

May 7, 1957

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APPARATUS FOR CONTINUOUSLY CLEANING RAILROAD TRACK BALLAST

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2 Sheets-Sheet 1

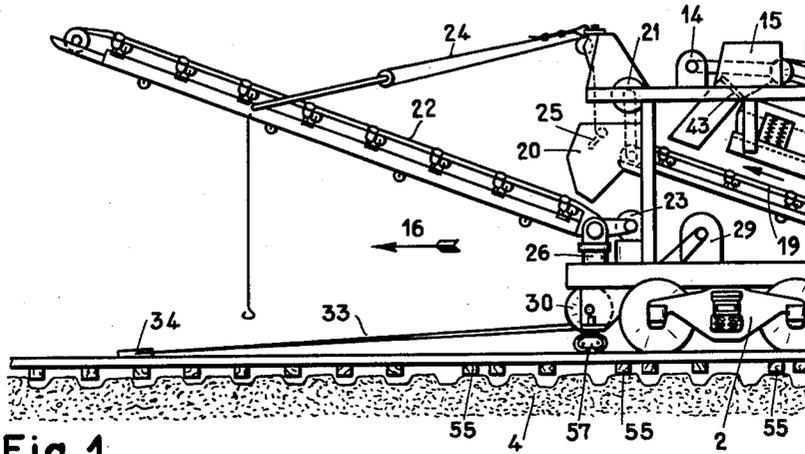


Fig. 1.

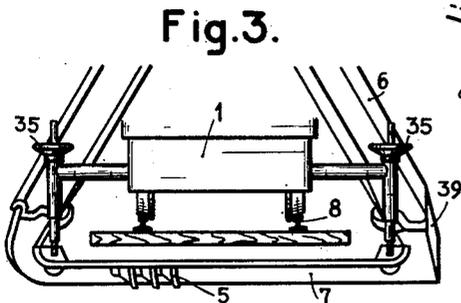
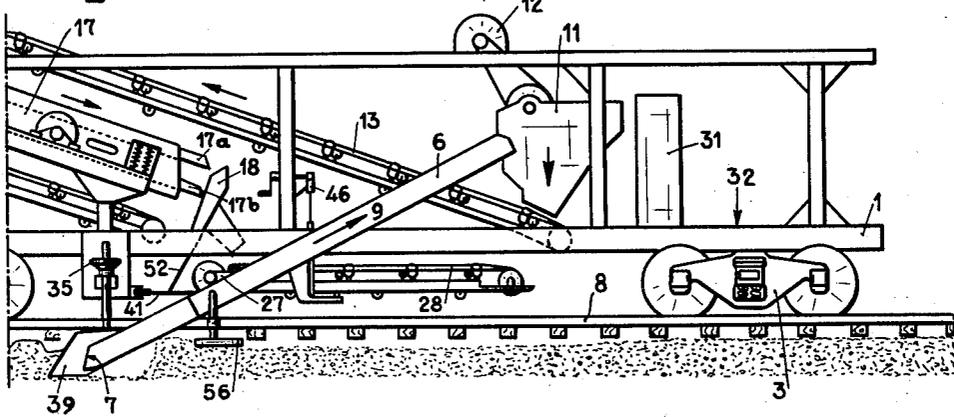


Fig. 3.

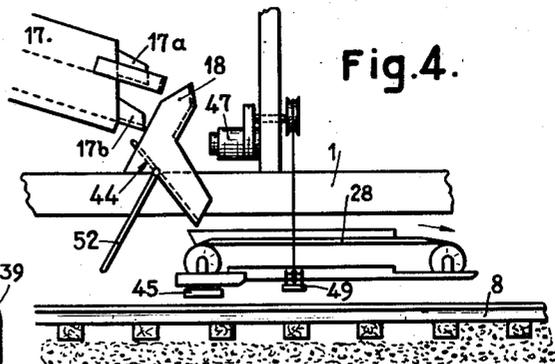


Fig. 4.

