

Sept. 19, 1944.

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2,358,657

APPARATUS FOR REMOVING, CLEANING AND RE-DISTRIBUTING BALLAST

Filed June 6, 1942

7 Sheets-Sheet 1

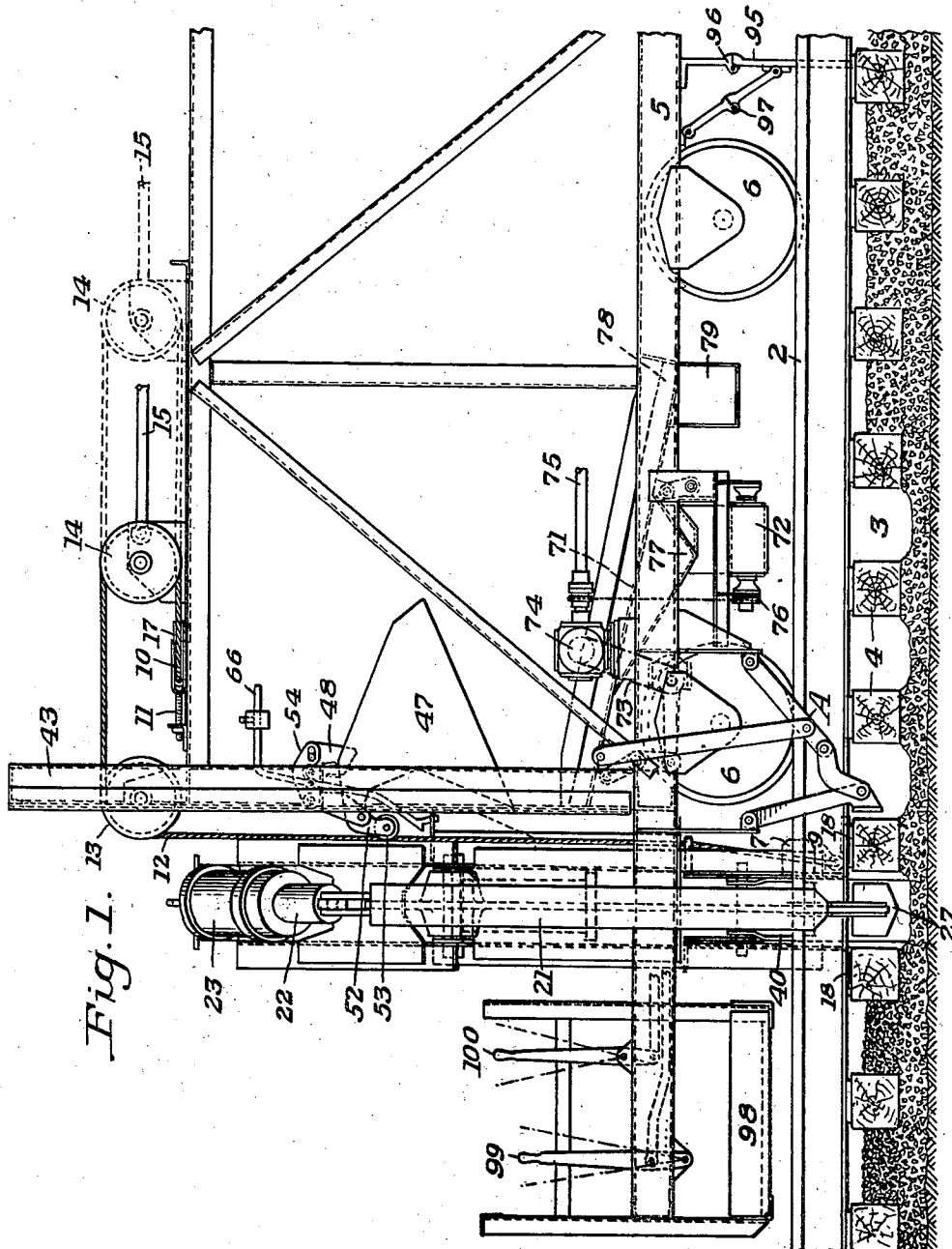


Fig. 1.

