United States Patent

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[54] **RAILROAD TIE SORTING APPARATUS**
5 Claims, 8 Drawing Figs.

[52] **U.S. Cl.** **209/125;** 214/6
[51] **Int. Cl.** **B07c 7/00**
[50] **Field of Search** 214/6B, 6G, 6K; 209/125, 73, 74

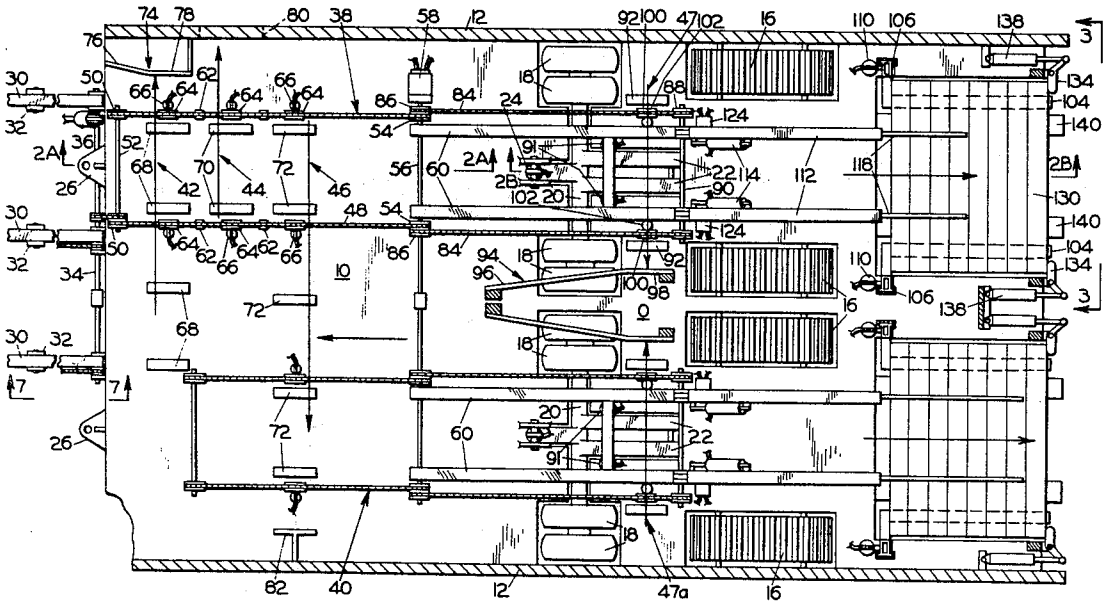
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ABSTRACT: Railroad tie sorting apparatus comprises a wheeled vehicle adapted to be drawn down a railroad right-of-way from which the ties are to be salvaged and sorted. Longitudinal and lateral conveyors mounted on the vehicle receive the ties, sort them into relayable, post grade, and reject categories and eject the rejects from the vehicle. Stacking means forms the relayable and post grade ties into stacks which may be banded and removed from the vehicle by a lift truck.



