July 26, 1960 G. E. SUDEROW 2,946,557

JACKING MECHANISM

Filed May 8, 1958 6 Sheets-Sheet 1

Fig. 1.

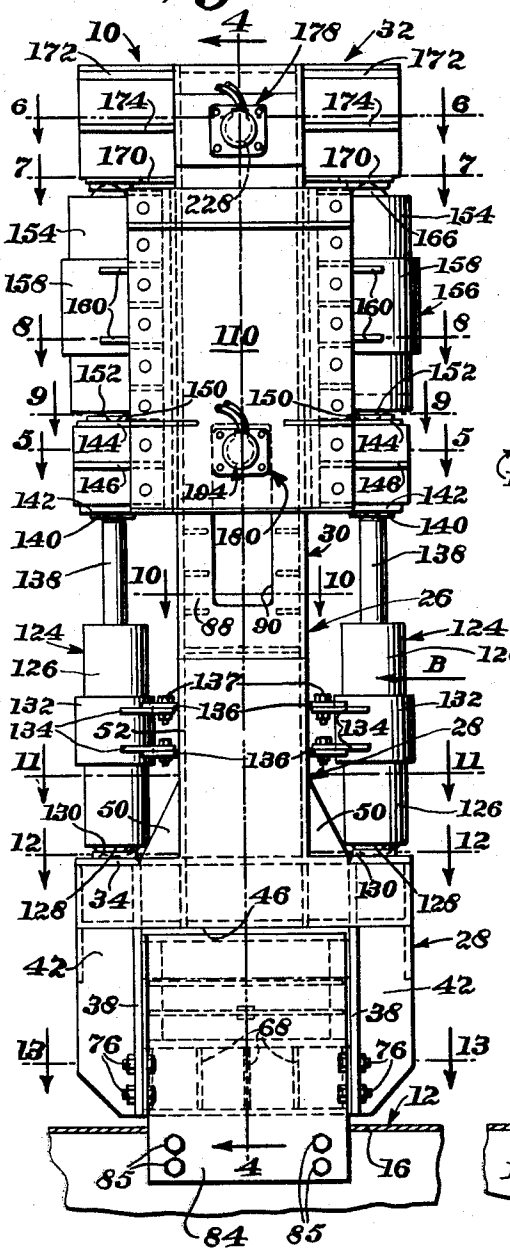
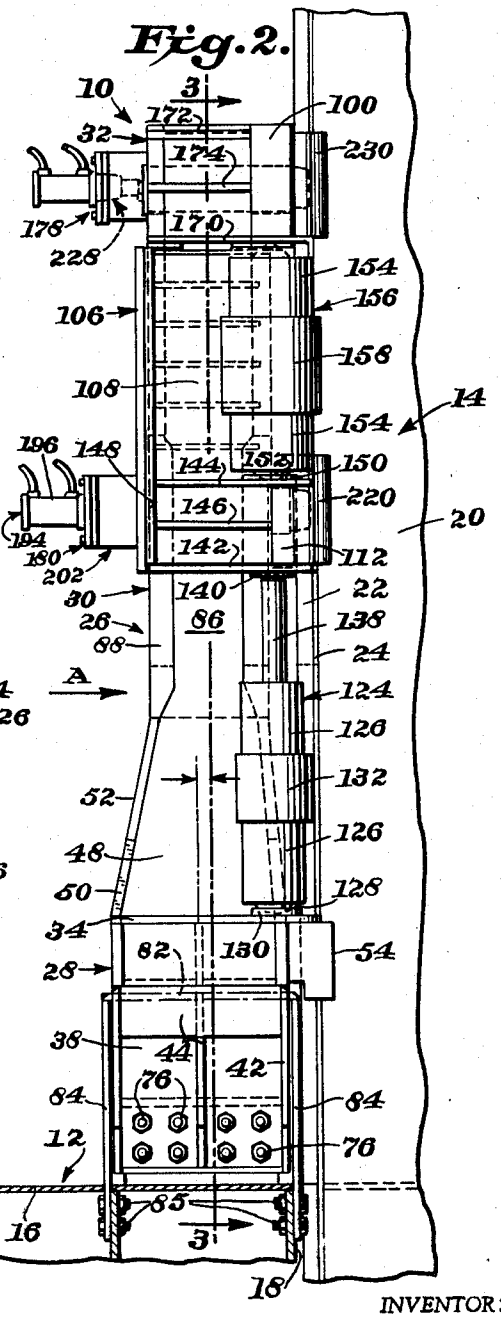


Fig. 2.



INVENTOR:

George E. Suderow,

BY Cushman, Darby & Cushman
ATTORNEYS.

July 26, 1960 G. E. SUDEROW 2,946,557

JACKING MECHANISM

Filed May 8, 1958 6 Sheets-Sheet 2

Fig. 3.