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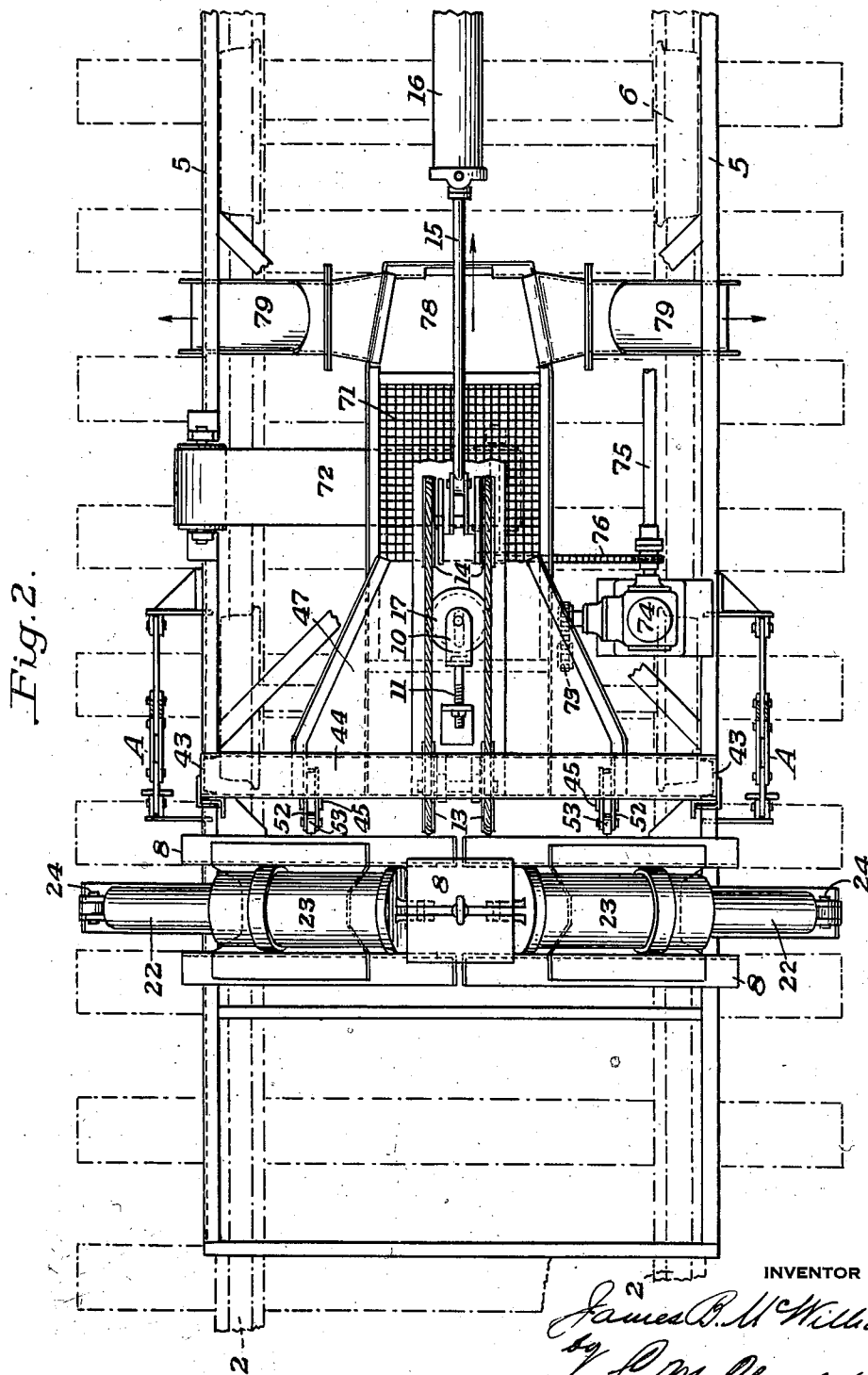
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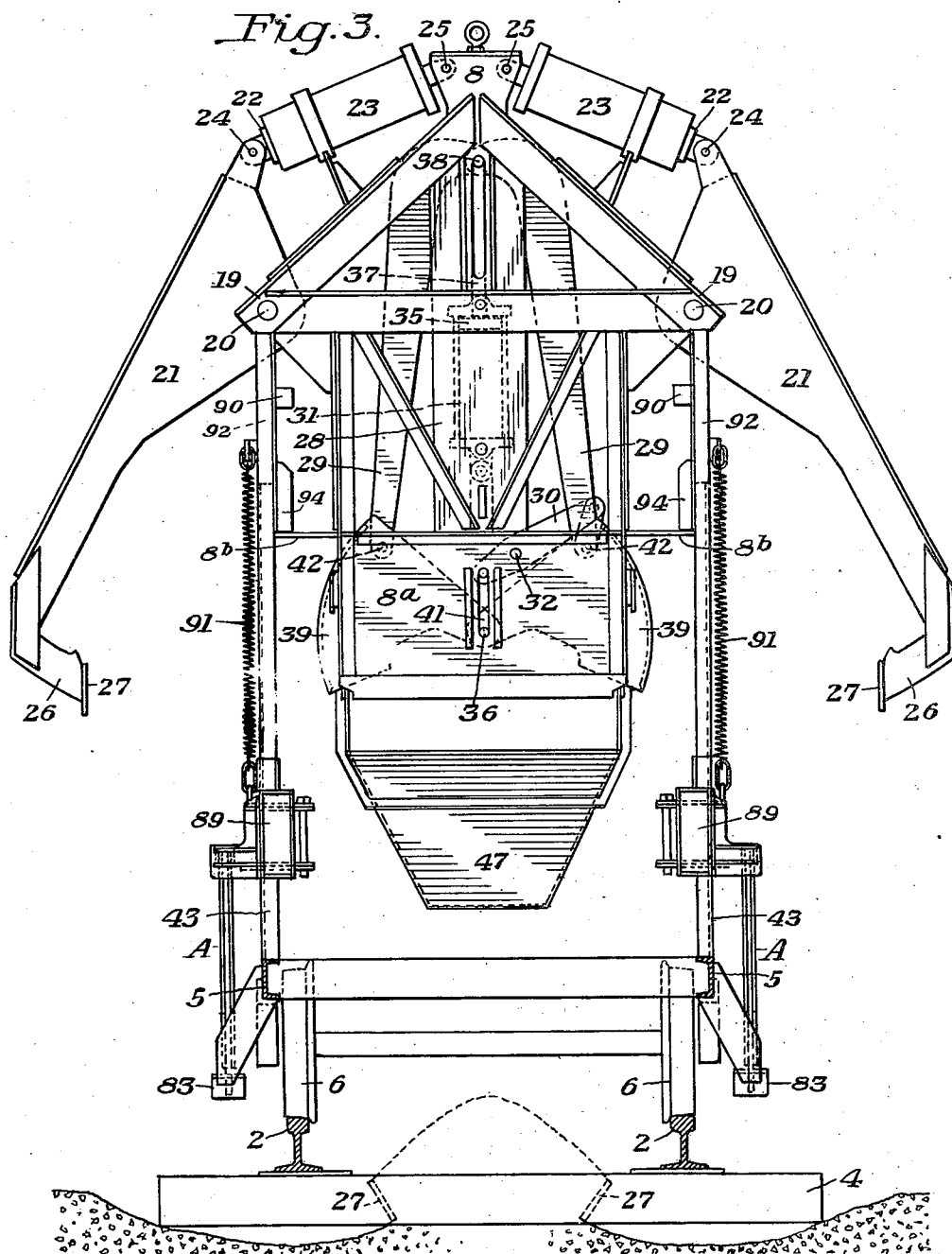
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