Jan. 19, 1960 J. C. STEIN ET AL 2,921,390

BALLAST PLOW FOR USE UNDER RAILWAY TRACKS

Filed Oct. 7, 1954 4 Sheets-Sheet 1

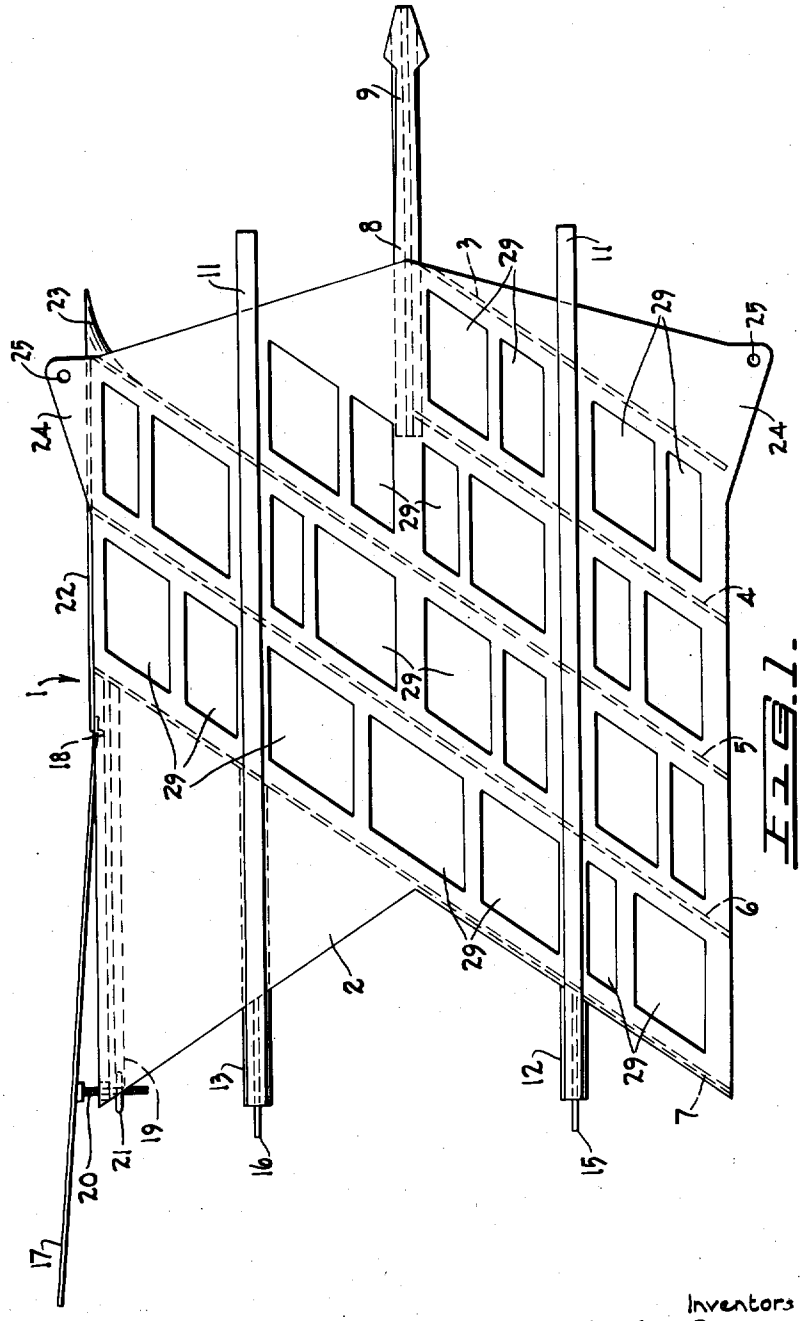


FIG. 1.