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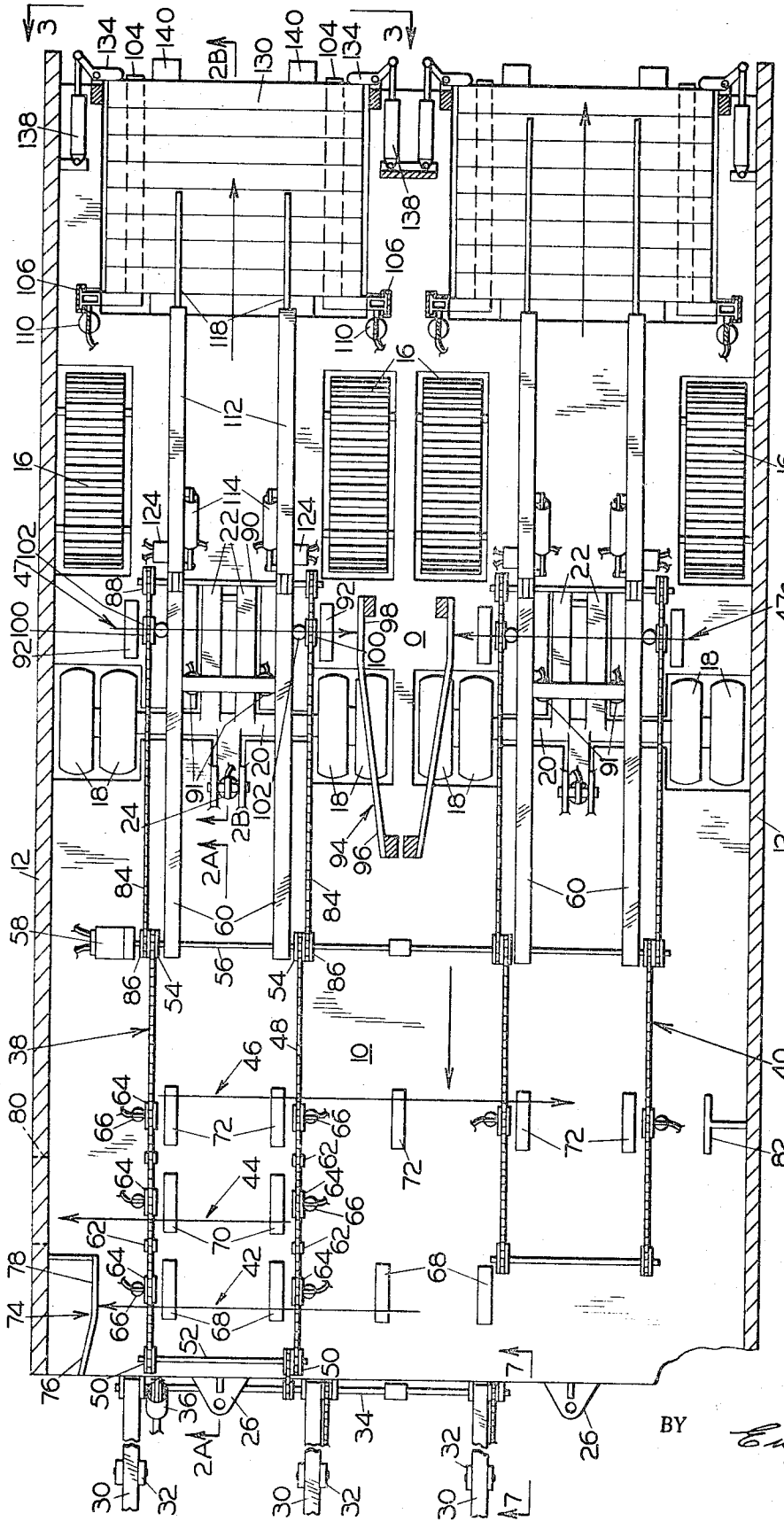


FIG. 1

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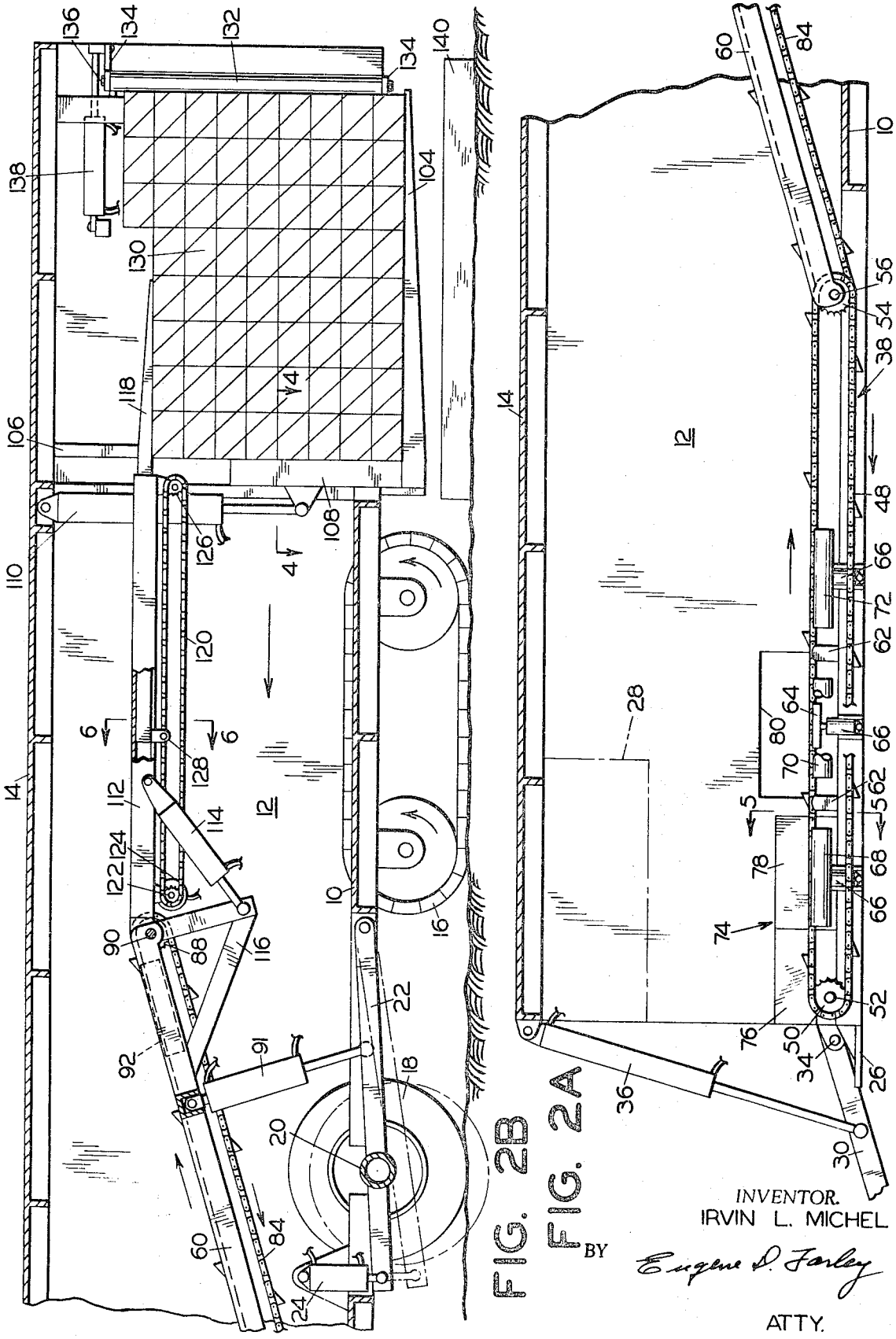


