Jan. 27, 1942. J. D. RAUCH 2,271,344

RECLINABLE SPUD CONSTRUCTION

Filed Dec. 23, 1940 2 Sheets-Sheet 1

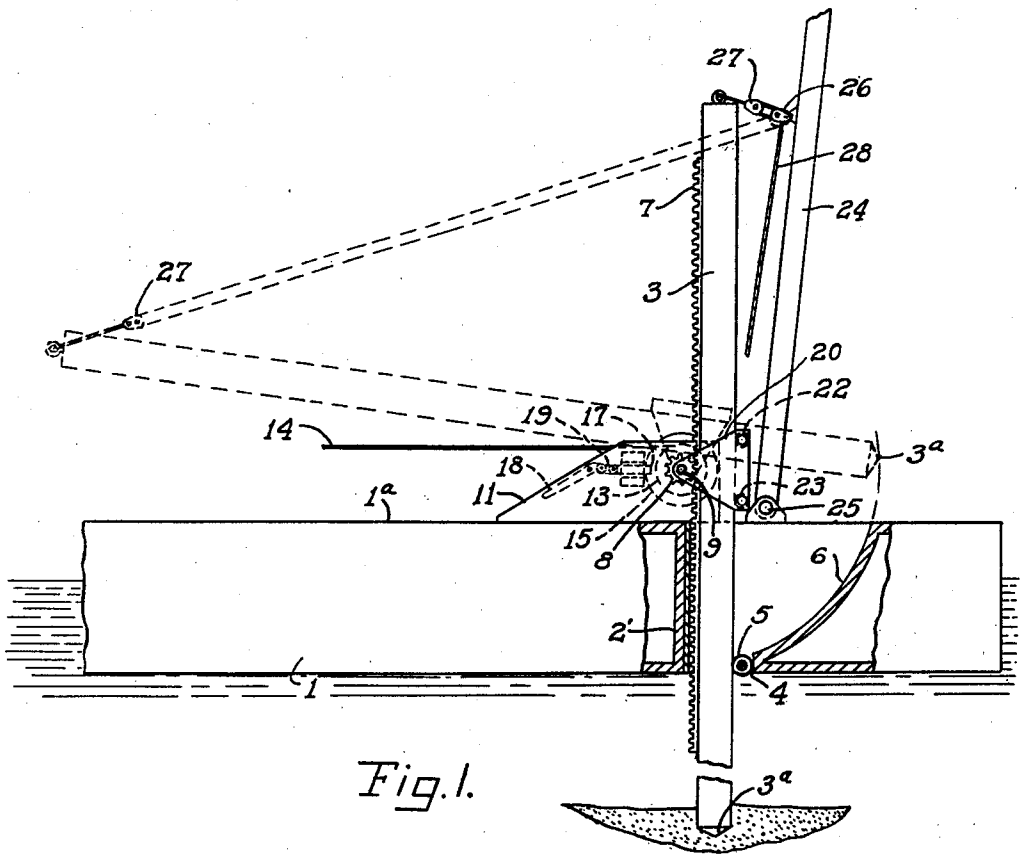


Fig. 1.

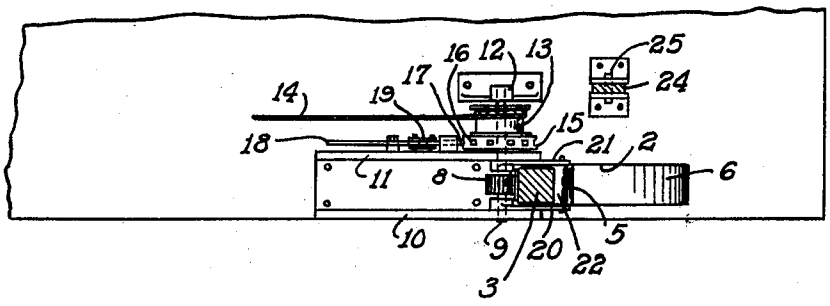


Fig. 2.

