April 24, 1962 L. J. ROUSSEL 3,031,167

HYDRAULIC DEVICE FOR SKIDS

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Fig. 1

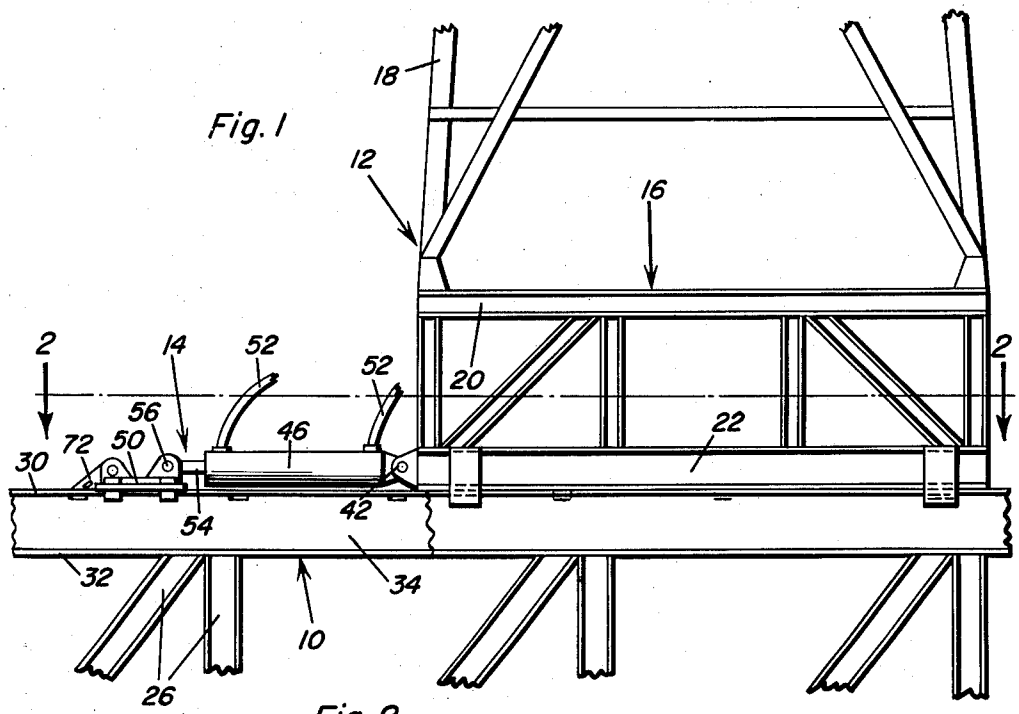
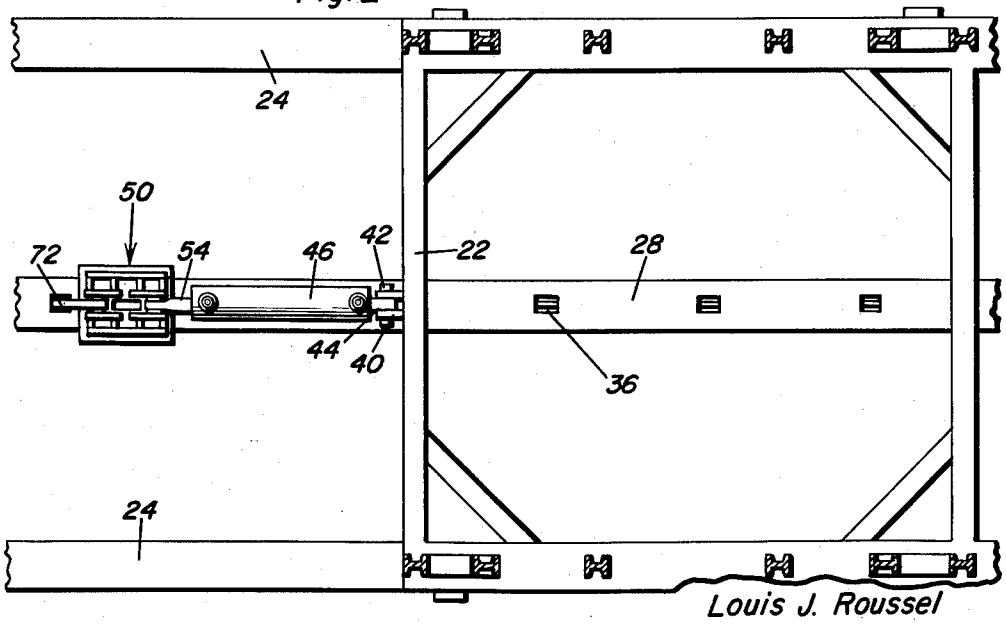


