July 11, 1961 W. H. KNIPPEL ET AL 2,991,725

RAILWAY TIE SPACER

Filed Oct. 30, 1957

6 Sheets-Sheet 1

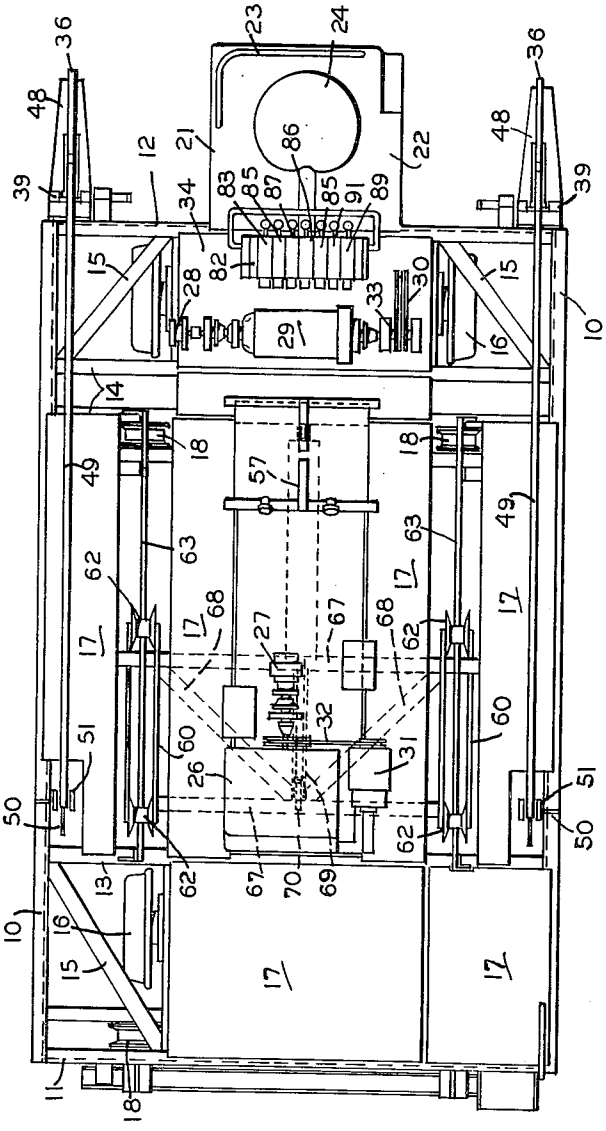


Fig. 1.

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6 Sheets-Sheet 2

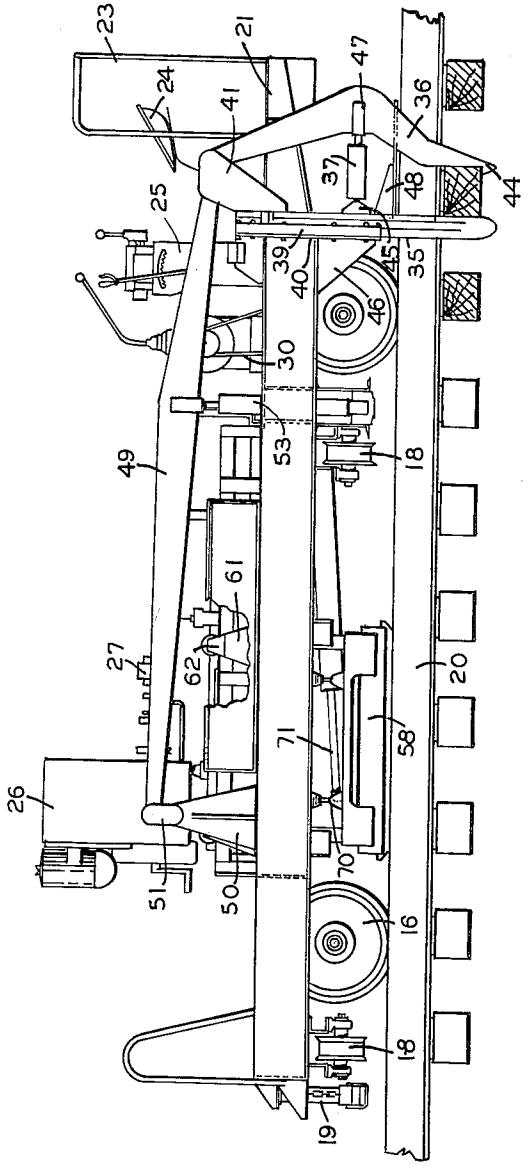


Fig. 2.

