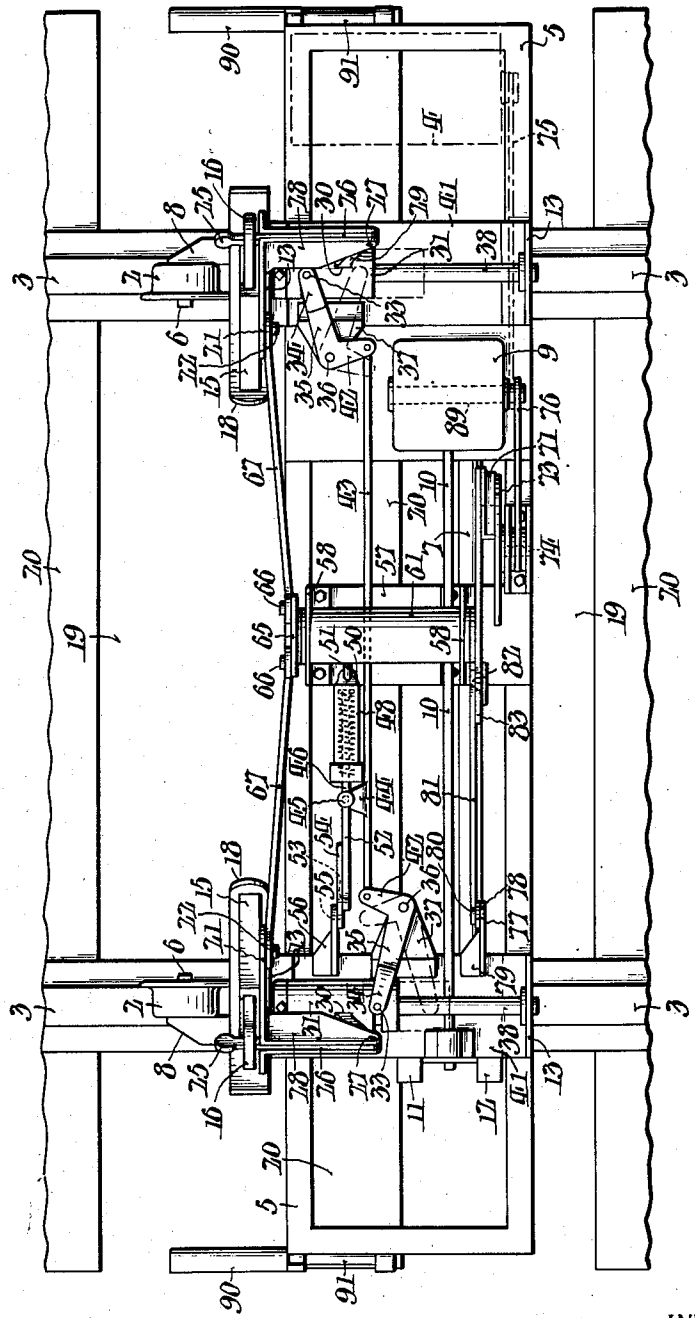
Feb. 16, 1954 J. M. FOX ET AL 2,669,041

APPARATUS FOR REMOVING BALLAST FROM BELOW RAILROAD TRACK RAILS

Filed May 1, 1948 4 Sheets-Sheet 1

FIG. 1



WITNESSES

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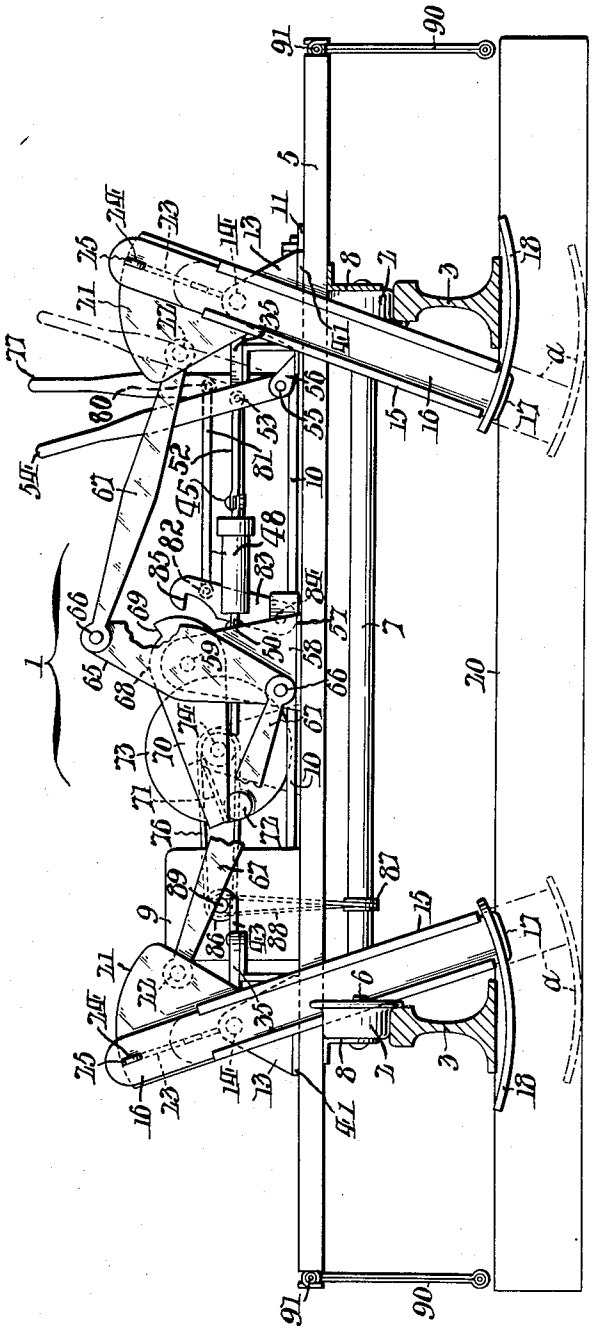
ATTORNEYS.

Feb. 16, 1954 J. M. FOX ET AL 2,669,041

APPARATUS FOR REMOVING BALLAST FROM BELOW RAILROAD TRACK RAILS