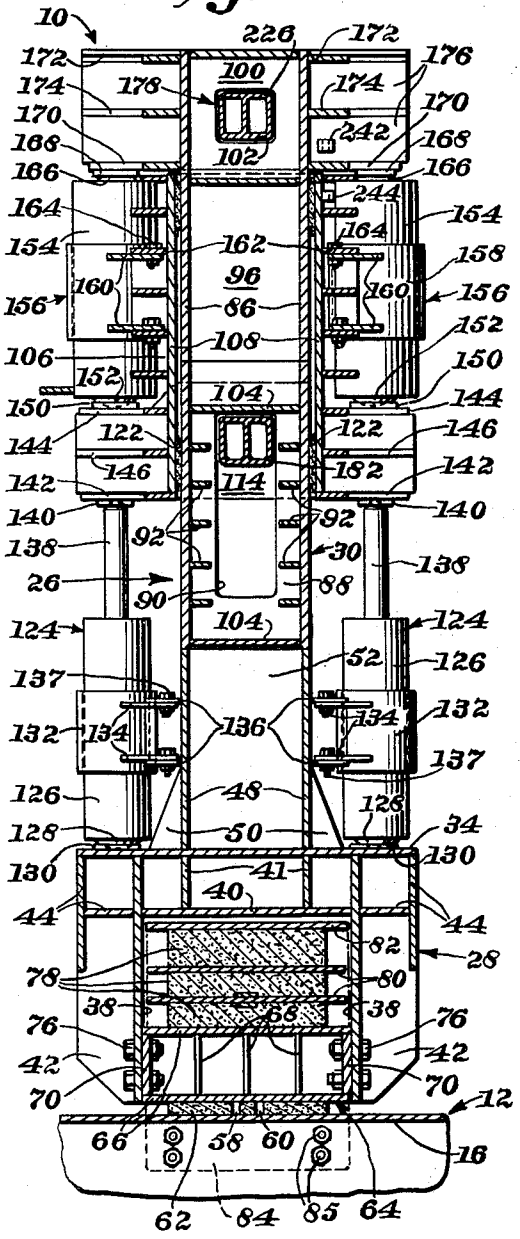
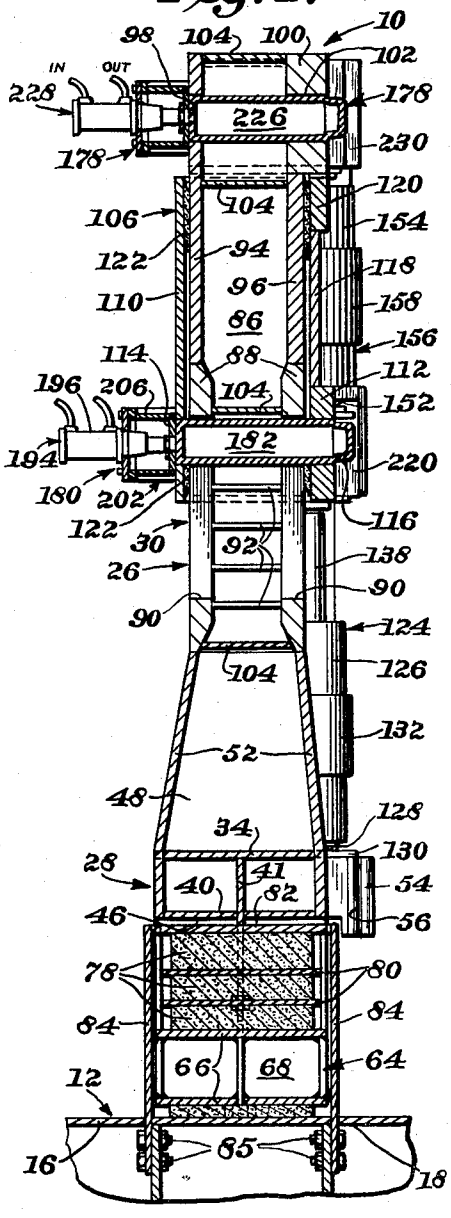


Fig. 4.



INVENTOR:

George E. Suderow,

BY Cushman, Darby & Cushman

ATTORNEYS.

July 26, 1960 G. E. SUDEROW 2,946,557

JACKING MECHANISM

Filed May 8, 1958 6 Sheets-Sheet 3

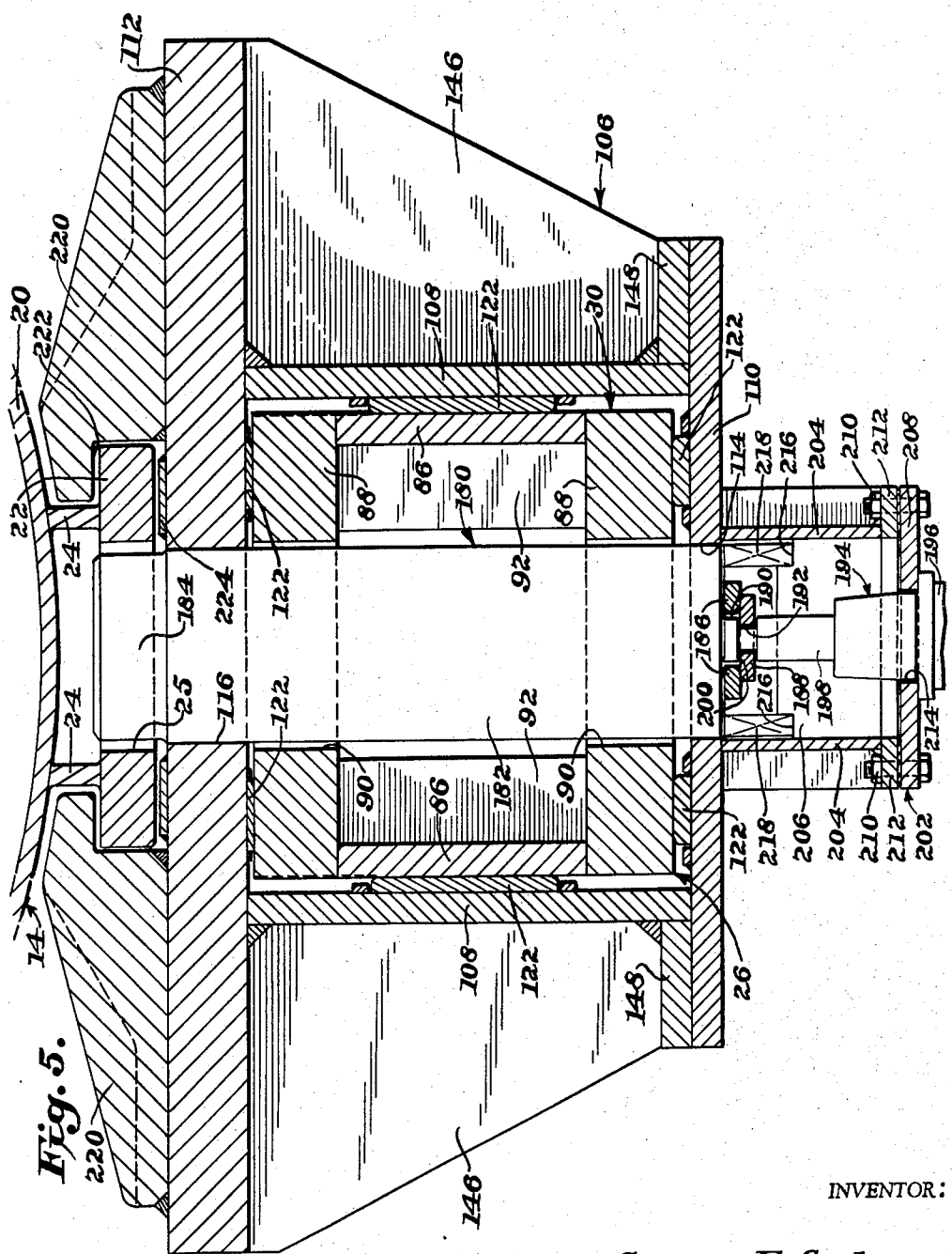


Fig. 5.

INVENTOR:

George E. Suderow,

BY Cushman, Darby & Cushman

ATTORNEYS

July 26, 1960 G. E. SUDEROW 2,946,557

JACKING MECHANISM

Filed May 8, 1958 6 Sheets-Sheet 4

Fig. 6.