FIG. 2B

FIG. 2A

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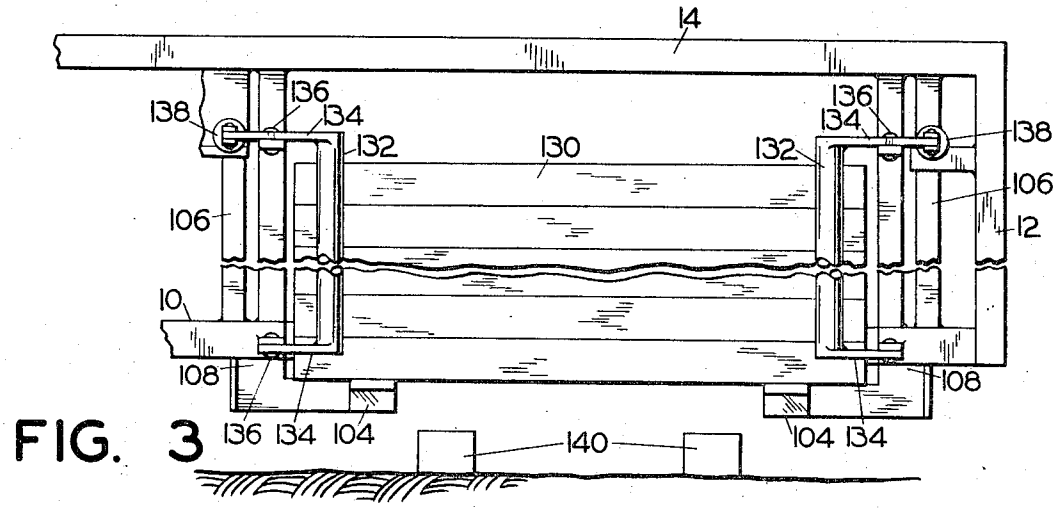
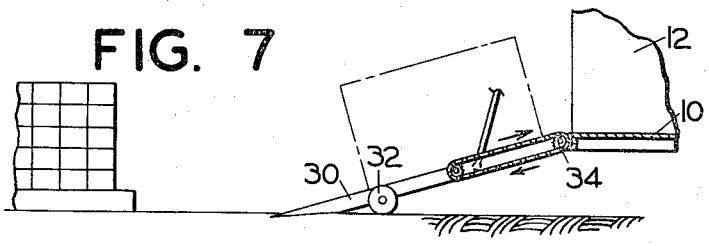


