Dec. 19, 1961 F. PLASSER ET AL 3,013,616

BALLAST CLEANING APPARATUS

Filed Nov. 17, 1959

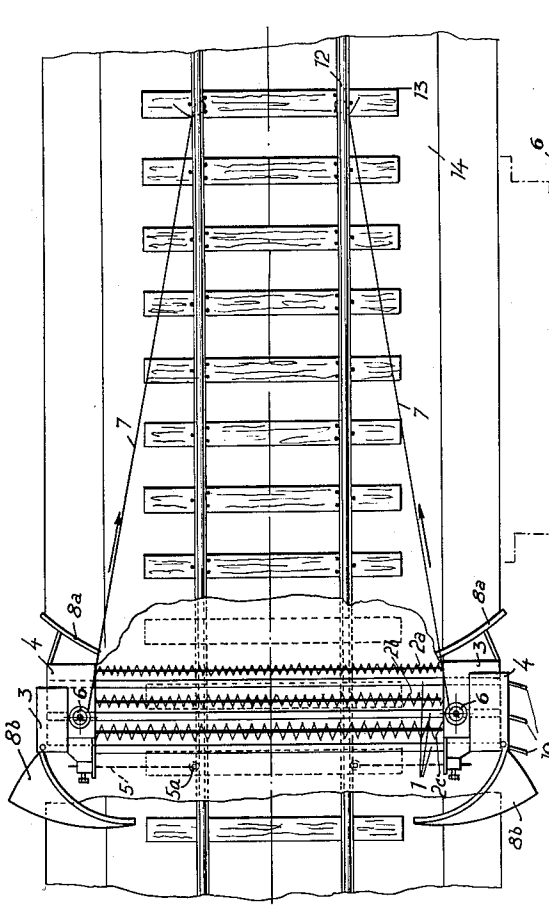


FIG. 1

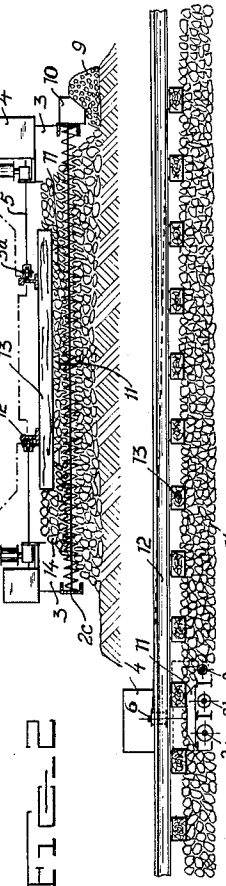


FIG. 2

FIG. 3

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United States Patent Office 3,013,616 Patented Dec. 19, 1961

3,013,616
BALLAST CLEANING APPARATUS

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Filed Nov. 17, 1959, Ser. No. 853,578
Claims priority, application Austria Nov. 18, 1958
9 Claims. (Cl. 171—16)

The present invention relates to railroad bed maintenance, and more particularly to the art of cleaning the ballast in a railroad bed.

In all conventional ballast cleaning apparatus, the ballast is removed from the bed. Dirt, dust, plants, broken rocks, etc., are removed from the ballast while it is out of the bed and the cleaned ballast is then returned to the bed. This cleaning method involves usually unwieldy and high power consuming ballast conveyors. It has the additional disadvantages of producing temporarily railroad bed portions which have no ballast and involving difficulties in replacing the cleaned ballast in the proper position and location under the track. The track portions which have no ballast must be specially supported temporarily when a train approaches and is to travel over such a portion. It is obvious, therefore, that the conventional ballast cleaning methods are highly inefficient.

In accordance with the present invention, the ballast is never removed from the bed but a ballast cleaning means is positioned in the ballast under the track and cleans the ballast within the bed while being advanced through the ballast under the track. This eliminates conveying the ballast since the ballast is loosened and cleaned in situ.

A cleaning apparatus of this type is simple in construction and inexpensive. The cleaning is effected efficiently and traffic may move over the track portion being cleaned without hindrance.

According to one feature of the invention, the cleaning means is an element extending transversely across the width of the ballast bed and is rotated and/or vibrated while it is advanced through the ballast to have a cleaning movement of its own. This cleaning movement serves simultaneously to transport the waste away from the ballast.