Fig. 2



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Fig. 3

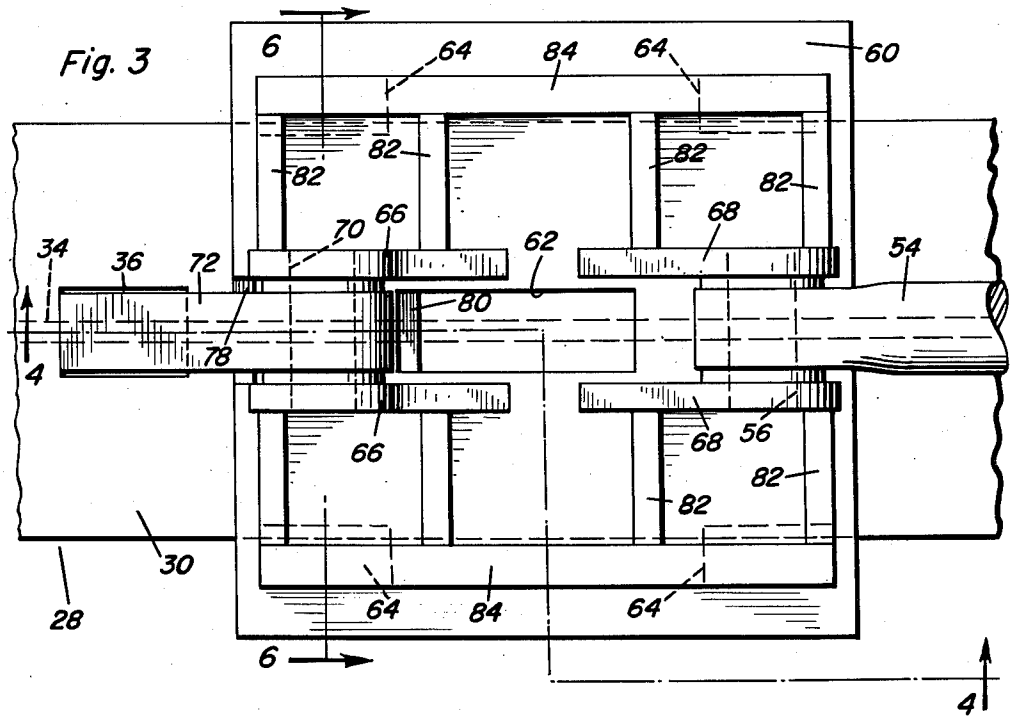
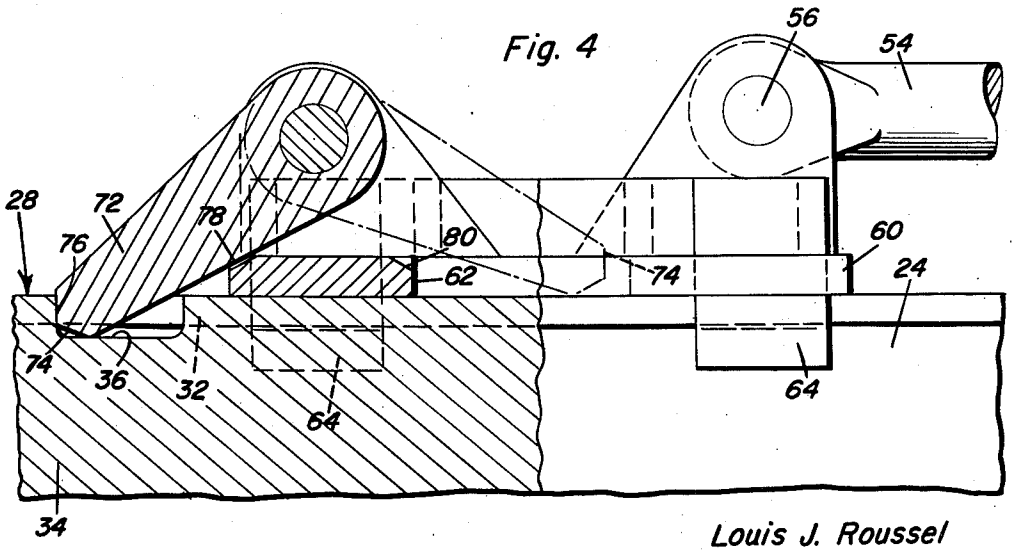