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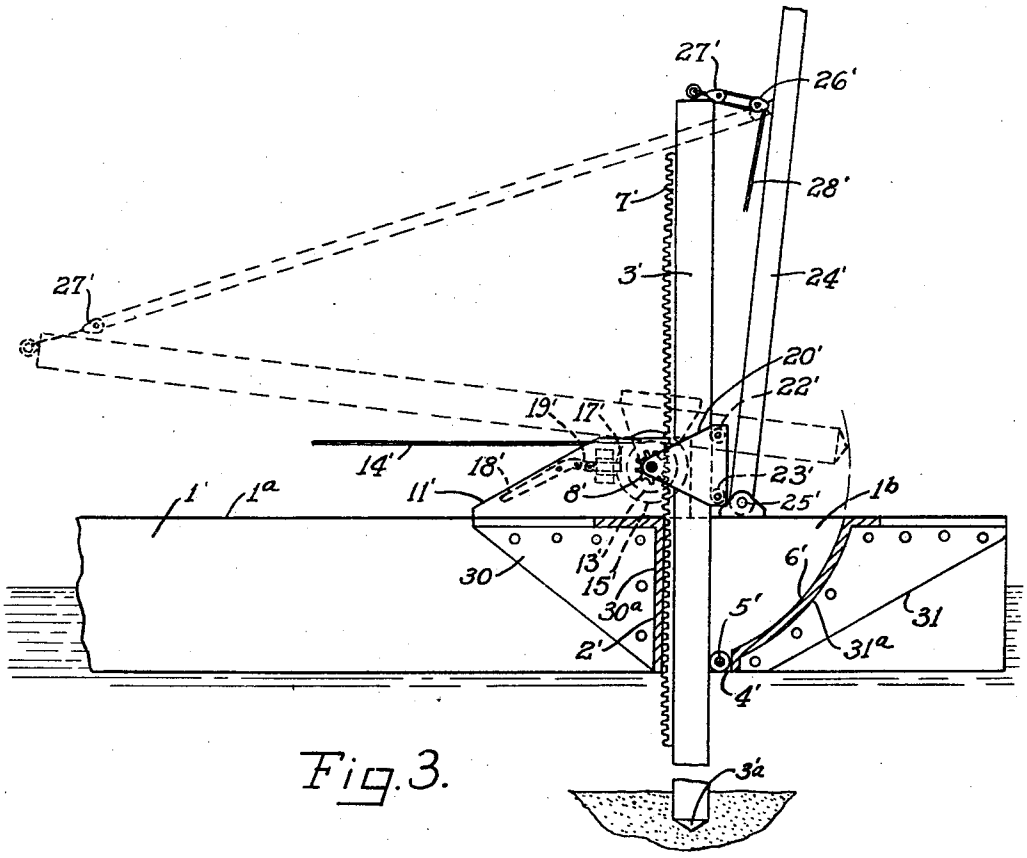


Fig. 3.

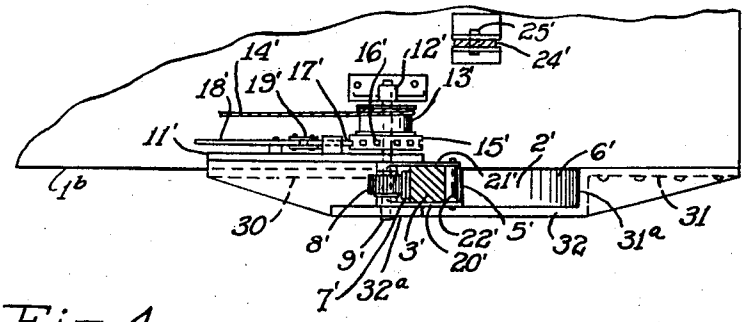


Fig. 4.

