Oct. 28, 1941. L. D. HOLMES 2,260,623

HOISTING MECHANISM FOR LOCOMOTIVES

Filed July 22, 1940 3 Sheets-Sheet 1

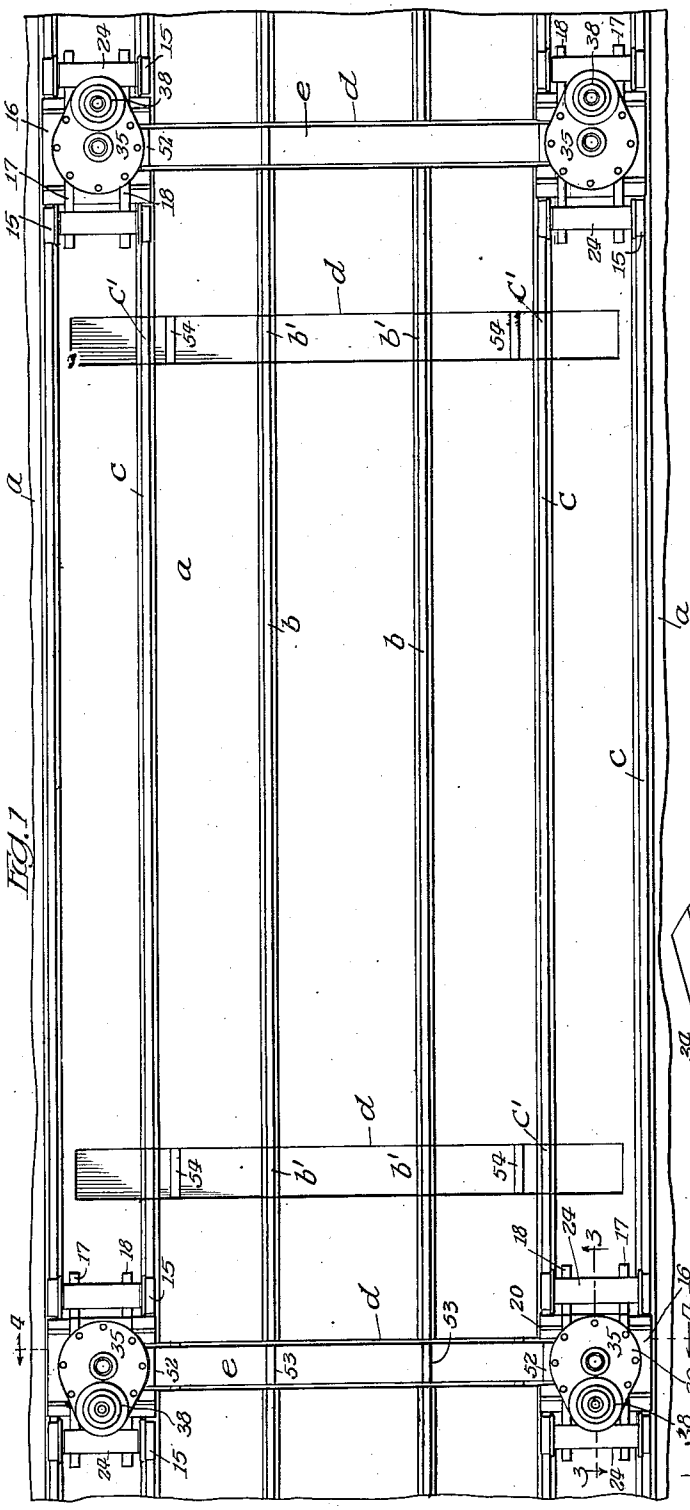


FIG. 1

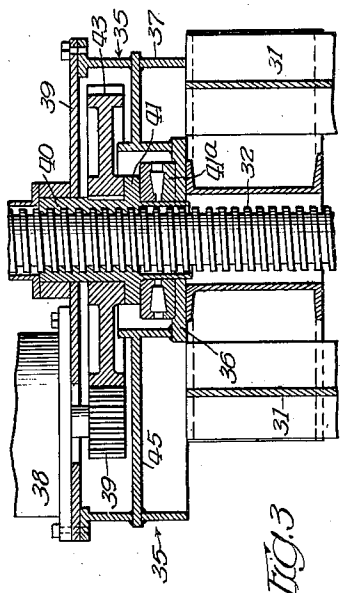


FIG. 3

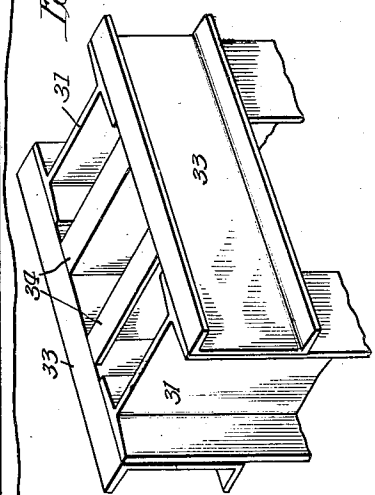


FIG. 2

Inventor
Louis D. Holmes
By Fred Gerlach
His Atty

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HOISTING MECHANISM FOR LOCOMOTIVES