FIG. 3

FIG. 7



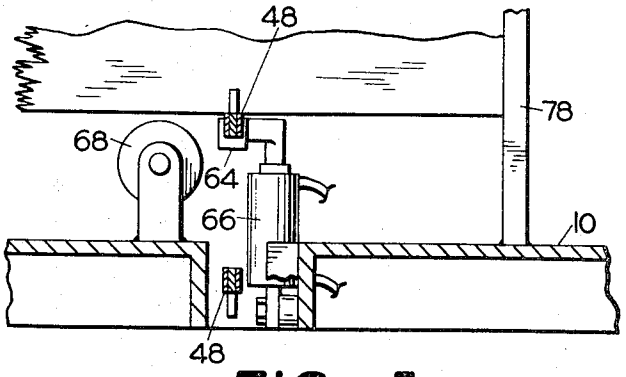


FIG. 5

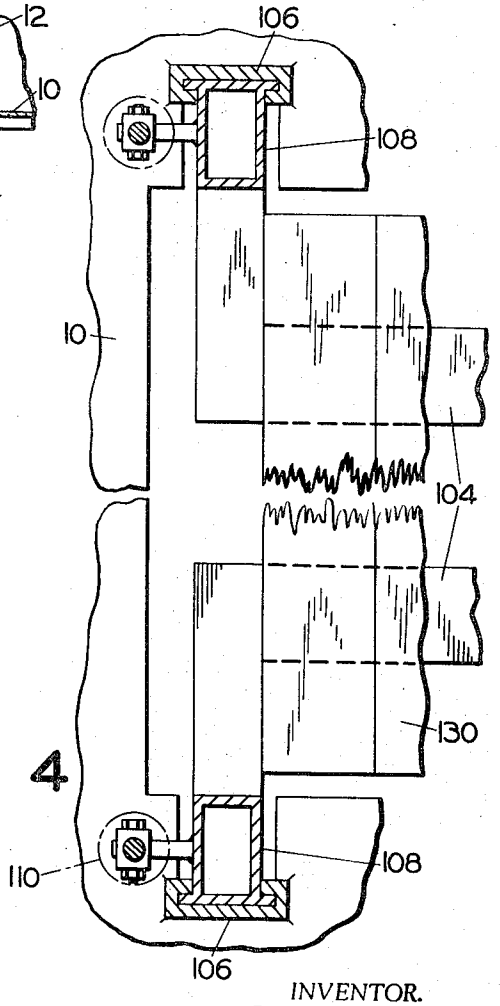


FIG. 4

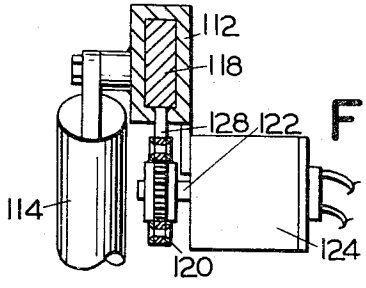


FIG. 6

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RAILROAD TIE SORTING APPARATUS

This invention relates to railroad tie sorting apparatus.

In the past, when the ties of an existing railroad track have been replaced, or when a railroad line has been abandoned, the economical sorting and recovery of the reusable ties has presented a serious problem.

It has been the practice to traverse the right-of-way with a vehicle on which the ties are loaded. All of the ties may be loaded at one time and conveyed to a central station where they are sorted manually into reject grade, fence post grade, and relayable grade categories. In the alternative, three separate traverses of the right-of-way may be made in which each of the foregoing categories is collected separately. In either event, the recovery operation involves a great deal of manual labor and is correspondingly time-consuming and costly.

It is the general purpose of the present invention to provide railroad tie sorting apparatus comprising a wheeled vehicle which may be drawn along the railroad right-of-way and which automatically feeds the ties to a system of longitudinal and lateral conveyors. These sort the ties into reject, post and relayable categories.

It is another important object of the present invention to provide railroad tie sorting apparatus which stacks the reusable classes of recovered ties so that they may be bundled and removed for storage and use at other locations.

Still a further object of the present invention is the provision of railroad tie sorting apparatus which is versatile in that it may be applied to the sorting of diverse classes of used railroad ties as well as to the laying of new railroad ties on the railroad roadbed.

A further object of the present invention is the provision of railroad tie sorting apparatus which may be used as a stationary unit, as one which is self-propelled, or as one which is drawn along the railroad right-of-way.

Still a further object of the present invention is the provision of railroad tie sorting apparatus which is suitable for movement from one work location to another by various means, as by being towed along the highway, or by being hauled on a railroad car or truck.

Still another object of the present invention is the provision of a railroad tie sorting apparatus which will sort all classes of ties in a single, integrated operation, which will handle a high volume of ties in unit time, which is not hazardous to personnel, and which does not require manual lifting of heavy ties.

The manner in which the foregoing and other objects of the invention are accomplished will be apparent from the accompanying specification and claims considered together with the drawings, wherein:

FIG. 1 is a plan view of the herein described railroad tie sorting apparatus, with its roof removed;

FIGS. 2A and 2B are longitudinal sectional views of the apparatus taken along lines 2A–2A and 2B–2B, respectively of FIG. 1;

FIG. 3 is a view in rear elevation of the apparatus looking in the direction of the arrows of line 3–3 of FIG. 1;

FIGS. 4, 5 and 6 are detail, sectional views, taken along lines 4–4, 5–5 and 6–6, respectively, of FIGS. 2A and 2B; and

FIG. 7 is a fragmentary view in side elevation looking in the direction of the arrows of line 7–7 of FIG. 1 and illustrating the infeed of the apparatus.