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2,271,344

RECLINABLE SPUD CONSTRUCTION

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Application December 23, 1940, Serial No. 371,430

16 Claims. (Cl. 37—73)

This invention relates to spuds for anchoring dredges, or other water craft, and more particularly to a spud construction employing an integral spud of a common type adapted to be vertically aligned respecting the hull when it is positioned for the anchoring operation.

In many types of dredging operations where it is impracticable to employ bank spuds either because of the condition of the bank, or because of the width of the waterway, it is necessary to use spuds operable vertically respecting the dredge, the lower end of the spud being embedded in the waterway bottom for anchoring the dredge during the dredging operations. With spuds of this type raised from the anchoring position for enabling movement of the dredge to a new location, a considerable problem is encountered when the dredge is required to pass under low over-hanging obstacles, such as bridges or the like, because of the height above the water line to which the spud extends when so raised.

The problem is particularly acute when the dredging operations require digging at a considerable depth and where relatively shallow draft as well as low overhead clearance limitations are encountered in moving the dredge from one location to another. Under such conditions, a relatively long spud may be required to be used at the dredging locations and it may be necessary to raise the lower end of the spud to a point at least as high as the bottom of the hull of the dredge to clear shallow stretches of the waterway when the dredge is being moved. If during such movement low overhanging obstacles are encountered where the clearance is less than the length of the spud extending above the water line when so raised, the spud may often have to be dismantled to permit the dredge to pass such obstacles, involving considerable delay and expense.

It has been heretofore proposed to employ spuds of a telescoping construction, or spuds comprising hinged sections, but while such proposals may have utility where the digging depth is not great, they are subject to disadvantages under the acute condition, above mentioned, where the clearance above the water line is only a small fraction of the depth at which digging operations are required to be undertaken. Under such condition, because it is often necessary to utilize the spuds for the raising of the hull in the water, the telescoping or hinged section types of spud, heretofore proposed, are subject to disadvantages either in respect to their incapability of performing such hull raising function, or in respect to their incapability of being confined within a sufficiently small vertical compass when raised.

It is therefore a primary object of the present invention to provide a spud construction meeting the requirements of conditions of minimum clearance above the water line, minimum draft limitations in moving a dredge from one location to another, and maximum depth at which digging operations are to be undertaken.

For the purposes of my invention and to meet the requirements of certain operating conditions with which the invention is designed to deal, I conceive an integral type of spud, as distinguished from a telescoping or hinged section type, to be most satisfactory.

It is a further principal object of this invention to provide a spud construction in which a vertically operating spud is enabled to be laid back in a reclining position above and adjacent to the deck of the water craft when fully raised without dismantling the spud or disengaging the spud from its operating mechanism.

Another principal object of the invention is to provide a spud construction of the type just referred to wherein the spud may be moved toward reclining position above and adjacent to the hull deck before the spud is fully raised.

Still another principal object of the invention is the provision of a spud construction of the type just referred to having means for automatically vertically alining the spud as the same is moved from the reclining to the anchoring position.

A further object of the invention is to provide a well construction, for employment inside of the hull line, which will enable the spud to be automatically vertically alined for its anchoring function when lowered while permitting the spud to be moved toward reclining position above and adjacent to the hull deck before it is fully raised.

Another object of the invention is the provision of a well construction, suitable for use either inside of or outside of the hull line, which will enable the spud to be automatically vertically alined for its anchoring function when lowered while permitting the spud to be moved toward a reclining position above and adjacent to the hull deck before it is fully raised.

In carrying the invention into practice, I employ an integral spud of any suitable length appropriate for anchoring the water craft in the maximum depth of water at the location where digging operations are to be undertaken, means for moving the spud longitudinally as well as pivotally about a point of support located close

to, but above, the deck of the water craft, and means for automatically positively alining the spud vertically when the same is moved longitudinally downwardly after the spud has been swung to an approximate vertical position.