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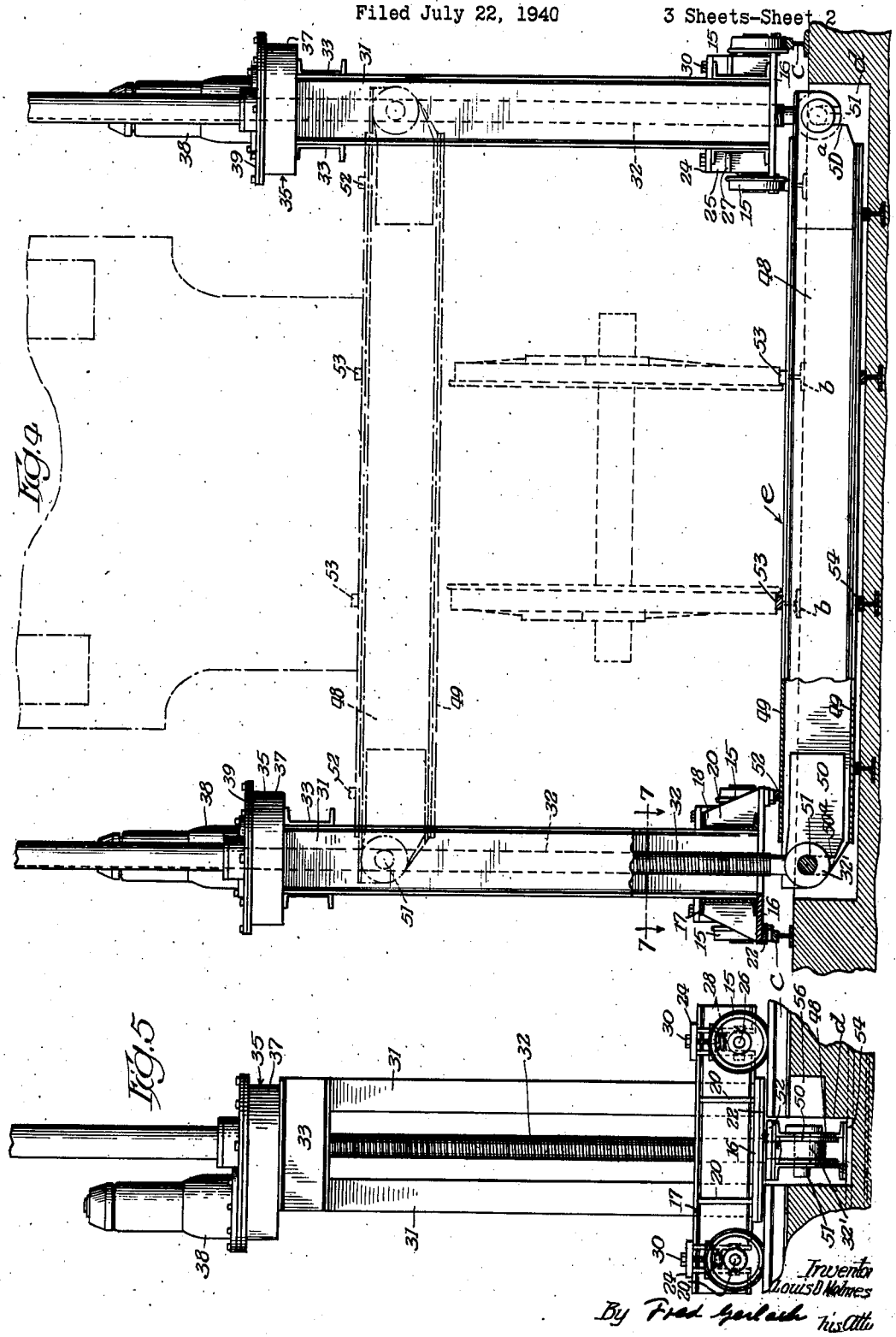


Fig. 4

Fig. 5

Inventor
Louis D. Holmes
By Fred Garlach
his Atty.