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Filed Oct. 7, 1954 4 Sheets-Sheet 2

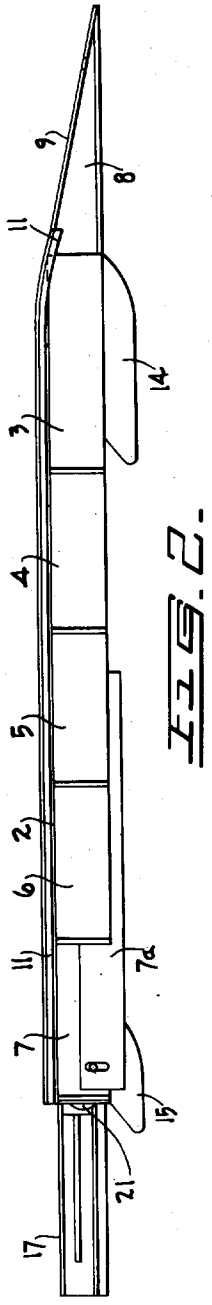


FIG. 2.

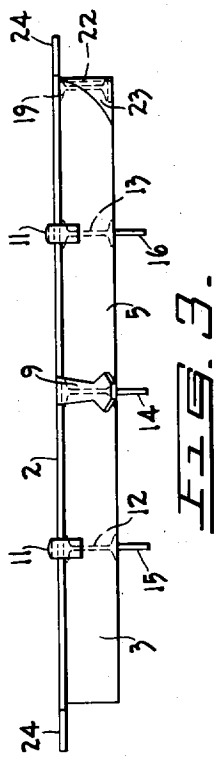


FIG. 3.

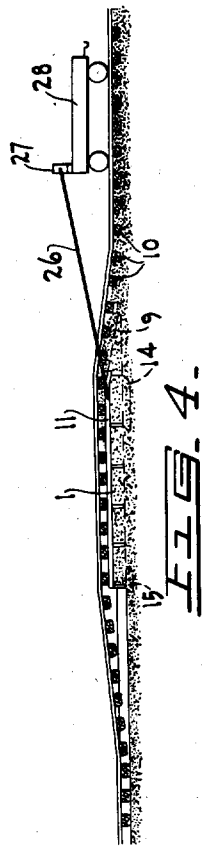


FIG. 4.

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BALLAST PLOW FOR USE UNDER RAILWAY TRACKS

Filed Oct. 7, 1954 4 Sheets-Sheet 3

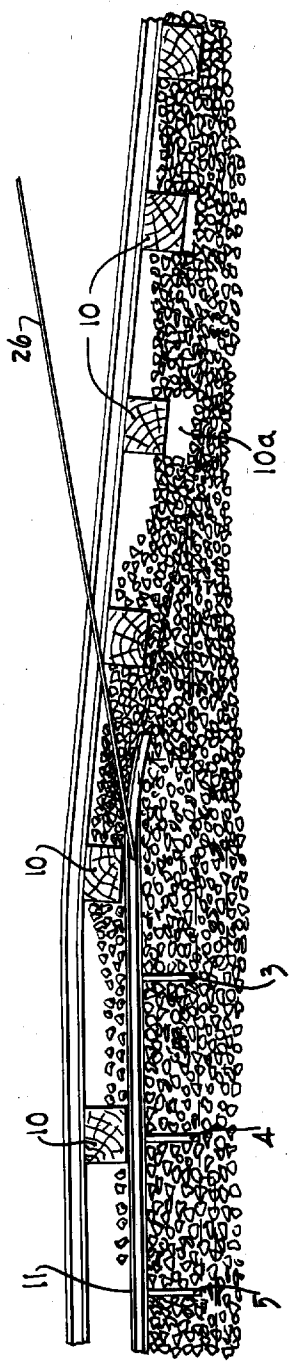


Fig. 4a.

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BALLAST PLOW FOR USE UNDER RAILWAY TRACKS