Fig. 4



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Fig. 5

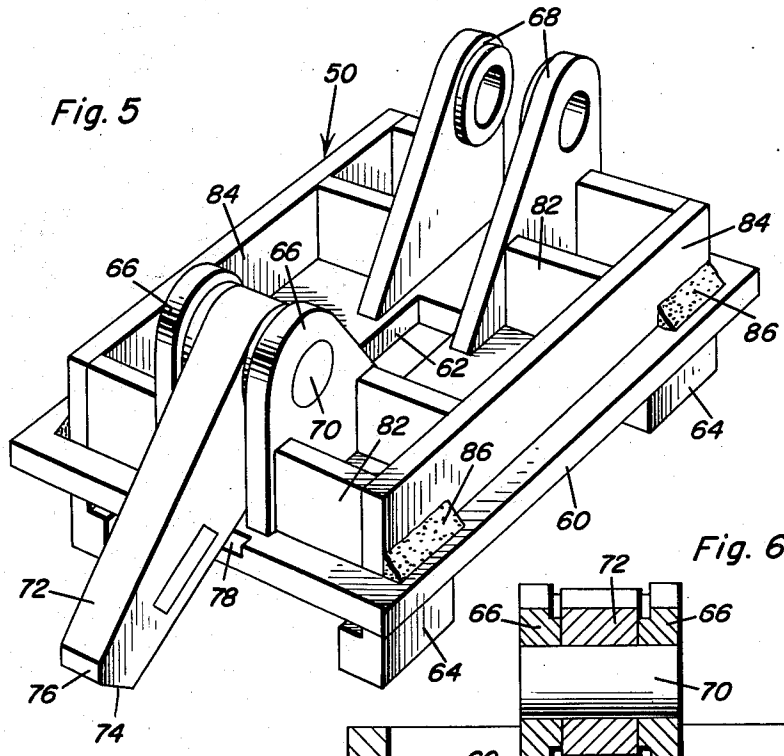


Fig. 6

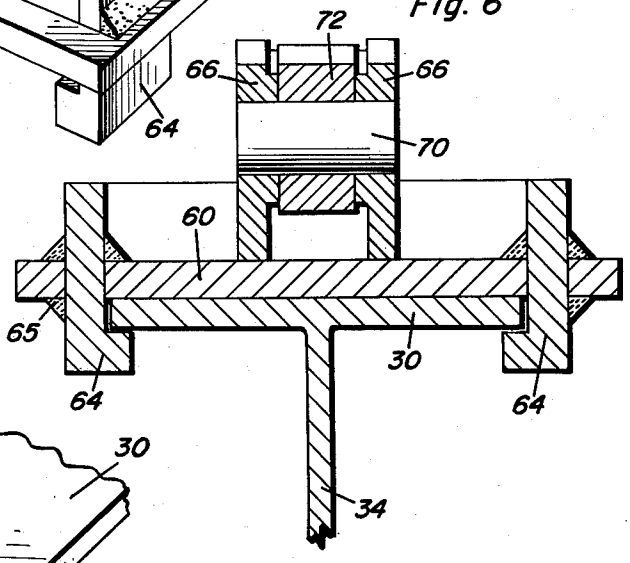
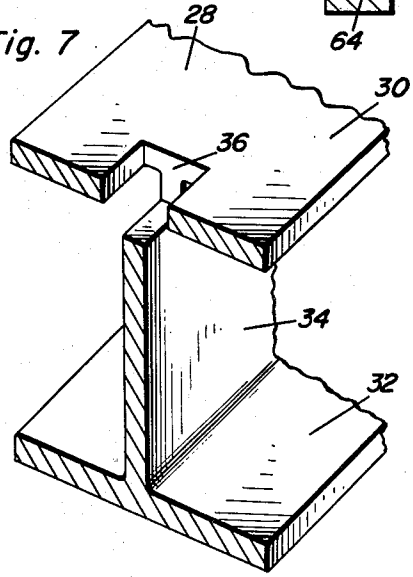


Fig. 7



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HYDRAULIC DEVICE FOR SKIDS

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12 Claims. (Cl. 254—105)

This invention comprises a novel and useful hydraulic device for skids and more particularly relates to a hydraulic means whereby the floor structure of a drilling rig mounted upon a skid may be effectively pushed into and from a desired position upon the substructure of a derrick support such as one adapted for off-shore drilling operations.