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FIG. 2.



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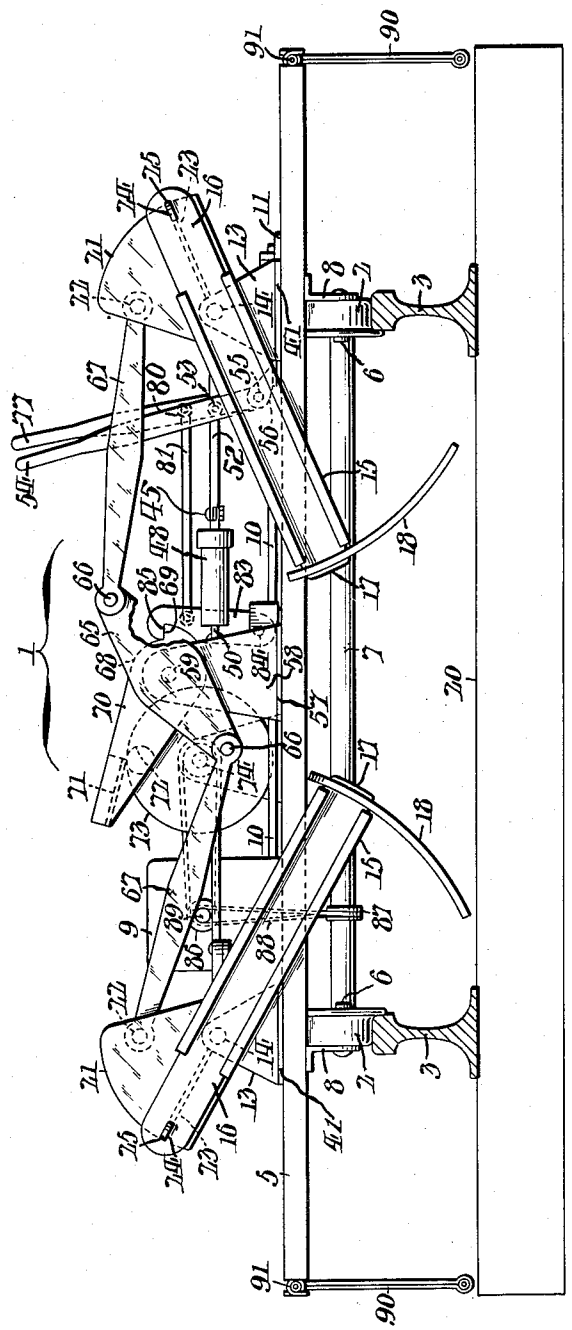
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Feb. 16, 1954 J. M. FOX ET AL 2,669,041

APPARATUS FOR REMOVING BALLAST FROM BELOW RAILROAD TRACK RAILS

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FIG. 3.