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Fig. 6

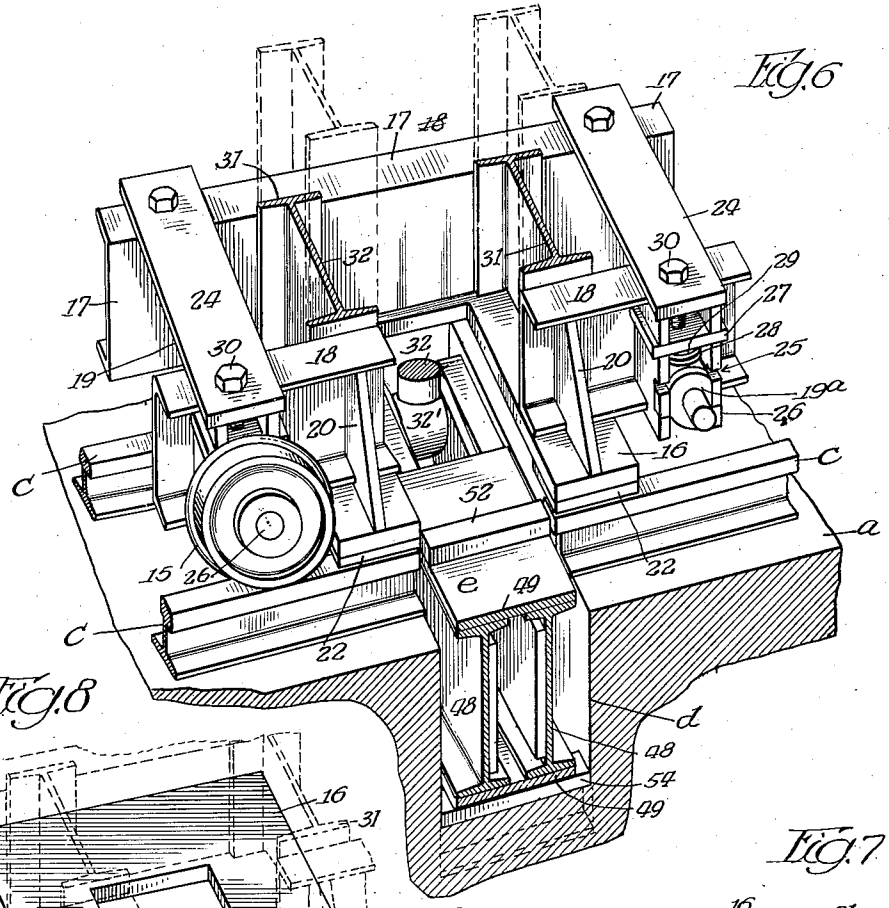


Fig. 8

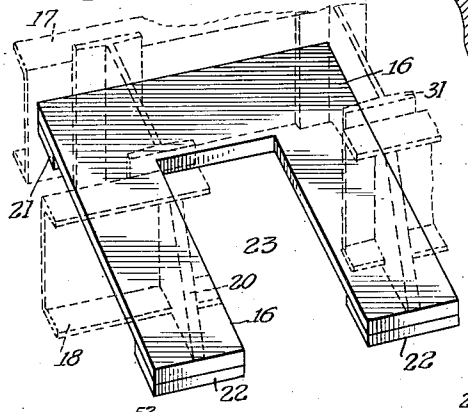


Fig. 7

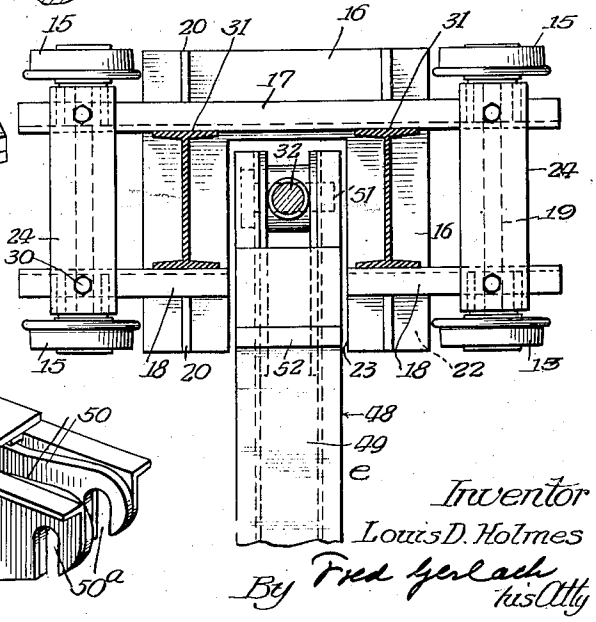
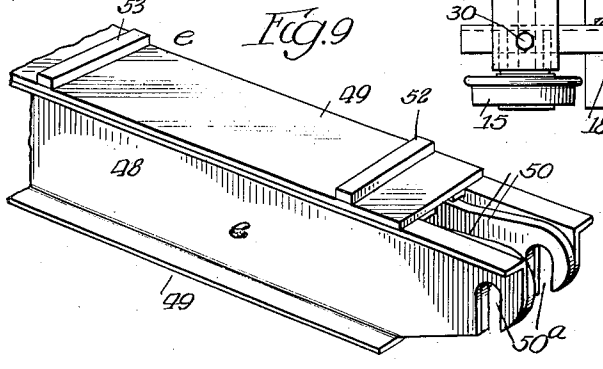