In the well drilling art it is frequently necessary to move the derrick of the drilling rig from one location to another. This is particularly desirable when it is intended to install a drilling rig upon a prepared supporting substructure for drilling an off-shore well. For this purpose drilling rigs have been designed in which the lower portion or substructure of the drilling rig including the lower portion of the drilling derrick thereof is detachable from the upper portion of the derrick and is mounted upon a skid or sled to facilitate its movement as a unit to and from a particular location.

It is therefore the primary purpose of the present invention to provide an apparatus which will effectively facilitate the sliding movement of such a drilling rig substructure to and from a substructure mounting therefor.

A further object of the invention is to provide a hydraulic device which will with certainty and facility effect a positive motion of a skid upon which the substructure of a drilling rig is mounted upon the supporting foundation and especially of the off-shore type.

Yet another object of the invention is to provide a hydraulic device in accordance with the foregoing objects which shall have a novel and efficient cooperation with the skid of the drilling rig and the supporting foundation to facilitate and control positively the sliding movement of the skid upon the foundation.

A more specific object of the invention is to provide a hydraulic device in accordance with the preceding objects which shall cooperate with longitudinally spaced apertures through an eye beam or similar structural element forming a part of the foundation to effect positive sliding movement of the skid upon such foundation.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is a side elevational view, parts being broken away, showing a suitable supporting foundation and especially one of the off-shore drilling type together with a substructure of a drilling rig mounted upon a skid and with the hydraulic actuating means of the present invention shown applied thereto for effecting positive movement of the skid and drilling rig upon the support foundation;

FIGURE 2 is a horizontal sectional view taken substantially upon the plane indicated by section line 2—2 of FIGURE 1;

FIGURE 3 is a fragmentary view in plan showing upon an enlarged scale the manner in which the hydraulic actuating device is associated with a beam of the support structure for effecting positive movement of the skid thereon;

FIGURE 4 is a vertical longitudinal sectional view taken substantially upon the plane indicated by the broken section line 4—4 of FIGURE 3 and showing in full and dotted lines alternative positions of the dog of the hydraulic actuating means for effecting movement of the skid in different directions upon the support foundation;

FIGURE 5 is a perspective view of the hydraulic jack slide forming a part of the actuating mechanism of this invention;

FIGURE 6 is a vertical transverse sectional view taken substantially upon the plane indicated by the section line 6—6 of FIGURE 3 and showing the manner in which the slide of the hydraulic jack is slidably mounted upon the upper flange of the structural beam forming a part of the support foundation; and

FIGURE 7 is a fragmentary detail view in perspective of the longitudinal structural beam of the support foundation with which the hydraulic jack of this invention specifically coacts.

Referring first to FIGURE 1 it will be observed that the numeral 10 designates generally a suitable supporting structure upon which the subassembly 12 of a drilling rig derrick is adapted to be mounted. The hydraulic device for sliding the subassembly 12 upon the support 10 is designated in FIGURE 1 generally by the numeral 14.

It may be here understood that the subassembly 12 includes a subassembly base portion indicated generally by the numeral 16 together with a conventional derrick structure 18. Inasmuch as the derrick assembly of a drilling rig is of conventional design and forms no part of the present invention, a further description of the same is deemed to be unnecessary.

The subassembly includes the usual structural members including bracing shown by the numerals 20 and at their lower ends are mounted upon any suitable construction of skid which is here identified by the numeral 22.

The supporting structure or support foundation 10, as shown in FIGURE 2, includes a plurality of generally parallel horizontal structural I or H beams 24 having suitable brace supporting elements as at 26. One of these beams such as the beam 28 is modified in order to permit and cooperate with the use of the hydraulic device 14.

