PATENT SPECIFICATION 743,811

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COMPLETE SPECIFICATION.

Improvements relating to Grab Dredgers.

We, PRIESTMAN BROTHERS LIMITED, a British Company, of Holderness Engineering Works, Hull, England, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement :—

In dredging under water with deep grab dredging equipment, it is desirable for the operator to be able to tell the exact moment at which the open grab comes to rest upon the bottom, so that he can immediately arrest the winches and thus avoid paying out the rope after the grab has ceased to descend, and thereby avoid the consequent danger of entangling the slack rope in the grab. As the grab may be operated at considerable depth, for example 200 feet beneath the surface, it is quite impossible for the operator to observe the grab up to the moment when it touches down, and although he may be provided with depth gauges and other instruments to indicate the position of the grab in relation to the dredger, these instruments do not indicate with sufficient accuracy the position of the grab in relation to the level at which it will come to rest which, of course, depends upon, not only the level of the under-water bed, but also its character and the exact position at which the grab descends in relation to previous cuts.

The present invention provides a means of indicating the exact moment at which the weight of the grab is taken by the bottom and this can be conveyed to the operator visually or aurally, so that he can then bring the winches to rest without delay. It not only enables dredging to be carried out more effectively, but prevents uncertainty and saves time in winding and unwinding unnecessary lengths of rope and in operating the grab.

According to the present invention the upward movement of the jib resulting from the reduction of load due to the grab of a deep grab dredger resting on the surface being dredged, acts to operate a signal, thus determining when the grab reaches the surface being dredged. The signal itself may be rendered inoperative except when the jib is luffed to one particular position.

One convenient way of achieving the operation of the signal is to make use of a resilient link or connection between two parts in the luffing tackle, the relative movement between which operates an electric switch.

A deep grab dredger according to the invention is shown in the accompanying drawings, in which :

Figure 1 is a side elevation view of the deep grab dredger ;

Figure 2 is an elevational view of the resilient joint in the luffing tackle of the dredger ; and

Figure 3 is a diagram of the signal circuit.

Referring to Figure 1, this shows a deep grab dredger for under water operation. So that it may be readily moved to its working position for dredging the sea bed, it is mounted on a suitable barge or similar vessel 1. A jib 3 is pivoted at 4 to a main supporting structure 2 and, in the drawings, it is shown fully luffed out. The grab 5 of the dredger is operated and raised or lowered by means of cables 6 which are driven by a twin rope winch indicated by reference numeral 11. Between the winch and the grab the cables 6 pass over a pulley 7 in the jib and a guide pulley 8 mounted on the structure 2.

The movement of the jib 3 is controlled by a luffing tackle which comprises a power unit 12 operating a luffing crank 13 fixed to a shaft 10 and pivoted at 16 to a luffing arm 14 which in turn is pivoted at 15 to the lower section of the jib 3.

Figure 2 shows the connection between the

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luffing crank 13 and the luffing arm 14 in greater detail. This connection is a resilient connection so that a relative movement between the arm 14 and the crank 13 is produced under a change in load. For this purpose the end of the arm 14 is provided with a sliding block 15 pivoted at 16 to the crank 13. The block 15 has four bolts 19 and these slide in longitudinal slots 17 and 18 in the sides of the arm 14. The bolts 19 have plates 21 which stop the heads of the bolts from passing through the slots. The block 15 is connected by a threaded rod 22 to a plunger 39 slidable in cross pieces 20, 26, in the arm 14. The plunger has a collar 30 against which one end of a spring 23 bears, the other end bearing against a further collar 25 which abuts against the cross piece 26. The end of the rod 22 is squared at 38 to enable the relative position of the plunger and block 15 to be adjusted. Thus it can be seen that any alteration of the load on arm 14 will cause a movement of the arm relative to the crank 13 due to the compression or expansion of the spring 23.

The alteration in the load is caused by the weight of the grab 5 being taken by the sea bed and this causes an upward movement of the jib 3 and thus a slight reduction in the compression load on the arm 14. As stated this change in load causes a movement between the arm 14 and the crank 13 and this is used to operate a switch and provide a signal to the dredger operator when the bucket has reached the sea bed.

The switch is indicated by reference numeral 27 and has an operating lever 28. The switch 27 is mounted on a bracket 29 which is adjustably mounted in the crank 13. In operation the lever 28 can be engaged by a striker 31 which is mounted on the arm 14, due to a reduction in compression, causes the switch to be actuated. It will be seen that the striker can only engage the switch lever when the jib is fully luffed out. The adjustable bracket 29 enables the luffing angle of the jib at which the switch may be engaged to be altered.

Referring to Figure 3, the switch 27 is shown in its normal closed position, when the load of the grab is on the jib, and thus the current is not sufficient to operate the signal lamp 32, which is in parallel with the switch 27. However as soon as the switch is opened the full current passes through the lamp 32 and thus gives a visual signal when the grab 5 has reached the sea bed. In addition an audible signal 33 is in parallel with the lamp and this too can be brought into operation by means of a manual switch 34. The circuit also includes fuses 35, a resistance 37 placed in series to ensure balanced operation and a relay 36 which will open the main control current circuit if the signal arrangement fails to operate due to mechanical or electrical faults.