In its broad aspect, the railroad tie-handling apparatus of my invention includes a wheeled frame adapted to be drawn along a railroad right-of-way from which the used ties have been uprooted and placed along the surface of the ground in the path of travel of the vehicle. The vehicle is provided with feeding means which feeds the ties to a system of longitudinal and lateral conveyors. These sort the ties into reject, post, and relayable grades.

Discharge means are provided for discharging the reject category from the vehicle. Separate tie support means are provided for receiving the post and relayable grades separately from their respective conveyors. Upwardly indexing stacking means cooperate with the support means in stacking the latter

two categories into stacks containing a predetermined number of ties. The stacks then may be banded into bundles which are deposited by the support means onto cross ties or other supports from which the bundles may be picked up by a lift truck or other suitable lifting and conveying mechanism.

Considering the foregoing with particular reference to the drawings:

As shown particularly in FIGS. 1, 2A and 2B, the presently described apparatus is mounted on a wheeled vehicle which may be self-propelled or, preferably, towed or drawn along a railroad right-of-way. The vehicle is of substantial dimensions and, for adaptability to particular operations or for ease in transportation from place to place, may be divided into two longitudinal sections. These may be used or transported separately.

The vehicle thus comprises a substantial frame including a floor **10**, a pair of longitudinal sides **12** and a roof **14**. The roof is elevated sufficiently to accommodate stacks of ties, as well as to provide working room for an operator stationed at a suitable central operator's station, for example, station O of FIG. 1.

The frame is supported for travel over rough terrain such as a dismantled railroad bed by means of caterpillar tracking units indicated collectively at **16**. There may be four such units in alignment laterally across the frame. The units may be idler units, if the apparatus is to be towed, or powered units, if it is to be self-propelled.

While track units **16** are used to support the vehicle as it traverses a railroad roadbed, they are not suitable for use when the vehicle is to be drawn rapidly along a highway. Accordingly there are provided a plurality of pairs of wheels **18** arranged two pairs on each side to accommodate longitudinal division of the vehicle where this is desired.

Provision is made for advancing the wheels into engagement with the ground when they are to be used to support the vehicle and for retracting them when tracks **16** are to be thus used.

To this end, each group of wheels rotatably is mounted on a wheel shaft **20** which in turn is supported on the outer end of a pair of spaced support arms **22**. The inner ends of these pivotally are connected to floor **10**.

An hydraulic cylinder **24** or other suitable motor means pivotally is connected to one of arms **22** intermediate its ends. By its use, the wheel group may be shifted between its full line elevated position of FIG. 2B and its dotted line lowered position of that FIG. It will be noted that in its lowered position it reaches a plane below the plane of tracks **16** so that it lifts the latter clear of the ground when the unit is to be transported.

The wheeled frame and housing thus provided is open at both ends, tunnellike. Its leading end is provided with a pair of drawbars **26** by means of which it may be drawn along the railroad right-of-way using a tractor or other source of drawing power. Power for the various driven units mounted on the wheeled frame may be supplied from a diesel or gasoline motor **28** mounted in a suitable location, as by being suspended from roof **14**, as shown in FIG. 2A.

Feed means are provided for feeding ties to the unit as it is drawn or propelled along the railroad right-of-way.

This means comprises a loading ramp or apron which includes a plurality of longitudinally extending, laterally spaced, loading forks **30** projecting forwardly from the front end of the frame. Any suitable number of forks may thus be employed.

In the illustrated form of the invention there are three, two located in working relation to one longitudinal half of the unit. These are to be used when the unit is employed as a half unit. A third fork is spaced laterally from the other two and located centrally of the other longitudinal half of the unit for use only when the unit is to be employed in its entirety.

The forward ends of the forks are supported by wheel pairs **32** which track along the ground. The inner ends of the forks are fixed to a shaft **34** journaled in bearings mounted on the leading end of the frame.

Shaft **34** is shown as a single element. However, if the frame is to be longitudinally divisible, the shaft as well as other trans-

verse power units illustrated herein, may be made into two segments suitably coupled together in an obvious manner.

The forks may be adjusted between raised and lowered positions by means of an hydraulic cylinder **35**, the piston rod of which is connected to one of the forks and the case of which pivotally is connected to the front of the vehicle frame.

The feed unit including forks **30** feeds a system of longitudinal and lateral conveyors which convey and sort the ties as they progress along the length of the vehicle. The arrangement of the conveyors is shown particularly in FIG. **1**.

