

PATENT SPECIFICATION

(11)

1268 041

1268041

DRAWINGS ATTACHED

- (21) Application No. 58248/67
- (22) Filed 21 Dec. 1967
- (21) Application No. 15753/68
- (22) Filed 2 April 1968
- (23) Complete Specification filed 21 March 1969
- (45) Complete Specification published 22 March 1972
- (51) International Classification B 66 c 23/62
- (52) Index at acceptance
B8B 1A 1C2 31
- (72) Inventor ROBERT MORRISON



(54) IMPROVEMENTS TO JIB CRANES AND SWINGING DERRICKS

(71) We, SPEEDCRANES LIMITED, of Tarbet Street, Gourrock, Renfrewshire, Scotland, a British Company, 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:—

The invention relates to jib cranes, and swinging derricks, and in particular to the conversion of such gear for dealing economically with either heavy or light loads and to the control of the load during luffing or slewing of the jib.

The invention has particular application to jib cranes, and swinging derricks, which include a winch with twin barrels rotating in the same direction, or a winch having a single barrel with a central flange, the lifting line or lines being secured to each barrel, or to each of the two parts of the single barrel adjacent to the central flange, in such a way that the two ends of the one line, or the ends of the two lines, wind on or pay out at the same time.

More particularly the invention relates to such cranes or derricks when used on ships for loading and unloading cargo where it is of advantage to have gear adapted for lifting heavy loads which can be changed for use with relatively light loads.

It is a disadvantage with known constructions that a long labour consuming process of rerigging the crane is required to change from lifting and transferring from ship to quay, or visa versa, relatively light loads, say 1 to 5 tons, to lifting and transferring heavy loads, say 20 to 25 tons.

It is among the objects of the invention to reduce the time taken and the labour force required to effect the necessary changes in the rigging of the crane from that required for work with heavy loads to that required for smaller loads.

It is also a disadvantage of known constructions that prevention of a pendulum or

swinging movement of the load during operation of the lifting gear is effective mainly only with respect to slewing and, furthermore, that the stresses imposed on the members of the apparatus are sometimes excessive.

It is among the objects of the invention to prevent or minimise oscillation of the load in all directions during operation of the lifting gear in a controlled manner and without submitting the supporting structure to undue stresses.

According to the invention a jib crane or swinging derrick including winch means and load conversion means to provide for lifting either light or heavy loads said load conversion means comprising a pulley block member adapted to be secured, in an inoperative position, to the jib of the crane or derrick when operating with light loads, whereby the lifting line runs freely and lifting may be effected at winch speed, and to be released from the jib and to engage, in an operative position between another pulley block member and a further pulley block member, the lifting line of the rigging of the crane without re-reeving the lifting line when heavy loads are to be lifted.

Thus, for example, by disengaging a pulley block, disposed according to the invention and comprising two pulleys, from the jib and effectively interposing the pulley block in the lifting line of the crane a single purchase lifting effort can be converted to a multiple purchase, for example, a four part purchase.

According to the invention furthermore additional pulley block members so disposed in the rigging that the lines inter-connecting the additional pulley block members and the cargo block of the crane form an inverted pyramid and are effective to reduce oscillatory movement of the load during lifting and/or transfer of the load.

The invention is illustrated by way of example in the accompanying diagrammatic drawings, in which:—

Figures 1—3 illustrate the conversion, by

[Price 25p]

Price 75p

means of pulley blocks comprising single pulleys, from a single part purchase to a multiple part purchase as, for example, a two, three, four or five part purchase as required.

5 In Figures 1—6, the lifting line is denoted by A, the cargo block by B, standard sheaves of pulleys by C and D, and an additional cargo block by E.

10 Alternative or additional cargo block means are denoted by E_1 and E_2 and alternative or additional pulleys by D_1 and D_2 .

15 In the construction shown in Figure 1 the full lines show the lifting line A passing over pulleys C and D to the cargo block B suspended from the head of the jib to give a single part purchase.

20 By inserting cargo block E in a bight of the line intermediate C and D and anchoring B to any part of the jib structure a two part purchase is obtained.

By securing B to E_1 , as shown in the dotted lines, a three part purchase is obtained.

25 In the construction shown in Figure 2 the lifting line A passes over pulley means C to sheave D_1 to D_2 to the cargo block B to give a single part purchase. A cargo block E_2 is disposed in the bight of the cargo line between D and D_2 and a cargo block E_1 in the bight of the line between C and D.

30 When only E_2 is used with B secured thereto a three part purchase is obtained; when E_1 and E_2 are both used with B secured thereto a five part purchase is obtained.