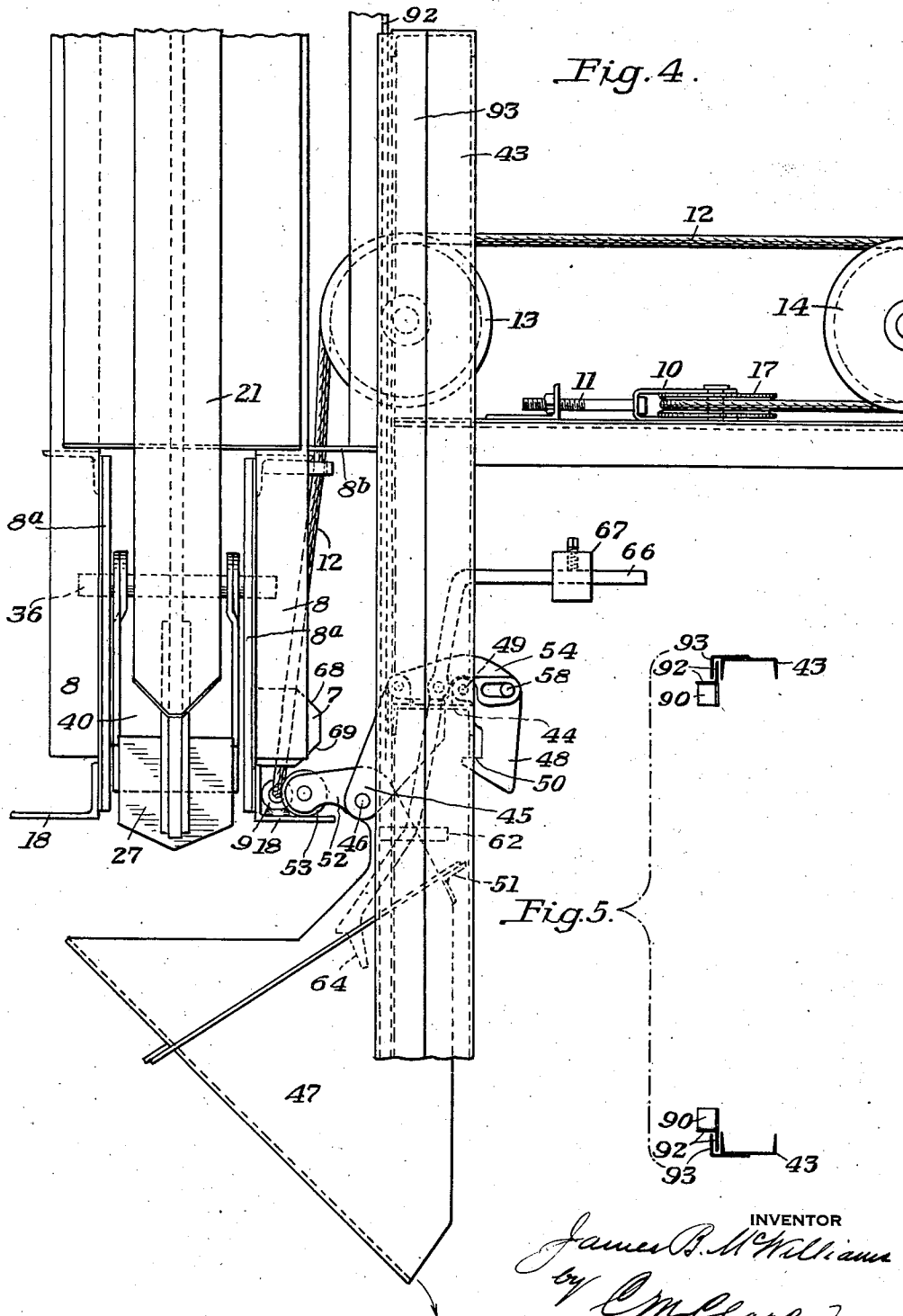
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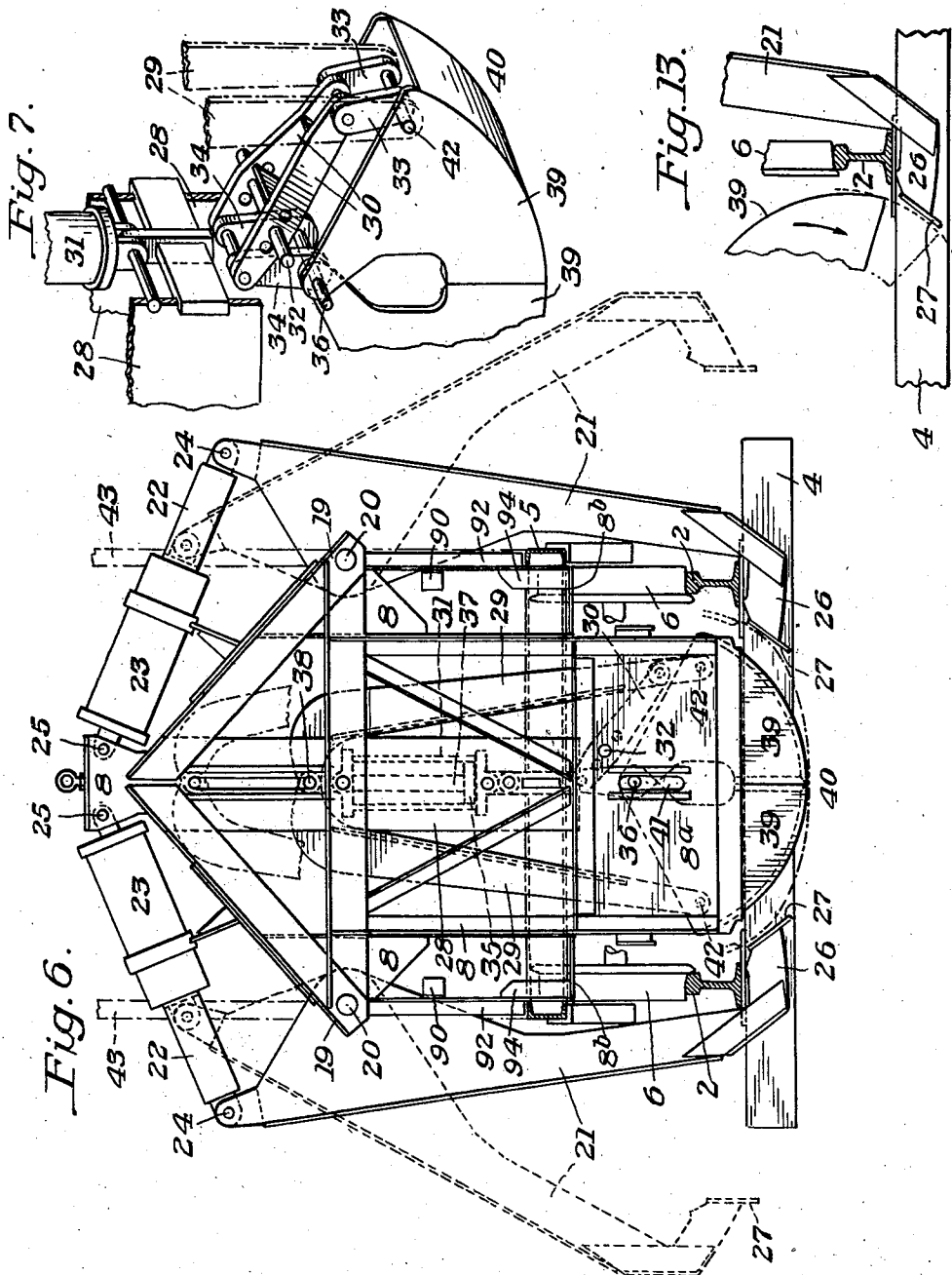
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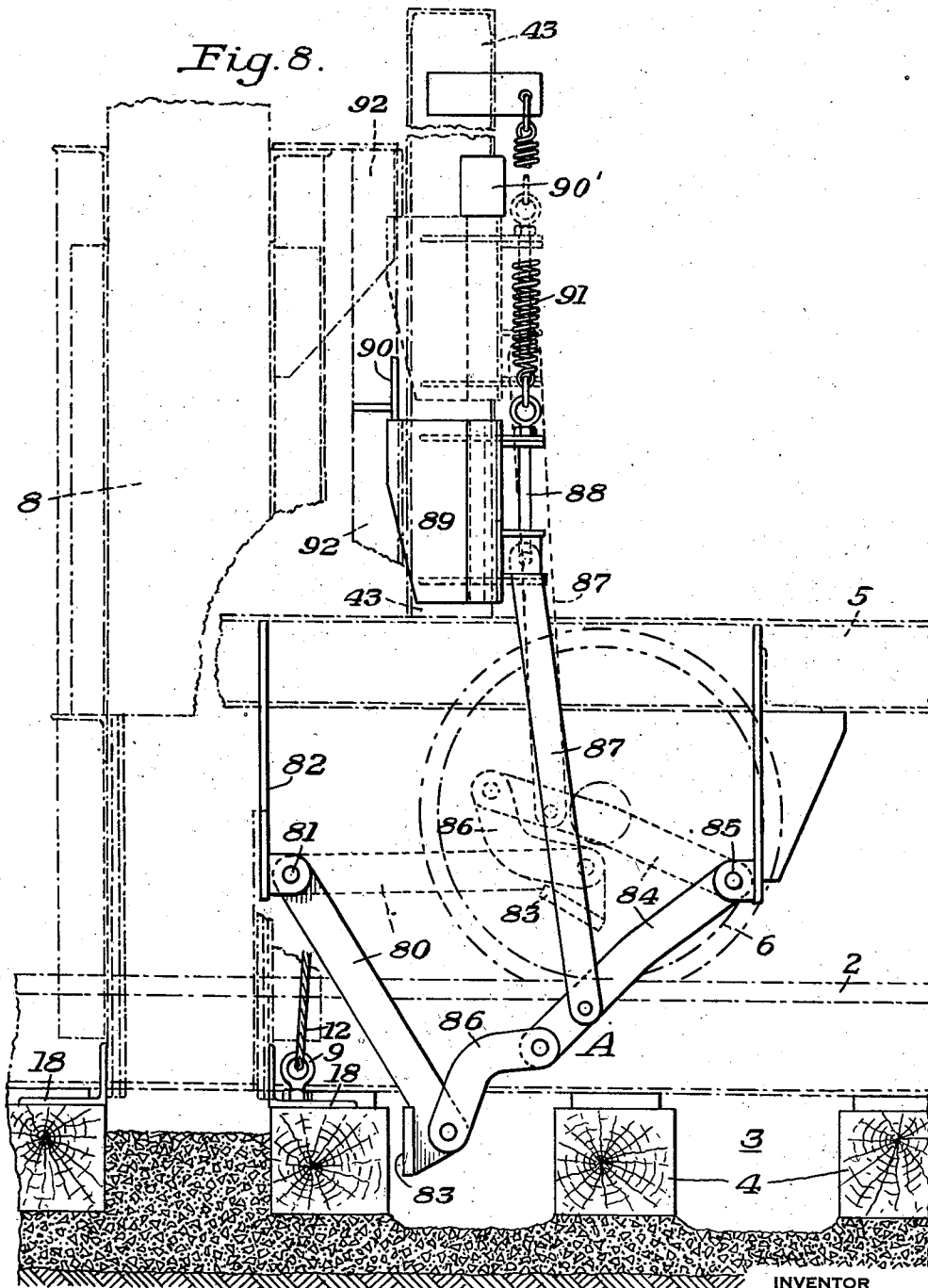