As shown in that figure, a first longitudinal conveyor, illustrated collectively at **38**, extends along one of the longitudinal halves of the unit substantially to its midpoint. A second longitudinal conveyor, indicated collectively at **40**, extends along the other of the longitudinal halves of the unit substantially to the midpoint.

A series of five lateral conveyors indicated collectively at **42, 44, 46, 47**, and **47*a*** respectively are arranged parallel to each other at spaced, longitudinal intervals. They intercept one or both of longitudinal conveyors **38, 40**.

The direction of motion of the entire unit is to the left as viewed in FIG. **1**. The drives associated with the respective conveyors is such that conveyors **38** and **40** move parallel to each other longitudinally toward the rear of the machine; conveyors **42, 44, 47*a*** move laterally parallel to each other in the direction of the right side of the machine; and conveyors **46** and **47** move laterally parallel to conveyors **42, 44, 47*a*** but to the left side of the machine.

Conveyors **38** and **40** may be substantially identical in construction. Accordingly the construction of conveyor **38** only is described herein.

The conveyor comprises a pair of endless chains **48**, FIGS. **1** and **2A**, which mesh with sprockets **50** keyed to an idler shaft **52** at their upstream end and sprockets **54** keyed to a drive shaft **56** at their upper end. Shaft **56** is powered by an hydraulic motor **58** and is supported in bearings mounted on the upstream ends of longitudinally extending parallel arms **60**.

The upper stretches of chains **48** are guided by stationary guides **62**. They are guided further by guides **64** which are shiftable between raised and lowered positions. To this end they are mounted as offset crossheads on cylinder **66**. Thus raising and lowering of movable guides **64** correspondingly raises and lowers the upper stretches of chains **48**.

This action is used in transferring ties carried by chains **48** to selected ones of lateral conveyors **42, 44, 46**.

The lateral conveyors comprise spaced live rolls arranged and driven in a direction of propelling motion at right angles to the direction of drive of longitudinal conveyors **38, 40**.

To this end, lateral conveyor **42** comprises a sequence of four powered rollers, indicated at **68**. These extend almost completely across the apparatus. They intercept the extensions of the longitudinal axes of all three forks **30**.

Lateral conveyor **44** comprises a pair of drive rolls **70** arranged to intercept the extensions of the longitudinal axes of the right-hand two only of forks **30**. They also intercept conveyor **38**.

Lateral conveyor **46** comprises a sequence of five spaced live rolls **72**. These are arranged to intercept both the extensions of the longitudinal axes of all three of forks **30**, as well as both of longitudinal conveyors **38, 40**.

The drives of rolls **68, 70** comprising lateral conveyors **42, 44** are to the right, while the drive of rolls **72** of lateral conveyor **46** is to the left, when viewed facing in the direction of travel of the vehicle.

It is to be noted further that lateral conveyor **42** has for its target a combination guide and abutment element **74**. This member has for its function aligning the ends of the ties so that they are perfectly arranged for stacking.

For this purpose, combination guide and abutment element **74** is comprised of a guide section **76** which aligns ties introduced onto the conveyor in positions which are too far to the right. Abutment section **78** serves as a target for ties conveyed on lateral conveyor **42** and which otherwise would be located too far to the left.

Lateral conveyor **44** has for its target a window **80** in the sidewall of the vehicle. This provides an aperture through which rejected ties are ejected from the unit by operation of the conveyor.

Conveyor **46** has for its target an abutment **82** which aligns the ties with respect to their travel along conveyor **40**.

Conveyors **38** and **40** include adjustable elevating sections which have for their function elevating the ties in indexed vertical increments as required to stack them.

Thus the upwardly inclined section of longitudinal conveyor **38** includes arms **60** which support drive shaft **56**, above referred to. It also includes a pair of parallel, longitudinally extending endless chains **84** which serve as extensions of chains **48**. At their downstream ends, the chains engage a pair of drive sprockets **86** keyed to drive shaft **56**. At their upstream ends they engage a pair of idler sprockets **88** which are fixed to idler shaft **90**.

The upper ends of support arms **60** also are mounted pivotally on idler shaft **90**. They are indexed upwardly by means of hydraulic cylinder **91**.

Chains **84** intercept lateral conveyor **47**. This conveyor has for its function aligning ties which may have become disarranged on the conveying system so that the ties may be stacked in proper registration to each other. It consists of a pair of spaced drive rolls **92** arranged at substantially right angles to chains **84**.

These rolls have as their target a combination guide and abutment member **94**. This member includes a guide **96** which guides any misaligned ties inwardly, and an abutment **98** against which the ties are driven by lateral conveyor **47** to align them.