35 Figure 3 shows the same arrangement of pulley means as that of Figure 2 but adapted for a different shape of jib head, as for example a jib of box section and pulley D_2 attached to the mast included to provide top-ping relief.

40 With cargo block E_1 inserted in the bight of the rope between C and D, a single, two part, or three part purchase is afforded depending on whether B is used as the cargo block, is secured to the jib structure or to E_1 . By inserting the cargo block E_2 a single, two part, three part, four part, or five part purchase is afforded.

50 Figure 4 shows a construction with pulleys C, C_1 , D, D_1 and cargo blocks B, E_1 and E_2 disposed in the bight of the line A adapted to provide two, four or six part purchases and also an anti-oscillatory effect on the load during luffing and/or slewing of the jib.

55 Figure 5 shows a construction similar to Figure 4 but in which cargo blocks E_1 and E_2 are interpolated between C and D and C_1 and D_1 respectively so that the cargo block B is disposed centrally between E_1 and E_2 to provide a balanced loading of the cargo head.

60 Figure 6 shows a construction to provide an anti-oscillatory effect similar to that of Figure 5 but in which by connection of cargo block B in the manner shown to the two

cargo blocks E_1 and E_2 a two part purchase or alternatively a six part purchase is afforded.

Figures 7, 8 and 9 illustrate a construction using either a single or double line and either a double barrelled winch, or a single barrel winch provided with a dividing central flange the lifting line or lines being secured to each barrel or to each of the two parts of the single barrel adjacent to the central flange, and in which an adjustable friction block having a lining of material of relatively high coefficient of friction is utilised to minimise the oscillatory effect during movement of the load.

Figure 7 shows the disposition of lifting lines and pulley sheaves, and

Figures 8 and 9 illustrate the manner in which the disposition and operation of the lifting gear according to the invention can be quickly adjusted to provide for economic operation with heavy or light loads and also a modified construction in which joining links are included in the rigging.

In the construction illustrated in Figure 7 in which two lines are employed the parts (denoted as R & S) of the lines adjacent the winch are passed over blocks D and E, then (denoted as C_1 and C_2) over blocks L and N attached to the load hook means and then (denoted as B_1 and B_2) to blocks F and G and then (denoted as 1 B_1 and 2 B_2) forward in a substantially horizontal plane to blocks H and K and then (denoted as A_1 and A_2) to an adjustable friction block P.

The two lines are passed around block P at least one turn in opposite directions and securely fastened to the sheave, thus forming a pyramid with the hook or load attachment means at the apex.

Alternatively if one line is used it is passed round block P at least twice.

If during operation the load tends to move in the direction of the arrows T or U, the movement either shortens or lengthens both A_1 and A_2 , thereby making B_1 and B_2 lift or lower the load.

If during operation, movement of the load takes place in the direction of the arrows V or W, then C_1 , B_1 and A_1 will lengthen and C_2 , B_2 and A_2 will shorten, or vice versa.

Any pendulation which takes place because of the latter movement already described, will cause A_1 and A_2 to rotate block P and the effect of the load on the adjustable friction block P will, by engaging a lining of material having a relatively high coefficient of friction slow up and retard the changing lengths of C_1 , B_1 and A_1 , and C_2 , B_2 and A_2 and thereby reduce pendulation.

Figures 8 and 9 illustrate how, in combination with the anti-pendulum effect construction illustrated in Figure 7 rapid adjustment of the number of "purchases" can be effected to deal with heavy loads or light loads as the occasion demands.

Figure 8 shows (in full lines) lines A_1 — A_2 and friction block P in a position that would enable a load within the winch power to be lifted at winch speed and, (in dotted lines) A_1 — A_2 and friction block P disposed to effect lifting of heavy loads. In the first case L and N are pulled into the upper position shown and secured to the jib in that position. Figure 9 shows a view from the front of the crane of the disposition of the sheaves and blocks for operation in the above rig.

Alternatively block P can be secured to a structure in a position between blocks H and K, and blocks L and N can be used to provide a four part purchase to lift a load of approximately twice the power of the winch and at half the winch speed.

Advantageously a friction damper rope and joining links X and Y comprising suitable sockets or shackles with or without ball-bearing swivels are respectively provided at the end of line A_1 between H and P and at the end of line A_2 between K and P the length of the friction damper rope which connects the joining links X and Y and passes around the friction block P being such that the joining links X and Y will not foul blocks H and K in use.

This construction provides a convenient method of removal and replacement of the friction damper rope should wear occur and also facilitates the rigging of the crane since it is not necessary to deal with the whole of ropes A_1 and A_2 .