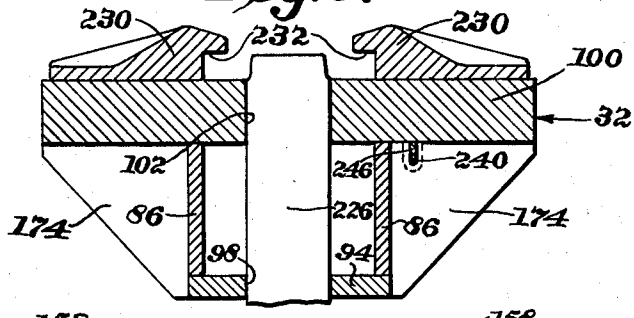


Fig. 7.

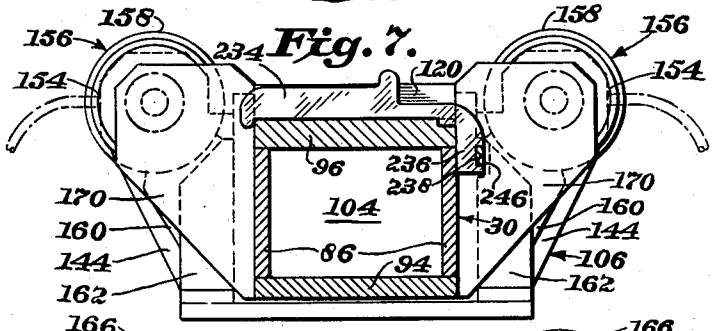


Fig. 8.

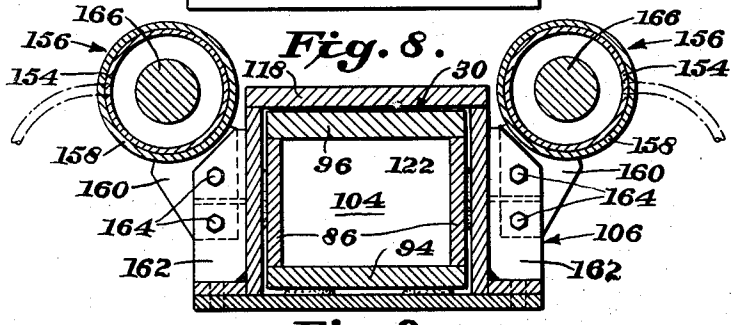
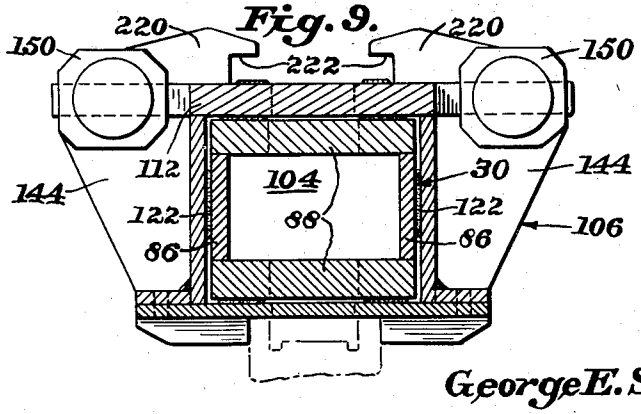


Fig. 9.



INVENTOR:

George E. Suderow,

BY Cushman, Darby & Cushman

ATTORNEYS.

July 26, 1960 G. E. SUDEROW 2,946,557

JACKING MECHANISM

Filed May 8, 1958 6 Sheets-Sheet 5

Fig. 10.

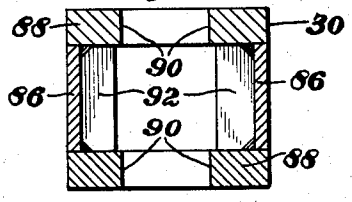


Fig. 11.

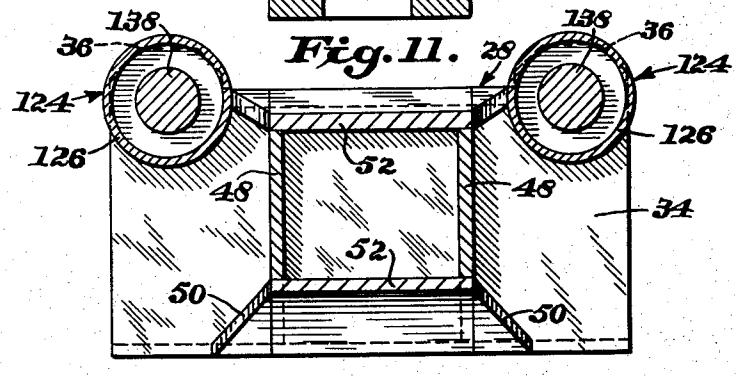


Fig. 12.

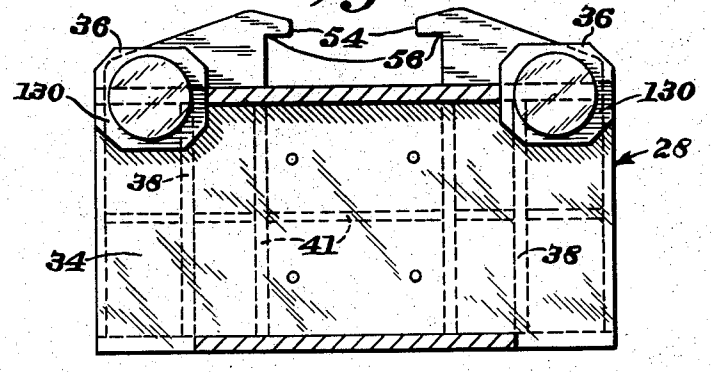
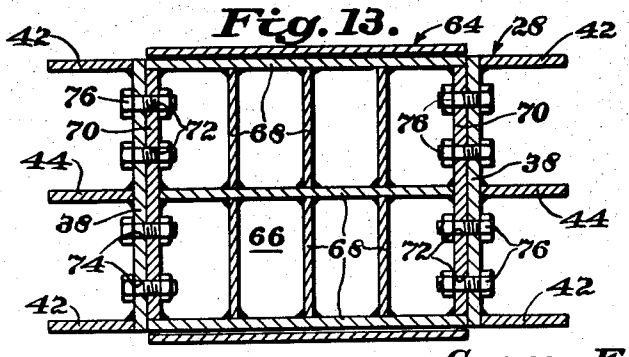


Fig. 13.