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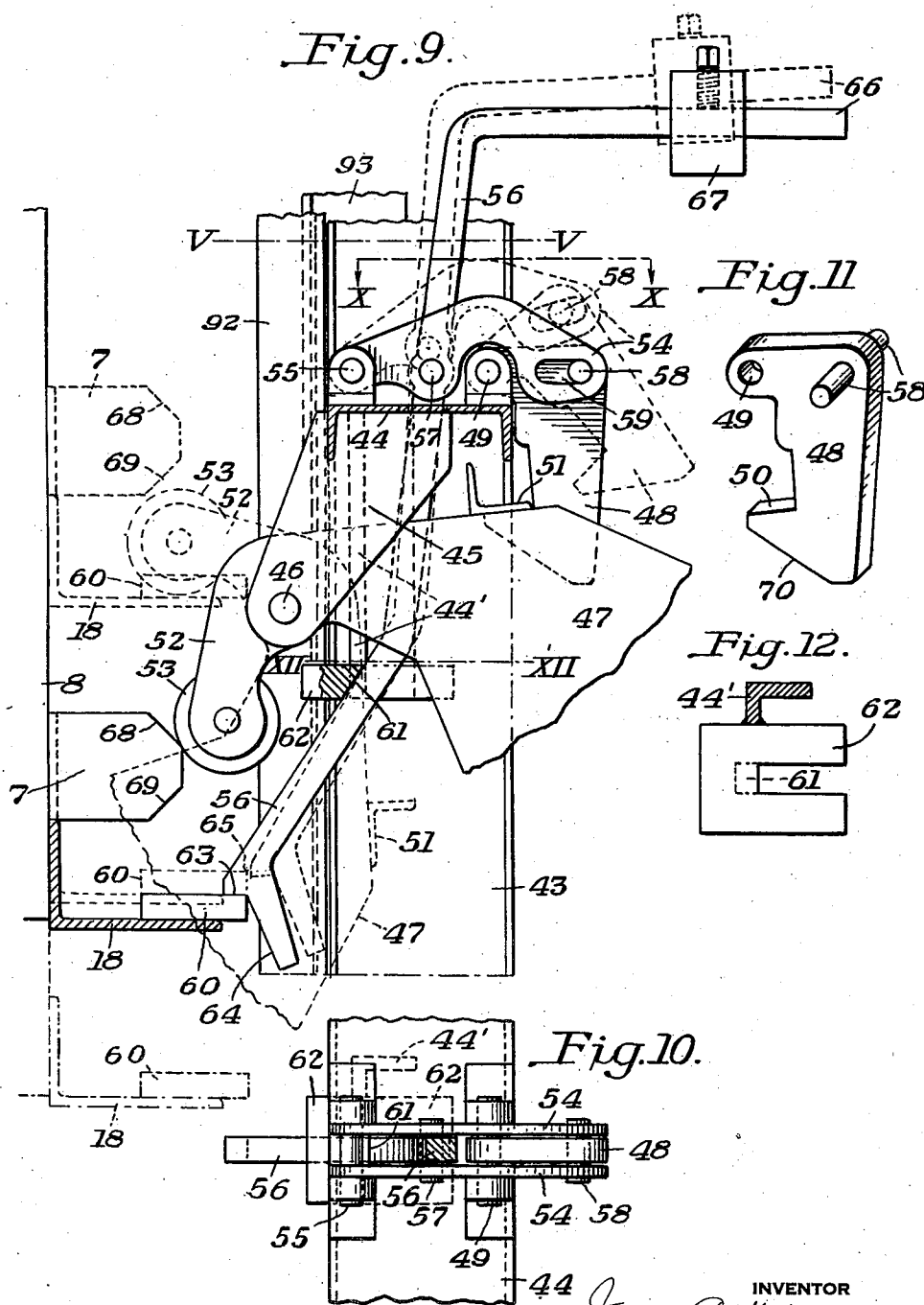
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APPARATUS FOR REMOVING, CLEANING AND RE-DISTRIBUTING BALLAST