Fig. 9



Inventor
Louis D. Holmes
By Fred Gerlach
his Atty

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UNITED STATES PATENT OFFICE

2,260,623

HOISTING MECHANISM FOR LOCOMOTIVES

Louis D. Holmes, Harvey, Ill., assignor to Whiting Corporation, Harvey, Ill., a corporation of Illinois

Application July 22, 1940, Serial No. 346,764

13 Claims. (Cl. 104—32)

The invention relates to hoisting mechanism of the type adapted for raising locomotives for making repairs.

Heretofore it has been the practice to use a pair of stationary jacks and a pair of jacks movable relatively to the stationary jacks, each pair being adapted to lift a beam extended under the locomotive frame and fitting into transverse recesses in the shop floor. One pair of jacks was movable longitudinally of the locomotive track to provide different spacings between the lifting beams for engaging locomotives of different lengths or different portions of the locomotives. In constructions heretofore used it was necessary to provide longitudinal pits below floor level for the longitudinally movable jacks for driving connections between the jacks.

One object of the present invention is to provide hoisting mechanism which includes jacks which may be supported substantially at floor level and are adapted to lower the lifting beams into the transverse recess without providing pits for the columns of the longitudinally movable jacks. In the attainment of this object the bases or carriages of the jacks are mounted to travel on tracks on the shop floor and at the sides of the locomotive track, the lifting elements, such as screws, are suspended from the upper ends of the columns on the jacks, and the bases of the jacks are formed with openings to permit the ends of the lifting beams to pass vertically therethrough in order to make it possible to lift the beams into and out of the transverse recesses, when lifting or raising the locomotive.

Another object of the invention is to provide hoisting mechanism comprising a series of four jacks, each with power-operated driving mechanism including motors, at the upper ends of the columns, and gearing between the jacks and pits for said gearing are dispensed with.

Another object of the invention is to provide jacks of this type which are sturdy in construction and in which the motors and gearing for operating the lifting screws are disposed at the top of the column so that the lifting screws will be suspended from above and subjected to tension by the loads.

Another object of the invention is to provide hoisitng mechanism for a lifting beam which comprises jacks at the sides of the locomotive track which are built up of beams and plates for sustaining heavy loads.

Other objects of the invention will appear from the detailed description.

The invention consists in the several novel features which are hereinafter set forth and are more particularly defined by claims at the conclusion hereof.

In the drawings: Fig. 1 is a plan of hoisting mechanism exemplifying the invention. Fig. 2 is a perspective of the structure forming the upper end of the vertical columns of the jacks for supporting a lifting screw. Fig. 3 is a section of the mechanism for the operation of one of the lifting screws and its housing taken on line 3—3 of Fig. 1. Fig. 4 is a transverse section taken on line 4—4 of Fig. 1, parts being broken away for illustrative purposes. Fig. 5 is a side elevation of one of the lifting jacks with a lifting beam connected thereto, the transverse pit being shown in section. Fig. 6 is a sectional perspective of the base structure of one of the jacks and one end of the lifting beam suspended from the lifting screw. Fig. 7 is a horizontal section taken on line 7—7 of Fig. 4. Fig. 8 is a perspective of the bottom plate of the carriage or base of a jack. Fig. 9 is a perspective of an end portion of one of the lifting beams.

The invention is exemplified in connection with a shop floor *a*; a pair of rails *b* on the floor which form a track for a locomotive; a pair of rails *c* at, spaced from each side of, and extending parallel to the locomotive track and forming narrow gauge tracks for the lifting jacks; a series of transverse recesses *d* in the floor *a* under and intersecting the locomotive track and the inner pair of rails *c*; one pair of transversely aligned lifting jacks for raising and lowering a lifting beam *e* for one end of the locomotive and another pair of transversely aligned lifting jacks for raising and lowering the other end of the locomotive; and lifting beams *e* fitting in recesses *d*. Each pair of jacks is adapted to simultaneously lift both ends of a lifting beam *e*. In practice, both pairs of jacks are simultaneously raised or lowered in handling a locomotive. These jacks are alike in construction and a description of one is applicable to all.