I prefer to locate the last means in a position, respecting the hull of the water craft, such that the spud may be swung about its point of support to reclining position before the lower end of the spud is raised above the level of the deck. In order to accomplish this latter object when the spud is positioned inside of the hull line, I provide a novel construction of well through which the spud is to be moved from its reclining to anchoring position, which well includes a wall, a portion of which has a forwardly extended arcuate contour, and the lower portion of the well being restricted for confining the spud in a vertical position when a portion of the spud extends into such restricted portion of the well.

The outwardly extending arcuate contour of the upper portion of one of the walls of the well enables the spud to be swung about its point of support when the lower end of the spud is raised above the restricted portion of the well, and also serves to direct the spud to vertically alined position by engagement of the lower end of the spud with the outwardly extending upper portion of the well when the spud is being lowered to operating position.

The same construction of well, involving the provision of a wall, a portion of which has an outwardly extending arcuate contour, is applicable for use when the spud is to be operated outside of the hull line, as shown by one embodiment of the invention.

For a detailed description of the invention reference is now had to the accompanying drawings in which:

Figure 1 is a view in side elevation of one form of apparatus embodying the invention, wherein the spud is mounted for operation inside of the hull line, said view looking toward one side of a portion of the hull of the water craft to which the apparatus is applied, the spud well being shown in section.

Figure 2 is a top plan view of the form of the invention shown in Figure 1, the spud being shown in section.

Figure 3 is a view in side elevation of apparatus embodying another form of the invention, wherein the spud is mounted for operation outside of the hull line, said view looking toward one side of a portion of the hull of the water craft, portions of the spud well being shown in section.

Figure 4 is a top plan view of the form of the invention shown in Figure 3, the spud being shown in section.

Referring first to the construction illustrated by Figures 1 and 2, the numeral 1 indicates the hull of a dredge or similar type of water craft which is provided, as seen best in Figure 2, with a spud well 2 positioned inside of the hull line and which extends through the hull vertically from the deck to the bottom thereof for the accommodation of a spud 3 which may be raised and lowered through the well, and, consequently, vertically through the hull. It will be understood that wells 2, for the accommodation of spuds 3, will preferably be provided on either side of the hull 1, usually both fore and aft, so as to maintain the craft on an even keel when the spuds 3 are lowered to and their lower ends embedded in the bottom of the body of water to perform their anchoring function.

The lower portion of the well 2 is narrowed or restricted in cross sectional area, as at 4, to confine the spud within a narrow compass at such point for maintaining the same vertically alined during the lowering of the spud to anchoring position. At this point 4 of restricted cross sectional area of the well 2, there may be provided a roller 5, extending across the well 2 and journaled in the side plates thereof, for engaging one side of the spud 3 for reducing the friction incident to the operation of the spud within the restricted portion of the well 2.

The well 2, above its restricted portion, is widened in one direction, by providing one wall 6, preferably the forward wall, with an outwardly extending arcuate contour, as indicated in Figure 1, whereby to permit the swinging of the spud 3 about its pivotal support as soon as the lower end 3a of the spud is raised above the roller 5.

Any suitable operating means for moving the spud longitudinally and for causing it to swing about a point of support may be provided, and, as shown, such means may take the form of rack and pinion instrumentalities and pivotally supported means for maintaining the rack engaged with the pinion during all positions of longitudinal and swinging movement of the spud 3.

The operating instrumentalities illustrated include the provision of rack teeth 7 formed on the back side of the spud 3, which mesh with a pinion 8, fixed to a shaft 9, rotatably supported in suitable bearings in the spaced vertical plates 10 and 11 secured to the deck 1a of the hull 1. The shaft 9 is extended through the plate 11 and its inner end is suitably journaled in a bearing 12 secured to the deck 1a. Fixed to the shaft 9 is a drum 13 connected with a suitable source of power by a cable 14 fastened to the drum and looped thereabout by means of which the pinion 8 may be caused to rotate for moving the spud longitudinally. The drum 13 has a circumferential flange 15 provided with pockets or ratchets 16 to receive the nose of a lock bar 17 operable by a lever 18 pivotally connected to the plate 11, and connected with the lock bar 17 by means of a link 19 pivoted to one end of the lock bar and to one end of the lever.

