.

5. An apparatus for treating railway ballast embodying therein propellible means, means movable with the propellible means for removing ballast disposed outwardly from the tie ends, and means operatively connected to one side of said last mentioned means and operating in advance thereof and formed to produce a line of cleavage in said ballast adjacent the tie ends and also formed to present an upwardly inclined surface portion to the ballast for exerting an upward and inward pressure on the intertie end ballast for loosening the same some distance inwardly of said tie ends.

6. An apparatus for treating railway ballast embodying therein propellible means, means movable therewith for removing ballast disposed out-

wardly of the tie ends, means movably mounted on one side of said last mentioned means and formed to produce a line of cleavage in said ballast adjacent the tie ends, said means including a portion on the outside thereof for presenting an upwardly inclined surface to the ballast for exerting an upward and inward pressure on the intertie end ballast for loosening the same some distance inwardly of said tie ends, and means for moving said movable means laterally so that the same may be made to follow the line of the tie ends.

7. An apparatus for treating railway ballast embodying therein propellible means, means movable therewith for removing ballast disposed outwardly of the tie ends, means pivotally connected to one side of said last mentioned means and formed to produce a line of cleavage in said ballast adjacent the tie ends and also formed with a laterally outward offset bottom portion to exert an upward and inward pressure on the intertie end ballast for loosening the same some distance inwardly of said tie ends, and means for swinging said pivotally mounted means inwardly or outwardly so that the same may be made to follow the line of the tie ends.

8. An apparatus for treating railway ballast embodying therein propellible means, means movable therewith for removing ballast disposed outwardly of the tie ends, means pivotally connected to one side of said last mentioned means and formed to provide a line of cleavage in said ballast adjacent the tie ends and also formed with a laterally outward offset bottom portion to exert an upward and inward pressure on the intertie end ballast for loosening the same some distance inwardly of said tie ends, and hydraulic means for swinging said pivotally connected means laterally so that the same may be made to follow the line of the tie ends.

9. An apparatus for treating railway ballast embodying therein propellible means, means movable therewith for removing ballast disposed outwardly of the tie ends, means pivotally connected to each side of said first mentioned means, for lateral movement whereby lines of cleavage may be formed in the ballast between the tie ends of adjacent tracks, and means for swinging each of said last mentioned means independently of the other so that they may be made to follow the lines of the tie ends of adjacent tracks, said pivotally connected means being so formed that when following the lines of said tie end they will exert an upward and inward thrust on the intertie end ballast to loosen the same.

10. An apparatus for treating railway ballast embodying therein propellible means, means movable with the propellible means for removing ballast disposed outwardly from the tie ends, and a vertically disposed, plate-like cleavage member on one side of said means and extending forwardly therefrom and having a laterally outward offset bottom portion which operates to impose an upward and inward thrust on the intertie end ballast from below to loosen the same.

11. An apparatus for treating railway ballast embodying therein propellible means, means movable with the propellible means for removing ballast disposed outwardly of the tie ends, a member pivotally connected to each side of said means for forming a line of cleavage at each side of intertrack ballast along the tie ends of adjacent tracks, hydraulic means carried by said first mentioned means and operatively connected to said cleavage members for swinging them in-

wardly or outwardly so as to follow the lines of the tie ends, and means for controlling said hydraulic means.

12. An apparatus for treating railway ballast embodying propellible means, means movable with the propellible means for removing ballast disposed outwardly of the tie ends, a member pivotally connected to each side of said means for forming a line of cleavage at said side, and along the adjacent tie ends, and means for swinging said pivotally connected member inwardly and outwardly in order to follow the lines of the tie ends.

13. In an apparatus of the kind described, a plate-like member for forming a line of cleavage in the ballast, a part of the bottom portion of said plate being disposed substantially parallel with but being offset laterally from the top portion to provide an inclined intermediate connecting portion.

14. In an apparatus of the kind described, a plate-like member for forming a line of cleavage in the ballast, said member having a relatively sharp front edge, a part of the bottom portion

of said member being disposed substantially parallel with but being offset laterally from the top portion to provide an inclined intermediate connecting portion.

15. In an apparatus of the kind described, a plate-like member for forming a line of cleavage in the ballast, said member being relatively sharp at its front edge and provided at its rear edge with a tubular portion whereby the member may be pivotally mounted, a part of the bottom portion of said member being disposed substantially parallel with but being offset laterally from the top portion to provide an inclined intermediate connecting portion.

16. In an apparatus of the kind described, a plate-like member adapted to be substantially perpendicularly disposed to form a line of cleavage in the ballast, the front edge of the bottom portion of said member being offset laterally thereof but connected thereto by an inclined intermediate portion, the lateral offset of said bottom portion diminishing toward the rear edge of said plate-like member.

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