Filed Oct. 7, 1954 4 Sheets-Sheet 4

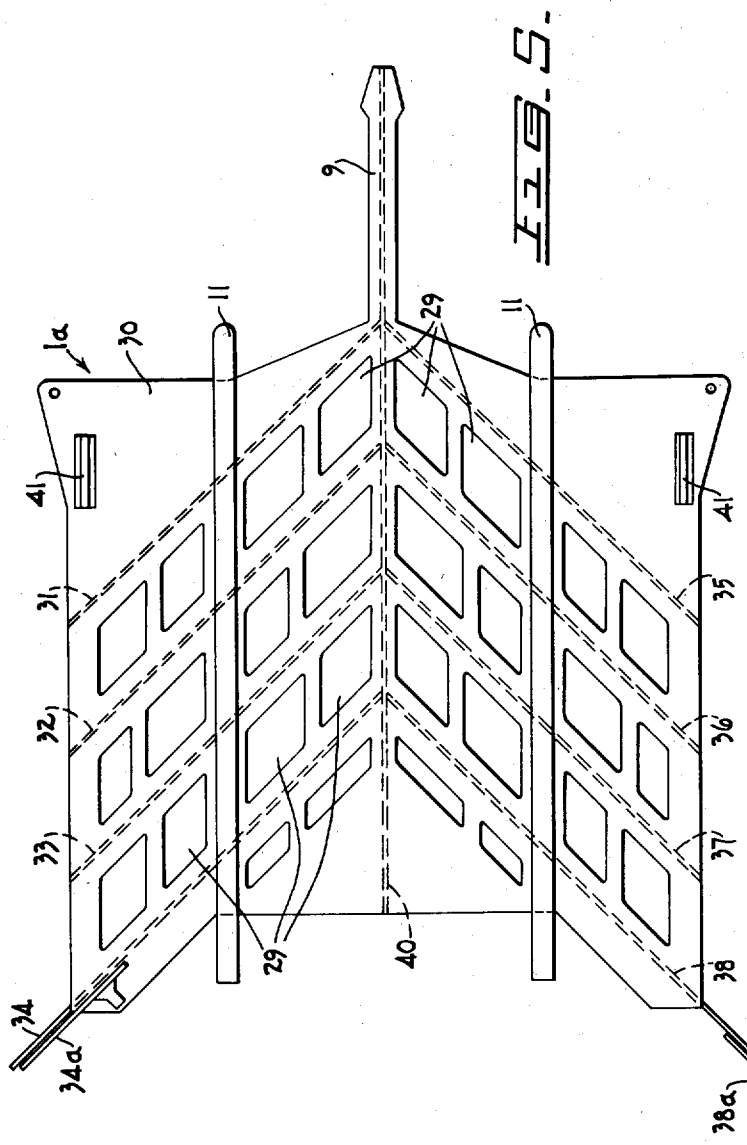


FIG. 5.

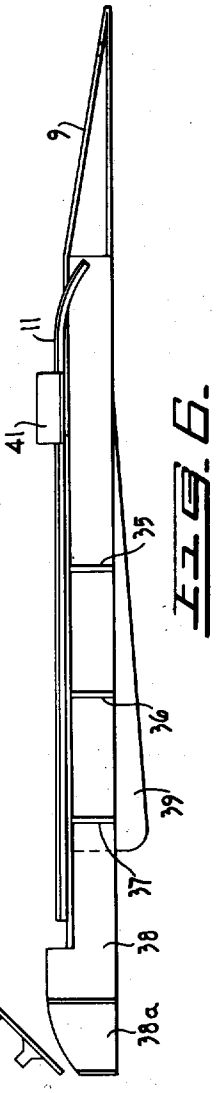


FIG. 6.

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United States Patent Office 2,921,390
Patented Jan. 19, 1960

2,921,390

BALLAST PLOW FOR USE UNDER RAILWAY TRACKS

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Application October 7, 1954, Serial No. 460,798

Claims priority, application Canada June 23, 1954

12 Claims. (Cl. 37—104)

This invention relates to a plow device for removing fouled ballast from a railway road bed. Devices of this type, sometimes known as "undertrack plows" or "ballast plows," are inserted between the road bed and the ties to which the track rails are secured, and are then towed along the track in this position by a locomotive. As the plow progresses, it raises the ties from the road bed ahead of it, supports these ties and the track secured thereto as it passes underneath, and finally allows the ties and track to resettle onto the road bed behind it.

As will be appreciated, the weight of the ties and track supported by the plow is considerable, and the plow is therefore pressed firmly down against the ballast constituting the road bed. By providing the plow with a scraper blade, it is then possible to separate an upper layer of fouled ballast, and, if desired, relace it with fresh ballast before the ties are finally relaid.