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6 Sheets-Sheet 3

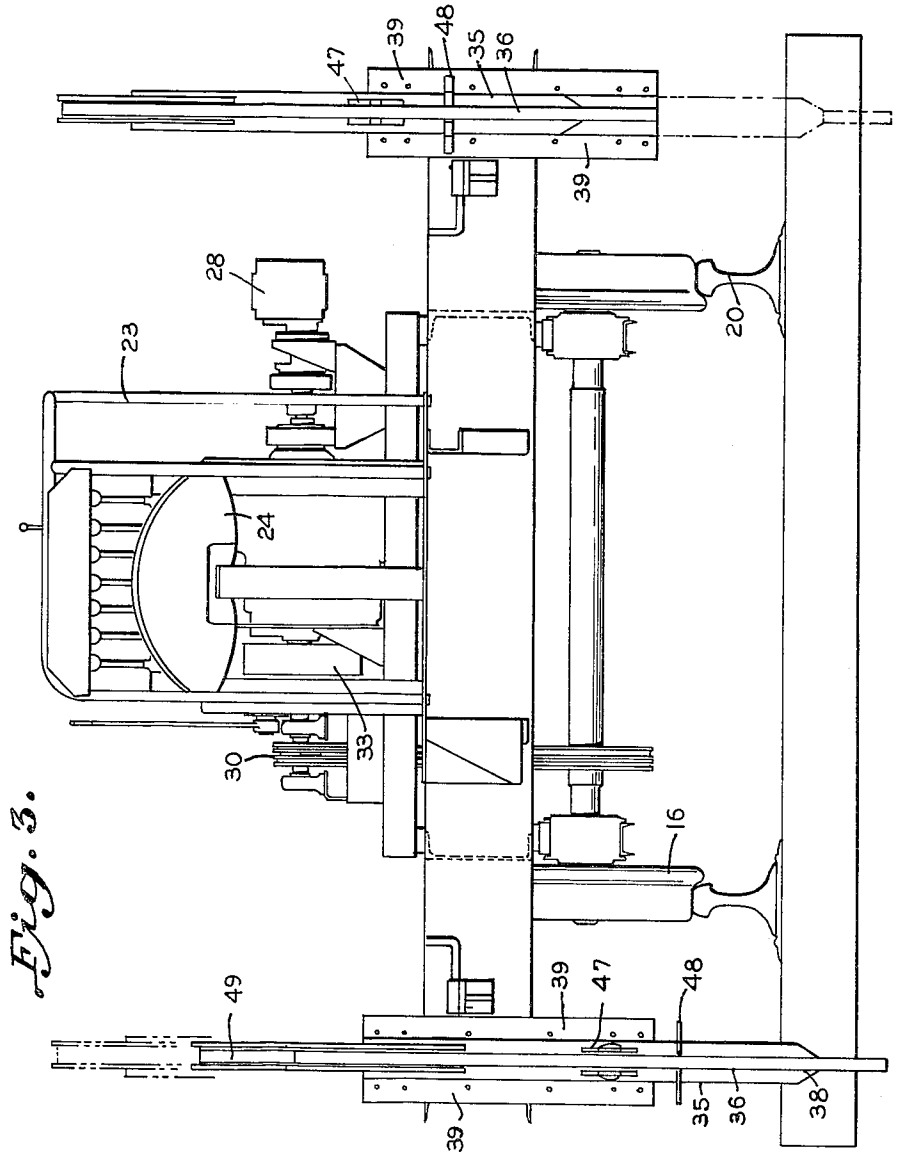


Fig. 3.

