The present invention relates generally to load-handling cranes and concerns more particularly a jib crane which is portable.

The primary aim of the invention is to provide a novel jib crane made up of easily transportable parts that can be quickly assembled and erected into operating relation at a desired point.

It is a collateral object of the invention to provide a crane of the type which is exceptionally light in weight while being strong and rugged.

In more detail, it is an object to provide a crane as characterized above supported in erect position by a novel swivel ring assembly which may be readily latched in place and which allows the crane to be smoothly and easily manipulated.

It is a further detailed object to provide a crane of the type described above with a novel base assembly which allows the crane to be easily swung erect and freely pivoted about a generally vertical self-alining axis.

Moreover, it is another detailed object to provide a crane having the above characteristics with a lightweight, inexpensive winch that is sturdy and effective.

Other objects and advantages of the invention will become apparent upon reading the following detailed description and upon reference to the drawings in which:

FIG. 1 is an elevation of a jib crane embodying the invention shown in erected, operation position;

FIG. 2 is a fragmentary sectional view of the base assembly forming a part of the crane shown in FIG. 1;

FIG. 3 is a fragmentary side view taken generally along the line 3-3 in FIG. 1;

FIG. 4 is a transverse section taken along the line 4-4 of FIG. 1;

FIG. 5 is a fragmentary section taken substantially along the line 5-5 of FIG. 4; and

FIG. 6 is a fragmentary section taken approximately along the line 6-6 of FIG. 1.

Turning first to FIG. 1, there is shown a jib crane 10 including a mast or tower 11 which supports a boom 12. The tower 11 is rotatably mounted on a base assembly 13 so that the tower may be turned about a generally vertical axis, and the boom 12 is pivoted at 14 to the tower, enabling the boom to swing up and down in a vertical plane. In the illustrated embodiment, the base assembly 13 is secured to the ground by a plurality of stakes 13a. A hoist 15 having a lifting hook 16 is carried at the outer end of the boom 12 and a winch 17 is coupled by means of a line 18 and tackle 19 to the boom 12 so as to control the latter's up and down swinging movement.

For rotating the tower 11 and thus swinging the boom 12 from side to side, a projecting handle 21 is extended from the tower 11 at a conveniently accessible height. It may thus be seen that by manipulating the handle 21 and the winch 17, the hoist 15 can be maneuvered above desired locations within the reach of the boom 12.

To hold the tower erect, a swivel ring assembly 25 is provided near the upper portion of the tower and a plurality of guy lines 26, preferably three in number, are coupled to the assembly 25 and are anchored to the ground at points spaced approximately equidistantly about the tower. Preferably, the boom 12 has its pivotal connection 14 disposed above the swivel ring assembly 25 so that the tower may be rotated throughout a full 360° without interference between the boom 12 and the guy lines 26.

In carrying out the invention, the tower 11 is made up of a plurality of pairs of opposed channel members rigidly joined by cross braces, with the pairs being releasably secured together. In the illustrated construction, three pairs of channel members are provided which define upper, middle and lower sections 31, 32 and 33 respectively. The upper tower section 31 is formed of opposed channel members 34, 35 joined by a latticework of cross braces 36. Plates 37 are secured to the top of the tower section 31 and serve to anchor the tackle assembly 19.

The middle tower section 32 is made up of opposed channel members 38, 39 which are joined by a lattice-work of cross braces 40. Similarly, the lower tower section 33 includes opposed channel members 41, 42 joined by a plurality of cross braces 43. Plates 44 join the channel members 41, 42 at the bottom of the tower section 33 so as to strengthen the lower end of the tower.

In order to releasably secure the tower sections 32, 33 together, overlapping portions secured to the respective tower sections are pinned together by removable pins. In the illustrated construction, the lower end of the section 32 is capped by a plate 46 (see FIG. 3) and the upper end of the tower section 33 is capped by a plate 47. A plurality of lugs 48 are secured to the outer sides of the channel members 38, 39 and the underside of the plate 46, and spaced pairs of flanges 49 are secured to the lower tower section 33 across the plate 47 and along the outer surfaces of the channel members 41, 42. When assembled, the lugs 48 fit within the pairs of flanges 49 and pins 50 are passed therethrough for releasably locking the tower sections 32, 33 together. It will be noted that the lower surfaces of the lugs 48 abut the top of the plate 47, and that the upper surfaces of the flanges 49 abut the bottom surface of the plate 46 so that the load carried by the middle tower section 32 is not transferred through the rods 50, but rather is transmitted through the lugs and flanges 48, 49, respectively.

Pursuant to the invention, the swivel ring assembly 25 includes a circular member which is sandwiched between the upper and middle tower sections 31, 32 respectively, and which releasably supports a ring smoothly rotatable relative to the member. In the illustrated arrangement, the circular member comprises a plate 51 (see FIGS. 4 and 5) having a circular central opening into which is fitted a cylindrical stiffening ring 52. Stiffening flanges 53 are also secured beneath the plate 51 to further rigidify the assembly.