Various difficulties have been experienced in practice with devices of this nature. A scraper blade of V shape has been employed to throw the ballast being removed to the sides; but this has given rise to difficulties when used on locations where two tracks extend parallel to one another, by reason of the close proximity of the tracks and the consequent impracticability of keeping the ballast removed from one track clear of the adjacent track. Trouble has also been experienced in maintaining the plow correctly oriented and centrally disposed beneath the ties. Many other difficulties have been encountered particularly in controlling the depth of cut taken by the plow.

The present invention concerns a ballast plow that has been designed to provide generally improved and simplified operation, more especially in respect to the aforementioned practical difficulties that have been experienced in the past.

The various features of the invention will become apparent from consideration of the two ballast plows illustrated in the accompanying drawings. In these:

Figure 1 shows a plan view of a first example of plow according to the invention;

Figure 2 shows a side view of the plow seen in Figure 1; and

Figure 3 shows a front view of the plow seen in Figure 1.

Figure 4 is a diagrammatic representation, demonstrating the method of operation of the plow of Figures 1 to 3; and

Figure 4A is a fragment of Figure 4 on an enlarged scale to illustrate more detail.

Figure 5 is a plan view of a second example of plow according to the invention; and

Figure 6 shows a side view of the plow seen in Figure 5.

Referring firstly to Figures 1 to 3, the ballast plow 1 shown therein comprises a flat plate 2 of sheet steel of generally rectangular shape, but cut to a V at its leading and trailing edges. This plate 2 is perforated by a number of holes 29 extending in four rows between five downwardly projecting steel strips forming scraper blades 3, 4, 5, 6 and 7, that are secured to the undersurface of the plate 2. These blades all project downwardly at

right angles to the plane of the plate 2, while extending across such plate in parallel planes inclined at an angle of about 50° to 60° to the front-to-rear central axis of said plate as defined by the apices of the V's formed thereon. As appears from Figure 1, the blades 5, 6 and 7 extend across the full width of the plate 2, whilst the blades 3 and 4 extend only from the right hand edge of the plate 2 to a centrally positioned I-beam 8 that is secured to the front part of the plate 2 to project forwardly therefrom. This beam 8 tapers towards its projecting forward end so as to form, in effect, a ramp 9, up which the ties 10 may slide, as best appreciated by reference to Figures 4 and 4A. Part of the upper flange of the beam 8 is cut away so that the ramp 9 extends evenly into the surface of the plate 2, the duty of supporting the ties being taken over at this point by a pair of smooth runners 11 having slightly upwardly curved upper surfaces in cross-section (see Figure 3). These runners 11 extend rearwardly on each side of the centre line and along the upper surface of the plate 2 to project somewhat beyond its trailing edge, at which points they are connected to the upper flanges of respective I-beams 12 and 13 arranged beneath the level of the plate 2. The beams 12 and 13 project to the rear from the blade 7, the beam 13 situated on the left hand side of the plow 1 consequently being rather longer than the beam 12 situated on the right hand side. The runners 11 are spaced apart a distance equal to the track gauge so that, in use, a track rail will be approximately directly above a runner. The front ends of the runners 11 are sloped downwardly to help raise any tie that may be hanging down unusually low.

The beams 8, 12 and 13 carry downwardly projecting keels 14, 15 and 16, respectively, which bite deeply into the ballast when the plow is in use and thus resist any side thrusts tending to move the plow away from its correct alignment beneath the ties. In addition, an adjustable wing 17 is preferably provided, hinged at 18 to a further I-beam 19 extending along the left hand rear edge of the plow. As seen in Figure 1, the angle at which the wing 17 projects, may be determined by a screw 20 attached to such wing and cooperating with a nut arranged adjacent the inner surface of the web of the beam 19. This nut may conveniently take the form of a hand wheel 21 for ease of adjustment. As will be further explained in connection with the operation of the whole device, the wing 17 acts as a land slide and assists in maintaining the plow straight in spite of the clockwise twisting action caused by the inclination of the blades 3 to 7 and the reaction to the forces they exert on the top layer of ballast.

As an optional feature, the blade 7 may have an adjustable portion 7*a* connected to the main blade 7 by a nut and slot arrangement. As demonstrated in Figure 2, this portion 7*a* may be lowered to project somewhat below the level of the bottoms of the other blades. The setting of the portion 7*a* provides a useful means of controlling the running characteristics of the plow, as will be referred to again below. In Figure 3, the portion 7*a* has not been shown, for simplicity, it being assumed to be in the upward or retracted position. Similarly the wing 17 is taken as lying flush against the beam 19.