What we claim is :—

1. A deep grab dredger having a signal to show when the jib is relieved of the weight of the grab, which signal is arranged to be operated by the resulting upward movement of the jib.

2. A dredger according to Claim 1, in which a resilient link or connection is provided between two parts in the luffing tackle of the jib, which connection yields as a result of the reduction in load when the jib is relieved of the weight of the grab, the signal being connected to be operated by the resulting relative movement between the two parts.

3. A dredger according to Claim 1 or Claim 2, in which the operation of the signal is effected by an electric switch which is mounted on one part of the luffing tackle and which is operated by the other part of the luffing tackle.

4. A dredger according to Claim 2 or Claim 3, in which the jib is luffed by a strut linking a rotatable crank arm and a downward extension of the jib beyond the pivot at the jib foot and the resilient connection is provided between the strut and the luffing crank arm.

5. A dredger according to any one of Claims 2 to 4, in which the resilient connection is constituted by a spring loaded pivot block able to slide longitudinally in the end of the luffing arm and pivoted to the luffing crank so as to permit relative movement between the arm and the crank under a change in load.

6. A dredger according to any one of Claims 3 to 5, in which the switch and a member for operating the switch are mounted, one on the crank arm and the other on the luffing arm, in such a position that the member and the switch are only engageable to operate the signal when the jib is luffed into one particular position.

7. A dredger according to Claim 3, in which the switch operates a visual or an audible signal.

8. A dredger according to Claim 1, substantially as described with reference to the accompanying drawings.

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* C L M S *

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The switch is indicated by reference numeral 27 and has an operating lever 28. The switch 27 is mounted on a bracket 29 which is adjustably mounted in the crank 13. In operation the lever 28 can be engaged by a striker 31 which is mounted on the arm 14, due to a reduction in compression, causes the switch to be actuated. It will be seen that the striker can only engage the switch lever when the jib is fully luffed out. The adjustable bracket 29 enables the luffing angle of the jib at which the switch may be engaged to be altered.

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2. A dredger according to Claim 1, in which a resilient link or connection is provided between two parts in the luffing tackle of the jib, which connection yields as a result of the reduction in load when the jib is relieved of the weight of the grab, the signal being connected to be operated by the resulting relative movement between the two parts.

3. A dredger according to Claim 1 or Claim 2, in which the operation of the signal is effected by an electric switch which is mounted on one part of the luffing tackle and which is operated by the other part of the luffing tackle.

4. A dredger according to Claim 2 or Claim 3, in which the jib is luffed by a strut linking a rotatable crank arm and a downward extension of the jib beyond the pivot at the jib foot and the resilient connection is provided between the strut and the luffing crank arm.

5. A dredger according to any one of Claims 2 to 4, in which the resilient connection is constituted by a spring loaded pivot block able to slide longitudinally in the end of the luffing arm and pivoted to the luffing crank so as to permit relative movement between the arm and the crank under a change in load.

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PROVISIONAL SPECIFICATION.

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The present invention provides a means of indicating the exact moment at which the weight of the grab is taken by the bottom and this can be conveyed to the operator visually or aurally, so that he can then bring the winches to rest without delay. It not only enables dredging to be carried out more effectively, but prevents uncertainty and saves time in winding and unwinding unnecessary lengths of rope and in operating the grab.

The grab is lowered from the jib of a dredging crane which is for this operation fully luffed out. When the jib head is relieved of the weight of the grab upon the latter coming to rest on the bottom, the corresponding reduction in load on the jib luffing tackle is considerable. The invention consists in employing this reduction on the load on the jib luffing tackle to operate a signal to which the operator can respond. This may be done by inserting a resilient joint or link in the luffing tackle so that relative movement between the two parts connected by the resilient joint or link causes the operation of the signal and this may conveniently be done by an electric switch mounted on one part and operated by the other.

To prevent the signal, which is preferably a lamp operated by the switch, from operating except when the jib is luffed to maximum out-reach, an arrangement may be provided to render the signal inoperative when the jib is luffed in.

In an example of a dredger according to the invention, the dredging grab is suspended from the head of a jib which is pivoted at about one-fifth of the distance from the inner end of the jib to a framework mounted on the dredging vessel. The jib thus acts as a double-armed lever and the luffing action is caused by luffing arms linking the shorter or inner arm of the jib to cranks on a transverse shaft driven through suitable reduction gearing from an electric motor controlled by the operator. The luffing arms are not pivoted directly to the cranks but each has a pivot block pivoted to the cranks and sliding longitudinally in the end of the luffing arm and normally held against a stop at the end by a buffer spring. The weight of the jib and grab put the luffing arm under compression and the load on the pivot block tends to compress the buffer spring. A switch provided on one of the luffing arms has an actuating arm which is engaged by the sliding block and held open when the grab is suspended from the fully luffed out jib. When the grab touches down on the bottom, the sliding block moves outwards somewhat due to the decrease in load, so that the switch arm moves sufficiently to close the switch.

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