WITNESSES

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Feb. 16, 1954 J. M. FOX ET AL 2,669,041

APPARATUS FOR REMOVING BALLAST FROM BELOW RAILROAD TRACK RAILS

Filed May 1, 1948 4 Sheets-Sheet 4

FIG. 4.

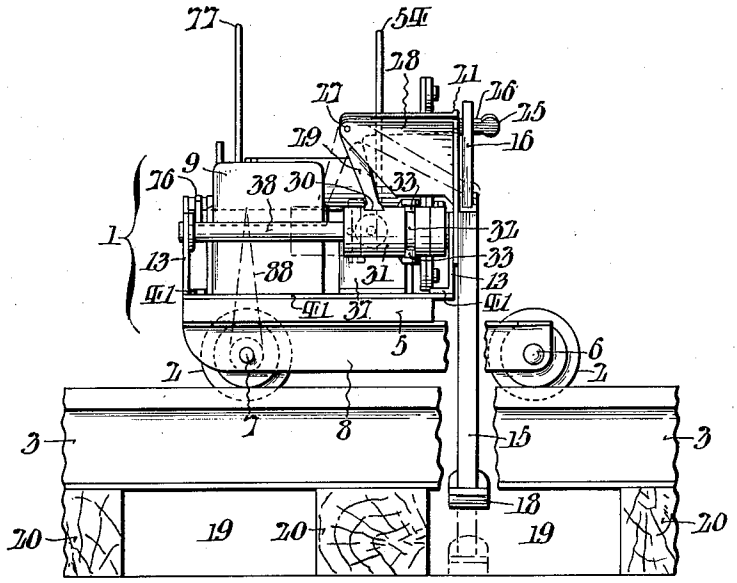
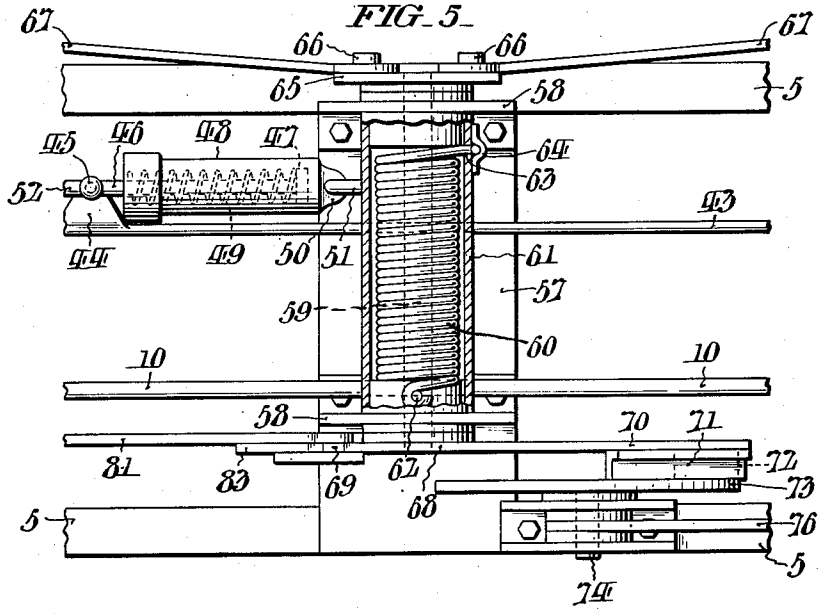


FIG. 5.



WITNESSES

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UNITED STATES PATENT OFFICE

2,669,041

APPARATUS FOR REMOVING BALLAST FROM BELOW RAILROAD TRACK RAILS

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Application May 1, 1948, Serial No. 24,468

14 Claims. (Cl. 37—104)

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Our invention has general reference to means for removing materials such as broken stone, cinder, slag, gravel or dirt comprising the ballast in track, from below the rails between the ties of railroad tracks in order to provide a cleared space under the base of rails and below the surface of the ties. This cleared space is desirable when removing ties, and also prior to adzeing of the ties by hand or machine to provide proper bearing for tie plates when renewing rail or gauging the track, in order that the adze blades or bits may not strike the ballast. In electrical signal territory the elimination of any contact between the ballast and tie plates or rails improves the track circuits, as will be further explained. The clearing of space under the rails makes it possible to insert or reave a chain, belt, or cable in the cribs between ties and under the rails as found desirable.