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7 Sheets-Sheet 7



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UNITED STATES PATENT OFFICE

2,358,657

APPARATUS FOR REMOVING, CLEANING,
AND REDISTRIBUTING BALLASTJames B. McWilliams, Pittsburgh, Pa., assignor
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burgh, Pa., a corporation of Pennsylvania

Application June 6, 1942, Serial No. 446,024

13 Claims. (Cl. 37-104)

My invention is an improvement in apparatus for removing ballast from between the ties of railroad tracks, separating accumulated foreign matter therefrom, and re-distributing the cleaned ballast, generally known as a cribbing machine.

The present machine is an improvement in that class of apparatus disclosed in my prior Patents 1,594,969 and 2,132,176, and particularly in the novel features, functions, elements and results accomplished thereby.

It has in view to effect removal, cleaning, and redistribution of the ballast by periodically moving the machine along the track rails, and arresting same with the operative mechanism in register with each intervening space between the ties, known as crib.

The machine comprises a travelling support or truck provided with a vertically disposed carriage frame providing a guiding mounting for a rising and lowering carriage member, means operatively mounted in said carriage member for laterally moving the static ballast inwardly towards the middle of each single crib to receptive position and condition for a clam shell bucket, means, as such bucket, for engaging a section of such accumulated ballast and contained foreign matter, means for actuating the ballast moving means and said bucket, and means for raising and lowering the carriage. Additional features also include an automatically adjustable chute for receiving the contents and distributing same to screening and distributing means, means for bracing and adjusting the ties, power transmitting connections to various operative elements, and various working parts and details, as shall be more fully hereinafter described.

Referring to the drawings:

Fig. 1 is a side elevation of the machine in operative relation to the crib spaces between the ties.

Fig. 2 is a plan view of Fig. 1.

Fig. 3 is an end view with the operating carriage member and its working parts in elevated position with the clam shell bucket in open discharging position.

Fig. 4 is a similar partial detail view showing the chute in inward receiving position.

Fig. 5 is a transverse section of the frame structure on the line V—V of Fig. 9.

Fig. 6 is a partial end view like Fig. 3 showing the working parts lowered with the clam shell bucket closed.

Fig. 7 is a perspective view showing the bucket and its link mechanism.

Fig. 8 is a partial detail view showing the tie bracing mechanism in lowered position.

Fig. 9 is a detail view showing the holding and releasing mechanism for the chute.

Fig. 10 is a transverse sectional view on the line X—X of Fig. 9.

Fig. 11 is an isometric detail of the chute engaging and releasing latch.

Fig. 12 is a detail sectional view on the line XII—XII of Fig. 9.

Fig. 13 is a further detail view illustrating co-operating movement of the bucket in relation to the pushing shoe of the ballast moving arm.

The machine is designed to be operatively mounted upon and to move intermittently along the rails 2 of a railroad track, by motor driven power not necessarily illustrated, but geared with the axles of wheels 6, and having controlling means as levers, valves, etc. The machine is designed to be thus periodically propelled to locate the working elements properly with relation to the cribs 3 between ties 4. It comprises a main base framing 5 having axle journal bearings and superimposed vertical framing members, as channels, along and in parallelism with which the vertically moving sliding frame or carriage is guided in assuming its alternating positions. The slide frame 8 is made of suitable structural members, front and back, rigidly connected as a unit, and having front and back cross plates 8a, functioning to cooperate with the incorporated working parts, as hereinafter described. The slide frame is provided at its lower rear portion with socket eyes or other devices 9 for connection with the terminals of continuous cable 12. These pass upwardly and over sheaves 13 and 14 at the upper part of the structure, sheaves 14 being mounted in a carrier connected with piston rod 15 of the piston of a horizontally disposed cylinder 16. The middle section of the cable engages a horizontally disposed sheave 17 mounted as shown in an adjusting clevis 10 having tightening or loosening means, as a threaded bolt 11. The piston of cylinder 16 is operated by any available fluid controlled by a suitable valve of well known construction, not necessarily shown in the drawings. By such means the slide frame or carriage 8 is thus adapted to be actively raised, and lowered by gravity along its framing 43, as will be understood, or by other suitable means.