INVENTOR:

George E. Suderow,

BY Cushman, Darby & Cushman

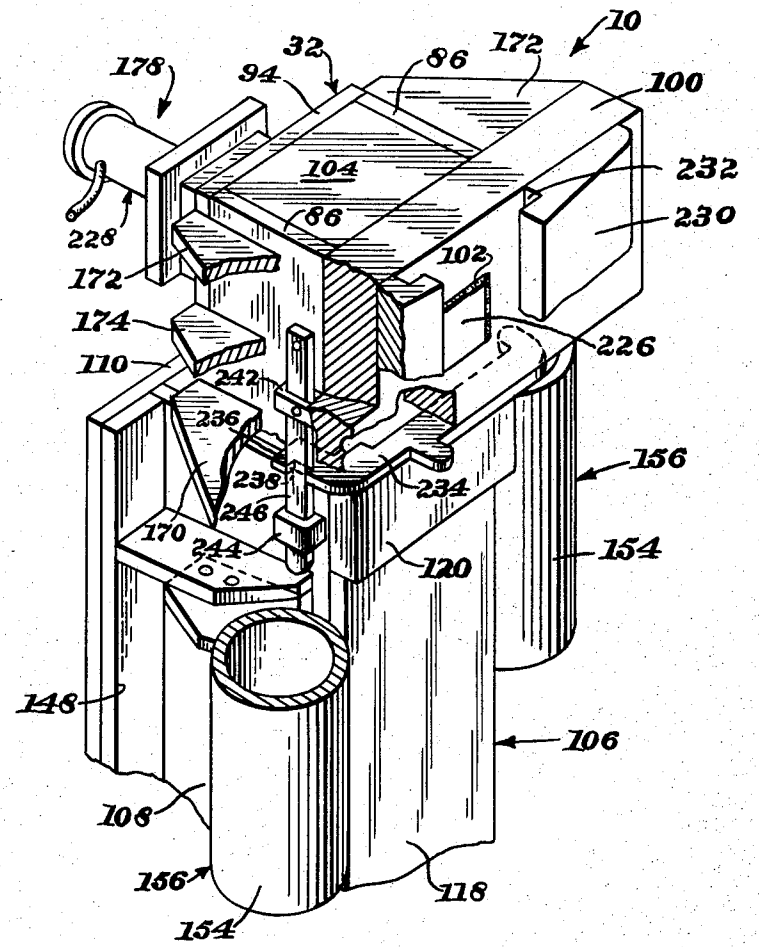
ATTORNEYS.

July 26, 1960 G. E. SUDEROW 2,946,557

JACKING MECHANISM

Filed May 8, 1958 6 Sheets-Sheet 6

Fig. 14.



INVENTOR:

George E. Suderow,

BY Cushman, Darby & Cushman

ATTORNEYS.

United States Patent Office 2,946,557 Patented July 26, 1960

2,946,557

JACKING MECHANISM

George E. Suderow, New York, N.Y., assignor to De Long Corporation, New York, N.Y., a corporation of Delaware

Filed May 8, 1958, Ser. No. 733,969

16 Claims. (Cl. 254—93)

This invention relates to mobile marine platforms and more particularly to improvements in a jacking mechanism for effecting relative vertical movement between a marine platform and a vertically extending supporting leg therefor.

The system of erecting a marine bottom supported platform over a body of water embodying a floating platform arranged to receive a plurality of vertical supporting legs which can be moved downwardly relative to the platform, after the latter has reached a marine site of operation, to engage and become imbedded in the marine bottom, and to subsequently raise the platform on the embedded legs to a desired level above the water level is well known. For example, Patent No. 2,775,869 issued January 1, 1957, to R. W. Pointer discloses such a system. One of the main advantages of this system is that the platform, thus erected, can be readily removed and transported to a new marine site of operation.

In the systems heretofore proposed, the aforesaid relative movement between the platform and supporting legs is effected by a jacking mechanism which is satisfactory to temporarily retain the platform in its raised operating position. However, where operations are to be carried out over an extended period, additional means must be provided to insure safe maintenance of the platform in its operating position.

The present invention contemplates a simple arrangement for locking the jacking mechanism between the platform and supporting legs in such a manner as to insure safe and proper maintenance of the platform in its elevated position on the supporting legs.

Accordingly, it is an object of the present invention to provide a jacking mechanism of the type described having improved means for effecting a rigidly locked connection between the platform and a supporting leg therefor so that temporary operations can be carried out on the platform over an extended period of time without the necessity of providing complicated auxiliary securing means which require considerable time and effort to put into operation.

Another object of the present invention is the provision of a jacking mechanism including a pair of sections mounted for relative vertical movement, each carrying a leg engaging pin, which mechanism has improved means for positively preventing movement between said sections in one vertical direction, when the pins are engaged, so as to insure that the pins will transit substantially equal loads.

Another object of the present invention is the provision of a jacking mechanism of the type described having improved means for mounting the same on a platform.

Still another object of the present invention is the provision of a jacking mechanism of the type described embodying a plurality of horizontally movable pins and improved mechanical means for locking the pins in engagement with a vertical supporting leg.

A further object of the present invention is the provision of a jacking mechanism of the type described which is simple but sturdy in construction, and economical to manufacture and maintain.

These and other objects of the present invention will become more apparent during the course of the following detailed description and appended claims.

The invention may best be understood with reference to the accompanying drawings wherein an illustrative embodiment is shown.

In the drawings:

Figure 1 is a front elevational view of a jacking mechanism unit embodying the principles of the present invention;

Figure 2 is a side elevational view of the jacking mechanism unit showing the same in operative position with respect to a marine platform and a vertical supporting leg;

Figure 3 is a cross-sectional view taken along the line 3—3 of Figure 2;

Figure 4 is a cross-sectional view taken along the line 4—4 of Figure 1;

Figure 5 is a cross-sectional view taken along the line 5—5 of Figure 1;

Figure 6 is a cross-sectional view taken along the line 6—6 of Figure 1 showing the structure adjacent thereto;

Figure 7 is a cross-sectional view, similar to Figure 6 taken along the line 7—7 of Figure 1;

Figure 8 is a cross-sectional view, similar to Figure 6, taken along the line 8—8 of Figure 1;

Figure 9 is a cross-sectional view, similar to Figure 6, taken along the line 9—9 of Figure 1;

Figure 10 is a cross-sectional view, similar to Figure 6, taken along the line 10—10 of Figure 1;

Figure 11 is a cross-sectional view, similar to Figure 6, taken along the line 11—11 of Figure 1;

Figure 12 is a cross-sectional view, similar to Figure 6, taken along the line 12—12 of Figure 1;

Figure 13 is a cross-sectional view, similar to Figure 6, taken along the line 13—13 of Figure 1; and

Figure 14 is a fragmentary perspective view of the upper end of the jacking mechanism unit with parts, broken away for purposes of clearer illustration.