While the cleaning means may take a great variety of forms, it is always advantageous to provide a guide means for the support frame of the cleaning means to guide the apparatus in the direction of the track while it advances. The guide means may consist of a pair of transverse guide rods extending inwardly from the support frame to the track rails to guide the apparatus in fixed relation to the track. Also, upward movement of the cleaning means may be prevented by providing additional guide means on the support frame for engagement with the track ties.

If adjustable side plates are mounted on the apparatus forwardly or backwardly of the cleaning means, as is preferred, any ballast outside the bed will be returned thereto as the apparatus advances. This will assure complete cleaning of all the ballast and will also suitably shape the lateral sides of the bed as the cleaning operation proceeds.

The cleaning apparatus may be advanced by a mobile tractor moving on or adjacent the track to push or pull the apparatus. Preferably, however, the apparatus is advanced by providing it with elongated flexible pulling members, such as ropes, whose outer ends may be fixed at a distance from the apparatus and whose inner ends are attached to rolls on the apparatus, rotation of the rolls causing the ropes to be wound on the rolls and thus pulling the apparatus forwardly. In this case, the apparatus advances intermittently.

The cleaning means consists of one or more rotating screw conveyors extending transversely across the width of the ballast bed, the pitch of the conveyors being so small that useful ballast particles, for instance above a minimum diameter of about 1 to 1½ inches, cannot enter the conveyor. Upon rotation, such screw conveyors will merely move the useful ballast particles backwardly while the undersize waste particles entering the conveyors will be transported laterally away from the ballast.

Preferably, the track is slightly lifted while the cleaning means passes through the ballast and the screw conveyors are rotated in a direction opposite to the direction of the apparatus advance so that the ballast is moved over the top of the conveyors toward the back while the dirt and waste falls into the conveyors and is removed thereby.

In the drawing.

FIG. 1 is a top view of the ballast cleaning apparatus of the present invention;

FIG. 2 is a fragmentary rear view of the apparatus of FIG. 1 with parts removed; and

FIG. 3 is a side view of the ballast cleaning apparatus.

Referring now to the drawing, FIG. 1 shows a ballast roadbed **14** carrying a railroad track consisting of ties **13** and rails **12**. As shown, a portion of track **12** and a few ties **13** have been removed at the location where the ballast cleaning apparatus is lowered into the ballast.

The cleaning apparatus includes a support frame **1** for the ballast cleaning means constituted in the illustrated embodiment by three screw conveyors **2***a*, **2***b* and **2***c*. The pitch of the screw conveyors is so small that only dirt, such as earth, sand, plants, etc., can enter between the flights of the conveyors to be moved laterally away from the bed while the rocks of sufficient size to form the ballast move backwardly over the circumferences of the conveyors. It will be appreciated that the pitch of the conveyor screw has been conventionally illustrated. The screw conveyors are rotated by a pair of motors **4** mounted laterally on both sides of the conveyors and connected to them by any suitable power transfer means, such as gears.

To counteract the natural tendency of the rotating screw conveyors to move laterally outwardly of the ballast, the support frame carries a pair of transverse guide rods **5** which may be moved or pivoted into contact with the rails **12**, thus keeping the apparatus centered on the track. Friction between the ends of guide rods **5** and the rails may be minimized by mounting idling rollers **5***a* or similar anti-friction means on the guide rod ends.

Movement of the cleaning apparatus through the ballast **14** in the direction of the arrow shown in FIG. 1 is obtained by a driven means consisting of flexible pulling ropes **7** and rolls **6** upon which the pulling ropes may be wound.

As shown, the pitch of the conveyor screws preferably increases from the first to the last element, the first screw conveyor **2***a* serving primarily to loosen the ballast and to transport it to the top of the succeeding conveyors, as seen in FIG. 3.

Suitably shaped, oblique side plates **8***a* and **8***b* are mounted on the support frame to return ballast which has been laterally displaced back to the ballast bed. These side plates have been omitted from the showing of FIG. 2 in order to reveal the drive arrangement of the apparatus. Sheet metal scraper plates **10** may be provided to push the dirt **9** away from the bed, as seen in FIG. 2. A plurality of glide rails **11** may be replaceably mounted on the support frame to contact the underside of the ties and thus to provide an additional guide means for the cleaning apparatus when it moves through the ballast as shown in FIGS. 2 and 3.