At the bottom of the slide frame are oppositely disposed angles 18 adapted, when lowered, to rest firmly on the tops of adjacent ties, with ample intervening space, i. e. full width of each crib.

The frame of the slide 8 is provided at its upper

opposite side portions with hinge bearings 19, to each of which is pivoted at 20, track material displacing means in the form of laterally swinging pushing or ramming arms 21. These are adapted to be swung inwardly between the ties when lowered as in Fig. 6, through the crib areas, and outwardly therefrom before being raised, as in Fig. 3. Both of the arms 21 are operated together, through the piston rods 22 of the pistons of cylinders 23, each cylinder being pivotally connected with the upper extremity of each arm, as at 24.

The inner ends of the cylinders are pivotally connected with the top of the sliding frame 8 at 25, for compensating movement. The piston of each cylinder is operated from any available source of fluid pressure (not shown) provided with suitable control valves of usual type.

Each arm 21 is provided at its lower extremity with an inwardly projecting extension 26, insertible partly through the crib between the ties, with permissible clearance, underneath the rail, as in Fig. 6. Each such extension is provided with an inclined flat face scooping shoe or ram 27, acting as a pusher for the ballast towards the middle of the track.

The inclination of ram 27 facilitates action on the packed ballast in the manner of a plow share, tending to disturb and move it inwardly and upwardly, and facilitating formation of a middle pile accumulation, indicated in dotted lines, Fig. 3, for easy grasping by the inwardly and downwardly moving action of the terminal edges of the bucket.

While arms 21 are shown as made of structural steel shapes, welded or riveted, it will be understood that they may be readily produced as forgings or steel castings, of one integral piece.

The construction is such as to provide, in addition to the ballast disturbance and movement, more effective and efficient action by the bucket sides, in entering the mass. Thus, by properly locating the shoes 27 with approximately close relation to the arc of movement of the bucket edges in closing together, as in Figs. 6 and 13, the approaching edges of the bucket will pass along closely over inside the shoes, acting as guides, and more easily and freely into and underneath the mass. In this respect the machine materially reduces the difficulty of entering underneath the assemblage of broken stone or the like.

Mounted on the vertically movable housing frame 8, between front and back plates 28, is a cylinder 31, (see Fig. 7) having a piston 35 and a piston rod 37 pivotally connected at 38 with connecting arms 29 engaging the link mechanism of the bucket opening and closing means. These comprise a pair of levers 30, 30, pivoted on cross pin fulcrum 32 between plates 8a, and pivotally connected by links 33 with the terminals of arms 29.

As shown in Fig. 7, additional holes in levers 30 for the cross pin 32 may be provided, for varying the fulcrum bearing and leverage stroke, as may be desired.

Such connection is by cross pin 42 extending through the sides of the bucket halves at their upper corners. Levers 30 are pivotally connected by their inner shorter ends with links 34 with the hinge pin 36 of the opposite halves or sections 39 of the clam shell bucket 40.

When piston 35 is lowered, as in Fig. 6, due to appropriate valve control, with downward thrust of arms 29, the hinge pin moves upwardly by short end lever action, through opposite guiding slots 41

of plates 8a and the bucket closes, assisted by gravity. When piston 35 is raised, as in Fig. 3, lifting arms 29, the action of levers 30 is reversed, and the bucket is opened for discharge.

At each side, extending upwardly from the main longitudinal truck beams, are a pair of upright columns 43, of channel form, connected by a cross beam 44 having downwardly extending brackets 45 between which, by cross pin 46, is pivotally mounted the chute 47. Such chute is normally held outwardly beyond the rising bucket and its load by means of a latch 48 pivoted at 49 between bearings on cross beam 44 and having an interlocking shoulder 50 engageable under a cross bar, as angle 51, Fig. 9. Lever extensions 52 of the chute are provided with terminal rollers 53 adapted to be engaged by cams 7 located slightly above flanges 18 of the upwardly moving frame 8 with its loaded bucket. Such mechanism operates, first to tilt the chute further outwardly by the cams 7 for free timed release of the latch, and immediately thereafter to thrust the latch inwardly below the chute cross bar 51, at the end of upward movement of the slide frame.

Such operation is effected at the termination of the upward travel of frame 8, locating the chute underneath the loaded bucket, which is then opened by upward movement of piston 35 of cylinder 31, the arms 21 having been withdrawn by action of cylinders 23 and elevated with the main frame, as in Fig. 3.

The release of latch 48 is simultaneously effected by upward movement of lever 54, pivotally mounted at 55 on beam 44, by lifting action of controlling arm 56. Said arm is pivoted to lever 54 at 57 and the lever engages a cross pin 58 of the latch by clearance slot 59.

Arm 56 is adapted to be elevated by rising action of slide frame 8, beginning just before its ultimate lift, with final release of latch 48, and to be thrust outwardly to the dotted line position of Fig. 9, by an abutment 60 on flange 18 and the sloping face 61 of cam 62 supported from beam 44 by connection 44'.

As shown, arm 56 is provided with a shoulder 63 above a terminal sloping face 64 of an extended prong, and engageable by rising abutment 60. As the arm 56 rises to lift lever 54, cam 61 causes it to be moved outwardly beyond the abutment just before termination of upward movement of the frame 8. Upon reverse movement downwardly of the frame, the contents of the bucket having been discharged into the chute and therefrom to the screen, the arm 56 having been temporarily held outwardly by the abutment 60 as indicated at 65, will fall by gravity, lowering lever 54 and latch 48 to normal position. The arm 56 is provided with a lever extension 66 and adjustable counterweight 67, to ensure resumption of normal position upon lowering of main slide frame 8, ready for the next operation.