Each lifting-jack comprises a supporting base or carriage which is provided with four wheels 15 at the corners thereof to adapt the jacks to travel on the rails *c* of the track at one side of the locomotive track. Each base comprises: a bottom-plate 16; a channel-beam 17 extending the length of the base at its outer side, and forming a continuous side at the outer side of the base or carriage, and having its lower flange abutting the top face of plate 16, and a pair of channel-beams 18 having their bottom flanges abutting the top-face of plate 16, and forming an

interrupted inner side, at the inner side of the base. The abutting faces of beams 17 and 18 and the top face of plate 16 are welded together. The ends of beams 17, 18 project beyond the ends of plate 16 to carry the axles 19 for the wheels 15 endwise of plate 16. Brace-plates 20 are welded to the plate 16 and the beams 17 and 18 to connect the beams and plate against lateral deflection of the beams by the loads. The plate 16 is reinforced by a bar 21 welded to the bottom face, and at the outer side, of plate 16 and bars 22 are similarly welded to the plate at its inner side. Plate 16 is provided with an opening 23 which extends vertically therethrough and outwardly from its inner side to the inner side of beam 17. The purpose of this construction is to provide a rigid base for the jack which is provided with the opening 23 through which a lifting-beam may be raised and lowered, as hereinafter described. Cross-bars 24 are welded to top flanges of beam 17 and beams 18, respectively. The ends of the axles 19 are journaled in blocks 19a which are slidable in pedestals 25. Each pedestal is formed of vertical plates 26 and a top plate 27, which are welded to the beams 17 and 18 and to the bars 24. Springs 28 are interposed between the bearing-blocks and plates 29. Set screws 30 are threaded through the top plate of the pedestals to engage plates 29 for adjusting the tension of the springs. The reinforcing bars 21, 22 are vertically aligned with, and spaced slightly above, the heads of the rails *c*, so that when the jacks are not supporting a locomotive, springs 28 will support the base for travel on the wheels 15. When, however, the jacks carry a heavy load, the springs 28 will yield sufficiently to permit the bars 21, 22 to engage the rails *c* and thereby transmit the weight of the load directly from the base to said rails. A pair of vertical I-beams 31 fit between, and are welded to the inner faces of, side-beams 17, 18 and their lower ends abut against, and are welded to, the top face of bottom plate 16. Beams 31 are spaced apart correspondingly to the width of opening 23. Opening 23 is located at the longitudinal center of the base and between upright beams 31. The upper ends of beams 31 are rigidly connected by channel-beams 33 (Fig. 2), the inner faces of the channel-beams being welded to the outer faces of beams 31. Between beams 31 the inner faces of beams 33 are also cross-connected by channel-beams 34, the ends of which are welded to the inner faces of beams 33. A lifting screw 32 extends vertically between the beams 31 and is suspended from above, as hereinafter described, at the longitudinal and transverse center of the base, so that the load will be carried by the base-structure without tendency to tilt the column and base. The mechanism for rotating the screw 32 to raise and lower a lifting-beam is mounted at the upper end of the column. A gear-housing 35 formed of plate metal sections welded together, is fixedly secured on the top of the column. Housing 35 comprises a central bottom member 36 which is secured on the top of the beams 34; a depending rim 37 welded to the abutting portions of the top faces of beams 33; and a cover 39 which is removably secured to the body of the housing. The mechanism for rotating the screw (Fig. 3) comprises an electric motor 38 which is mounted on, and at one side of, the cover 39 of the gear-housing; a pinion 39 fixed to the depending shaft of motor 38 and located in the body of the housing; a gear 43 located in the housing and meshing with pinion 39; and a nut 40 keyed to the gear 43 and rotatable therewith. Nut 40 is provided with a flange 41 which is supported by a thrust-bearing 41a between said flange and the base member 36 of the housing. The upper end of the nut 40 extends through, and is journaled in, cover-plate 39. The lifting screw 32 is threaded to, and suspended from, nut 40. A stationary tube secured to the top of cover 39 encloses the upper end of screw 36. When the motor 38 is operated, pinion 45 will drive gear 43 and rotate nut 40 which is held against axial movement, and screw 32 which is also held against rotation at its lower end, as hereinafter described, will be shifted longitudinally according to the direction of rotation of gear 43. Motor 38 is of the reversible type, so that it may be driven and operated in one direction to rotate nut 40 to raise the screw and in the opposite direction to lower the screw. The lower end of screw 32 is provided with an eye 32' for connection to a lifting-beam by a pin 51, as hereinafter described. In this construction the screw is suspended from the nut at the top of the column so that the loads on the screw will subject the screw to tension. Each jack is provided with an electric motor 38 and operating gearing for its nut 40 and screw 36 so that no driving connections between the screws are necessary.