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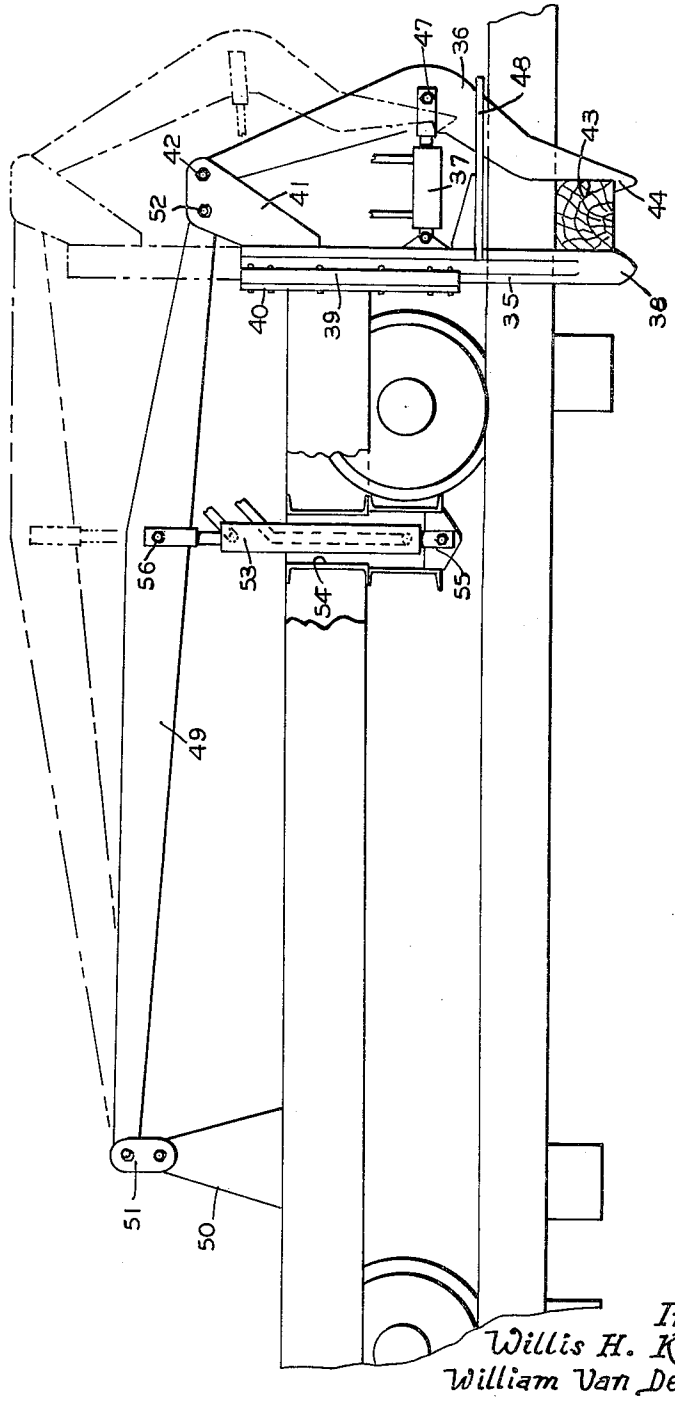


Fig. 4.

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RAILWAY TIE SPACER

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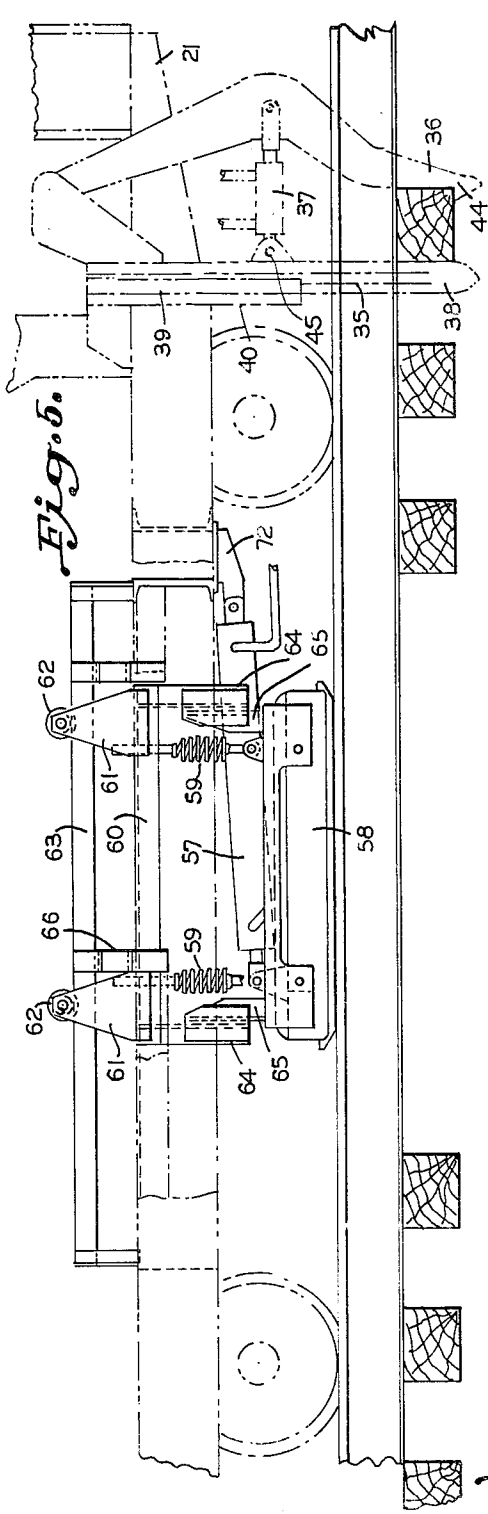


Fig. 6.