The left hand forward edge of the plow is enclosed by a strip 22 of sheet metal secured to the ends of blades 5, 6 and 7, this metal acting as a forward continuation of the wing 17. At the extreme forward left hand edge, the plow has a plow shear 23, the trailing surface of which extends into that of the blade 5.

Ears 24 are provided on each side of the plate 2, to project slightly to the sides at the front edges thereof. These ears 24 have holes 25 to which cables 26 (see Figure 4) may be secured by suitable shackles—not illustrated in detail. The other ends of the two cables

are then secured to a suitable drawbar **27** mounted on a car **28** coupled to a locomotive (not shown).

The manner of operation of the plow **1** will be best appreciated from consideration of Figures 4 and 4A. As it is drawn along by the cables **26**, the plow lifts the ties **10** ahead of it away from the road bed. This leaves a number of cavities in the ballast (designated by **10***a* in Figure 4A), and it is the ballast between these cavities and a strip along each side of the track beyond the ends of the cavities that is to be removed. In other words, in practice, the plow will be called upon to remove ballast to a depth of about five to six inches. To meet this requirement, it has been found satisfactory in practice to make the depth of the blades **3**, **4**, **5**, **6** and **7** slightly more than the depth of the cut, say eight inches. The portion **7***a* of the blade **7** may be set to project rather more below the plate **2** than the other blades. The setting of this portion **7***a* has an important bearing on the riding characteristics of the plow, and determination of the best setting will be a matter for consideration in the light of the particular circumstances pertaining, for example the condition and nature of the ballast and the characteristics of the track and the towing apparatus.

As the plow is drawn along, it cuts what is in effect a shallow trench, the bottom of which is on the level previously occupied by the bottoms of the ties, and the left hand edge of which consists of a sharp vertical wall that is cut by the plow shear **23**. The right hand side of the trench has no definite edge, since the ballast material removed is thrown to that side and since the road bed slopes downwardly away from the track. The left hand edge of the trench may not be so sharply defined if the track is a single one, since then the road bed will also slope away to the left, but the above is written on the assumption that the plow is in use on one of a pair of tracks, this being the primary application of this form of plow.

The leading blades—the blade **3** in respect of that ballast on the right hand half of the track and the blade **5** in respect of that ballast on the left hand half of the track—impinge upon the layer of ballast to be removed and deflect the same towards the right hand side of the track. It is found in practice, however, that if a sufficiently deep layer of ballast is to be removed, that is to say down to the depth of the bottoms of the ties, it is never possible for a single blade to deflect the large quantity of ballast involved with any degree of efficiency. This has been one of the difficulties with plows proposed in the past in which reliance has been placed on a single blade, and it has led either to unsatisfactory operation or to restriction in the depth of cut that can be taken with consequent need for more than one pass of the plow over the same length of track.

The additional blades are an important feature of the present invention and have in practice been found necessary for obtaining the most efficient operation. The ballast that cannot adequately be deflected completely to the side by the leading blades **3** and **5**, is pushed forwards in front of the plow until it piles up to a height above that of the plate **2** whereupon it "boils" over onto the top of such plate and passes downwardly again through the holes **29**. The ties which lie just above the plate **2** tend to assist this action which is diagrammatically illustrated in Figure 4A.

In passing down through the holes **29**, the ballast takes up a position in front of the next succeeding blades, i.e., the blades **4** and **6** on the right and left hand sides respectively. This ballast is then deflected to the right by such additional blades. The blades **3** and **4** are intended to deal as far as possible with the ballast on the right hand side of the track, thus leaving the right hand ends of blades **5** and **6** free to receive the ballast deflected to the right by the left hand ends of these blades, and to convey such ballast to the extreme right hand edge of the plow. In practice, however, there is often some ballast spilled over from the blade **4**, and also from the blade **6**. For this reason the fifth blade **7** has been found desirable in practice.