Referring now more particularly to the drawings, there is shown a jacking mechanism generally indicated at 10 which is arranged to be mounted on a marine platform, generally indicated at 12, for effecting relative vertical movement in either direction with respect thereto, a vertical extending supporting leg, generally indicated at 14. In general, the jacking mechanism 10 is arranged to be utilized in a mobile marine construction system of the type described in Pointer Patent 2,775,869 issued January 1, 1957.

The present jacking mechanism is of a type similar to that disclosed in my copending application Serial No. 523,323 filed July 20, 1955. Thus, in operation, the jacking mechanism of the present invention embodies two or more circumferentially spaced jacking mechanism units. Since the units are of identical construction, only a single unit has been disclosed in the drawings and will be described hereinafter. It will, of course, be understood that two or more of such units may be employed for effecting vertical movement of a single supporting leg 14.

The construction of the platform 12 is preferably the same as the aforesaid Pointer patent. In general, the platform includes an upper deck 16 and a plurality of vertical openings or wells 18 through which the vertical

supporting legs 14 are arranged to extend. As disclosed in the Pointer patent, a marine construction system will utilize a plurality of such supporting legs each maintained in the well of the platform and a jacking mechanism utilizing two or more of the units hereinafter described is provided for each supporting leg to effect the proper vertical movement thereof with respect to the platform.

The supporting leg 14 utilized in connection with the present jacking mechanism is preferably constructed of an elongated cylindrical caisson or tube 20 having a longitudinally extending jacking bar 22 secured to the exterior periphery thereof as by connecting plates 24 suitably welded to the bar 22 and the caisson 20. The jacking bar 22 has a plurality of longitudinally spaced apertures 25 formed therein, each aperture preferably being of rectangular configuration. Again, it should be understood that for each of the jacking mechanism units utilized there will be an associated jacking bar provided on the supporting leg.

The jacking mechanism unit itself comprises a first pin carrying section 26 including a base portion 28 which is arranged to be mounted on the platform, a vertically disposed central portion 30 extending upward from the base portion and an upper head portion 32 formed on the upper end of the central portion 30. All these portions of the jacking mechanism section 28 may be of any suitable construction. As shown, they are preferably built up of structural members such as steel plates, angle irons and the like, rigidly secured together as by welding or the like.

The base portion of the jacking mechanism section 26 includes a main horizontally disposed plate 34 of generally rectangular configuration having a pair of transversely spaced extensions 36 projecting from one side thereof adjacent opposite ends of the plate (see Figures 11 and 12). A pair of vertically disposed plates 38 are welded at their upper ends to the undersurface of the plate 34 at positions disposed inwardly from each end thereof. The plate 34 and the plates 38 are strengthened in any suitable manner, as, for example, by means of a lower horizontal plate 40 rigidly secured between the plate 38 in a position spaced below the plate 34 and a plurality of vertical plates 41 rigidly interconnected, as by welding or the like, between the plates 34, 38 and 40. In addition, spaced vertical end plates 42 are welded to the exterior edges of the plates 38 and the lower edges of the plate 34 extending outwardly from the plates 38. Additional plates 44 are rigidly interconnected, as by welding or the like, between the plates 42 and the associated plates 34 and 38. The base portion 28 thus provides a pair of spaced legs defining a downwardly facing recess 46 at the lower end of the jacking mechanism section 26. The recess 46 is open at its bottom and extends horizontally through the lower end thereof from one side to the other, as best shown in Figures 1 and 3.

Extending upwardly from the central portion of the main horizontal plate 34 is a pair of transversely spaced vertical side plates 48, welded to the plate 34 and strengthened by any suitable means such as gusset plates 50 or the like. The plates 48 are preferably of trapezoidal configuration and opposite side edges of both plates have vertical end plates 52 rigidly secured thereto and to the associated edges of the plate 34 between the extensions 36 thereof. Rigidly secured to the inwardly disposed end plate 52 below the horizontal plate 34 is a pair of transversely spaced rigid hook members or claws 54 which together with the associated portion of the plate 52 define a recess 56 for receiving the jacking bar 22 of the supporting leg 12 (see Figure 12).

As best shown in Figures 1–4, the base 28 of the jacking mechanism section 26 is mounted on the deck 16 of the platform 12 in a position adjacent the well 18. To this end, a plurality of spaced rigid lugs 58 are secured to the upper surface of the platform deck to be received in corresponding openings 60 formed in a pad 62 of shock absorbing material, such as neoprene rubber or the like, as shown in Figure 3. Mounted on the pad 62 is a rigid, horizontal structure, generally indicated at 64. This structure is preferably made up of a plurality of plates welded together, such as a pair of horizontal rectangular plates 66 and a plurality of vertical plates 68 secured therebetween including opposed side plates 70. The side plates 70 are suitably apertured, as at 72, to register with corresponding apertures 74 formed in the lower end portions of the plates 38 of the base portion. Suitable bolts 76 extend within the registering holes 72 and 74 serve to secure the platform 74 to the base portion 28. Mounted on the structure 64 is a plurality of pads 78 of shock absorbing material, such as neoprene, rubber or the like, having plates 80 interposed therebetween. The upper surface of pad 78 is arranged to engage the under-surface of a bight portion 82 of an inverted U-shaped strap. The opposite edges of the strap bight portion are rigid with the upper end of vertical legs 84, the lower ends of which are rigidly anchored to the platform 12, by any suitable means such as bolts 85.

The central portion of the jacking mechanism unit is made up of a rectangular box construction and includes a pair of transversely spaced vertical side plates 86 having their lower ends welded or otherwise secured to the upper ends of the plates 48 of the base portion 28. Secured between the lower portion of the plates 86 between the opposite edges thereof is a pair of relatively thick vertical lower end plates 88 each having a vertically elongated slot 90 formed therein. As shown in Figure 10, a plurality of vertically spaced, horizontally disposed, rectangular gusset plates 92 are rigidly secured between each side of the end plates 88 and the associated side plate 86.

Secured between the outer edges of the side plates 86 is an upper end plate 94 having its lower edge welded to the upper edge of the associated lower end plate 88. An opposite upper end plate 96 is secured between the inner edges of the upper portion of the plates 86 with its lower edge secured to the upper edge of the other lower end plate 88. The upper edge of the plate 94 extends to the upper end of the jacking mechanism unit and has a rectangular aperture 98 formed therein. A corresponding relatively thick plate 100 is mounted on the upper edge of end plate 96 and extends beyond the side edges thereof. A horizontally extending rectangular aperture 102 is formed in the central portion of the plate 100 in alignment with the aperture 98. Suitable horizontal brace plates 104 are rigidly secured between the vertical side plates 86 and the vertical end plates 88, 94, 96 and 100.