The cleaning apparatus operates as follows:

As indicated in FIG. 1, a portion of the track and two

or three ties are removed from the roadbed and the apparatus is placed into the ballast underneath the track level from the side, for instance by means of a hoist. After the apparatus is emplaced, the ends of ropes 7 are fixedly attached or anchored, for instance to tie bolts, at a distance from the apparatus, as indicated in FIG. 1. Motors 4 are now actuated to drive the screw conveyors as well as rolls 6. This causes the screw conveyors to rotate while the ropes 7 are slowly wound on rolls 6 to pull the apparatus forwardly through the ballast under the track.

The forward screw 2*a* of smallest pitch and diameter may be provided with dirt loosening means and loosens the ballast as the screw rotates and the apparatus slowly moves ahead. The loosened ballast is moved backwardly by the rotating screw 2*a* to the tops of succeeding screw conveyors 2*b* and 2*c*, all matter small enough to fall through the spaces between the screw flights being removed from the ballast while the cleaned ballast will be returned to the bed behind screw conveyor 2*c*. The dirt and other matter removed from the ballast is transported laterally outside the bed by the rotating screw conveyors and is seized by scrapers 10 to be moved away from the roadbed.

In view of the tendency of the screw conveyors to move laterally out of the bed during rotation, the cleaning apparatus is guided along the track by the lateral guide rods 5 and glide rails 11.

It may be desirable to build the apparatus so that the support frame and/or the cleaning means may be readily taken apart to facilitate the initial positioning of the apparatus underneath the track. If the support frame is strong enough, the apparatus may be left in the ballast while trains move over the track, which is a considerable advantage over known ballast cleaning apparatus which must be removed from the track in a time-consuming operation every time a train approaches or which may be used only on track portions completely closed to traffic.

What we claim is:

1. In a ballast cleaning arrangement, in combination, a ballast bed including useful ballast particles having a predetermined minimum dimension, and waste particles of a size smaller than said predetermined dimension, a railroad track supported on said ballast bed and having two rails and ties, and a ballast cleaning apparatus comprising a support frame, a rotatable screw conveyor mounted on said support frame and positioned in the ballast bed transversely of and under the track, the screw conveyor extending across said bed and having a pitch smaller than said predetermined dimension and greater than the size of said waste particles, whereby useful ballast particles cannot enter the conveyor, means operatively associated with said apparatus for advancing the support frame with the screw conveyor through the ballast under and along the track, and guide means on the support frame guiding the apparatus in the direction of the track while the support frame advances.

2. In the ballast cleaning arrangement of claim 1, said guide means including at least one pair of transverse guide rods extending inwardly from the support frame to the track rails to guide the apparatus in fixed relation to the track.

3. In the ballast cleaning arrangement of claim 2, said guide rods being pivotal into and out of contact with the track rails.

4. In the ballast cleaning arrangement of claim 3, the ends of the guide rods carrying rollers for glidingly engaging the track rails.

5. In the ballast cleaning arrangement of claim 1, additional guide means mounted on the support frame for engagement with the track ties.

6. In a ballast cleaning arrangement, in combination, a ballast bed including useful ballast particles having a predetermined minimum dimension, and waste particles of a size smaller than said predetermined dimension; a railroad track mounted on said ballast bed and having two rails and ties; a ballast cleaning apparatus comprising a support frame, a rotatable screw conveyor mounted on said support frame and positioned in the ballast bed transversely of and under the track, the screw conveyor extending across said bed and having a pitch smaller than said predetermined dimension and greater than the size of said waste particles, whereby useful ballast particles cannot enter the conveyor; and means operatively associated with said apparatus for advancing the ballast cleaning apparatus along the track while said screw conveyor is positioned in said ballast bed.

7. In an arrangement as claimed in claim 6, an additional screw conveyor mounted on said support frame and positioned in said ballast bed in substantially parallel relationship to said first-named conveyor, said screw conveyors being of different pitch.

8. In the ballast cleaning arrangement of claim 6, a pair of side plates laterally outside the ballast bed and shaped to return any ballast outside the bed to the ballast bed as the apparatus advances along the track.

9. In the ballast cleaning arrangement of claim 6, said advancing means including at least one roll and a flexible pulling member windable on said roll.

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