Thus, as shown in FIGURE 7, the beam 28 is shown as an H or I beam having horizontal upper and lower flanges as at 30 and 32 connected by a vertical web 34 therebetween. At longitudinally spaced intervals along the upper flange 30 there are provided a series of apertures or recesses as at 36. It will be observed that recess 36 is cut through the upper flange 30 into the vertical flange 34 as shown clearly in FIGURE 7 to provide thus a pocket or recess for a purpose to be subsequently apparent. Any convenient spacing of the openings 36 in the beam 28 can be provided, a spacing of about two feet being found to be generally satisfactory for the purposes of this invention.

At one of its extremities the skid 22 is provided with a pair of forwardly projecting lugs 40 between which is removably secured as by a bolt or the like 42 a lug 44 of a hydraulic cylinder unit 46 whose other end is connected to a slide 50. The slide 50 and hydraulic cylinder form the components of the hydraulic device 14 previously mentioned.

Suitable flexible conduits as at 52 are connected to opposite ends of the hydraulic cylinder 46 and to a suitable source of hydraulic pressure and control means, not shown, to selectively supply an operating force at either end of the cylinder. Received in the cylinder is a piston, not shown, having a piston rod 54 which in turn is pivotally connected as by a pivot pin 56 to the slide 50.

As so far described it will thus be apparent that the length of the hydraulic unit consisting of the cylinder 46 and the piston rod 54 may be selectively longitudinally expanded or contracted in accordance with the fluid pres-

sure supplied by means of the conduits 52 to the opposite ends of the cylinder.

Attention is now directed primarily to FIGURE 5 wherein it will be observed that the slide 50 consists of a flat plate 60 having a medially and longitudinally disposed slot 62 therethrough which overlies the center line connecting the recesses or slots 36 previously mentioned in the longitudinal beam 28. Extending beneath the plate 60 and rigidly secured thereto are sets of L-shaped lugs or brackets 64 which may be rigidly secured as by welding or the like as at 65. As shown in FIGURE 6 these brackets together with the plate 60 serve to embrace the outer edges of the upper flange 30 of the structural member 28 whereby to slidingly retain the slide 50 thereon for longitudinal guided sliding movement.

Rising from the upper surface of the plate 60 are pairs of lugs 66 and 68. These lugs are apertured, the former to receive a pin 70 while the latter receive the pin 56 previously mentioned by which the piston rod 54 of the hydraulic cylinder unit is pivotally connected thereto. Pivoted between the lug 66 by the pin 70 is a dog 72. The outer end of this dog has a pair of inclined flat surfaces as at 74 and 76. It will be observed from FIGURE 5 that the edge of the slide plate 60 is notched or cut away as at 78 to permit clearance whereby the dog can be swung into the position shown in FIGURE 5 or in full lines in FIGURE 4 with its nose portion engaged in the recess 36 in the top and vertical flanges 30 and 34 of the beam 28. In this position the face 76 of the dog will abut against an end wall of the recess so that when the hydraulic cylinder is actuated the entire slide will be held against this end wall of the recess and the skid, upon expansion of the cylinder and piston unit 46 and 54 will move the skid 22 towards the right causing it to slide upon the longitudinal members 24, 28 of the support foundation 10.

However, the inner end of the slot 62 previously mentioned in the plate 60 of the slide is likewise beveled or cut away as at 80 to provide adequate clearance so that when the dog is swung over to the dotted line position shown in FIGURE 4, the previously mentioned surface 74 will now engage the opposite end wall of the aperture 36 and by pushing thereagainst will thus move the skid in the opposite direction. Thus the hydraulic means will effect a step-by-step movement of the skid along the support foundation 10 it being understood that the stroke of the hydraulic cylinder will be sufficient to effect travel between successive recesses 36 upon the beam 28.

From a further reference to FIGURE 5 it will be observed that the lugs 66 and 68 are securely braced to each other and to the plate 60 by means of cross pieces 82 and longitudinal members 84, the latter being welded or otherwise secured to the plate 60 as by welding 86.

From the foregoing, the construction and operation of the device will be readily understood and further explanation is believed to be unnecessary. However, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. A hydraulic device for moving oil well rig skids upon a support foundation of the type having a longitudinal beam with a series of longitudinally spaced recesses comprising; a slide having retaining means for clamping it to said beam for longitudinal sliding movement upon its top surface, a hydraulic cylinder and piston unit having one end secured to said slide and its other end to an oil well rig skid, said slide having a dog pivotally mounted thereon and engageable selectively and in sequence in said beam recesses whereby to anchor said slide and effect step-by-step sliding movement of said skid longitudinally of said support foundation, said slide including a flat plate slidably engaging the top surface of said beam, lugs on said plate pivotally fastening said dog and said cylinder and piston unit thereto, said plate having a cut away portion to provide clearance for said dog when the latter is engaged in a recess in said beam, said plate having longitudinal slot therein adapted to receive said dog therethrough when the dog is selectively pivoted about its support lugs in opposite directions to engage recesses in said beam whereby said slide and said cylinder and piston unit may effect sliding of said skid in opposite directions upon said longitudinal beam.