The exterior surface of the plates 86, 88, 94 and 96 form a rectangular column upon which a second pin carrying section 106 of hollow rectangular box-like structure is mounted for vertical sliding movement. The section 106 includes a pair of vertical side plates 108 having an outer end plate 110 rigidly secured between the outer edges thereof and a relatively thick inner end plate 112 rigidly secured between the opposite lower edges thereof. The plates 110 and 112 have aligned rectangular apertures 114 and 116 formed therein in alignment with the slots 90 formed in the plates 88 of the central portion of the jacking mechanism section 26. In addition, a central vertical end plate 118 is secured between the edges of the plates side 108 above the plate 114 and an upper end plate 120 is secured above the plate 118 between the edges of the plates 108 to complete the box-like configuration of the vertical sliding section 106. Preferably, the interior surface of the plates 108, 110, 114, 118 and 120 have provided thereon bearing elements 122 of Phosphor bronze or the like for engaging the exterior surface of the central portion of the jacking mechanism section 28.

In order to effect the vertical sliding movement of the

section 106 relative to the central portion of the jacking mechanism section 26, there is provided a pair of lower single acting hydraulic piston and cylinder units 124 disposed on opposite sides of the central portion of the section. Each hydraulic piston and cylinder unit 124 includes a cylinder 126 having its lower end provided with a rounded bearing element 128 for engagement within a recessed bearing plate 130, rigidly secured to the upper surface of the plate 34 adjacent the associated extension 36 thereof. The central portion of the cylinder 126 has a cylindrical retaining member 132 suitably secured thereto, the latter having a pair of vertically spaced apertured brackets 134 extending horizontally therefrom. A pair of cooperating apertured brackets 136 are rigidly secured to the associated plates 48 of the base portion and the brackets 134 and 136 are detachably secured by any suitable means, such as bolts 137.

Each hydraulic piston and cylinder unit 124 also includes the usual piston (not shown) slidably mounted in the cylinder 126 and having a rigidly connected piston rod 138 extended therefrom upwardly through the cylinder. The upper end of each piston rod 138 is formed with a convex surface to fit within a recess formed in a bearing plate 140 secured to the lower surface of a lower horizontal plate 142 extending outwardly from the end of the lower edge of the associated plate 108. Rigidly secured to each plate 108 above the associated plate 142 is an upper horizontal plate 144 and an intermediate plate 146, all of the plates 142, 144 and 146 being rigidly interconnected by suitable plates 148 extending vertically therebetween.

Rigidly secured to the upper surface of plate 144 is a pair of recessed bearing plates 150 arranged to receive the convex lower ends 152 of a pair of cylinders 154 of a pair of upper hydraulic piston and cylinder units 156. As before, the cylinder 154 has a cylindrical retaining member 158 suitably secured thereto. A pair of vertically spaced brackets 160 extend horizontally from the retaining members 158 and cooperate with a pair of vertically spaced brackets 162 rigidly secured to the associated end plate 108 extending horizontally outwardly therefrom. The brackets 160 and 162 are suitably apertured to receive appropriate securing elements, such as bolts 164 or the like.

In a like manner, each hydraulic piston and cylinder unit 156 includes the usual piston (not shown) slidably mounted within the cylinder 154 having a piston rod 166 rigidly secured thereto extending upwardly through the cylinder. The upper end of each piston rod is rounded to seat within a recess of a bearing plate 168 rigidly secured to the under surface of a horizontal plate 170 rigidly secured to the associate vertical side plate 86 extending horizontally outwardly therefrom. The plates 170 together with similar upper plates 172, intermediate plates 174, plate 100 and the associated portions of the side plates 86 and end plate 84 form the head portion 32 of the jacking mechanism section 26.

Mounted for horizontal movement within the openings 98 and 102 in the head portion of the section is an upper jacking bar or pin assembly 178. A lower jacking bar or pin assembly 180 is carried by the lower end of the vertical sliding section 106 for horizontal movement between the apertures 114 and 116 formed therein and the slots 90 formed in the central portion of the jacking mechanism section 26. In general, the assemblies 178 and 180 are of substantially identical construction so that the description of one should suffice to give a clear understanding of both.

As shown in Figure 5, the assembly 180 includes a horizontally disposed pin 182 which is preferably of rectangular configuration in cross-section. The pin 182 may be of solid construction or of plates welded together to form a rigid, hollow construction. The pin 182 has its inner end as reduced at 184 for entry within an aperture 25 in a jacking bar 22 of the supporting leg and a pair of horizontally spaced vertically extending bars 186 are rigidly secured to the outer end surface thereof. A connecting plate 188 is rigidly secured to the outer surfaces of the bars 186 so as to form a socket 190 on the end of the pin 182. Plate 188 has a U-shaped slot 192 formed in its upper end. The socket 190 and the slot 192 are arranged to detachably receive a double acting hydraulic piston and cylinder unit 194. The unit includes the usual cylinder 196 having a conventional piston (not shown) slidably mounted therein. A piston rod 198 is rigidly secured to the piston and extends from the cylinder toward the outer end and has its outer end provided with an angular recess 200 arranged to seat within the slot 192.

The piston and cylinder unit 194 is carried by a housing 202 rigidly secured to the outer surface of the associate plate 110. The housing 202 includes a pair of horizontally spaced side plates 204 interconnected by a pair of vertically spaced plates 206. A cover plate 208 is detachably secured, as by bolts 210 or the like, to suitable flanges 212 formed on the outer edges of the plates 204 and 206. The central portion of the cover plate 208 is apertured, as at 214, to receive the cylinder 196 of the unit 194. As best shown in Figure 5, the upper and lower plates of the housing 202 have spaced inclined notches 216 formed therein for receiving a pair of removable wedge elements 218 when the associated pin 182 is in its fully extended position to thereby lock the same in such position.

The assembly 180 further includes a pair of transversely spaced hooked shaped elements or claws 220 similar to claws 54 which together define a recess 222 for receiving the jacking bar 22. Preferably, bearing elements 224, of Phosphor bronze or the like are provided on the interior surface of the recess 222 for engaging the exterior surface of the jacking bar.

As stated above, the upper locking pin assembly 178 is similar in construction to the assembly 180 and in general includes a bolt or pin 226 movable horizontally by a piston and cylinder unit 228. In addition claws 230 define a recess 232 and are provided for receiving the jacking bar 22.

Operation

In operation, each jacking mechanism unit is mounted on the platform 12 by first positioning the pad 62 into registering engagement with the lugs 58. Next, the rigid structure 64 is moved laterally above the pad 62 together with the upper pads 78 and plates 80. The inverted U-shaped strap is then secured in position and, finally, the jacking mechanism unit itself is moved into position so that the structure 64 and pads 78 are disposed within the recess 46 and between the lower legs of the base portion. The apertures 72 in the rigid structure 64 and the apertures 74 in the plates 38 of the base portion are properly aligned and the bolts 76 are secured therein.