The cams 7 as shown, are provided with upper inclined faces 68 and lower oppositely inclined faces 69. With the chute held outwardly for clearance of the rising bucket, as in Fig. 1, the upwardly moving cams engage rollers 53 to slightly further elevate the chute for free release of latch 48, permitting the chute to fall to receptive position, as in Fig. 4. Upon reverse downward movement of the frame, cam faces 69 engage the rollers from above, tipping the chute again outwardly beyond the zone of the lowering open bucket, and effecting its engagement by the latch. The latch as shown is pro-

vided with an inclined cam face 70 engageable by the outer edge of cross bar 51 in rising, temporarily elevating lever 54 and arm 56, and with prompt resumption of the latch to chute-retaining position.

With the chute in lowered receiving position underneath the bucket, its released contents pass to a downwardly inclined screen 71, through which foreign material as dirt, cinders, etc. pass to a conveyor belt 72 leading outwardly laterally to any suitable discharge or convenient receptacle. The screen is preferably agitated by a suitable cam or other mechanism, not shown, but actuated through a driving chain 73 or the like, driven from a gear box 74 and a power shaft 75, from which a chain or other drive 76 actuates the conveyor belt 72. The screen is provided with a suitable lower discharge chute 77 leading to the conveyor belt 72.

Screened ballast passes over the screen to a terminal portion 78 from which a pair of lateral trough conduits 79, registering with each successive crib 3, as the machine is successively advanced and stationed, extend for distribution of cleaned ballast thereto, beyond the rails. A portion of such ballast may be finally shoveled back to fill the cribs, or if desired, the end of terminal portion 78 may be also open for middle delivery between the rails, as indicated by the arrow, or adjustable endmost deflecting gates may be utilized for varying flow distribution of the ballast, as will readily be understood by the designing engineer.

For preventing displacing movement of a rear tie, as by action of the bucket in entering the crib, or of the side arms and their rams, I provide the means shown in Fig. 8, comprising the opposite side series of elements generally indicated by the letter A, Fig. 3. These consist of arms 80 pivoted at 81 to a depending bracket 82 of the carriage 5 having a shoe 83 for location in the open crib, closely behind the tie adjacent the crib to be emptied. An opposite arm 84 is similarly pivoted at 85 to a similar bracket and is pivotally connected to arm 80 by an intervening link 86, such elements comprising a bracing toggle combination. These assemblages of bracing elements, in opposite side duplication, are connected by bars 87 which in turn are connected by suitable means and eye bolt 88 with depressing heads 89 slidably mounted on opposite beams 43.

The slide frame 8 is connected at each side, as by transverse plates 8b, with opposite vertical guide members as angles 92 each provided with a plate abutment 90. Abutments 90 are adapted, towards the last portion of the downward stroke, to engage and depress the heads 89. The abutment carrying guides 92 are slidably mounted in vertical slots between the main columns 43 and spaced angle bars 93, as in Fig. 5.

The plates 8b are connected with and actuate the abutments 90 by means of connecting bracket 94 and slide bar 92.

Upon lowering of slide frame 8 together with connections 8b, bracket 94, and slide bars 92, abutments 90 engage and depress heads 89, extending springs 91 against their normal lifting action. Such movement, by bars 87, thrusts shoes 83 into resisting relation to the tie and each end portion thereof, firmly opposing its disturbance. Thus, during downward movement of the slide and prior to inward movement of the rams between the ties, and the following grasping action of the bucket, the shoes are

lowered to rear positioning, closely behind the tie for bracing resistance. Upon upward movement of the slide, until resisted by stop abutments 90', the levers are being withdrawn by the springs 91 to dotted line position for clearance, preparatory to the next forward movement of the machine, both operations being entirely automatic. The car may then be moved forwardly to the next adjacent crib, and the operation repeated.

The action of the rams is also effective to straighten ties which are not at right angles to the rails, or otherwise abnormally located, so that ties shall not be forced beyond the standard spacing.

For the purpose of removing undistributed ballast from the tops of ties as the machine proceeds, a scraper 95 may be located transversely below the truck, preferably retractible, as by suitable hinge and shoulder abutment bracing mechanism 96, 97, for erection and collapse, as in Fig. 1.

The advancing end of the machine is provided with an operator's pulpit 98 in which are mounted operating levers 99, 100, for control of the various valves etc. of the movement actuating elements, cylinders, etc. for timed operation thereof, in the proper order. These elements and their particular construction, timed functions, or the like, are not disclosed, but will be understood as existing and operating as according to recognized and approved practice.

The construction and operation of the machine will be readily understood and appreciated from the foregoing description.

It is designed for comparatively rapid, practicable and efficient operation according to the following cycle of operation.

The machine having been brought to an initial position along the track, it is located and arrested with the slide and its bucket and arms in raised position, in register with the first crib to be acted upon, a few of those beyond it rearwardly having already been excavated. The slide frame is then lowered to operative position with the flanges 18 resting on the ties at each side of the crib to be emptied. During such lowering faces 69 of cams 7 engage rollers 53 and thrust the chute 47 outwardly for automatic engagement by latch 48, providing clearance for downward movement of the slide frame. Intermediate of such descent the heads 89 are depressed, lowering the toggle assemblage A, and locating the resisting shoes closely adjacent to the tie in rear of the crib to be emptied. By such interfering resistance the tie is prevented from any material movement due to lateral pressure tending to disturb it by active entrance and pressure of the digging arms 21 and bucket 40.

Thereupon, by action of the piston rods 22, both arms are entered laterally between the ties and underneath the rail or rails as in Fig. 6. In so entering, they provide an anchoring hold with the rails against upward movement of the slide frame for any reason, as by action of the bucket in closing, and ensuring positive static conditions during such operations. The scoops 27, by reason of their inclination, engage the ballast in such a manner as to push it inwardly and upwardly towards the middle in an accumulating pile. At the same time, during their progress toward extreme inward positions as in Figs. 6 and 13, the entering edges and rounded faces of the scooping shoes closely approximate by their contour, the adjacent faces of shoes 27, and greatly facilitate closing and loading of the bucket.