2. The combination of claim 1 wherein an edge of said slot is cut away to provide clearance for said dog.

3. A hydraulic device for moving oil well rig skids upon a support foundation of the type having a longitudinal beam with a flat top flange with a series of longitudinally spaced recesses therein comprising; a slide having a flat bottom surface resting upon said top flange and provided with retaining means for clamping it to said beam for longitudinal sliding movement upon its top surface, a hydraulic cylinder and piston unit having one end secured to said slide and its other end to an oil well rig skid, said slide having a dog pivotally mounted thereon and engageable selectively and in sequence in said beam recesses whereby to anchor said slide and effect step-by-step sliding movement of said skid longitudinally of said support foundation, said slide including a flat plate slidably engaging the top surface of said beam, upstanding lugs on opposite ends of said plate pivotally fastening said dog and said cylinder and piston unit thereto, said plate having retaining means on its underside at each corner thereof for embracing the top flange of said beam for guiding and retaining said slide thereon and, brace members on the top surface of said plate rigidly connecting the latter and said lugs.

4. A hydraulic device for moving oil well rig skids upon a support foundation of the type having a longitudinal beam with a flat top flange with a series of longitudinally spaced recesses therein comprising; a slide having a flat bottom surface resting upon said top flange and provided with retaining means for clamping it to said beam for longitudinal sliding movement upon its top surface, a hydraulic cylinder and piston unit having one end secured to said slide and its other end to an oil well rig skid, said slide having a dog pivotally mounted thereon and engageable selectively and in sequence in said beam recesses whereby to anchor said slide and effect step-by-step sliding movement of said skid longitudinally of said support foundation, said slide including a flat plate slidably engaging the top surface of said beam, lugs on said plate pivotally fastening said dog and said cylinder and piston unit thereto, said plate having side walls rising from and secured to its top surface, cross members secured to said plate, said lugs and to said side walls for bracing said lugs to the latter, said plate having an opening therethrough for receiving said dog when the latter is pivoted about its support lugs in opposite directions to engage recesses in said beam whereby said slide and said cylinder and piston unit may effect sliding of said skid in opposite directions upon said beam.

5. A hydraulic device for moving oil well rig skids upon a support foundation of the type having a longitudinal beam with a flat top flange with a series of longitudinally spaced recesses therein comprising; a slide having a flat bottom surface resting upon said top flange and provided with retaining means for clamping it to said beam for longitudinal sliding movement upon its top surface, a hydraulic cylinder and piston unit having one end secured to said slide and its other end to an oil well rig skid, said slide having a dog pivotally mounted thereon and engageable selectively and in sequence in said beam recesses whereby to anchor said slide and effect step-by-step sliding movement of said skid longitudinally of said support foundation, said slide including a flat plate slidably engaging the top surface of said beam, lugs on said plate

pivotally fastening said dog and said cylinder and piston unit thereto, whereby upon successive longitudinal contraction and expansion of said cylinder and piston unit the slide will push the skid forward upon the support foundation and thus will ratchet with its dog longitudinally of the beam and will then anchor at the next recess for the next actuation, said plate having an opening therethrough for receiving said dog when the latter is pivoted about its support lugs in opposite directions to engage recesses in said beam whereby said slide and said cylinder and piston unit may effect sliding of said skid in opposite directions upon said beam.