To secure the tower sections 31, 32 and the ring assembly 25 together, the channels 34, 35 and 38, 39 are provided with opposed cap plates 34a, 35a and 38a, 39a respectively. The cap plates flatly abut opposite sides of the plate 51 and a plurality of bolts 51a are passed through the sandwiched plates 34, 35, 38, 39 so as to releasably secure the tower sections 31, 32 together on opposite sides of the swivel ring assembly plate 51.

Rigidly secured to the plate 51 and its underlying flanges 53, are ring members 54, 55 which define a circular surface 56 and an annular surface 57, respectively.

Fitted about the cylindrical swivel plate 51 above the annular surface 57 is a flat-sided ring 60 which carries lugs 61 to which the guy lines 26 are secured.
So that the ring 60 may turn smoothly about the plate 51, blocks of bearing material 62 are interposed between the flat sides of the ring 60 and the surfaces 56, 57. In the illustrated form, the blocks 62 are formed of nylon and are bolted to the ring members 54, 55 so that the ring 60 “floats” on the nylon bearing material.

To enable the winch line 18 to pass within the ring 60 of the swivel ring assembly 25, the plate 51 is provided with an annular opening 53 (see FIG. 4) which permits the line 18 to pass freely therethrough. During rotation of the tower 11, the line 18 thus rotates within the ring 60 and there is no interference between the guy lines 26 and the line 18.

For the purpose of releasably locking the ring 60 in place on the swivel assembly 25, a plurality of spring biased latches 65 are slidably carried by the ring 60 and are urged inwardly by compression springs 66 anchored against bolts 67 secured to the outer wall of the ring. The inner ends of the latches 65 are thus resiliently urged against the cylindrical surface 56 just beneath the bearing blocks 62 which are secured to the ring member 54. In this way, the latches, preferably three in number, prevent the ring 60 from being inadvertently lifted and separated from the swivel assembly 25. To separate the ring 60 for disassembly, the latch member 65 may be simply pulled outwardly so that their inner ends clear the bearing blocks 62 or the member 54 thereby permitting the ring 60 to be easily lifted from the remainder of the swivel ring assembly.

In keeping with the invention, the base assembly 13 supports the crane 10 against horizontal movement during erection and also provides a generally vertical, self-aligning free rotation of the tower 11 during operation of the crane. In the illustrated embodiment, the base assembly 13 includes a base plate 71 (see FIG. 1) which abuts the ground and which carries webs 72 that support a pair of upright members 73, 74 having upwardly directed slots 75, 76, respectively (see FIG. 2). A trunnion block 77 is rockably mounted between the members 73, 74 with its trunnions 78, 79 being fitted into the slots 75, 76, respectively. Formed in the upper surface of the block 77 is an upwardly opening semi-spherical seat 81.

The pin 82 is journaled in a frame 83 rigidly secured as a solid bottom portion of the lower tower section 33. The pin 82 has a ball portion 84 which is received and seated within the trunnion block seat 81. To reduce friction, both rotational bearings 85 and thrust bearings 86 are interposed between the pin 82 and the bearing sub-frame 83. A washer 87 carried by the pin 82 locks the pin within the sub-frame 83.

To make plain the operation and function of the base assembly 13, certain of the steps performed in erecting the crane 10 will be briefly reviewed. Upon selecting a desired site for the crane 10, the base plate 71 is secured to the ground or underlying surface by means of the stakes 13a or similar fastening devices. The trunnion block 77 is then dropped between the base members 73, 74 with the trunnions 78, 79 being rockably received within the slots 75, 76. The tower 11 is laid horizontally on the ground with the sub-frame 83, at the bottom of the lower tower section 33, being positioned closely adjacent to the base plate 71. To erect the tower 11, the trunnion block 77 is rocked onto its side and the ball portion 84 of the pin 82 is fitted into the socket 81. The trunnion block, being anchored within the slots 75, 76, provides a solid pivot point about which the tower may be swung erect from its horizontal position on the ground.

Once erected, with the base assembly 13 disposed as shown in FIG. 2, it will be seen that the weight of the crane 10 is borne by the thrust bearings 86 and that the tower 11 may pivot freely about the pin 82. Any variation between the true axis of the pin bearings 85 and the axis about which the tower 11 is rotated, is compensated by the slight rocking movement of the pin 82 within the semi-spherical seat 81. The pin 82 thus provides a self-aligning, generally vertical axis about which the tower 11 may rotate.

As an important feature of the invention, the winch 17 which controls the boom 12 is of a strong lightweight construction having few parts. In the preferred embodiment, the winch includes bracket plates 91, 92 which are secured to lugs on the channel member 41 (see FIG. 4). Fitted into the channel 97, 98, 99, 100, 101, respectively, and journal a cable drum 95 (see FIG. 6). Secured to the outer side of one end of the drum 95 is a ring gear 96. A pinion 97 is journaled in the adjoining end plate 94 as so to be in meshing engagement with the ring gear 96. A handle 98 is coupled to the pinion 97 through an assisble braking assembly 99, not shown in detail. Rotation of the handle 98 drives the pinion 97 and rotates the drum 95. The line 18 is wound about the drum 95, although for clarity the line is not shown in FIG. 6, and therefore it will be understood that rotation of the handle 98 controls the vertical swinging movement of the boom 12.