Figure 10 shows the head of the jib of a crane and the means for converting from light duty to heavy duty operation.

In Figure 10 the head of the jib is rigged to provide a single purchase. The lifting line 2 from the winch (not shown) passes round the conversion pulley block member 5 comprising two pulleys and in this position is secured to the jib and is held adjacent thereto in an inoperative stowed position, around a directing pulley 7, to and around a pulley (not shown in the drawing but hereinafter referred to as "pulley 3") located in a position on the head of the jib on the other side of the jib from pulley 4 and in a position corresponding to the pulley 4, and terminates in a load hook hanging vertically below "pulley 3".

To convert the rigging to provide four part purchase the pulley block member 5 is released from the jib 1 by removing pin 6 to receive the lifting wire 2 which then follows a path from "pulley 3" to which it is secured, to and around one pulley of the conversion pulley block member 5, around the directing pulley 7 still secured to the jib, to and around the second pulley of the conversion pulley block member 5, to and around pulley 4 and to the lifting winch (not shown).

It will be understood that neither pulley block member 5 nor directing pulley 7 when

in the stowed position interferes with the lifting line so that the line can run freely when operating single purchase, and that the position of the conversion pulley block member 5 and the directing pulley 7 are such that conversion from operation with light loads to operation with heavy loads can be simply effected by connecting the lifting line to "pulley 3" and removing pin 6 to release the pulley block member 5 from the jib.

The four part purchase may be converted to a five part purchase by providing a connecting or link line between a ring on the jib head and a cross-member of the pulley block member 5.

It will be appreciated that the invention provides a comprehensive lifting apparatus which provides for:—

1. An anti-pendulum effect in all directions; lifting of loads which may be two or three times the pull available at winch at a half or one-third winch speed.

2. A quickly adaptable method of reducing the number of "purchases" so that loads equal to winch power can be moved at winch speed with an anti-pendulum effect.

WHAT WE CLAIM IS:—

1. A jib crane or swinging derrick including winch means and load conversion means to provide for lifting either light or heavy loads said load conversion means comprising a pulley block member adapted to be secured, in an inoperative position, to the jib of the crane or derrick when operating with light loads, whereby the lifting line runs freely and lifting may be effected at winch speed, and to be released from the jib and to engage, in an operative position between another pulley block member and a further pulley block member, the lifting line of the rigging of the crane without re-reeling the lifting line when heavy loads are to be lifted.

2. A jib crane or swinging derrick according to claim 1, including additional pulley block members so disposed in the rigging that the lines inter-connecting the additional pulley block members and the cargo block of the crane form an inverted pyramid and are effective to reduce oscillatory movement of the load during lifting and/or transfer of the load.

3. A jib crane or swinging derrick according to claim 2, including an adjustable friction block in the lifting line having a lining of material with a relatively high co-efficient of friction.

4. A jib crane or swinging derrick according to any one of claims 1 to 3 in which the winch means comprises a winch with two barrels rotating in the same direction.

5. A jib crane or swinging derrick according to any one of claims 1 to 3, in which the winch means comprises a winch with a single barrel with a central flange.

Figure 8 shows (in full lines) lines A₁—A₂ and friction block P in a position that would enable a load within the winch power to be lifted at winch speed and, (in dotted lines) A₁—A₂ and friction block P disposed to effect lifting of heavy loads. In the first case L and N are pulled into the upper position shown and secured to the jib in that position. Figure 9 shows a view from the front of the crane of the disposition of the sheaves and blocks for operation in the above rig.

Alternatively block P can be secured to a structure in a position between blocks H and K, and blocks L and N can be used to provide a four part purchase to lift a load of approximately twice the power of the winch and at half the winch speed.

Advantageously a friction damper rope and joining links X and Y comprising suitable sockets or shackles with or without ball-bearing swivels are respectively provided at the end of line A₁ between H and P and at the end of line A₂ between K and P the length of the friction damper rope which connects the joining links X and Y and passes around the friction block P being such that the joining links X and Y will not foul blocks H and K in use.

This construction provides a convenient method of removal and replacement of the friction damper rope should wear occur and also facilitates the rigging of the crane since it is not necessary to deal with the whole of ropes A₁ and A₂.

Figure 10 shows the head of the jib of a crane and the means for converting from light duty to heavy duty operation.