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2 Sheets-Sheet 2

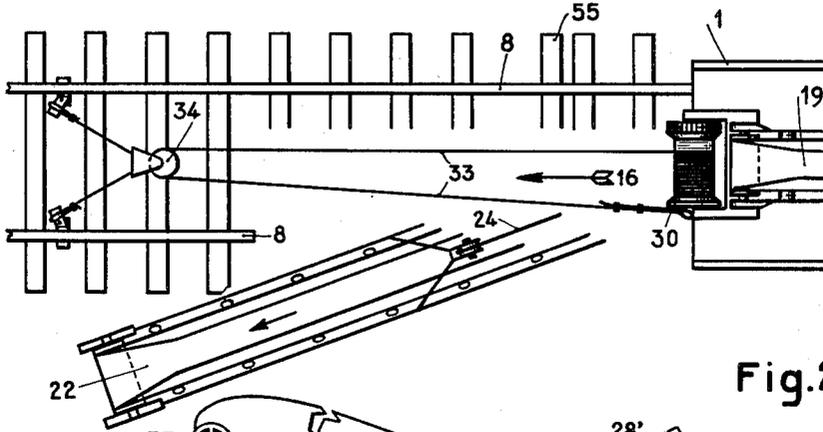


Fig. 2.

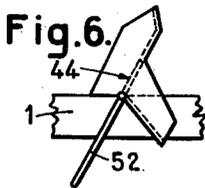
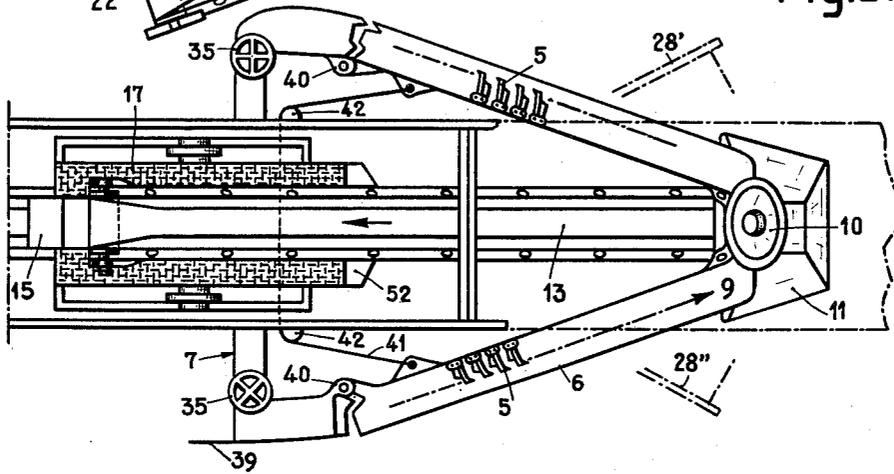


Fig. 6.

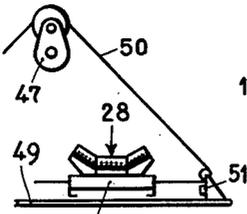


Fig. 5.

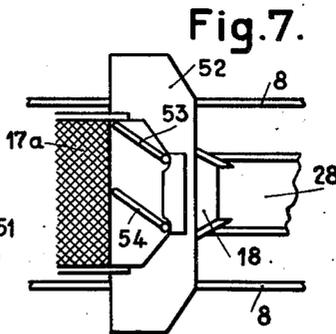


Fig. 7.

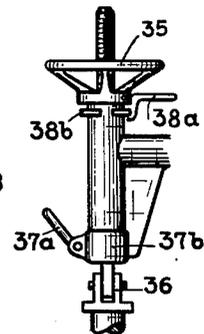


Fig. 8.

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APPARATUS FOR CONTINUOUSLY CLEANING RAILROAD TRACK BALLAST

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3 Claims. (Cl. 262—2)

The present invention relates to a screening car for continuously cleaning track ballast.