Engagement of the lock bar 17 with one of the pockets 16 of the flange 15 holds the drum 13 and pinion 8 against rotation, locking the spud in the desired position through the engagement of its ratchet teeth 7 with said pinion 8.

For maintaining the rack teeth 7 in engagement with the pinion 8, there is provided a stirrup pivotally supported on the pinion shaft 9, said stirrup comprising the keeper plates 20 and 21 pivoted to the shaft 9 on either side of the spud 3, and the keeper rollers 22 and 23 rotatably secured to the keeper plates and engaging the fore side of the spud 3. For controlling the pivotal movement of the spud 3 about the supporting pinion shaft 8 to reclining position, indicated by the dotted lines in Figure 1, there are provided suitable cable hoisting means comprising an A-frame 24 pivotally secured, as at 25, to the deck 1a, pulleys 26 and 27 secured respectively to the A-frame 24 and the upper end of the spud 3, and a rope or cable 28 trained over said pulleys.

It will be understood, of course, that the cable 28 need not be trained over the pulleys 26 and 27, unless desired, except when the raising and lowering operation of the spud is to be performed. And it will also be apparent that any other suit-

able means for performing the raising and lowering operation of the spud may be substituted for the cable and pulley means or the A-frame shown.

In operation, assuming that the spud is in the reclining dotted line position indicated in Figure 1, and it is desired to position the spud for performing its anchoring function, the spud will be raised to approximately vertical position by pulling downwardly on the free end of the cable **28**, whereupon, the lock bar **17** being withdrawn from locking engagement with the flange **15**, the spud **3** will be caused to be moved downwardly either by gravity or by rotation of the drum **13**. As the spud **3** moves downwardly, the lower end **3***a* thereof will enter the lower restricted portion **4** of the well **2** so as to automatically cause the spud to be engaged in said restricted portion of the well between the roller and the opposite wall of the well **2**, whereby to maintain the spud against swinging movement and in vertical position when so engaged. As soon as the lower portion **3***a* of the spud **3** passes over the roller **5** in its downward movement, it will be properly vertically alined for the performance of its anchoring function, wherein the said lower end of the spud is embedded in the bottom of the body of water in which the craft is operating.

When the spuds **3** have been driven downwardly as far as desired, and, in practice, the latter part of such movement may often be accomplished by applying power to the pinion shaft **9** for causing the spuds **3** to be driven forcefully into the channel bottom for raising the hull **1** thereupon to support increased weight incident to the dredging operations, the lock bar **17** will be caused to enter one of the pockets **16** of the drum flange **15** for locking the spud **3** against movement relative to the hull **1**.

When it is desired to raise the spuds **3** for moving the craft to a new location, the latch **17** will be withdrawn from locking engagement with the flange **15**, and power applied to the cable **14** for rotation of the drum **13**, shaft **9** and pinion **8**, to rack upwardly the spud **3**. If, in moving from one location to another, it is necessary to pass obstacles under conditions of minimum clearance, the spud **3** will be racked upwardly until its lower end **3***a* is raised above the upper extremity of the restricted portion of the well, or, in other words, above the roller **5** whereupon the spud may be swung in an arc about its pivotal support on the shaft **9** to the reclining dotted line position shown in Figure 1 under the control of the cable **28**.

As will be apparent, by reason of the provision of the arcuate contoured wall **6** of the well **2**, it is not necessary to raise the lower end of the spud **3** above the level of the deck **1***a* before starting its swinging movement to reclining position.

Referring to the embodiment of the invention, shown by Figures 3 and 4, the operating instrumentalities for pivotally supporting the spud **3** to enable its movement from vertical to reclining position, and for causing longitudinal movement thereof, are essentially the same as those described in reference to the construction of Figures 1 and 2, and, likewise, the well construction, illustrated in Figures 3 and 4, has the same essential characteristics, except that the well in Figures 3 and 4 is located outside of the hull line instead of through the hull as in Figures 1 and 2.