As stated above, usually two jacking mechanism units are utilized to effect the vertical movement of each supporting leg 14 within the well 18 relative to the platform 12. Since the operation of each jacking mechanism unit is identical, a description of a single unit should suffice to give a clear understanding of the entire operation. It will be understood that after the unit has been mounted on the platform, as indicated above, the supporting leg is lowered, as by a crane or the like, downwardly into the associated well 18. In this regard, the jacking bar 22 of the supporting leg is fed within the recesses 232, 222, and 56 formed by the claws 230, 220, and 54 of the jacking mechanism unit. The engagement of the bar within the recess permits limited lateral movement of the supporting leg with respect to the platform but effectively prevents rotational movement of the supporting leg about its longitudinal axis relative to the platform.

Initially, both the upper pin 226 and lower pin 186 are engaged within apertures within the jacking bar 22 adja-

cent the lower end thereof so as to retain the supporting leg in an elevated transport position above the platform. In this position, the platform is transported, as by a suitable towing vessel or the like, to a marine site where operations are to be carried on. It will be understood that suitable controls may be provided for actuating the hydraulic and cylinder units **194** and **228** of the pin assemblies **180** and **178** respectively and the lower and upper units **124** and **156** such as disclosed in the aforesaid application Serial No. 523,323. In addition, the sequence in which the various hydraulic piston and cylinder units are actuated to effect the desired relative movement between the supporting leg and platform is fully disclosed in the aforesaid application to which reference may be had if necessary.

Briefly, it will be noted that when the platform is floating on the surface of the water above the marine site, the supporting legs are retained in an elevated position by the jack pins of the jacking mechanism and the weight of the supporting leg is transmitted by the pins to the base portion **28** and from the base portion to the platform **12** through the pad **62**. By suitably actuating the various hydraulic piston and cylinder units, the supporting leg is lowered through the well **18** of the platform until the lower end of the supporting leg engages the marine bottom. Subsequent downward movement of the supporting leg with respect to the platform will effect a transfer of the weight so that after the supporting leg has reached a firm foundation in the marine bottom it serves to support the platform through the pins of the jacking mechanism unit. When the platform is supported from the embedded supporting legs, the platform is in effect suspended from the base portion of the jacking mechanism unit through the rigid structure **64**, pads **78**, and the horizontal plate **82** of the U-shaped strap rigidly secured to the platform **12**. It will be understood that continuing the relative downward movement of the supporting leg with respect to the platform has the effect of raising the platform above the surface of the water after the supporting legs have reached a firm foundation in the marine bottom. When the platform has reached a desirable level above the surface of the water the desired operations can be carried on. In such condition, the platform is suitable for many purposes as, for example, off-shore oil well drilling, radar stations, airdromes and the like.

When the platform is in its elevated operative position, the lower pin **182** is disposed in its engaged position within an aperture **25** of the jacking bar **22**. The pin is locked into its extended position by insertion of wedges **218** into the aligned notches **216**, as shown in Figure 5. It will be noted that the forward surface of the wedges **218** engage the outer surface of the pin **182** so as to prevent withdrawal of the same. In this condition, the associated hydraulic piston and cylinder unit **194** can be removed by loosening the bolts **210** and lifting the unit together with the cover **203** upwardly so as to move the end of the piston rod **198** out of the slot **192**.

With the lower pin **182** in locked extended position it will be noted that the weight of the platform is suspended from the supporting leg through the lower pin **182**, the upper hydraulic piston and cylinder units **156**, the head portion, central portion and base portion of the section **26**, the rigid structure **64**, pads **78** and the U-shaped strap. In order to lock the sliding section **106** to the central portion of the section **26** so as to permit deactivation and removal, if desired, of the hydraulic piston and cylinder units **156**, there is provided a plurality of shim plates **234** of various thicknesses arranged to be disposed between the upper surface of the plate **120** and the lower surface of the plate **100**. It will be understood that the spacing between the apertures **25** in the jacking bar is fixed and therefore a suitable number of shim plates are utilized which will enable the upper pin to contact the wall of the jacking bar defining the lower end of the aperture in which the upper pin is received.

As best shown in Figures 7 and 14, the shims **234** are generally of L-shaped configuration and include a leg **236** arranged to extend around one end of the central portion of the section **26**. The leg **236** of each shim is notched, as at **238**, and corresponding apertures **240** are formed in the plates **170**, **172** and **174** of the head portion of the jacking mechanism section. In addition, U-shaped supporting members **242** and **244** are rigidly secured to the plate **100** and plate **108** to provide recesses in alignment with the aforesaid apertures. A locking bar **246** is arranged to be extended through the recesses and apertures so as to maintain the shims in the proper position, as is clearly illustrated in Figure 14.

It will be seen that after the shims have been positioned as indicated above both the upper and lower pins transmit a portion of the load of the platform to the supporting leg and the entire jacking mechanism unit is rigidly maintained together. Of course, the upper pin is wedged into its extended position by utilizing additional wedges **218** in the manner described above in connection with the lower pin assembly **180**.

It will be understood that with the jacking mechanism units providing a rigid connection between the supporting legs and the platform, the latter may be utilized as a relatively permanent installation for an extended period of time without the necessity of further or auxiliary securing means.

When operations have been completed the above procedure is carried out in reverse so that the pins are unlocked and made to operate by the respective hydraulic piston and cylinder units and the section **106** is made to move vertically with respect to the main body of the unit by operation of the units **124** and **156**. In this manner the platform is again lowered with respect to the supporting legs onto the surface of the water and the supporting legs are subsequently pulled out of their embedded condition in the marine bottom to an elevated transport position with respect to the floating platform.

It thus will be seen that the objects of this invention have been fully and effectively accomplished. It will be realized, however, that the foregoing specific embodiment has been shown and described only for the purpose of illustrating the principles of this invention and is subject to extensive change without departure from such principles. Therefore, this invention includes all modifications encompassed within the spirit and scope of the following claims.

I claim:

1. A jacking mechanism for selectively effecting or restraining substantially vertical relative movement selectively in either direction between a platform-like body and at least one substantially upright body-supporting leg mounted on the body for substantially vertical movement relative thereto comprising a first section having a generally upright column portion, a second section mounted in surrounding relation on the column portion of said first section for substantially vertical sliding movement thereon, said column portion having a vertically elongated opening extending therethrough, a first horizontal pin carried by said first section for horizontal reciprocating movement relative thereto between extended and retracted positions, a second horizontal pin carried by said second section for horizontal reciprocating movement relative thereto between extended and retracted positions, said second pin extending through said opening, power means for selectively effecting the horizontal reciprocating movement of said pins, and power means for selectively effecting a vertical sliding movement in either direction of said second section on said first section portion.