It is an object of the present invention to provide an apparatus of the above character which is of improved sturdy construction; which is flexible so that the ballast can be completely or partially removed from the track and can be returned to the road bed in varying mixtures and proportions; and which is simple to adjust and to operate.

In carrying out my invention I provide a car which includes an endless digging chain equipped with digging shovels and arranged in the form of a loop disposed in a plane inclined no more than approximately 45° with respect to the ground. The endless digging chain is arranged in a triangle whose base is disposed at the leading end. The ballast materials removed by the digging chain follow a path arranged in the form of a figure eight due to the fact that the chain elevates it into a hopper through which it is discharged onto a lifting conveyor belt inclined in a direction opposite to that of the inclined plane in which the chain moves. The conveyor belt also cuts across the loop formed by the conveyor belt in the vicinity of the apex of the triangle and at its highest point it discharges through a hopper onto a vibrating screen allowing for a plurality of screening sizes. The screened material is fed substantially parallel to the lifting conveyor belt, but in an opposite direction, to a device that grades or mixes the sizes thus screened. The fine and unusable material passes through the vibrating screen onto an ejecting conveyor which is designed to feed it to the front of the car where it is suitably discharged.

In the accompanying drawing:

Fig. 1 is a side view, partially diagrammatic, of the complete car;

Fig. 2 is a plan view of the same, on a slightly larger scale, with portions omitted for purposes of clarity;

Fig. 3 is an end view thereof showing a portion only of the digging chain elements;

Fig. 4 is an enlarged exploded view of the end of the screen through which the screened ballast is discharged to be returned to the track, showing a modified arrangement for shifting the distributor belt;

Fig. 5 is a detailed view showing the lower distributing conveyor belt which may be used to distribute the screened ballast automatically over the whole width of the track with the modified arrangement of Fig. 4;

Fig. 6 shows a portion of the details in Fig. 4 with the trap door in another position;

Fig. 7 is a detailed plan view of the lower end of the screen showing the distributor spout; and

Fig. 8 shows an adjustable locking device for adjusting the height of the digging chain cable driven crosswise beneath the track.

The car, which is shown in full in Fig. 1 and partially in Fig. 2, consists of a frame 1 mounted on two trucks 2 and 3. It may be of any desired length, preferably the length of a standard car so that it may be coupled in any train make-up. Also the car may be supported on two axles only rather than on the trucks 2 and 3.

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The frame supports all the devices needed to pick up the ballast, to screen it, to return it immediately behind the position from which it was removed and, finally, to reject the unusable material.

The ballast, which is shown at 4, is picked up by an endless digging chain carrying digging shovels 5 and forming a practically triangular-shaped loop moving in an inclined plane within guides 6, forming an angle of no more than approximately 45° with the ground. For this purpose I found that an angle of approximately 30° is perfect.

The removal of the ballast is effected along a base 7 of this triangularly arranged chain which passes beneath the track 8 and constitutes the apex of the dihedral angle formed by the plane of the chain and the ground. The ballast thus picked up is carried in the direction shown by the arrow 9 in Fig. 2 to a pulley 10 which forms the vertex of the triangle and the highest point of the chain, from which it falls into hopper 11.

The digging chain may be driven by suitable means such as individual motor 12.

From hopper 11 the ballast falls onto a lifting conveyor belt 13 driven by individual motor 14 and inclined almost like the digging chain but in the opposite direction and in such a way as to cut across the loop formed by the latter.

The ballast to be cleaned is thus brought to a second hopper 15 occupying the highest point of the car reached by said ballast and located in front of the digging point 7 with respect to the direction of movement of the assembly shown by arrow 16.

From this hopper 15 the materials to be cleaned normally fall onto the screen 17, located underneath belt 13, running practically parallel to the latter but carrying the screened products backward to a point close behind the digging point, where they can drop by means of a hopper 18 and other elements which will be described hereinafter in greater detail.

It will thus be seen that the ballast, between its pick-up and its return to place in the immediate vicinity of the spot from which it was taken, goes through a figure eight circuit starting from the ground and forming a first loop in passing through hopper 11 and being picked up by lifting conveyor belt 13, and a second loop when it is lifted by the latter to hopper 15, then dropping back onto the ground almost at the starting point by passing through screen 17 and hopper 18.