The same characters of reference are used to designate identical parts in all of the figures of the drawings, and in Figures 3 and 4 reference characters followed by a prime designation indicate parts functionally similar to but of slightly different construction or arrangement from parts bearing corresponding numerals in Figures 1 and 2.

In Figures 3 and 4, the well **2'** is formed of angle bracket plates **30** and **31**, secured to the side plates **1***b* of the hull **1**, and an outer plate **32** secured to the angle plates. The hull side plates **1***b* form the inner wall of the well **2'**. The portion **30***a* of the bracket plate **30** is angularly disposed relative to the hull plate **1***b* to form the rear wall of the well **2'** against which the rack teeth **7** of the spud **3** impinge when the spud is positioned in the well. The portion **31***a* of the bracket plate **31** is likewise angularly disposed to form the forward wall of the well **2'** having the arcuately flared contour **6'**. The roller **5'** is rotatably supported by the hull plate **1***b* and the outer plate **32**, which latter is formed with the upstanding portion **32***a* to form a bearing for the outer end of the pinion shaft **9'** which extends through a vertical plate **11'** secured to the deck **1***a* as in the construction of Figures 1 and 2.

It will be noted that positive vertical alinement of the spud may be secured automatically by the centering action of the lower pointed end of the spud engaging between the roller and the opposite wall of the well as the spud moves into the restricted portion of the well, if the spud is nearly vertically alined initially.

It will be understood that after the spud **3** is swung to the reclining dotted line position of Figures 1 and 3, the upper end of the spud may be supported by a suitable carriage (or lowered to the deck) and the A-frame **24** may then be swung about its pivot **25** (preferably forwardly) likewise to a reclining position so as to afford the desired clearance during the passage of the dredge beneath lower overhanging obstacles.

From the foregoing it will be seen that the spud construction, herein described, makes provision for the complete withdrawal from its well or vertically alining means, of an integral spud without disassembling the same or causing it to be disengaged from its operating instrumentalities, under conditions providing maximum clearance regardless of the length of the spud. The necessity for employing an integral spud of the type herein referred to, as distinguished from spuds of the telescoping or hinged section type, under certain conditions, will be clear when it is borne in mind that the action of forcefully embedding the spud in the channel bottom is often required to be employed for raising the hull in the water to offset additional weight factors incident to the dredging operation.

Under such circumstances, the use of an integral spud overcomes certain disadvantages inherent in the telescoping and hinged section spuds heretofore proposed, which either are not adapted for accomplishing any raising of the hull in the water, or cannot be made sufficiently compact to afford the desired clearance above the water line where their extended length is sufficient to perform their anchoring function at great depth.

It will also be seen that the construction herein described provides automatic positive vertical alinement of the spud for its anchoring function when brought from reclining to approximate vertical position by the provision merely of means for restricting the side play of the spud when its lower end reaches a certain point, while the non-

restriction of such side play, above said point, enables swinging movement of the spud about its supporting axis prior to a time when the lower end of the spud is fully raised above the deck of the water craft.

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

1. In a spud construction of the class described, in combination, an integral spud, a pivotal axis therefor, means for pivotally supporting said spud on said axis for swinging movement thereabout and for longitudinal movement of the spud in the direction of its length relative to said axis, and means engageable with and disengageable from said spud as a result of longitudinal movement of the spud relative to said means for maintaining the spud against swinging movement when so engaged.

2. In a spud construction of the class described, in combination, a dredge or the like having a deck, an integral spud, a pivotal axis therefor fixed to the dredge, means for pivotally supporting said spud on said axis for swinging movement thereabout and for longitudinal movement of the spud in the direction of its length relative to said axis, and means engageable with and disengageable from said spud as a result of longitudinal movement thereof for positively maintaining the spud in vertical position relative to said deck when so engaged.