6. A hydraulic device for moving oil well rig skids upon a support foundation of the type having a longitudinal beam with a flat top flange with a series of longitudinally spaced recesses therein comprising; a slide having a flat bottom surface resting upon said top flange and provided with retaining means for clamping it to said beam for longitudinal sliding movement upon its top surface, a hydraulic cylinder and piston unit having one end secured to said slide and its other end to an oil well rig skid, said slide having a dog pivotally mounted thereon and engageable selectively and in sequence in said beam recesses whereby to anchor said slide and effect step-by-step sliding movement of said skid longitudinally of said support foundation, said slide including a flat plate slidably engaging the top surface of said beam, lugs on said plate pivotally fastening said dog and said cylinder and piston unit thereto, said plate having retaining means on its underside embracing a flange on said beam for guiding and retaining said slide thereon, said retaining means lying in the same transverse planes as the pivot axes of said lugs whereby said retaining means will directly transmit a thrust from said cylinder and piston unit to the flanges of said beam therebeneath, said plate having an opening therethrough for receiving said dog when the latter is pivoted about its support lugs in opposite directions to engage recesses in said beam whereby said slide and said cylinder and piston unit may effect sliding of said skid in opposite directions upon said beam.

7. A hydraulic device for moving oil well rig skids upon a support foundation of the type having a longitudinal beam with a flat top flange with a series of longitudinally spaced recesses therein comprising; a slide having a flat bottom surface resting upon said top flange and provided with retaining means for clamping it to said beam for longitudinal sliding movement upon its top surface, a hydraulic cylinder and piston unit having one end secured to said slide and its other end to an oil well rig skid, said slide having a dog pivotally mounted thereon and engageable selectively and in sequence in said beam recesses whereby to anchor said slide and effect step-by-step sliding movement of said skid longitudinally of said support foundation, said slide including a flat plate slidably engaging the top surface of said beam, lugs on said plate pivotally fastening said dog and said cylinder and piston unit thereto, the axis of the lugs having the cylinder and piston unit thereto being spaced at a greater vertical distance from said plate than the axis of the lugs having the dog connected thereto.

8. A hydraulic device for moving oil well rig skids upon a support foundation of the type having a longitudinal beam with a series of longitudinally spaced recesses comprising; a slide having retaining means for clamping it to said beam for longitudinal sliding movement upon its top surface, a hydraulic cylinder and piston unit having one end secured to said slide and its other end to an oil well rig skid, said slide having a dog pivotally mounted thereon and engageable selectively and in sequence in said beam recesses whereby to anchor said slide and effect step-by-step sliding movement of said skid longitudinally of said support foundation, said slide including a flat plate slidably engaging the top surface of said beam, lugs on said plate pivotally fastening said dog and said cylinder and piston unit thereto, said plate having a cut away portion to provide clearance for said dog when the latter is engaged in a recess in said beam, said plate has a longitudinal slot therein adapted to receive said dog therethrough when the dog is pivoted about its support lugs in opposite directions to engage recesses in said beam whereby said slide and said cylinder and piston unit may effect sliding of said skid in opposite directions upon said beam, said dog having inclined flat surfaces on its end for selected flat engagement with the opposite end walls of said recesses.

9. A hydraulic device for moving oil well rig skids upon a support foundation of the type having a longitudinal beam with a flat top flange with a series of longitudinally spaced recesses therein comprising; a slide having a flat bottom surface resting upon said top flange and provided with retaining means for clamping it to said beam for longitudinal sliding movement upon its top surface, a hydraulic cylinder and piston unit having one end secured to said slide and its other end to an oil well rig skid, said slide having a dog pivotally mounted thereon and engageable selectively and in sequence in said beam recesses whereby to anchor said slide and effect step-by-step sliding movement of said skid longitudinally of said support foundation, said beam having a horizontal upper flange and a vertical flange joined medially thereof, said recesses extending through said upper flange on both sides of said vertical flange and extending downwardly into the latter.

10. A jack mechanism for moving oil well rig skids upon a support foundation comprising a longitudinal I-beam fixed relative to said foundation and having a flat web with flat flanges perpendicularly disposed thereon and with said beam having a plurality of recesses extending through one of said flanges and into the material of said web, a slide having a flat surface slidable upon said one flange, a power operated means connected to said slide and to an oil well rig skid for effecting relative movement therebetween, said slide having a dog pivotally mounted thereon for movement to selective positions in which the free end of the dog extends in opposite directions, in each of which positions said dog is engageable in sequence in said beam recesses for anchoring said slide to said beam and effecting a step-by-step sliding movement of said skid on said beam.

11. The combination of claim 10 including retaining means on said slide, slidably embracing a flange of said beam.

12. The combination of claim 10 wherein said slide includes a base slidably engaging said one flange, said base having an opening therein for passage of said dog therethrough.

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