It will be noted that screen 17 is a double one with a pair of screens, 17a and 17b, arranged in spaced parallel relationship. The screen assembly rejects the largest size stones through its upper plane at 17a, which is of relatively coarser mesh, and average size stones through its lower plane at 17b, which is of relatively finer mesh, finally dropping the fine and unusable material onto the ejecting conveyor belt 19 which carries it to hopper 20. Conveyor belt 19 may be driven by individual motor 21.

At the front of the car there is articulated a discharging conveyor belt 22 driven by individual motor 23 and designed to remove the material rejected by hopper 20. The inclination of this belt can be adjusted by means of cable suspension 24 and crank 25. Due to vertical pivot 26, the belt can also be kept in the axis of the track 8 or moved laterally, as shown in the plan view of Fig. 2, so as to be able to load the material to be removed onto cars located on a parallel track or to be able, if necessary, to reject it onto the ground near the track onto a slope, for example.

Instead of crank 25 other suitable operating means, such as a motor, may be employed.

As can be seen, each of the conveyor belts as well as the digging chain has its individual motor. The same will be true of the screen, which is of the vibrating type supported by springs and driven by a cam which,

in turn, is operated by a motor (not shown in order to avoid overcrowding the drawing).

There are also other individual motors, at 27 for example, for operating distributing conveyor belt 28, referred to hereinafter, and at 29 for operating a winch 30, or even one or more motors that will enable the car to be self-propelled.

All these motors are controlled from a panel situated in a cabinet 31 and they can be fed either by an outside current source or by a generating unit which can be placed on the platform 32, in front of cabinet 31, thus making the car absolutely independent.

The advancing of the car during the screening operation is effected by means of winch 30 and its cable 33, whose free end is attached to the car after passing over a pulley 34, which has been anchored to track 8 by suitable means such as shown in Fig. 2.

We shall now review the operations of digging, screening, grading and returning the cleaned ballast to its place, describing the different arrangements that are particularly interesting in the equipment of the car shown.

As has been pointed out, the digging chain forms a relatively acute dihedral angle with the ground, and it can be seen that it scoops out the ballast by advancing against the latter with the edge consisting of the horizontal transverse blade located at 7.

This arrangement guarantees great rigidity, unlike, for example, digging chains of the type heretofore used which move in a vertical transverse frame.

The depth at which the transverse digging blade will scoop out the ballast can be regulated by means of handwheels 35, which make it possible to act on a locking screw, thus raising or lowering the blade.

Fig. 8 shows in detail one of these handwheels and the articulated attachments 36 by which each of them is connected to the bottom transverse blade support of the chain. This figure shows, at 37a, a small cam-type locking lever which acts on a tightening flange 37b for the purpose of locking the assembly at the work height selected, at a pressure, however, that can be overcome by an unusual force so that the transverse blade can be raised if it should run into unusually strong resistance. In order to prevent this slipping while the blade is being thrust into the ballast by means of handwheel 35, a hook 38a, which penetrates a cut-out circular flange 38b, makes it possible to lock it axially.

Figs. 1 and 2 also show, at 39, the blade portion generally used in this kind of arrangement, which is intended to retain the ballast that the digging shovels have a tendency to push laterally before them.

The plan view of Fig. 2 also shows the articulations 40 of the digging chain guide, which are necessary because of the fact that its active blade 7 can be shifted transversely on either side of the track in order, for example, to be able to avoid an obstacle such as the base of a signal or other track installation.

The chain guide is attached to the car frame by a cable 41 passing over two pulleys 42 and whose ends are each attached in the vicinity of the lower end of one of the triangular-shaped branches formed by these guides. This arrangement is an advantageous one in that it permits the lateral movement of the active part while providing a very strong attachment of the assembly in order to withstand the stresses resulting from the advancing of the chain against the material to be removed.