Means of the kind above referred to are now more commonly known as "kicking" apparatus or machines that serve to initially kick out that portion of the ballast from the "crib" which directly underlies the track rails.

A primary object of our invention is to provide an improved "kicker" unit which is extremely effective in use and easily controlled by a single operator.

Another object of our invention is to provide a machine, as defined in the preceding paragraph that is self-propelled and may be transported in either direction.

A further object is to provide a machine of the species above indicated in which the ballast removing or adzeing devices are extensible so as to gradually increase the depth of the ballast removed thereby from below the track rails.

A still further object is to provide a kicker or ballast-removing machine that is comparatively simple and cheap to manufacture and which is much lighter in weight than similar means heretofore available.

While the foregoing definitions are indicative, in a general way, of the aims of our invention, other objects with ancillary advantages will be evident to those skilled in the art upon a full understanding of the construction, arrangement and operation of the means hereinafter disclosed; but it will also be appreciated that said invention is susceptible of other embodiment or structurally modified forms coming equally within the terms and scope of the claims.

In the accompanying drawings:

Fig. 1 is a plan view of a typical form of our improved ballast removing apparatus or kicker machine.

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Fig. 2 is a side elevation looking down from above the preceding figure with the kicker or ballast releasing and impelling blades in active location and unlocked.

Fig. 3 is a similar view to the preceding with the kickers in inactive location and locked against movement.

Fig. 4 is an end elevation looking from the right toward the left hand of Figs. 2 and 3, with fragmentary portions broken out to better illustrate an otherwise partially hidden portion of one of the kicker devices; and

Fig. 5 is a fragmentary plan section, of a recoil means drawn to a larger scale and hereinafter fully explained.

In describing the form of this invention, exemplified by the drawings herewith, specific terms will be employed for the sake of clarity, but it is to be understood the scope of said invention is not thereby limited; each such term being intended to embrace all equivalents which perform the same function for an analagous purpose.

Referring more in detail to the drawings, the machine typified comprises a carrier or truck, comprehensively designated 1 in Figs. 2–4 only, mounted on flanged wheels 2, 2, and capable of progression along the track rails 3 by means of an appropriate driving connection from a suitable air-cooled motor, for example only, indicated by the dot-and-dash rectangle 4 in Fig. 1 such means being well known and needing no further illustration or explanation herein.

The carrier or truck 1 conveniently consists of a rectangular frame 5 which is provided with appropriate stub axles 6 for the forward track wheels 2, whereas the rear track wheels 2 are mounted on a drive shaft 7 journaled in bearings 8 Figs. 2 and 3, dependent from the bottom of the rearmost component of the rectangular frame 5. The drive shaft 7 is preferably under operative control of the motor 4 and an appropriate reversing mechanism, such as a friction-gear power-transmission 9, in turn shiftable, as required, by an actuator rod 10 with an associated pair of foot pedals 11, 12.

The frame 5 has rigidly mounted thereon, in vertical alignment with the respective rails 3—3 suitable brackets 13 each affording pivotal bearing at 14 for an oscillatable ballast kicker device 15 that is adapted to swing transversely relative to the associated rail 3. The device 15 is in the form of a channel section arm for telescopic guidance therein of a slide 16 having rigidly secured to its lower end, at 17, an arcuate adze-like blade or striker element 18 conveniently of rectangular formation in plan, for dislodging the

ballast in each crib 19 below the the rails 3—3 between adjacent ties 20, Fig. 4, and displace said ballast outwardly to the track shoulder from beneath said rails 3—3. The kicker devices 15 and striker elements 18 are made right and left hand for simultaneous operation in opposed directions to eject the ballast from the crib 19 outwardly, as hereinafter set forth.