Combination guide and elevating means are provided for raising and lowering the working stretches of chains **84** as required to transfer the ties to lateral conveyor **47** momentarily for aligning.

Such means comprise U-shaped guides **100** mounted as offset crossheads on hydraulic cylinder **102**. Extension of the cylinders raises the guides so that the chain stretches which they support are elevated sufficiently to remove the ties from contact with rollers **92**. Retracting the cylinders lowers the upper stretches of the chain so that the ties will contact rollers **92** when they are to serve their tie-aligning function.

Conveyors **38, 40** discharge the ties in aligned condition on indexing support and stacking means which aggregate the ties into a stack which may be bundled and discharged from the machine.

The support means employed for this purpose comprise a pair of inwardly offset forks **104**, FIGS. **2B** and **4**. The forks extend rearwardly of the vehicle and are of sufficient length to accommodate a stack containing the desired number of ties.

The inner ends of the forks are fixed to slides **108**. The slides work in vertical guides **106** fixed to the frame of the vehicle.

The forks are supported and moved by means of a pair of vertically arranged hydraulic cylinders **110**. The bases of these pivotally are mounted on roof **14**. Their piston rods are connected to slides **108**.

The construction of the stacking means employed for stacking the ties on forks **104** is illustrated particularly in FIGS. **2B** and **6**.

A pair of horizontal, hollow slide bars **112** communicates with chains **84** and in effect form longitudinal extensions of conveyor **38**. The downstream ends of slide bars **112** pivotally are connected to and supported by idler shaft **90**. They are supported by a pair of hydraulic cylinders **114**, the cases of which are pivoted to the slide bars and the piston rods of which are pivoted to brackets **116** which, in turn, depend from shaft **90**.

The undersides of hollow slide bars **112** are slotted. The bars house tongues **118** which deposit the ties on forks **104** and the superimposed stack. To this end tongues **118** may be extended and retracted in indexed increments.

The drive employed for this purpose comprises a pair of endless chains **120**, one associated with each of the tongues.

The downstream ends of the chains engage sprockets on a drive shaft 122. This is driven at a predetermined speed by an indexing, reversible, hydraulic motor 124.

The downstream ends of chains 120 engage idler sprockets mounted on an idler shaft and sprocket assembly 126. Connecting lugs 128 interconnect the inner ends of tongues 118 and chains 120.

Thus, as the ties are crowded along slide bars 112, they are transferred to tongues 118 which deposit them either on support forks 104 or on the superimposed ties in correct stacking registration with each other. In this manner a stack of ties 130 is built up on supports 104.

The trailing end of stack 130 is aligned by a pair of vertical gate members, the construction of which is shown in FIGS. 1, 2B and 3.

The gate members comprise a pair of vertically arranged flat tubes or bars 132 of substantial construction. The ends of the bars are connected to lever arms 134. These are pivoted to vertical frame members by means of pivot pins 136.

Upper lever arms 134 have extensions which are connected to the piston rods of hydraulic cylinders 138. Extension and retraction of the cylinders accordingly will move gates 132 between their closed and opened positions.

OPERATION

The operation of the herein described railroad tie sorting apparatus is as follows:

The entire unit in its FIG. 1 assembled position is self-propelled, or connected to a tractor and drawn, along a railroad roadbed from which the ties have been dislodged and laid in roughly aligned transverse positions. As the vehicle progresses, the ties are driven up feed forks 30 onto conveyor 42 which transfer them to chains 48 of conveyor 38. As they are pushed onto the chains, the ends of the ties which are misaligned to the right engage guide plate 76 which correctly aligns them. Any ties which are picked up by the two left-hand feed forks 30 are conveyed laterally against abutment 78 by lateral conveyor 42, thereby aligning them also.

The ties having their ends aligned next traverse lateral conveyor 44. This operates at the will of the operator to discharge any reject grade ties through port 80.

The remaining, salvageable ties continue along the conveyor until they are transferred to chains 84. These elevate the ties to an elevation determined by the setting of cylinders 94. The ties continue their progress until they reach guide and abutment unit 94.

The guiding section 96 of this unit guides any ties which are misaligned to the left into proper position. Operation of lateral conveyor 47 drives the ties against abutment 98, thereby realigning any ties which may have become misaligned to the right.

Further progress of the ties transfers them to slide bars 112 which house stacking tongues 118. As noted above, these have for their function depositing ties in proper stacked relation to each other on support forks 104.

At the commencement of operation, the support forks are indexed upwardly by operation of cylinders 110, and stacking tongues 118 are indexed downwardly by operation of cylinders 91 and 114 so that, with tongues 118 fully extended, the very first tie is deposited at the outer end of support forks 104. Here it is restrained from premature discharge by means of adjustable gates 132 which are controlled by the operation of cylinders 114 and which are in their closed position.