The ballast, having been extracted and lifted by the chain, then falls, as has already been explained, into hopper 11 and from there onto a lifting conveyor belt 13 over which, after completing the first loop, it reaches hopper 15 and is there again discharged.

At that spot there are two possibilities, due to the fact that this hopper contains an articulated trap-door 43, capable of occupying two positions.

In the position shown in Fig. 1, trap-door 43 leads the ballast onto the screen. By reversing its position, i. e.,

by turning it clockwise with respect to the drawing, it will be seen that all of the ballast will be discharged directly onto ejecting conveyor belt 19.

In that case all of the material would be discharged by hopper 20 onto discharging conveyor belt 22 to be removed from the track.

The above arrangement of the parts would result in complete removal of the ballast from the road bed rather than cleaning and restoring it to its original position. Under certain circumstances it would be appreciated that complete removal of the ballast is desirable. Normally, however, trap-door 43 will occupy the position shown.

In this case, the ballast will be dumped from hopper 15 onto screen assembly 17 and will partly pass through the two stages and come out again at 17a and 17b and the finest material will drop onto ejecting belt 19.

The materials leaving the screen at 17a will be the largest, those that have not passed through any mesh in the screen. Those leaving the screen at 17b will be smaller and those falling onto ejecting conveyor belt 19 will be the material that is too fine to be used. This rejected material is then removed, as has just been described, through hopper 20 and discharging conveyor belt 22.

Now, examining Fig. 4 more closely, we see that the usable materials which leave the screen normally drop into a hopper 18. The latter, however, has a hinged trap-door 44 which, in the position shown in Fig. 4, discharges the materials onto the distributing conveyor belt 28 which carries them a little farther towards the rear of the car in the direction shown by the arrow in Fig. 4.

This distributing conveyor belt is hinged at 45, which enables it to move laterally between the extreme positions 28' and 28'' of Fig. 2.

In the form shown in Fig. 1 these lateral movements can be made manually by means of a winch 46. In the form shown in Figs. 4 and 5 it is a motor 47 which effects this movement. This movement can be made automatic, as shown, in that support 48 of conveyor belt 28, sliding along a transverse rail 49, is moved by a cable 50 which is driven by a motor 47, while end-of-travel reversing contacts 51 automatically reverse the direction of rotation of the motor so as to obtain a to-and-fro movement, distributing the ballast over the whole width of the track and its ties.

If trap-door 44 is placed in the direction shown in Fig. 6, the cleaned ballast will drop back as closely as possible behind the position from which it was extracted, by distributing plate 52.

This plate can also be seen in the plan view of Fig. 7 and it should be noted that it extends over the whole width of the track and its ties, therefore making it possible to spread out the treated ballast. Up to this point we have spoken of a mixture of coarser ballast (coming from 17a) and finer ballast (coming from 17b). It is seen that everything which leaves the screen, except for unusable material, normally drops into hopper 18 or onto plate 52 or, with trap-door 44 raised, only onto plate 52.

It should be noted, however, that two vertical swinging trap-doors 53 and 54 are attached to the front of the distributing spout at the upper part 17a of screen 17.

When the two trap doors are placed in the position shown for single trap-door 53, all of the coarse material will be discharged from the screen into hopper 18.

On the other hand, when the two trap-doors are arranged in the position shown for the single trap-door 54, all the coarse material will be discharged beyond the hopper onto distributing plate 52.

Finally, the trap-doors may be arranged in approximately intermediate positions which will make it possible to mix and distribute the two sizes of ballast obtained in all desired proportions. Also, in addition, when the trap-doors 53 and 54 are thus arranged in intermediate

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positions, they will cause, in cooperation with trap-door 44, a portion of the materials to be discharged immediately behind the excavation and another portion to be discharged farther back by distributing conveyor 28.

As can be seen, the arrangement adopted is extremely flexible, permitting all possible combinations.

The car that has just been described offers still other advantages.