Each oscillatable kicker device 15 conveniently has secured or integrated to the outer face of its web portion a sector-shaped member or disk plate 21 carrying a projecting stud 22. This sector-shaped member or disk plate 21 includes a radial slot 23 preferably extending inwards from its upper perimetric edge toward the top of the kicker bearing bracket 13; said slot 23 is disposed to the rear and centrally of the upper portion of the hammer means 16 carrying the blade 18. The hammer means 16 is further provided with an aperture 24 therethrough for reception of the rounded end 25 of one arm 26 of a bell-crank pivoted at 27, Fig. 4, to a laterally projecting flange 28 from the disc-plate 21 and, whereby said hammer element 16 and blade 18 are rendered adjustable or telescopic relative to the oscillatable device 15. The other or downwardly inclined bell-crank arm 29 is engaged in a groove or recess 30 of an operating clutch or sleeve 31 that is circumferentially grooved at 32 for reception of opposed pins 33 in the forked end 34 of a second bell-crank 35, Fig. 1, fulcrumed by a vertical pivot 36 to a stationary bracket 37, so as to be movable horizontally in shifting the sleeve 31 on its bearing shaft 38. This shaft 38 is oscillatably mounted at its ends in the upstanding arms of spaced angle brackets 13, Figs. 1–4, rigid with a base-plate 41 integrated across the frame 5 aforesaid. At this juncture it is to be noted that similar means to that just described is provided on the frame 5 above both track rails 3—3 save for the necessary right and left-hand reversals. The shorter arms 42 of the sleeve-shifting bell-cranks 35 are pivotally coupled together by a connecting rod 43 which is integrated, near one end, to a laterally projecting lug 44 that is fulcrumed at 45 to a piston-rod 46 having a head 47 at its other end engaged in a cylindrical housing 48, with an associated coil-spring 49, under compression, therein, see Fig. 5 to best advantage. The right hand end of the housing 48, as viewed in Fig. 1 is linked at 50 to an anchorage 51 on a fixed plate 57 extending crosswise of the machine frame 5 at the center. Also attached to the lateral lug 44, and extending in a reverse direction to the piston-rod 46, is a coupler 52 pivotally attached at an intermediate point 53 to a hand lever 54, in turn fulcrumed at 55 to a suitable bearing bracket 56 rigid with the left hand base-plate 41, Fig. 1. Manual movement of the hand lever 54 in one direction shifts the respective operating sleeves 31 on their bearing shaft 38 in a manner to determine the depth to which the kicker or hammer means 16 operate, or as typically indicated by the dot-and-dash lines *a* in Fig. 2. As soon as the hand lever 54 is released by the operator it will be readily understood that the coil spring 49 reacts in its housing cylinder 48 to elevate the kicker hammer means 16 and blade components 18, to the position shown by full lines in Fig. 3.

In order that each ballast kicker device 15 may perform its intended purpose it must have imparted thereto a swinging or oscillatory movement, and, to this end, we make use of the means now to be described. This means, see Fig. 5 to best advantage, comprises bearings 58 upstanding from plate 57 for a rock shaft 59 having projection at its ends outwardly beyond said bearings 58. Concentric with the shaft 59 is a coil spring 60 in a tubular housing 61; said spring 60 having one end secured to the shaft 59 at 62 while the other end thereof extends through a hole 63 in the housing and is attached to a stationary lug 64 rigid with the adjoining bearing 58 and/or the housing 61. To one end of the shaft 59, the upper in Fig. 5 for example, is rigidly secured a double-armed lever 65, having at the respective ends stationary pins 66, each affording pivotal connections for the eyed end of a coupler 67, the other end whereof is similarly attached to the hereinbefore mentioned projecting stud 22 on the associated sector-shaped disc plate 21, of the respective kicker devices 15; while the power that rocks said devices in both directions is transmitted by said rods 67, as hereinafter set forth.

The spring influenced rock-shaft 59 has attached to its end, remote from the lever 65, an arm including a discous member 68 embodying a catch-tooth 69, to one side of said shaft 59, and an actuator extension 70 to the other side of such shaft; while said actuator extension 70 includes a flanking projection 71, at its free end, for engagement by a coactive roller 72 on a disc 73, fast on a drive shaft 74 to the right of the bearing 58 in Figs. 2 and 3. This shaft 74 is conveniently rotatable through appropriate drive means 75 indicated by dot-and-dash lines in Fig. 1, from the motor 4 to the power transmission 9, and from the latter to shaft 74 by an endless connection 76. Now it will be readily understood by those acquainted with the mechanical arts that, as the shaft 74 rotates, the roller 72 on the disc 73 will engage the flanking projection 71 on the actuator extension 70, of the spring-influenced rock-shaft 59, and wind-up the coil spring 60 until the parts just described reach a point, in their respective paths of travel, where they become disengaged. Such position is indicated in Fig. 3 of the drawings. Upon disengagement of roller 72 and flanking projection 71, coil spring 60 recoils, turning rock shaft 59 counterclockwise as viewed in Figs. 2 and 3. Kicker devices 15 are thereby thrust outwardly, projecting the ballast outwardly from its initial position below the rails 3—3.