3. In a spud construction of the class described, in combination, a spud, a pivotal axis therefor, means including a member encircling said spud for pivotally supporting said spud on said axis for swinging movement thereabout and longitudinal movement of the spud in the direction of its length relative to said axis, and means automatically engageable with and disengageable from said spud as a result of longitudinal movement thereof in the direction of its length relative to said axis for positively maintaining said spud vertically when so engaged.

4. In a spud construction of the class described, the combination with a dredge or the like having a deck, of a pivotal axis located above and adjacent to said deck, a spud, means including a member encircling said spud for pivotally supporting the same on said axis for swinging movement thereabout and longitudinal movement of the spud in the direction of its length relative to said axis, and means automatically engageable with and disengageable from said spud as a result of longitudinal movement thereof relative to said axis for positively maintaining the spud vertical relative to said deck when so engaged.

5. In a spud construction of the class described, the combination with a dredge or the like having a deck, of a pivotal axis located above and adjacent to said deck, a spud, means including a member encircling said spud for pivotally supporting the same on said axis for swinging movement thereabout and longitudinal movement of the spud in the direction of its length relative to said axis, and means engageable with said spud during longitudinal movement of the spud in the direction of its length respecting said axis and vertically respecting said deck for maintaining the spud against swinging movement when the spud is so engaged, said last means permitting longitudinal movement of said spud in the direction of its length into and out of engagement with said last means, said spud being swingable about said axis to a reclining position adjacent to and substantially parallel with said deck upon disengagement of said spud and said means.

6. In a spud construction of the class described, in combination, a dredge or the like having a deck, a spud, a pivotal axis therefor fixed to the dredge, means for pivotally supporting said spud on said axis for swinging movement thereabout and for longitudinal movement of said spud in the direction of its length relative to said axis, and means engageable with said spud during longitudinal movement thereof downwardly for maintaining the spud vertically relative to said deck when so engaged, said last means being so constructed and arranged as to permit disengagement of said last means from said spud during upward longitudinal movement of the latter at a point below the level of the deck whereby to enable swinging movement of said spud about said axis toward reclining position without raising the spud above the level of the deck.

7. In a spud construction of the class described, in combination, a dredge or the like having a deck, a pivotal axis located above and adjacent to said deck, an integral spud, means including a member encircling said spud for pivotally supporting said spud on said axis for swinging movement thereabout and for longitudinal movement of the spud in the direction of its length relative to said axis from a vertical position to a reclining position with the spud adjacent to and substantially parallel with said deck, and means automatically engageable with said spud during longitudinal movement thereof downwardly for positively maintaining the spud vertically relative to said deck when so engaged, said last means being so constructed and arranged relative to said deck as to permit disengagement of said last means from said spud during upward longitudinal movement of the latter at a point below the level of the deck whereby to enable swinging movement of said spud about said axis toward reclining position without raising the spud above the level of the deck.

8. In a spud construction of the class described, in combination, a spud well, a pivotal axis above said well, and a spud pivotally supported on said axis for swinging movement thereabout and for movement of the spud in the direction of its length relative to said axis whereby said spud may be inserted into and withdrawn from said well, said well having a lower restricted portion for positively maintaining said spud in vertical alignment when the same is positioned in said restricted portion, and said well being so constructed as to enable swinging movement of said spud about said axis when the lower end of said spud is raised above said restricted portion and while said spud is positioned within the well.

9. A spud well of the class described, comprising an enclosure having top and bottom openings for receiving a spud adapted to be operated therethrough, said enclosure having a lower portion of restricted cross-sectional area for preventing lateral movement of the spud while permitting longitudinal movement thereof through the well when a part of the spud is positioned in said restricted portion, said enclosure having an upper portion of greater cross-sectional area permitting lateral movement as well as longitudinal movement of the spud when a free end thereof is positioned within said latter portion.