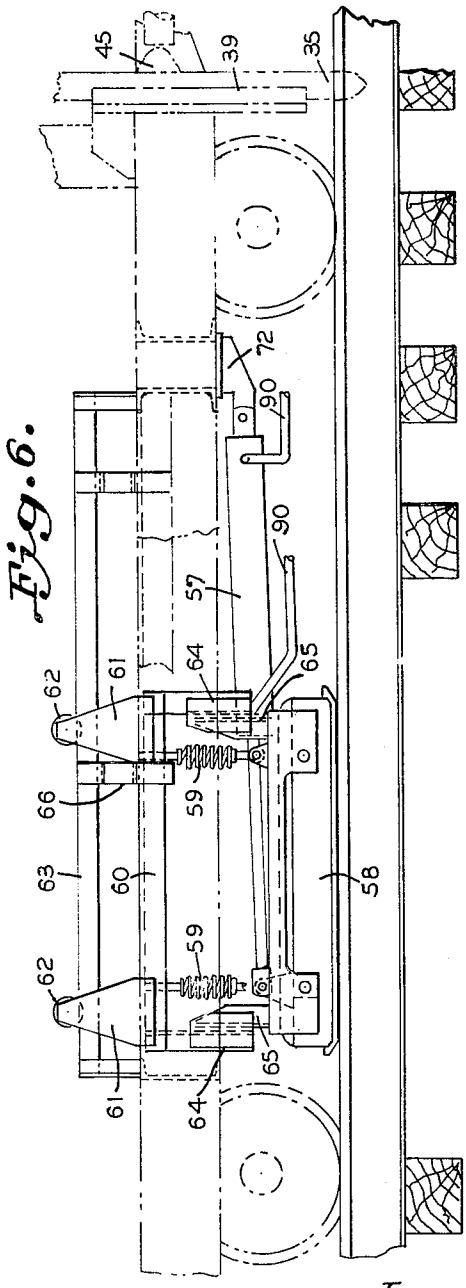


Fig. 6.