When the ballast has been kicked out of the crib 19 from immediately below the rails 3—3 tc the desirable depth, the operator of the machine grasps a hand lever 77 fulcrumed at 78 to a bracket 79 fast on the left hand base-plate 41 of Fig. 1. Coupled at 80 to the hand lever 77 is a rod 81, in turn pivotally connected at 82, to a locking element or dog 83 fulcrumed at 84 to the adjacent base-plate 57. The dog 83 embodies a tooth 85 at its free end adapted to engage the catch tooth 69 of the spring actuated disc 68 at a time when the kicker devices 15 have been raised to the normal retracted position of Fig. 3, which enables the machine to be moved along the track rails 3—3 without fouling the ties 20. The locking dog 83 must, obviously, be released by a reverse movement of the hand lever 77 after the kicker devices 15 are brought over the next crib 19 to be cleared of ballast below the rails 3—3.

It will be understood that progression of our improved ballast kicking machine along the track rails 3—3 in either direction may be conveniently effected by the foot pedals 11, 12 through the medium of sprocket gears 86, 87 with a chain

drive 88 from the output shaft 89 of the reversible power transmission 9 to the truck drive shaft 7, as schematically indicated by dotted and full lines in Figs. 2 and 3.

Having described the structure of our improved ballast kicking machine as typically illustrated by the accompanying drawings, the operation thereof is as follows:

With the coil spring 60 wound up and the kickers 15 held in the elevated position clear of the ties and so locked as a consequence of the engagement of the tooth 85 with the tooth 69 of the discous member 68 as in Fig. 3, the carriage is propelled on the track until said kickers are positioned directly above the crib at which the ballast is to be removed from beneath the rails 3—3. All being now in readiness, the lever 77 is swung to the right from the position shown in Fig. 3 to the position shown in Fig. 2 to withdraw the tooth 85 from engagement with the tooth 69 of the discous member 68 and thereby release the kickers for operation. Kickers 15, thus released, are immediately swung outwardly under the influence of gravity and the coil spring 60, arriving at the position shown in Fig. 2 of the drawings. The transmission 9 is thereupon set to drive the shaft 74 for clockwise rotation of the disk 73. At the beginning of each rotation of the disk 73, the roller 72 thereon engages the flanking projection 71 of the actuator extension 70 as shown in Fig. 2, thereby lifting the latter to turn the rock shaft 59 clockwise through a partial rotation, with consequent retraction of the kickers 15 as in Fig. 3 and re-winding of the coil spring 60. As the disk 73 continues in its rotation and the roller 72 passes beyond the inner end of the flanking projection 71 of the actuator extension 70, the coil spring 60 will immediately react by virtue of the energy stored in it as above explained, to turn the rock shaft 59 reversely or counterclockwise with the result that the kickers 15 will be suddenly swung outwardly about their pivots 14 and their blades 18 forcibly thrust beneath the track rails 3—3 as in Fig. 2, the motion being imparted thereto through the double-armed lever 65 and the rods 67. In this way it will be seen that the ballast will be not only effectively dislodged but displaced outwardly toward the shoulders of the track bed and there confined by baffle shields 90 which are pivotally suspended from the frame 5 by hinges 91.

As the operation proceeds, the hand lever 54 is manipulated and the kickers 15 extended, that is to say, the slides 16 shifted downwardly progressively by motion imparted through bell crank arms 26, 29, sleeves 31, bell cranks 35, connecting rod 43 and coupler 52, with the result that the blades 18 will be correspondingly depressed to remove the ballast from beneath the rails to the depth *a* in Fig. 2. Upon being released, the hand lever 54 and the parts controlled thereby will be automatically returned to the normal positions in which they are shown in full lines in Fig. 2 by action of the coil spring 49 (Fig. 5) upon the piston rod 46 connected to the coupler 52. After the ballast has been removed from one crib in the manner described, the kickers are lifted clear of the track bed, whereupon the apparatus is shifted on the rails 3—3 to the next crib and the operation repeated.