2. A jacking mechanism as defined in claim 1 wherein said first section includes a head portion rigid with the upper end of said column portion, said head portion receiving one of said pins.

3. A jacking mechanism as defined in claim 1 where-

in said second section includes a pair of opposed outwardly extending rigid portions, said first section having corresponding upper and lower pairs of rigid portions, and a single acting fluid pressure operated cylinder and piston unit between each rigid portion of said second section and the corresponding portion of each upper and lower pair of said first section.

4. A jacking mechanism as defined in claim 1 wherein said first section includes a base portion rigid with the lower end of said column portion, said base portion having means thereon for mounting said first section on a platform.

5. A jacking mechanism as defined in claim 4 wherein said base portion includes a pair of transversely spaced depending legs, and wherein said platform mounting means comprises a rigid horizontal structure having shock absorbing pad means on the opposite horizontal surfaces thereof, an inverted U-shaped strap embracing said horizontal structure and pad means arranged to be rigidly secured to the platform, and means detachably securing said rigid structure to the depending legs of said base portion.

6. A jacking mechanism as defined in claim 1 wherein said power means for effecting movement of said pins comprises a fluid pressure operated piston and cylinder unit detachably connected to each pin for moving the same between said extended and retracted positions and removable wedge means acting between each pin and the associated section for locking said pin in its extended position to thereby permit detachment of the associated piston and cylinder unit.

7. A jacking mechanism as defined in claim 6 wherein each unit includes a cylinder having a piston rod extending outwardly therefrom, means removably mounting each cylinder on its associated section in longitudinal alignment with its associated pin, means removably connecting each piston rod and associated pin in end-to-end alignment, and surface means rigid with each section spaced longitudinally from the rod connected end of the associated pin when the latter is in its extended position for engaging one surface of said wedge means when the opposite surface of the latter is engaged with said associated pin end.

8. A jacking mechanism as defined in claim 1 wherein shim means is provided for insertion between said sections for preventing relative movement of the latter in one direction out of a supporting position in which said pins transmit substantially equal loads.

9. In an apparatus of the type described including a platform-like body and a jacking mechanism for selectively effecting or restraining substantially vertical relative movement selectively in either direction between said body and at least one substantially upright body-supporting leg mounted on said body for substantially vertical movement relative thereto, the improvement comprising means for mounting said jacking mechanism on said platform, said means including a rigid horizontal structure having shock absorbing pad means disposed above and below the same, an inverted U-shape strap having a bight portion overlying the shock absorbing means above said structure and spaced legs extending downwardly therefrom for rigid securement to said platform, said jacking mechanism including spaced depending legs for rigid detachable securement to said structure.

10. A jacking mechanism for selectively effecting or restraining substantially vertical relative movement selectively in either direction between a platform-like body and at least one substantially upright body-supporting leg mounted on the body for substantially vertical movement relative thereto comprising a pair of sections mounted for relative vertical movement in either direction with respect to each other, power means for effecting relative movement in either direction between said sections, a pin mounted on each section for horizontal reciprocating movement between extended and retracted positions, a fluid pressure operated piston and cylinder unit detachably connected to each pin for moving the same between extended and retracted positions, and removable wedge means acting between each pin and the associated section for locking said pin in its extended position to thereby permit detachment of the associated piston and cylinder unit.

11. In a jacking mechanism of the type described, the combination comprising a jacking section having a horizontal pin slidably mounted therein for horizontal reciprocating movement between extended and retracted positions, a fluid pressure operated unit for effecting movement of said pin between said extended and retracted positions, said unit including a cylinder having a piston rod extending outwardly therefrom, means removably mounting said cylinder on said section in longitudinal alignment with said pin, means removably connecting said piston rod and said pin in end-to-end alignment, and surface means rigid with said section spaced longitudinally from the rod connected end of said pin when the latter is in its extended position for engaging one surface of a wedge when the opposite surface of the latter is engaged with said pin end.

12. A jacking mechanism as defined in claim 11 wherein said means removably connecting said piston rod and said pin comprises a plate rigidly secured to said pin end in spaced relation thereto, said plate having a slot formed therein, said piston rod end having an annular groove formed therein defining a portion of reduced diameter arranged to fit within said slot.

13. A jacking mechanism for selectively effecting or restraining substantially vertical relative movement selectively in either direction between a platform-like body and at least one substantially upright body-supporting leg mounted on the body for substantially vertical movement relative thereto comprising a pair of jacking sections mounted for relative vertical movement toward and away from each other, a leg engaging pin mounted on each section for horizontal reciprocating movement between extended and retracted positions, removable power means for effecting relative movement of said sections toward and away from each other, and shim means insertable between said sections for preventing movement of said sections toward each other out of a supporting position in which said pins transmit substantially equal loads whereby said power means can be removed.

14. A jacking mechanism as defined in claim 13 wherein said shim means comprises a series of flat L-shaped plates of varying thickness.

15. A jacking mechanism as defined in claim 14 wherein each of said L-shaped plates includes a locking element receiving cut-out and means on said sections for receiving a locking element and retaining the same in said plate cut out.

16. A jacking mechanism for selectively effecting or restraining substantially vertical movement selectively in either direction between a platform-like body and at least one substantially upright body-supporting leg mounted on the body for substantially vertical movement relative thereto comprising a first jacking section, means detachably mounting said section on the upper surface of the body, said mounting means including shock absorbing pad means for absorbing shocks incident to vertical forces applied to said section in either direction, a second jacking section mounted on said first section for vertical movement in either direction with respect thereto, a pin slidably mounted on each section for horizontal reciprocating movement between extended and retracted positions, a fluid pressure operated cylinder and piston unit for reciprocating each pin, each unit including a cylinder removably fixed to the associated section and a piston rod detachably connected in end-to-end longitudinal alignment with the associated pin, wedge means for locking each pin in an extended position to permit removal of the associated unit engageable between each rod connected pin end and spaced surface means rigid with the

associated section, power means removably secured between said sections for effecting relative movement therebetween in either direction, and shim means for insertion between said sections for preventing relative movement of the latter in one direction out of a supporting position in which said pins transmit substantially equal loads.

References Cited in the file of this patent

UNITED STATES PATENTS

2,775,869	Pointer	Jan. 1, 1957
2,822,670	Suderow	Feb. 11, 1958
2,858,105	Lucas	Oct. 28, 1958