In Figure 10 the head of the jib is rigged to provide a single purchase. The lifting line 2 from the winch (not shown) passes round the conversion pulley block member 5 comprising two pulleys and in this position is secured to the jib and is held adjacent thereto in an inoperative stowed position, around a directing pulley 7, to and around a pulley (not shown in the drawing but hereinafter referred to as "pulley 3") located in a position on the head of the jib on the other side of the jib from pulley 4 and in a position corresponding to the pulley 4, and terminates in a load hook hanging vertically below "pulley 3".

To convert the rigging to provide four part purchase the pulley block member 5 is released from the jib 1 by removing pin 6 to receive the lifting wire 2 which then follows a path from "pulley 3" to which it is secured, to and around one pulley of the conversion pulley block member 5, around the directing pulley 7 still secured to the jib, to and around the second pulley of the conversion pulley block member 5, to and around pulley 4 and to the lifting winch (not shown).

It will be understood that neither pulley block member 5 nor directing pulley 7 when

in the stowed position interferes with the lifting line so that the line can run freely when operating single purchase, and that the position of the conversion pulley block member 5 and the directing pulley 7 are such that conversion from operation with light loads to operation with heavy loads can be simply effected by connecting the lifting line to "pulley 3" and removing pin 6 to release the pulley block member 5 from the jib.

The four part purchase may be converted to a five part purchase by providing a connecting or link line between a ring on the jib head and a cross-member of the pulley block member 5.

It will be appreciated that the invention provides a comprehensive lifting apparatus which provides for:—

1. An anti-pendulum effect in all directions; lifting of loads which may be two or three times the pull available at winch at a half or one-third winch speed.

2. A quickly adaptable method of reducing the number of "purchases" so that loads equal to winch power can be moved at winch speed with an anti-pendulum effect.

WHAT WE CLAIM IS:—

1. A jib crane or swinging derrick including winch means and load conversion means to provide for lifting either light or heavy loads said load conversion means comprising a pulley block member adapted to be secured, in an inoperative position, to the jib of the crane or derrick when operating with light loads, whereby the lifting line runs freely and lifting may be effected at winch speed, and to be released from the jib and to engage, in an operative position between another pulley block member and a further pulley block member, the lifting line of the rigging of the crane without re-reeving the lifting line when heavy loads are to be lifted.

2. A jib crane or swinging derrick according to claim 1, including additional pulley block members so disposed in the rigging that the lines inter-connecting the additional pulley block members and the cargo block of the crane form an inverted pyramid and are effective to reduce oscillatory movement of the load during lifting and/or transfer of the load.

3. A jib crane or swinging derrick according to claim 2, including an adjustable friction block in the lifting line having a lining of material with a relatively high co-efficient of friction.

4. A jib crane or swinging derrick according to any one of claims 1 to 3 in which the winch means comprises a winch with two barrels rotating in the same direction.

5. A jib crane or swinging derrick according to any one of claims 1 to 3, in which the winch means comprises a winch with a single barrel with a central flange.



6. A jib crane or swinging derrick according to claim 4, or claim 5, in which a single lifting line is provided.
- 5 7. A jib crane or swinging derrick according to claim 4 or claim 5, in which two lifting lines are provided.
8. A jib crane or swinging derrick according to any of claims 4, 5, 6 and 7, in which the lifting line or lines is or are secured to each barrel or to each of the two parts of the single barrel adjacent to the central flange so that the two ends of the single line, or the ends of the two lines wind on or pay out at the same time.
- 10 9. A jib crane or swinging derrick according to any one of the preceding claims including pulley means so disposed as to provide topping relief.
- 15 10. A jib crane or swinging derrick according to any one of the preceding claims, in which the cargo block is adapted to be secured to the jib or disposed in a bight of the lifting line or lines.
- 20 11. A jib crane or swinging derrick according to claim 10, in which one or more additional cargo blocks are provided said additional cargo block or blocks being adapted to be secured to the jib or disposed in one or more bights of the lifting line.
- 30 12. A jib crane or swinging derrick according to claim 11, including two cargo blocks.
13. A jib crane or swinging derrick according to any one of the preceding claims effective to convert a single part purchase to a two part, three part, four part or five part purchase.
- 35 14. A jib crane or swinging derrick according to claim 3, including joining links comprising sockets or shackles disposed in the lifting line or lines adjacent the adjustable friction block to provide a friction damper rope passing round the friction block.
- 40 15. A jib crane or swinging derrick substantially as hereinbefore described and illustrated in the accompanying drawings.
- 45

EDWARD EVANS & CO.,
53—64 Chancery Lane,
London, WC2A 1SD.
Agents for the Applicants.

Printed for Her Majesty's Stationery Office, by the Courier Press, Leamington Spa, 1972.
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.



* C L H S *