10. A spud well of the class described, comprising an enclosure having top and bottom openings for receiving a spud adapted to be operated

therethrough, said enclosure having a lower portion of restricted cross-sectional area for preventing lateral movement of the spud while permitting longitudinal movement thereof through the well when a part of the spud is positioned in said restricted portion, said enclosure having one wall flared outwardly upwardly from the restricted portion to permit lateral movement of the spud when its free end is raised above said restricted portion.

11. A spud well of the class described, comprising an enclosure having top and bottom openings for receiving a spud adapted to be operated therethrough, said enclosure having a lower portion of restricted cross-sectional area for preventing lateral movement of the spud while permitting longitudinal movement thereof through the well when a part of the spud is positioned in said restricted portion, said enclosure having one wall flared outwardly upwardly in an arcuate curve from the restricted portion to permit swinging movement of the spud without longitudinal movement thereof when the free end of the spud is raised above said restricted portion.

12. A spud well of the class described, comprising an enclosure for receiving a spud adapted to be operated therethrough, a portion of said enclosure being of restricted cross-sectional area for closely encompassing the spud when the latter is positioned therein for preventing lateral movement of the spud while permitting longitudinal movement thereof through the well when the spud is so positioned, said enclosure being so constructed as to permit swinging movement of the spud when the lower end of the latter is raised above said restricted portion of the well.

13. A spud well of the class described, comprising an enclosure for receiving a spud adapted to be operated therethrough, a portion of said enclosure being of restricted cross-sectional area for closely encompassing the spud when the latter is positioned therein for preventing lateral movement of the spud while permitting longitudinal movement thereof through the well when the spud is so positioned, said enclosure being provided with anti-friction means adjacent the restricted portion thereof, and engaging the spud when the latter is positioned in said portion, said enclosure being so constructed, and the anti-friction means being so arranged, as to permit swinging movement of the spud when the lower end of the latter is raised above the location of the anti-friction means.

14. In apparatus of the class described, in combination, a dredge or the like comprising a hull having a deck, a spud, a pivotal axis therefor fixed to said hull, a pinion on said axis, said spud having rack teeth thereon for engagement with said pinion to move the spud in the direction of its length upon rotation of said pinion, means pivoted to said axis for maintaining the rack teeth in engagement with said pinion to pivotally support the spud on said axis for swinging movement thereabout and for longitudinal movement of the spud in the direction of its length relative to said axis, and means automatically engageable with and disengageable from said spud as a result of downward longitudinal movement of the spud in the direction of its length for positively maintaining the spud in a vertical position when so engaged, said last means being so constructed and arranged as to permit disengagement of said last means from said spud during upward longitudinal movement of the latter at a point below the level of the deck whereby to enable swinging movement of said spud about said axis toward a horizontal position before the spud has been raised above the level of the deck.

15. In a spud construction of the class described, in combination, an integral spud, a pivotal axis therefor, means for pivotally supporting said spud on said axis for swinging movement thereabout and for longitudinal movement of the spud in the direction of its length relative to said axis, and means engageable with and disengageable from said spud as a result of longitudinal movement of the spud relative to said means for maintaining the spud against swinging movement when so engaged, and means operable to lock the spud against longitudinal movement thereof.

16. In apparatus of the class described, in combination, a dredge or the like comprising a hull having a deck, a spud, a pivotal axis therefor fixed to said hull, a pinion on said axis, said spud having rack teeth thereon for engagement with said pinion to move the spud in the direction of its length upon rotation of said pinion, means pivoted to said axis for maintaining the rack teeth in engagement with said pinion to pivotally support the spud on said axis for swinging movement thereabout and for longitudinal movement of the spud in the direction of its length relative to said axis, and means automatically engageable with and disengageable from said spud as a result of downward longitudinal movement of the spud in the direction of its length for positively maintaining the spud in a vertical position when so engaged, and means engageable with and disengageable from the pinion for locking the pinion against rotation when so engaged to thereby prevent longitudinal movement of the spud.

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