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RAILWAY TIE SPACER

Filed Oct. 30, 1957 6 Sheets-Sheet 6

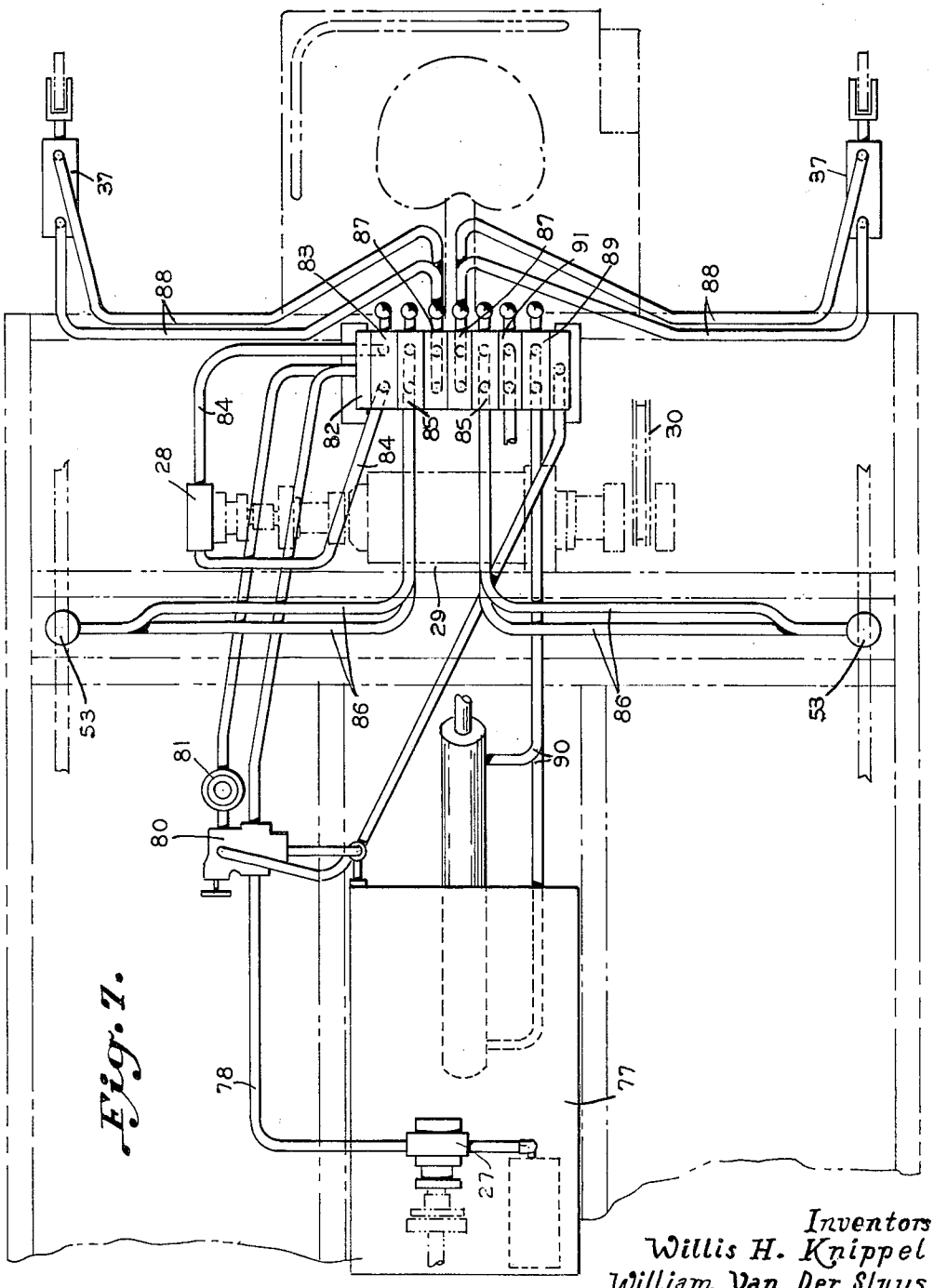


Fig. 7.

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United States Patent Office 2,991,725 Patented July 11, 1961

2,991,725

RAILWAY TIE SPACER

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Filed Oct. 30, 1957, Ser. No. 693,378
7 Claims. (Cl. 104—9)

This invention relates to a self-powered machine for positioning railroad crossties.

The principal object of the invention is the provision of a self-propelled railroad tie spacer which will nip and raise the ties to the underside of the track level, hold the ties for spiking, straighten skewed ties, position the ties, and which can be moved by increments in either direction for accurate positioning of the ties.

An important object of the invention is to provide a railway tie spacer having an anchor assembly and a main frame including tong assemblies movable relatively to the anchor assembly adapted automatically to square each tie in the roadbed with respect to the rails by the operation of the tong assembly.

Another object of the invention is the provision of a railway tie spacer having tie-engaging tong assemblies mounted on the main frame of the machine and having an anchor assembly suspended from the frame with the main frame and associated tong assemblies movable relatively to the anchor assembly.

A further object of the invention is to provide a railway tie spacer having magnetic track shoes affording fixed anchorages to provide a basing point for a relatively movable main frame and tong assembly to move in either direction.

A still further object of the invention is the provision of a railway tie spacer having pairs of tongs operable either simultaneously or independently and each including a vertically sliding tong and a pivotally mounted tong.

A further and more specific object of the invention is to provide a railway tie spacer having a pair of tie-engaging tong assemblies at each side of the machine including a vertically sliding tong and a pivoted tong member with the assemblies each suspended from a tong elevating beam and operable simultaneously or independently.

The foregoing and other objects of the invention are attained by the structure and arrangement illustrated in the accompanying drawings wherein:

FIGURE 1 is a general plan view of a railway tie spacer machine constructed in accordance with this invention;

FIGURE 2 is a general side elevational view of the machine showing the tongs engaged with a crosstie and holding the tie against the underside of the rail;

FIGURE 3 is a general end elevational view of the machine;

FIGURE 4 is a detailed side elevational view of the elevating beam arrangement for a tong assembly;

FIGURES 5 and 6 are detailed side elevational views of the machine showing the trolley suspended anchor mechanism with the main frame and associated tong assemblies in the retracted position in FIGURE 5 and in the maximum extended position in FIGURE 6; and

FIGURE 7 is a diagrammatic illustration of the hydraulic circuits and controls for the operation of the machine.

Maintenance of railway track and the laying of new track involves manipulation of the crossties which must be loosened or freed from the rails and then relocated

and respiked in the case of old ties and in the event new ties are used they must be positioned and spiked as would be required in the laying of new track or in replacing old ties. The crossties must be located in properly spaced relation along the track and spiked thereto and during the spiking operation the ties must be held nipped firmly against the underside of the rail bases and disposed directly at right angles to the rails. The crossties to be replaced or reworked usually are disarranged and extend under the track in an improperly spaced relation and in positions at an angle relative to the positions required when properly secured to the track and proper spacing and positioning of the ties necessitates extensive manipulation of the ties. The apparatus of the present invention accomplishes all of the handling movements necessary to bring each crosstie to the desired position at its required location without the necessity for any manual handling. The apparatus functions rapidly, positively and simply and comprises a self-propelled machine running on the rails supported by the crossties and having two tong assemblies carried outwardly of one end of the machine and located adjacent to each side for engaging a crosstie at spaced points. The assemblies each consist of a vertically sliding tong and a pivoted tong suspended from an elevating beam adapted to move the assemblies vertically independently of each other so that either one or both ends of a tie may be clamped for manipulation. The tong assemblies and elevating beams are mounted on the main frame of the machine and are movable therewith relative to an electro-magnetic rail anchor apparatus suspended from the frame. The lifting of the elevating beams, the clamping action of the tongs and the relative movement of the frame with respect to the anchor mechanism are all accomplished by means of hydraulically-actuated cylinders.