To enclose and protect the driving mechanism for the winch 17, an annular flange 101 is formed on the inner surface of the end plate 94 so as to closely overlie the outer periphery of the ring gear 96. The ring gear 96 and the flange 101 thus allow to enclose and protect the meshing gears which drive the winch 17.

To further the objective of lightweight, but strong, construction, aluminum alloys are used for the structural elements of the crane 10. It will be appreciated by those skilled in the art that the resulting crane structure is exceptionally light, and, when the tower 11 is separated into its sections 31, 32 and 33, the crane may be easily transported. The lightweight construction of the winch 17 contributes to the easy portability of the crane 10. As was pointed out above, the base assembly 13 facilitates erection of the crane and assures, together with the lightweight, improved bearings of the swivel ring assembly 25, smooth, easy rotation of the tower when the crane is in operation.

We claim as our invention:

1. A portable jib crane comprising, in combination, a plurality of pairs of opposed channel members rigidly joined by cross braces, said pairs being aligned and releasably secured to one another to define a tower, a circular plate having a vertically directed slots, said tower having upwardly directed slots, said tower being spacedly located between said plate, a cable drum journaled between said side plates, a cable wound on said drum and

2. In a rotatable tower crane, the combination comprising, a base plate having upwardly extending portions defining a pair of upwardly directed slots, a trunnion block rockably and movably supported in said slots, said block having an upwardly opening semi-spherical socket, a pivot pin having a lower ball portion seated within said socket, and thrust bearings mounted on said pin.
coupled to said boom, an internal ring gear secured to the outer side of one end of said drum and opening outwardly, a driving pinion journaled in said plate adjacent said gear with the pinion being in meshing engagement with said ring gear, a handle coupled to said ring gear enabling the drum to be rotated and the boom thus raised and lowered, and means to permit rotation of said tower about a generally vertical axis.

5. In a portable crane having a jib boom pivoted on a tower, a lightweight winch for raising and lowering said boom comprising, in combination, a bracket rigidly secured to said tower, a pair of side plates supported by said bracket in spaced relation, a cable drum journaled between said side plates, a cable wound on said drum and coupled to said boom, an internal ring gear secured to the outer side of one end of said drum and opening outwardly, the side plate adjacent said ring gear having an annular flange closely surrounding the periphery of said ring gear, a driving pinion journaled in said plate adjacent said gear with the pinion being in meshing engagement with said ring gear, and a handle coupled to said ring gear enabling the drum to be rotated.

6. In a portable crane having a jib boom pivoted on a tower, the combination comprising a bracket rigidly secured to said tower, a pair of side plates supported by said bracket in spaced relation, a cable drum journaled between said side plates, a cable wound on said drum and coupled to said boom, an internal ring gear secured to the outer side of one end of said drum and opening outwardly, a driving pinion journaled in said plate adjacent said gear with the pinion being in meshing engagement with said ring gear, and a handle coupled to said ring gear enabling the drum to be rotated.

7. A portable jib crane comprising, in combination, a plurality of pairs of opposed channel members rigidly joined by cross braces, said pairs being aligned and releasably secured to one another to define a tower, a support member fixed transversely of said tower between two of said pairs of members, said support member defining a cylindrical surface surrounding the tower and an annular surface extending outwardly from the lower portion of said cylindrical surface, blocks of bearing material secured to both said cylindrical surface and said annular surface, a swivel ring surrounding said member and having surfaces in abutting engagement with said blocks of bearing material so that the member is smoothly rotatable within said ring, and guy wires coupled to said ring for supporting said tower in an erect position extending upwardly from said base plate.

8. In a rotatable crane tower, the combination comprising, a support member fixed transversely of said tower at a mid-portion thereof, said member defining a cylindrical surface surrounding the tower and an annular surface extending outwardly from the lower portion of said cylindrical surface, blocks of bearing material secured to both said cylindrical surface and said annular surface, a swivel ring surrounding said member and having surfaces in abutting engagement with said blocks of bearing material so that the member is smoothly rotatable within said ring, said ring having connections for the coupling of guy lines thereto, and spring biased latches carried by said ring for snapping beneath the bearing blocks on said cylindrical surface so as to prevent accidental displacement of said ring from the supporting member.

9. In a rotatable crane tower, the combination comprising, a support member fixed transversely of said tower at a mid-portion thereof, said member defining a cylindrical surface surrounding the tower and an annular surface extending outwardly from the lower portion of said cylindrical surface, a swivel ring surrounding said member and having corresponding surfaces in abutting engagement with said annular and cylindrical surfaces so that the member is smoothly rotatable within said ring, and said ring having connections for the coupling of guy wires thereto.

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Disclaimer


Hereby enter this disclaimer to claim 9 of said patent.

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