When the next succeeding tie comes along, stacking tongues 118 are indexed inwardly an increment equal to the width of one tie. This sequence is repeated until the bottom row of ties has been stacked.

Thereupon forks 104 are indexed downwardly by the height of one tie tier, stacking tongues 118 extended fully, and the process repeated until the second tier has been completed. This procedure is repeated until forks 104 have been indexed downwardly as far as they can go. Thereafter additional tiers are superimposed by indexing upwardly slide bars 112 and stacking tongues 118 which they house by adjustment of cylinders 91 and 114.

When the stack has been completed, the forward progress of the vehicle is arrested and a pair of spaced crossties 140 placed beneath the stack. Support arms 104 then are lowered until the stack has been transferred to the crossties.

Forward motion of the vehicle thereupon continues leaving the completed stack behind. The stack is banded and transferred to its intended use.

Where reusable ties of two categories are present, as is the case when there are both relayable ties and post grade ties, these two categories are sorted from each other by use of conveyor line 40.

In the first instance, the ties are all transferred to and arranged on conveyor line 38. However, as the ties of one category, for example, post grade ties, traverse lateral conveyor 46, the operator actuates this conveyor which conveys the post grade ties laterally to the left until they abut against abutment 82.

This places them squarely over conveyor 40 which is an essential duplication of conveyor 38. It transfers the post grade ties to a separate stacking unit which stacks and discharges them from the vehicle in the same manner as has been described above in connection with the relayable ties.

If desired, the apparatus may be used to lay new ties along a railroad right-of-way. At the present time this is done manually with expenditure of great labor.

Where it is to be accomplished by the described apparatus, stacks or bundles of new ties are mounted on an apron including feed forks 30 in the manner illustrated in FIG. 7. The entire stack then is transferred to conveyor 30 and the ties manually laid on the conveyor chains.

The unit then progresses along the right-of-way with support forks 104 and stacking tongues 118 substantially aligned with each other and with gate bars 132 in their open position. When the ties reach the rear end of the apparatus, they will be discharged along the right-of-way at a spacing determined by the speed of the vehicle.

When the apparatus is to be transported from one place to another, wheels 18 are lowered by means of cylinders 24 until tracks 16 clear the ground. It then may be towed to the new location. In the alternative, the unit may be so constructed that it may be divided into two longitudinal halves, each of which is transported separately by towing, by being placed on a railroad car, or by being loaded on a truck.

It is to be understood that the form of my invention herein shown and described is to be taken as an illustrative example of the same and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of my invention or the scope of the subjoined claims.

I claim:

1. Railroad tie handling apparatus comprising:
   a. a frame;
   b. longitudinal conveyor means extending from the front of the frame to a central station thereon and adapted to transport transversely arranged ties one by one to said central station;
   c. lateral conveyor means intercepting the longitudinal conveyor means and communicating with a discharge station at the side of the frame;
   d. tie transfer means associated with the conveyor means for transferring selected ties to the lateral conveyor;
   e. tie support means arranged to receive ties from the longitudinal conveyor;
   f. upwardly indexing tie stacking means positioned for stacking the ties on the support means; and
   g. second longitudinal conveyor means, support means and stacking means positioned in spaced alignment with the first and including second lateral conveyor means for conveying selected ties thereto.

2. The railroad tie handling apparatus of claim 1 wherein the stacking means includes a pair of horizontal, rearwardly

extending support forks, vertical guide means, slide means mounting the forks on the guide means, and motor means connected to the slide means for indexing the forks vertically one tie tier at a time.

3. The railroad tie handling apparatus of claim 1 wherein the stacking means includes a pair of longitudinally arranged hollow slide bars, a pair of stacking tongues slidably mounted within the slide bars, indexing drive means for indexing the tongues inwardly the width of one tie at a time, and indexing lifting means for lifting the slide bars vertically one tie tier at a time.

4. The railroad tie handling apparatus of claim 1 wherein the stacking means includes a pair of vertical gate bars, pivotally mounted lever means supporting the gate bars between open and closed positions, and motor means connected to the lever means for adjusting the gate bars between such positions.

5. The railroad tie handling apparatus of claim 1 wherein the frame includes a plurality of spaced caterpillar-type tracks for supporting the frame as it traverse the railroad roadbed, and a plurality of support wheels, pivoting support arms mounting the wheels, and motor means for adjusting the wheels between a retracted position, and an extended position wherein they are lowered to a plane at which they support the apparatus with the tracks lifted from the ground.