In the drawings the main frame of the railway tie spacing machine is shown as comprised of longitudinal beams **10** forming the side supporting sills of the structure and which are connected by transverse end sill beams **11** and **12** and intermediate crossbeams **13** and **14**. The crossbeam **14** is comprised of a pair of beams arranged back to back in spaced relation and at the four corners of the frame diagonal brace members **15** connect the end sill beams with the side sill beams where the crossbeams **13** and **14** join therewith and thereby greatly rigidify the rectangular frame structure. The main frame is supported on inboard type wheels and axles **16**. Tread plates **17** are mounted on the upper surfaces of the various beam members forming the main frame as best shown in FIGURE 1. Setoff wheels **18** are provided to enable the machine to be set off of main line rails to permit passage of trains while working under traffic conditions and hydraulic jacks such as **19** (see FIGURE 2) are provided to raise the machine from the rails **20** and enable temporary setoff rails to be placed under the setoff wheels so that the machine can then be rolled off the main line.

At one end of the machine an extended platform **21** is provided which projects outwardly of the end sill **12** and has a tread plate **22** coincident with the level of the tread plates **17**. The platform is for the operator of the tie spacing machine and contains a guard railing **23** which is disposed in back of and on one side of the operator's seat **24**. The entire main frame and operator's platform are all secured and integrated by welding. A control stand **25** is provided on the machine adjacent to the operator's platform **21** and convenient to the seat **24** for ready accessibility to the operator of the hydraulic controls for actuating the machine and is

welded to the framing. An internal combustion engine 26 provides power for propelling the machine and drives a hydraulic pump 27 which provides power for the hydraulic system for operation of the tie spacing devices as hereinafter more fully referred to and for the propulsion of the machine by means of a hydraulic motor 28. The final drive is through a selective speed transmission 29 and flexible chain and sprocket connection 30 to the axle of one of the wheel and axle assemblies 16. The engine 26 also drives a generator 31 by means of a belt 32 to provide the current for operating the magnetic track shoes hereinafter described. The transmission shaft contains a brake drum 33 for cooperation with brake mechanism (not shown) to provide for regular braking as well as parking and emergency service. The entire drive train including the hydraulic motor 28, transmission 29, brake drum 33 and the driving sprocket of the drive 30 is assembled as a unit on a base plate 34 which is bolted to the main frame with provision for adjustment of the tension of the driving chain.

The tie spacing devices comprise the tong assemblies which are located at the operator's end of the machine and are disposed upon opposite sides of the operator's platform where the operator has a clear view of the position of the crosstie and the respective tong assemblies. The tong assemblies each include a vertically sliding tong 35 and a pivoted tong 36 operatively connected by an actuating or clamping cylinder 37 which serves to clamp the tie between the tongs and to release the engagement of the tongs with the tie. The tong assembly at each side of the machine is located outside of the adjacent rail 20. The sliding tong 35 is provided with a bottom spear portion 38 which is hardened to withstand the wear of repeated penetration of the ballast and is guided vertically through guide plates 39 which are bolted to a support plate 40 welded to the main frame as best indicated in FIGURES 2 and 4. A gusset plate 46 reinforces the connection of the support plate to the frame. Each sliding tong is provided adjacent its top portion with a pivot bracket comprised of a pair of spaced plates 41 secured thereto by welding and which provide for the pivotal attachment of the tong 36 and the lifting beam for the tong assembly.

The pivoted tong 36 is mounted in the bracket 41 on pivot bolt 42 and is suspended therefrom for a joint vertical movement with the sliding tong 35. The lower portion of the pivoted tong is provided with a vertical face 43 parallel to the opposing face of the sliding tong and between which the crosstie is adapted to be clamped. The lower end of tong 36 is formed with a hooked portion 44 which also is hardened to withstand the wear of repeated penetrations of the ballast and provides a supporting surface for the tie adapted to be utilized in raising the crosstie and nipping it against the underside of the rail base for spiking. The tongs 35 and 36 are actuated to clamp the crosstie by the hydraulically-operated clamping cylinder 37 which is mounted in a pivot bracket 45 welded to the tong 35 and the cylinder rod is provided with a jaw or clevis member 47 pivotally connected with the tong 36 intermediate its ends. The tong members 35 and 36 are maintained in alignment by means of a bifurcated slide guide bracket 48 which is welded to the tong 35 and extends outwardly upon opposite sides of the tong 36 to provide a positive guide therefor throughout the full range of movement of the pivoted tong to keep the two tongs always in the same operating plane with the clamping force of the pivoted tong directed toward the sliding tong.