From the foregoing it will be readily understood that the kicker devices 15 are simultaneously activated by the motor 4. It is also to be particularly noted that our improved kicker mechanism for removing ballast from below railroad track rails 3—3, intermediate the ties 20, has a highly useful adjunctive feature in that when the ballast in the crib 19 gets fouled with finer material filling its interstices it becomes more or less conductive of electricity and, when damp, therefore short circuits the rails 3—3 when used for electrical signalling purposes. Hence by removing the damp ballast from under the rails 3—3, so that no material contact therewith exists, such short-circuiting trouble is effectively overcome.

Furthermore, while we have described our invention as adapted for removing ballast from below the track rails it is to be distinctly understood that the kicker devices 15 may be readily arranged for tamping-in ballast below the rails 3 or the ties 20. Accordingly, although the drawings and foregoing descriptive matter disclose the best means, which we have so far contemplated, embodying our improvements, we desire to be not limited to the details of such disclosure, inasmuch as in the further application of our invention many changes in form and construction may be made, as circumstances require or experience suggest, without departing from the spirit of said invention, within the scope of the following claims.

Having thus described our invention, we claim:

1. Apparatus for removing ballast from below track rails intermediate adjacent ties comprising a wheeled truck; means on the truck supporting swingable kickers each including a telescopic adze-like member; mechanism on the truck operatively coordinating the kickers for simultaneous oscillation in opposed directions; means on the truck for maintaining the kickers elevated when said kickers are inactive; means on the trunk operative to oscillate the kickers; means on the truck to move the telescopic members outwards to increase the depth of ballast removed; recoil means on the truck opposing the active swing of the kickers and effective to impart an initial impulse during the reverse swing of said kickers; and power means on the truck operative to impel the kicker adze-like members against the ballast below the track rails.

2. The invention of claim 1, wherein the power means further serves to actuate mechanism operative to propel the truck in either direction along the track rails.

3. The invention of claim 1, wherein the active swing of the kickers is outward below the track rails; and wherein dependent blinds are provided, at the sides of the truck, to prevent the ejected ballast being thrown beyond the side limits of the track.

4. The invention of claim 1, further including means on the truck whereby the truck may be jogged across the crib intervening adjoining ties so as to clear the full width of said crib directly below the track rails.

5. The invention of claim 1, wherein the adze-like kicker members are in the form of arcuate blades of rectangular outline and comparatively narrow width.

6. In apparatus for removing ballast from beneath track rails in the cribs between ties, a carriage shiftable along the track; ballast dislodging elements with arms supported on the carriage for swinging movement laterally thereof and having blade projections at their lower ends adapted to be thrust beneath the rails to dislodge the ballast; and mechanism including a rock shaft, means through which the dislodging elements are connected to the rock shaft for actuation, a coiled

spring surrounding the rock shaft with one end thereof secured to the shaft and the other end anchored on the carriage, an arm affixed to the shaft, and a rotary disk with a stud thereon to engage a lateral projection at the end of the arm during part of each revolution of the disk to turn the rock shaft in one direction for retraction of the dislodging elements and at the same time to wind up the spring for ultimate release to turn the rock shaft suddenly in the opposite direction for impartation of forcible active kick impulses to the dislodging elements.

7. Ballast removing apparatus according to claim 6, further including a manually controllable latch element for locking the dislodging elements against movement in a retracted position with the blade projections thereof elevated clear of the track bed when the apparatus is to be moved along the track.

8. Ballast removing apparatus according to claim 6, wherein the blade projections of the dislodging elements are connected to slides shiftable lengthwise of the arms of said elements; and further including manually controllable means whereby said slides can be adjusted during the operation of said elements, as and for the purpose disclosed.

9. Apparatus for removing ballast from beneath track rails in the cribs between ties, comprising a carriage movable along the track, an arm pivotally mounted on said carriage with capacity to swing between the ties in a plane arranged transversely of the rails, a ballast displacing element mounted on said arm with capacity as said arm swings about its pivot to pass beneath a rail to dislodge ballast therefrom, spring means drivingly connected to said ballast moving element and effective when loaded and released to urge said ballast moving element toward said ballast, power means on said carriage, connecting means for connecting said power means to said arm to swing said arm about its pivot against the force of said spring means, thereby retracting the ballast moving element from the crib and loading said spring means, and release mechanism arranged with respect to said connecting means and said arm to disconnect suddenly said power means from said arm, thereby suddenly releasing the spring means causing it to drive said ballast moving element beneath the rail against the ballast in the crib with a force sufficient to dislodge the ballast and move it out beyond the rail.