Each lifting-beam is formed of a pair of I-beams 48 which are spaced apart, and top and bottom plates 49 welded to the top and bottom faces of the flanges of beams 48 and spanning the spaces between them. Reinforcing members 50 are welded to the inner faces of the webs of the I-beams 48. The webs of beams 48 and reinforcing members 50 are provided with slots 50a for receiving a coupling pin 51 for connecting the screws 32 of a transverse pair of the jacks to the ends of the lifting-beam. Each lifting-beam *d* fits into any of the transverse recesses *d* in the floor. The outer ends of each beam *d* are adapted to pass through the openings 23 in plates 16 of the jacks and between the upright beams 31 of the supporting columns so they can be raised to the upper portion of the columns by the screws and their operating mechanisms. Each of the inner rails *c* is interrupted at the recesses *d* to permit the lifting-beam to be raised and lowered below the level of the base-structure of the jacks. Rail sections 52 bridge the gaps in rails *c* through which the beam passes vertically, and are welded to the top plate 49 of the lifting-beam to close the gaps in the inner rails *c* over a recess *d* when a lifting-beam *e* is located in said recess. The lifting-beam is also provided with rail sections 53 which bridge the gaps in the rails *b* at the recess *d* into which the beam *e* is lowered. Normally, when the lifting-beam *e* is lowered in a recess *d*, its bottom plate 49 is supported on rail sections 54 which may be embedded in the concrete forming the bottom of the recesses *d*, so that the load of the locomotive running on the track will be transmitted directly through the lifting-beam to rail sections 54. The rails *a* for the truck tracks are preferably supported at the floor level or a level corresponding with the rails *b*. This makes it possible to avoid the use of longitudinal pits for the bases or carriages of the jacks.

In practice, it is desirable to move at least one and, in some instances, two pairs of jacks to or from each other for hoisting locomotives of different lengths or engaging the lifting-beams with locomotives at different points. For this purpose,

additional recesses *d* are provided into which the lifting-beams may be lowered at the desired points. Rails *b* are interrupted at all of the recesses *d* and removable rail sections b^1 are removably secured to the adjacent ends of the rails to form bridging sections over the recesses *d* in which no lifting-beam is located. Removable rail sections *c'* are also provided for the gaps over the recesses *d* at the inner rails *c* in the recesses which contain no lifting-beam.

When it is desired to transfer a lifting-beam *e* from one recess *d* to another, the pair of jacks connected to said beams will be operated to raise the beam above track level while the locomotive track is clear. Bridging rail sections *c'* will then be placed across the gaps in the inner rails *c* over the recesses *d*, from which the beam has been raised. The pair of jacks will then be rolled into position to bring the beam over the recess *d* into which the beam is to be lowered. Rail sections *c'* and *b'* across the latter recess, will then be removed and the lifting screws operated to lower the beam through the openings **23** in bottom plates **16** of the bases of the jacks into said recess. Said rail sections *b'* will be placed in the recess *d*, from which the lifting-beam has been transferred. If desired, the pair of jacks at the other end may be used to transfer a lifting-beam *e* from one recess *d* into another in the same manner. When the beams *e* at both ends are in the recesses *d*, the locomotive will be spotted on rails *b* for engagement of the desired points by both lifting-beams. When the locomotive is ready to be lifted, the four motors **38** are synchronously operated under a suitable unitary control to rotate nuts **40** and simultaneously rotate screws **32** to lift the four screws **32** and the lifting-beams at both ends of the locomotive to the desired extent. When the repairs have been made, the motors are operated in the reverse direction to operate the screws **32** and lower the locomotive into place on the running gear and the lifting-beams into the recesses *d* below track level. The locomotive can then be propelled over the rails *b* and out of range of the hoisting mechanism.

If desired, a lifting-beam may be provided in each of the recesses and the pair of jacks may be rolled along the rails *c*, respectively, to bring them into operative position above any of the lifting-beams. In this case, the screws **32** may be uncoupled from one beam and coupled to another upon withdrawal of pins **51** from the ends of the lifting-beams. In order to permit this to be done, a pocket **56** is provided in one side of each recess *d* to permit the pins to be disconnected from the lifting-beam.