This "boiling" or spilling action of the ballast is valuable, not only in that it distributes the ballast between the various blades, but also because it acts to break up agglomerations of lumps of ballast, stones or refuse that tend to form and become firmly united together by a coating of dried mud.

The reaction of the ballast tending to slew the plow around in a clockwise direction (as viewed in Figure 1) or move it bodily to the left is countered by the wing **17** which abuts against the vertical left hand wall of the trench cut by the plow, and by the keels **14**, **15** and **16** which extend down into the ballast below the level of the bottom of the trench.

All the ballast is thrown clear of the ends of the blades **3** to **7** at the right hand side of the track. This fouled ballast is then collected by a mechanism specially designed for this purpose and mounted on a rail car, is cleaned and is then subsequently relaid on the track by hand or by a suitable mechanical device. Canadian patent application Serial No. 653,870, corresponding to U.S. Patent 2,769,172, issued October 30, 1956, discloses a device suitable for such relaying of the cleaned ballast.

It is one of the features of the plow **1** that all the ballast is deflected to the right. Assuming the plow to be drawn along the track in the normal direction of the trains thereon, it will be seen that the ballast will be thrown in the direction that will be away from the adjacent track. If, however, the circumstances are such that this feature of uni-directional displacement of the ballast is not essential, a second type of plow **1***a*, as illustrated in Figures 5 and 6, may be employed.

In this construction the deflecting blades extend backwardly and outwardly from a central member, so that the ballast is thrown to both sides. The upper plate **30** is generally similar to the plate **2**, except that the perforations **29** are differently arranged to follow the spaces between blades **31** to **34** on the left hand side and **35** to **38** on the right hand side. Also the V formations of the leading and trailing edges are somewhat modified. The three keels previously employed are replaced by a single keel **39**, which is simply a projecting part of the central member **40**. A ramp **9** is provided as before, and also runners **11**. In addition an upstanding plate **41** is arranged on each side of the plate **30**. The function of these plates **41** is to engage the end of a tie if the plow becomes deflected sideways from its correct running position. This ensures either that the plow is urged back into its correct position or that the plow is stopped before it can move sideways sufficiently for the towing cable to become entangled in the ties. The operation of this plow **1***a* is generally similar to that described in connection with the plow **1**, the ballast spilling over from the first blades **31** and **35** and through the perforations **29** to be engaged and deflected by the succeeding blades.

The rear blades **34** and **38** are shown as being rather longer than the remainder of the blades and projecting beyond the edge of the plate **30**. This is an optional feature, as also is the provision of hinged extensions **34***a* and **38***a* on the projecting ends of the blades **34** and **38**. The extension **34***a* is shown in the upward or withdrawn position and the extension **38***a* is shown in the downward or operative position. Suitable means will be provided for holding these hinged extensions in each position. They will both normally be secured in their operative positions when the plow is in use, in order to throw the ballast clear away from the track, but this will be a matter of choice in each particular set of circumstances and especially having regard to the structural gauge of the track, i.e., tunnels, platforms or other obstructions that might be fouled by the extensions.

It is desired to emphasize that in order to ensure clarity in the drawings of the essential features of the plows illustrated, minor structural details have in general been

omitted. For example stiffening members may be secured to the lateral edges of the plates **2** or **30**, especially the plate **2** at the right hand edge since the adjacent parts provide little reinforcement in the longitudinal direction. Also, it has been found expedient to illustrate a blade of variable depth (i.e., the portion **7***a*) on the plow **1**, and the projecting rear blade with its hinged extension (blades **34** and **38**) on the plow **1***a*. It is, however, to be understood that any of these features either alone or in combination may be employed on either plow, just as the tie deflecting plates **41** are equally suited for use on the plow **1** as well as the plow **1***a*.

We claim:

1. A device for removing fouled ballast from the surface of a railway road bed, comprising a flat elongated perforated metal sheet, a pair of raised strips fixedly secured to the upper surface of said sheet and extending from front to rear therealong, a plurality of blade members disposed one behind the other and projecting downwardly from said perforated metal sheet, said blade members being inclined to the front-to-rear axis of the device as defined generally by the raised strips and a keel extending generally parallel to said strips and projecting below the bottom edges of said blade members.