As has already been pointed out, it carries all the facilities necessary and sufficient for the work to be performed on a chassis or frame whose length is not out of proportion since it can easily be cut down to the length of a standard car.

It is possible by means of my invention to return the cleaned ballast to a point immediately behind the excavated portion so that there never will be more than an extremely short section of track which is unsupported by ballast.

Furthermore, the car is very stable and particularly free from side vibration since the vibrating screen runs axially and not transversely, as is generally the case.

Since the axles may be driving axles, the car can be self-propelled, if desired.

The cleaning operation will, furthermore, be performed in a very simple manner, as shown in Fig. 1, by shifting ties for some distance ahead of the car and as the latter advances, so that each third tie 55, for example, will rest on the ballast. The track is thus raised a sufficient height, approximately 5 to 7 inches, and is sufficiently supported so that the car can proceed along the track without the slightest trouble.

The ties are then put back in place immediately behind the digging chain and as soon as the leveling-grading device 56 has lightly tamped the surface of the freshly-restored ballast.

Since it may at times be necessary, or at least advisable, to lighten the load for a while on the front truck, which is required to roll on the raised track, there is a small extra truck 57 which rolls on four rollers and which can be placed under the frame at the very front thereof. It can be provided with threaded rods which form a jack and thus make it possible to regulate at will the load carried by the four rollers which, if necessary, can even take the full load off truck 2.

The distance between the digging point and the rear truck 3 is, moreover, more than sufficient to enable the track to settle on the ballast and the restored ties without warping. This truck will then roll along a normally settled track and the operating conditions can readily be such that the track will be restored to its initial height without further ado unless it is desired to lower it slightly.

It is obvious that the load on the rear axle can also be shared by a small extra truck, as has been proposed at 57 for the front one.

It is obvious that any other suitable method of raising the track more or less can be used, depending on the need and the case involved.

Instead of providing a generating unit on the car, the latter could, naturally, also be accompanied by a generator that would feed it current and by means of which the load could also be removed from truck 3 by raising frame 1 with tackle blocks mounted on this auxiliary car.

It is also obvious that winch 30 makes it possible to work just as well with a single cable, whose free end would be anchored to the track, rather than with a double cable passing over a pulley such as 34.

The arrangement shown has the advantage of doubling the power developed by the winch.

In both cases there is, for example, the possibility of a forward movement that can vary from approximately 35 to 225 yards per hour, particularly by means of a speed control device that could accompany the winch motor 29.

It is to be understood that the embodiment of the in-

vention described above is merely illustrative and not limited to the scope of this invention which may be variously otherwise constituted within the scope of the appended claims.

I claim:

1. Apparatus for continuously cleaning railroad track ballast comprising: a supporting railroad car cooperable to ride on the track whose ballast is to be cleaned; an endless digging chain supported on said car and having a plurality of scoops mounted thereon and arranged in a generally triangular loop with the base of the triangle located beneath the car and facing towards the leading end with respect to the direction of movement of the car and with the apex facing towards the trailing end, said triangular loop being disposed in a plane inclined upwardly and rearwardly from the base to the apex at an angle of no more than 45° to the ground, said base serving as the digging point and the scoops that are located there-along being cooperable to receive ballast material from the road bed of the track on which the car is disposed and then carry it upwardly and rearwardly to the apex of the triangle; a conveyor mounted on said car and inclined in a direction opposite to that of the plane of the digging chain and intersecting the loop formed by the chain with the lower end of the conveyor disposed beneath the apex of the triangular loop so as to receive ballast material from the scoops of the digging chain and convey it forwardly and upwardly at an angle; a vibrating screen assembly mounted on said car and disposed beneath the forward end of the conveyor so as to receive the ballast material conveyed thereon and inclining downwardly and rearwardly therefrom, said screen assembly having a plurality of screens of different sizes for separating the ballast material into components of different sizes; rejecting means mounted on said car for receiving the finest components from the screen assembly and for conveying them to another portion of the car for ultimate rejection; distributing means for receiving other components from said screen assembly and for grading them and returning them to the road bed at a position behind the digging point wherein the distributing means comprises a hopper located adjacent the discharge end of the screen assembly, a distributing plate extending for the whole width of the track communicating with the hopper and a conveyor belt mounted on the railroad car and extending rearwardly from the outlet end of the hopper.