Upon termination of the inward travel of arms

21, the piston 35 of cylinder 31 and arms 29 are lowered, with upward movement of links 34, closing the grab bucket upon the contained ballast, as in Fig. 6. Thereupon the arms 21 are retracted, as is also piston of cylinder 16, effecting lifting tension by cable 12, the ends of which, connected with opposite lower portions of the slide frame as at 9, elevate the slide frame and bucket for discharge into chute 47, as in Fig. 3. Just before termination of such upward movement cams 7 cause the outwardly held chute to tip slightly further outwardly for easy release of latch 48, followed immediately by such release, causing the chute to fall by gravity, then to be tipped slightly inwardly by passage of cams 7 beyond the rollers 53, finally being located in receiving position, and so held by flanges 18 at termination of their upward travel, under the loaded bucket.

The piston 35 of cylinder 31 is then raised, opening the bucket which discharges into the chute, effecting flow movement over the screen and elimination of screenings, and deposit of the cleaned ballast into the emptied rear crib or cribs, as described.

The lifting frame and its parts may remain in such upper position pending such final disposition of the material being acted upon; the machine is then moved one tie spacing for registration with the next occupied crib; and the operation is repeated successively along the trackway.

The machine as a whole is strong, compact, self-contained, comparatively simple, and highly efficient in operation, and greatly reduces the time and expense of removing, cleaning and replacing ballast in its intended use. It may be changed or varied in design, detail construction, or otherwise, by the skilled mechanic or builder, within the scope of the following claims.

I claim:

1. The combination of a supporting truck and laterally spaced apart columns thereon, of a vertically movable slide frame, vertical guide means between the slide frame and the columns, means for lowering the slide frame as controlled by said guiding means, upon adjacent ties and for elevating it thereabove, a tie bracing shoe depending from the truck, and lowering and raising means therefor operable by the slide frame.

2. The combination of a supporting truck and laterally spaced apart columns thereon, of a vertically movable slide frame, vertical guiding means between the slide frame and the columns, means for lowering the slide frame as controlled by said guiding means, upon adjacent ties and for elevating it thereabove, a tie bracing shoe and pivotally connected toggle joint mechanism therefor depending from the truck, and lowering and raising means therefor operably connected with the slide frame.

3. In combination with the vertically moving slide frame of a cribbing machine as described having a grab bucket, a pair of oppositely arranged pivotally mounted pusher arms, actuating means for thrusting the terminals of said arms inwardly between the ties for middle accumulation of ballast and in close relation to the closing arc of the grab bucket sides, and means mounted in the slide frame for effecting closing of the bucket during presence of the pusher arm terminals in inwardly closed relation to the bucket.

4. In combination with the vertically moving slide frame provided with the pivotally connected double side bucket, an opposing pair of laterally swinging side arms, and means for actuating the

bucket for opening and closing; terminal inclined plow plates on the arms adapted to be thrust inwardly to close guiding relation to the arc of movement of the bucket lips in closing.

5. In combination with the vertically moving slide frame provided with the pivotally connected double side bucket, the opposite pair of laterally swinging side arms, and means for actuating the bucket for opening and closing; terminal inwardly disposed ballast moving portions adapted to be thrust inwardly between adjacent ties and below the rails thereon adapted to engage the rails and provide anchoring resistance to undesired upward movement of the slide frame during closing of the bucket.

6. In a cribbing machine as described, the combination with the supporting truck and its framework and the vertically movable slide frame, means for preventing movement of a tie or for correcting displacement thereof consisting of a bracing shoe depending from the truck, lowering and raising means therefor, and means operable by the slide frame for actuating said means.

7. In a cribbing machine as described, the combination with the supporting truck and its framework and the vertically movable slide frame, means for preventing movement of a tie or for correcting displacement thereof consisting of a pair of arms oppositely pivoted to bearings suspended from the truck, one of said arms having a bracing shoe, a link pivotally connecting said arms providing for toggle joint erection or collapse, a thrusting and lifting arm, a vertically moving head, a normally operative retracting spring connected therewith, and an element operable by downward movement of the slide frame adapted to engage said head to effect lowering of the bracing shoe behind a tie.

8. In a cribbing machine as described, the combination with the supporting truck and its framework and the vertically movable slide frame, means for preventing movement of a tie or for correcting displacement thereof consisting of a pair of arms oppositely pivoted to bearings suspended from the truck, one of said arms having a bracing shoe, a link pivotally connecting said arms providing for toggle joint erection or collapse, a thrusting and lifting arm, a vertically moving head, a normally operative retracting spring connected therewith, and an element operable by downward movement of the slide frame adapted to engage said head to effect lowering of the bracing shoe behind a tie, said equipment being in duplicate at opposite sides of the truck.

9. In a railway cribbing machine as described provided with a track supported truck having a vertically movable slide frame, spring retracted means provided with a tie engaging bracing shoe and a depressing member, and a lowering abutment operatively connected with the slide frame adapted to engage said member.

10. In a railway cribbing machine as described provided with a track supported truck having a vertically movable slide frame, spring retracted means depending from each side of the truck each provided with a tie engaging bracing shoe and a depressing member, and a pair of lowering abutments operatively connected with the slide frame adapted to engage said members to lower the bracing shoes between adjacent ties.

11. In a railway cribbing machine as described provided with a track supported truck having a vertically movable slide frame, toggle joint means depending from each side of the truck provided

with tie engaging bracing shoes, retracting means therefor for elevating said means to inoperative position, slidably mounted depressing members connected with said toggle joint means, and lowering abutments operatively connected with the slide frame adapted to engage said depressing members to lower the toggle joint means and locate the bracing shoes between adjacent ties.

12. In a railway cribbing machine as described provided with a track supported truck having oppositely located columns, a vertically movable slide frame having ballast engaging elements, spring retracted means depending from each side of the truck provided with tie bracing shoes, depressing members for said means slidably mounted on said columns, and lowering abutments operatively connected with the slide frame adapted to engage said depressing members for

lowering thereof during upward tension on said spring retracted means.

13. In a railway cribbing machine as described provided with a track supported truck having oppositely located columns provided with slotted guideways, a vertically movable slide frame having ballast engaging elements, means depending from the truck having tie bracing shoes, depressing members for said means slidably mounted on said columns, elevating springs therefor, and lowering abutments operatively connected with the slide frame having guides in said slotted guideways and adapted to engage said depressing members for lowering thereof during lowering of the slide frame and opposing tension of the elevating springs.

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