2. A device as claimed in claim 1, wherein at least three blades are employed, the perforations in the sheet being situated above the spaces between each adjacent pair of blades.

3. A device as claimed in claim 1, having at least one of said blade members extending less than the full width of the said sheet and at least one of said blade members extending the full width of said sheet, all of said blade members extending in generally the same direction.

4. A device as claimed in claim 1, having two of said blade members extending from the center line of the device outwardly and rearwardly to a first lateral edge of the sheet, and having at least two further blade members disposed behind said first mentioned blade members extending from the other lateral edge of the sheet to the first mentioned lateral edge.

5. A device as claimed in claim 3, in which the leading end of the leading blade of those which extend the full width of said sheet, bears a plow shear adapted to make a sharp vertical cut in the ballast.

6. A device as claimed in claim 3, including a hinged wing member attached to one side of the device near the rear thereof so as to be swingable out from such side, and securing means for maintaining such wing member in such projecting position, the wing member being on that side of the device from which the leading ends of those blade members extending the full length of said sheet extend.

7. A ballast plow comprising a flat elongated perforated metal sheet having a towing axis, a pair of raised strips fixedly secured to the upper surface of said sheet and extending from front to rear therealong, a plurality of blade members disposed one behind the other and projecting downwardly from said perforated metal sheet, said blade members being inclined to the front-to-rear axis of the device as defined generally by the raised strips, and guiding keel means projecting below the bottom edges of said blade members and extending parallel to said towing axis and including portions spaced apart from one another substantially in the direction of said towing axis.

8. A ballast plow comprising a flat elongated perforated metal sheet having a towing axis, a pair of raised strips fixedly secured to the upper surface of said sheet and extending from front to rear therealong, a plurality of blade members disposed one behind the other projecting downwardly from said perforated metal sheet, said blade members being inclined to the front-to-rear axis of the device as defined generally by said raised strips, a first guiding keel situated at the rearward end of said sheet, projecting below the bottom edges of said blade members and extending parallel to said towing axis, and a second guiding keel situated at the rearward end of said sheet, projecting below the bottom edges of said blade members and extending parallel to said towing axis.

9. A ballast plow comprising a flat elongated perforated metal sheet having a towing axis, a pair of raised strips fixedly secured to the upper surface of said sheet and extending from front to rear therealong, a plurality of blade members disposed one behind the other and projecting downwardly from said perforated metal sheet, said blade members being inclined to the front-to-rear axis of the device as defined generally by the raised strips, a first guiding keel situated at the rearward end of said sheet in a position displaced from said towing axis towards one lateral edge of said plate, projecting below the bottom edges of said blade members and extending parallel to said towing axis, and a second guiding keel situated at the rearward end of said sheet and displaced from said towing axis towards the other lateral edge of said sheet projecting below the bottom edges of said blade members and extending parallel to said towing axis.

10. A device as claimed in claim 1 wherein the most rearwardly disposed blade member projects downwardly beyond the bottom edge of the most forwardly disposed blade member.

11. A device for removing fouled ballast from the surface of a railway roadbed, comprising a flat elongated perforated metal sheet, a pair of raised strips fixedly secured to the upper surface of said sheet and extending from front to rear therealong, and a plurality of blade members disposed one behind the other and projecting downwardly from said perforated sheet, said blade members being inclined to the front-to-rear axis of the device as defined generally by the raised strips, and the most rearwardly disposed blade member of which projects downwardly beyond the bottom edge of the most forwardly disposed blade member.

12. A device for removing fouled ballast from the surface of a railway roadbed comprising a pair of track-supporting strips extending from front-to-rear of said device, ballast-deflecting means, a keel extending generally parallel to said strips and projecting below the lowest portion of said ballast-deflecting means, and rigid spacing means lying generally in a horizontal plane and interconnecting said track-supporting strip, said ballast-deflecting means and said keel, said ballast-deflecting means comprising a plurality of bladed members disposed one behind the other and projecting downwardly from the horizontal plane of said spacing means, said bladed members being interconnected and spaced by said spacing means, and one of said means including portions which project forward from the upper edges of said bladed members and define with the remaining portions of said ballast-deflecting means and spacing means a plurality of apertures lying in said horizontal plane and located between said bladed members.

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