In some installations it is sufficient to provide one pair of movable jacks and one pair of stationary jacks. In such cases the bases of one pair of jacks may be anchored to the shop floor so they are level with the movable jacks. By having both pairs of jacks movable longitudinally of the locomotive track, greater adaptability of the hoisting mechanism for operating lifting-beams at different longitudinal spacings, is provided.

When the beam *e* rests on rail sections **54**, the screws **32** are lowered slightly so the load of the locomotive traveling over the beams will be transmitted directly to said rail sections and will not be imposed upon the screws. When the locomotive is supported on the lifting-beams, the load is sufficient to compress the springs **28** and permit the bars **21**, **22** of the bases of the jack to settle directly on the rails *c*. This supports the locomotive without the wheels on the bases and will hold the bases of the jacks against longitudinal movement on rails *c*.

The invention exemplifies hoisting mechanism in which portable jacks are mounted to travel on tracks at floor level or substantially at the level of the locomotive tracks so that pits of sufficient length for the travel of the lower portions of the jacks below the level of the lifting-beams, are eliminated.

The invention also exemplifies hoisting mechanism in which the operating mechanism for the lifting elements or screws are located at the upper ends of the columns and the screws, in carrying loads, are subjected to tension, as distinguished from compression.

The invention also exemplifies bases for the jacks which are provided with openings through which the ends of the lifting-beams can be shifted vertically and in which the lifting beams are provided with rail sections for bridging gaps in the inner rails of the track for the jacks so that a jack may be shifted over the lifting-beam in a transverse recess.

While the hoisting mechanism has been described for hoisting locomotives, it will be understood that it may be used for other heavy rolling stock.

The invention is not to be understood as restricted to the details set forth, since these may be modified within the scope of the appended claims, without departing from the spirit and scope of the invention.

Having thus described the invention, what I claim as new and desire to secure by Letters Patent, is:

1. In hoisting mechanism for locomotives, the combination of a pair of portable lifting jacks, each jack comprising a portable base, an upstanding column having its lower end fixedly secured to the base and movable therewith, and a vertical lifting element associated with the column, each base being provided with an opening extending vertically therethrough, through which the lower end of the vertical lifting element is adapted to pass, a lifting beam connected to the lower ends of the lifting elements and movable vertically through the openings in and below the frames, and mechanism mounted at the upper end of the column for operating said elements to raise or lower the lifting beam.

2. In hoisting mechanism for locomotives, the combination of a pair of portable lifting jacks, each jack comprising a portable base, an upstanding column having its lower end fixedly secured to the base and movable therewith, and a vertical lifting screw associated with the column, each base being provided with an opening extending vertically therethrough, through which the lower end of the lifting screw is adapted to pass, a lifting beam connected to the lower ends of the lifting screws and having its ends movable vertically through the openings in and below the frames, and mechanism mounted at the upper end of the column for operating said screws to raise or lower the lifting beam.

3. In hoisting mechanism for locomotives, the combination of a pair of lifting jacks, each jack comprising a base provided with wheels for transportation, an upstanding column having its lower end fixedly secured to the base and movable therewith, and a vertical lifting element associated with the column, each base being provided with an opening extending vertically there-

through, through which the lower end of the vertical lifting element is adapted to pass, a lifting beam detachably connected to the lower ends of the lifting elements and having its ends movable vertically through the opening and below the wheels on the frame, and mechanism mounted at the upper end of the column for operating said elements to raise or lower the lifting beam.

4. In locomotive hoisting mechanism, the combination of a pair of four-wheeled trucks, a pair of lifting-jacks on the trucks, each comprising an upstanding column fixed on the truck, and a lifting mechanism including an element suspended from the upper end of the column and centrally of the truck, the trucks being provided with openings extending vertically through their confronting sides, and a lifting-beam having its ends connected to said elements and simultaneously movable vertically through said openings to a position below the truck by said elements.

5. In locomotive hoisting mechanism, the combination of a pair of four-wheeled trucks, lifting-jacks on the trucks, each comprising an upstanding column fixed on the trucks, a lifting mechanism including a screw suspended from the upper end of the column and centrally of the truck, the trucks being provided with openings extending vertically through their confronting sides, and a lifting-beam having its ends connected to, and simultaneously movable vertically through, said openings to a position below the truck by, said screws.

6. In locomotive hoisting mechanism, the combination of a pair of four-wheeled trucks, lifting-jacks on the trucks, each comprising columns fixed on the trucks, a lifting mechanism including a vertical screw in the column, a nut for the screw mounted in the upper end of the column and centrally of the truck, and an electric motor and gearing for rotating the nut, mounted at the upper end of the column, the trucks being provided with openings extending vertically through their confronting sides, and a lifting-beam having its ends connected to said elements and simultaneously movable vertically by said elements and through said openings to a position below the truck.