The clamping cylinder 37 provides the actuating force for operating the pivoted tong relative to the sliding tong in clamping the tie for handling either in positioning or lifting the tie and to release the clamping force when the tie has been placed. The vertical movement of the sliding tong 35 and consequently the tong assembly since the pivoted tong 36 is suspended from the bracket 41 on the sliding tong is obtained by means of the elevating beam 49. The tong elevating beam 49 is of substantial length and is connected at one end to an upright pedestal structure 50 welded to the main frame of the machine and upstanding therefrom. The connection of the beam to the pedestal is through the medium of links 51 which provide a pivotal connection and afford some longitudinal movement of the beam as it is elevated whereby the lifting movement of the sliding tong 35 may be maintained in a directly vertical line. The opposite end of the beam 49 is pivotally connected to the bracket 41 as by pivot bolt 52 to provide a lifting connection to the tong assembly. The lifting force for each beam 49 and the respectively associated tong assembly is provided by hydraulically-actuated elevating cylinder 53 which is disposed vertically and mounted in a well 54 (see FIGURE 4) in the main frame of the machine. The cylinder is pivotally mounted on a saddle 55 in the bottom of the well and the piston mount of the cylinder is pivotally connected at 56 to the elevating beam at a point intermediate its ends whereby the force of the cylinder is exerted vertically to lift the beam and raise the associated tong assembly.

Propulsion of the machine during normal travel to or from a work location is had by means of the hydraulic motor 28 through the transmission 29 and drive 30 to the axle but for tie spacing operations the propelling force is provided either by the motor 28 for propelling the machine from tie to tie or by a single hydraulic cylinder 57 which reacts between the main frame of the machine and an anchor device securely held to the rails by means of electro-magnetic track shoes to move the machine from one tie to the next and to space each successive tie relative to the preceding one. The track shoes 58 are each suspended by means of springs 59 from a trolley 60 which is supported for relative longitudinal rolling movement with respect to the main frame by means of brackets 61 and trolley wheels 62 running on a trolley rail 63 adjacent to each side of the machine and in vertical alignment with the respective tracks 20. The trolleys 60 each have vertically disposed depending guide brackets 64 which are disposed in opposed relation to upstanding brackets 65 on the track shoes and which serve to take the reaction forces between the trolley and track shoe resulting from the operation of the hydraulic cylinder 57 and prevent relative longitudinal displacement as well as to prevent relative transverse movement thereby maintaining the shoes 58 in alignment with the tracks 20. Relative longitudinal movement between the main frame of the machine and the trolleys is limited by stop member 66 as best shown in FIGURES 5 and 6 and which serves to limit relative movement in either direction. The track shoes 58 are connected transversely by beams 67 which are braced by diagonals 68 and a longitudinal center strut 69. A pivot bracket 70 is provided at the convergence of the diagonals 68 with the transverse beams 67 and affords a pivot connection for the piston rod 71 of the spacing cylinder 57 which is pivotally connected at its opposite end to a bracket 72 on the main frame. When the track shoes are energized by the generator 31 they magnetically clamp the tracks 20 and frictionally prevent any relative movement therebetween and fixedly anchor the connecting frame structure 67, 68 and 69 against displacement thus providing a rigid base against which the spacing cylinder 57 is adapted to exert forces to advance and retract the entire frame and the associated tong assemblies relative to the trolleys 60 and the track shoes 58 with their connecting framework whereby the crossties are positioned by the movement of the main frame relative to this anchor structure.

The elevating beams 49 may be raised individually by the respective cylinders 53 or operated simultaneously by means of the controls and the cylinders 37 actuating the tongs 35 and 36 at either side of the machine may be

operated separately or simultaneously by means of the controls in clamping the crossties whereby a tie may be manipulated at one end or at both ends for straightening from a skewed position or bodily moved to a properly spaced position. The hydraulic circuit for operating the various cylinders 37, 53 and 57 as well as the hydraulic motor 28 is shown in FIGURE 7 wherein the engine-driven hydraulic pump 27 drawing hydraulic fluid from a reservoir 77 provides hydraulic pressure for the system. When the pump driven by the engine is operating and none of the various hydraulic devices are being used the fluid flows from the pump 27 through circuit 78 to a vented relief valve 80 used in conjunction with an accumulator 81 and back to the reservoir 77 through a circuit 79. In operation the fluid is directed to an inlet section 82 of a hydraulic control valve assembly which is mounted on the machine in a location readily accessible to the operator's position adjacent to the seat 24 and which contains the valves for operating all the hydraulic cylinders and the motor comprising seven three-positions sixway valves provided with respectively associated circuits connected with the various cylinders and the motor. An open center valve 83 with circuit 84 controls the operation of the motor 28. A closed center valve 85 with associated circuit 86 controls the operation of each of the elevating cylinders 53. Closed center valves 87 with circuits 88 control operation of the respectively associated clamping cylinders 37 while closed center valve 89 with its associated circuit 90 controls the operation of the spacing cylinder 57. The closed center valve 91 effects the actuation of the setoff cylinders 91. Thus all of the controls for effecting the manipulation of the crossties are located where they may be actuated by the operator from his position where he can see both of the tong assemblies and the crosstie for proper positioning.