10. In apparatus for removing ballast from beneath track rails in the cribs between ties, a carriage shiftable along the track, ballast dislodging elements supported on the carriage for swinging movement laterally thereof and adapted to be thrust beneath the rails to dislodge the ballast, a rock shaft, mechanical means through which the ballast dislodging elements are connected to the rock shaft for actuation, spring means attached to said rock shaft, said spring means continuously urging the rock shaft to turn about its axis in one direction, power driven mechanical means travelling in a continuous path on said carriage, and a motion transmitting linkage fixed to said rock shaft and normally disposed in a part only of said continuous path, the power driven mechanical means thereby periodically contacting said motion transmitting linkage causing it to turn the rock shaft in opposition to the force of the spring means, and said power driven mechanical means also periodically suddenly releasing said motion transmitting linkage, rendering the spring means suddenly operative to actuate the ballast dislodging elements.

11. In apparatus for removing ballast from beneath track rails in the cribs between ties, a carriage shiftable along the track, arms supported on the carriage for swinging movement laterally thereof, ballast dislodging elements on said arms, said ballast dislodging elements having blade projections at their lower ends adapted to be thrust beneath the rails to dislodge the ballast; and mechanism including a rock shaft, means through which the ballast dislodging elements are connected to the rock shaft for actuation, spring means yieldably urged against said rock shaft to induce said rock shaft to turn in a first direction about its axis, an arm affixed to said rock shaft, rotary means with an eccentric thereon, said eccentric being positioned to engage said arm during a part of each revolution of the rotary means to turn the rock shaft in the direction opposite said first direction for retraction of the ballast dislodging elements and winding the spring, and said eccentric also being positioned to disengage said arm suddenly during another part of each revolution, suddenly releasing said spring means to turn the rock shaft suddenly in said first direction for impartation of a kick impulse to said dislodging elements.

12. Apparatus for removing ballast from beneath track rails in the cribs between ties, comprising a carriage movable along the track, a swinging arm pivotally mounted on said carriage with capacity to swing transversely of said rails, an extension arm mounted on said swinging arm with capacity to move lengthwise thereof, a ballast moving element on said extension arm, power operated means drivingly connected to said swinging arm and effective to oscillate said swinging arm about its pivot, thereby alternately driving said ballast moving element against the ballast below the track rail and retracting the ballast moving element therefrom, a mechanical linkage attached to said extension arm and operable from the carriage to adjust the extension arm lengthwise of said swinging arm to shift the ballast moving element toward and away from said pivot as the swinging arm moves about said pivot, thereby adjusting the ballast moving element to contact ballast at different depths, and resilient means continuously urged against said mechanical linkage with a force sufficient when unopposed to retract said ballast moving element toward said pivot.

13. Ballast dislodging mechanism for removing ballast from beneath a track rail in the crib between ties comprising a support movable along the track, a ballast kicking tool having a ballast dislodging blade element swingably carried by said support with capacity for swinging movement laterally of the rails and downwardly beneath the rail between the ties to dislodge the ballast and remove it from under the rail, resilient reactive drive means carried by said support and connected to urge said kicking tool and blade element to swing toward said ballast, said resilient drive means having capacity when loaded and released to drive said blade element sharply into the ballast, retracting means with power drive means also carried by said support, connecting means between the retracting means and kicking device including mechanical means periodically establishing a positive mechanical connection between the power means and kicking tool with capacity to withdraw the blade element positively from the ballast against the force

exerted by said resilient drive means, and concurrently to load said resilient reactive drive means, and said connecting means also including release mechanism arranged with respect to said kicking tool and said retracting means to disconnect suddenly said kicking tool from said retracting means, thereby freeing the resilient drive means causing it to drive the kicking tool blade element into the ballast.

14. The ballast dislodging mechanism defined in claim 13 wherein the ballast kicking tool includes a pivotally mounted extensible arm on which said blade element is carried, and wherein means are provided for extending said arm while it is moving, whereby the ballast may be removed to successive depths with successive strokes of the blade element.

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