7. The combination with a shop floor provided with a pair of rails on the floor forming a track for a locomotive, a pair of truck rails parallel to, and at each side of, the locomotive track and substantially at floor level, the floor being provided with a transverse recess below and intersecting the locomotive track and the inner rails of the truck tracks, a pair of four-wheeled trucks adapted to travel on the truck tracks, each comprising a base having a vertical opening extending vertically through its inner side, an upstanding column on the base, and a lifting mechanism including a vertically movable element, and a lifting-beam movable vertically into and out of the recess and having its ends movable vertically through said openings in the bases and connected to said elements for vertical movement through said openings.

8. The combination with a shop floor provided with a pair of rails on the floor forming a track for a locomotive, a pair of truck rails parallel to, and at each side of, the locomotive track and substantially at floor level, the floor being provided with a transverse recess below and intersecting the locomotive track and the inner rails of the truck tracks, a pair of four-wheeled trucks adapted to travel on the truck tracks, each comprising a base having a vertical opening extending vertically through its inner side, an upstanding column on the base and a lifting mechanism including a vertically movable element, a lifting beam movable vertically into and out of the recess and having its ends movable vertically through said openings in the bases and connected to said elements for vertical movement through said openings, and rail sections on the beam extending across the recess at the inner rails of the truck tracks.

9. The combination with a shop floor provided with a pair of rails on the floor forming a track for a locomotive, a pair of truck rails parallel to, and at each side of, the locomotive track and substantially at floor level, the floor being provided with a transverse recess below and intersecting the locomotive track and the inner rails of the truck tracks, a pair of four-wheeled trucks adapted to travel on the truck tracks, each comprising a base having a vertical opening extending vertically through its inner side, an upstanding column on the base and a lifting mechanism including a vertically movable suspension element, and a lifting-beam movable vertically into and out of the recess and having its ends movable vertically through said openings and connected to said elements for vertical movement through said openings, and rail-sections on the beam extending across the recess at the inner rails of the truck tracks and at the rails of the locomotive track.

10. The combination with a shop floor provided with a pair of rails on the floor forming a track for a locomotive, a pair of truck rails parallel to, and at each side of, the locomotive track and on the floor, the floor being provided with a transverse recess below and intersecting the locomotive track and the inner rails of the truck tracks, a pair of four-wheeled trucks adapted to travel on the truck tracks, each comprising a base having a vertical opening extending vertically through its inner side, an upstanding column on the base and a lifting mechanism including a vertically movable screw supported in suspension at the upper end of the column and a motor mounted at the upper end of the column for shifting the screw, and a lifting-beam movable vertically into and out of the recess and having its ends movable vertically through the openings in the bases and connected to said elements for vertical movement through said openings, and rail sections on the beam extending across the recess at the inner rails of the truck tracks and at the rails of the locomotive tracks.

11. The combination with a shop floor provided with a pair of rails on the floor forming a track for a locomotive, a pair of truck rails parallel to, and at each side of, the locomotive track and substantially at floor level, the floor being provided with a plurality of transverse recesses below and intersecting the locomotive track and the inner rails of the truck tracks, a pair of four-wheeled trucks adapted to travel on the truck tracks, each comprising a base having a vertical opening extending vertically through its inner side and upstanding column on the base, a lifting mechanism including a vertically movable element, and a lifting-beam movable vertically into either of the recesses and through said openings and having its ends detachably connected to said elements for vertical movement through said openings.

12. In a lifting jack for locomotives, the combination of a base provided with wheels and comprising an underlying plate, side beams to which the underlying plate is fixedly secured, a pair of

upright beams forming a column and having their lower ends extended to the plate and fixed between the side beams, a vertically movable lifting screw disposed between the beams, gearing mounted on top of the column for raising or lowering the screw, and a lifting beam connected to the lower end of the screw and having one of its ends extending between the upright beams, the underlying plate and one of the side beams of the frame having an opening extending vertically therethrough through which the ends of the lifting beam can pass to a point below the frame.

13. In a lifting-jack for locomotives, the combination of a portable base formed of beams spaced apart transversely and a plate underlying and secured to said beams, a pair of upright beams spaced apart and fitting between the beams of the base structure and on top of the plate and forming a vertical column, the plate being formed with an opening at one side thereof and between the upright beams, a rotatable nut mounted at the top of the column, a lifting screw passing through the nut, supported in suspension therefrom and disposed between the upright beams, an electric motor, gearing between the motor and the nut, the lower end of the screw being movable through the opening in the underlying plate, and a lifting element connected to the lower end of the screw, movable through said opening.

LOUIS D. HOLMES.