2. Apparatus for continuously cleaning railroad track ballast comprising: a supporting railroad car cooperable to ride on the track whose ballast is to be cleaned; an endless digging chain supported on said car and having a plurality of scoops mounted thereon and arranged in a generally triangular loop with the base of the triangle located beneath the car and facing towards the leading end with respect to the direction of movement of the car and with the apex facing towards the trailing end, said triangular loop being disposed in a plane inclined upwardly and rearwardly from the base to the apex at an angle of no more than 45° to the ground, said base serving as the digging point and the scoops that are located there-along being cooperable to receive ballast material from the road bed of the track on which the car is disposed and then carry it upwardly and rearwardly to the apex of the triangle; a conveyor mounted on said car and inclined in a direction opposite to that of the plane of the digging chain and intersecting the loop formed by the chain with the lower end of the conveyor disposed beneath the apex of the triangular loop so as to receive ballast material from the scoops of the digging chain and convey it forwardly and upwardly at an angle; a vibrating screen assembly mounted on said car and disposed beneath the forward end of the conveyor so as to receive the ballast material conveyed thereon and inclining downwardly and rearwardly therefrom, said screen assembly having a plurality of screens of different sizes

for separating the ballast material into components of different sizes; rejecting means mounted on said car for receiving the finest components from the screen assembly and for conveying them to another portion of the car for ultimate rejection; distributing means for receiving other components from said screen assembly and for grading them and return them to the road bed at a position behind the digging point wherein the distributing means includes a hopper mounted at the discharge end of the screen assembly to receive components therefrom, a distributing plate extending for the entire width of the track communicating both with the discharge end of the screen assembly and with the hopper, and a conveyor belt mounted on the railroad car and extending rearwardly from the discharge end of the hopper and in which the screen assembly includes adjustable discharge means for one size of the component for directing that size component to the distributing plate alone or to the hopper and conveyor belt alone or to both.

3. Apparatus for continuously cleaning railroad track ballast comprising: a supporting railroad car cooperable to ride on the track whose ballast is to be cleaned; an endless digging chain supported on said car and having a plurality of scoops mounted thereon and arranged in a generally triangular loop with the base of the triangle located beneath the car and facing towards the leading end with respect to the direction of movement of the car and with the apex facing towards the trailing end, said triangular loop being disposed in a plane inclined upwardly and rearwardly from the base to the apex at an angle of no more than 45° to the ground, said base serving as the digging point and the scoops that are located there-along being cooperable to receive ballast material from the road bed of the track on which the car is disposed and then carry it upwardly and rearwardly to the apex of the triangle; a conveyor mounted on said car and inclined in a direction opposite to that of the plane

of the digging chain and intersecting the loop formed by the chain with the lower end of the conveyor disposed beneath the apex of the triangular loop so as to receive ballast material from the scoops of the digging chain and convey it forwardly and upwardly at an angle; a vibrating screen assembly mounted on said car and disposed beneath the forward end of the conveyor so as to receive the ballast material conveyed thereon and inclining downwardly and rearwardly therefrom, said screen assembly having a plurality of screens of different sizes for separating the ballast material into components of different sizes; rejecting means mounted on said car for receiving the finest components from the screen assembly and for conveying them to another portion of the car for ultimate rejection; distributing means for receiving other components from said screen assembly and for grading them and returning them to the road bed at a position behind the digging point wherein the distributing means includes a hopper mounted at the discharge end of the screen assembly to receive components therefrom and having two discharge outlets, a distributing plate extending for the entire width of the track mounted adjacent one discharge outlet of the hopper to receive material therefrom, a conveyor belt mounted adjacent the other discharge outlet of the hopper to receive material therefrom, and means for closing one or the other of said outlets.

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