In the operation of the machine to manipulate the crossties for proper spacing and positioning the operator brings the machine to a position where the vertically sliding tong 35 is disposed adjacent to and above one side of the crosstie to be handled and the tong assembly is then lowered by means of the cylinder 53 after which the pivoted tong 36 is brought into engagement with the other side of the crosstie to clamp the tie against the tong 35 by means of the cylinder 37 and the tie may then be nipped against the underside of the rail 20 with the hook 44 supporting the tie for spiking. The tong assembly at either side of the machine may be thus operated to manipulate one end of the crosstie or the operator may engage both tong assemblies with the tie to remove the tie bodily or nip it against the rail for spiking at both ends. When the machine is brought up to a crosstie to be positioned the rail anchor device comprised of the clamping shoes 58 and the connecting members 67, 68, 69 and 70 is clamped to the rails 20 to provide a base point from which to work in properly spacing the tie. The main frame of the machine with the associated tong assemblies may be moved relatively to the anchoring device in either direction by means of the cylinder 57 to bring the tie into the required position.

Thus the machine of this invention affords a tie spacing mechanism which may be utilized to straighten skewed ties, to position the ties, to nip the ties to the underside of the track level, to hold the ties against the underside of the rails for spiking, which may be moved by increments in either direction for accurate positioning of the ties and which is self-propelled in either direction to the work site and wherein all of these functions are performed hydraulically and wherein also the machine is movable relatively to an anchor device carried thereby during the straightening and positioning operations.

What is claimed is:

1. In a machine for positioning a crosstie under the rails of a railway the combination including a wheel-supported main frame having an engine driving a hydraulic pump, vertically sliding tong mechanism including a vertical tong member and means confining said vertical tong member for movement only in a vertical direction in fixed relationship to said frame and a tong member pivotally mounted from said vertical tong member for clamping said crosstie, an anchor device carried by said frame having means operable into clamping engagement with said rails to provide a base point for positioning said crosstie, and a hydraulic cylinder actuated by fluid pressure generated by said pump operatively connected between said anchor device and the frame to move said frame for positioning said tie.

2. In a machine for positioning a crosstie under the rails of a railway the combination including a wheel-supported main frame, rail fastening means suspended from the frame and movable longitudinally thereof, means connected to and reacting between said frame and the fastening means for moving said frame along the rails relative to said fastening means, a tong assembly for making clamping engagement with a crosstie including a first tong guided directly on said frame for movement only in a vertical direction in fixed relationship to the frame and a second tong pivotally related to said first tong for vertical movement therewith, and power means operatively connected to said second tong for swinging said second tong relatively to said first tong into and out of clamping engagement with a crosstie straddled by said assembly.

3. In a machine for positioning a crosstie under the rails of a railway the combination including a main frame, a rail-engaging wheel assembly supporting the frame at each opposite end thereof, rail fastening means suspended from the frame and movable longitudinally thereof, means connected to and reacting between said frame and the fastening means for moving said frame along the rails relative to said fastening means, a tong assembly for making clamping engagement with a crosstie including a first tong guided directly on said frame for movement only in a vertical direction in fixed relationship to the frame and a second tong pivotally related to said first tong for vertical movement therewith, power means operatively connected to said second tong for swinging said second tong about its pivot relatively to said first tong into and out of clamping engagement with a crosstie straddled by said assembly, a generally horizontal tong assembly elevating beam pivotally connected at one end to said frame and pivotally connected at its other end to said tong assembly, and means mounted on said frame between said wheel assemblies reacting between said beam and frame for elevating said beam and tong assembly.

4. In a machine for positioning a crosstie under the rails of a railway the combination claimed in claim 2 including a pair of tong assemblies at one end only of the frame mounted on opposite sides thereof.

5. In a machine for positioning a crosstie under the rails of a railway the combination claimed in claim 3 including a pair of tong assemblies adjacent one end only of the frame, each of said assemblies being mounted laterally outwardly beyond the adjacent rail-engaging wheel assembly.

6. In a machine for positioning a crosstie under the rails of a railway the combination claimed in claim 3 including a pair of tong assemblies mounted at one end only of said frame on opposite sides thereof, a pair of beams each connected to one of said tong assemblies, and separate individual means for elevating the respective beams.

7. In a machine for positioning a crosstie under the rails of a railway the combination claimed in claim 2 in which the means for moving the frame along the rails relative to the fastening means comprises a hydraulic cylinder and piston assembly connected between the frame and the fastening means, said combination including a hydraulic pressure generating means mounted on the frame and connected to said cylinder and piston assembly, an operator's platform mounted on the frame,

and valve means controlling said cylinder and piston assembly mounted adjacent said platform.

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