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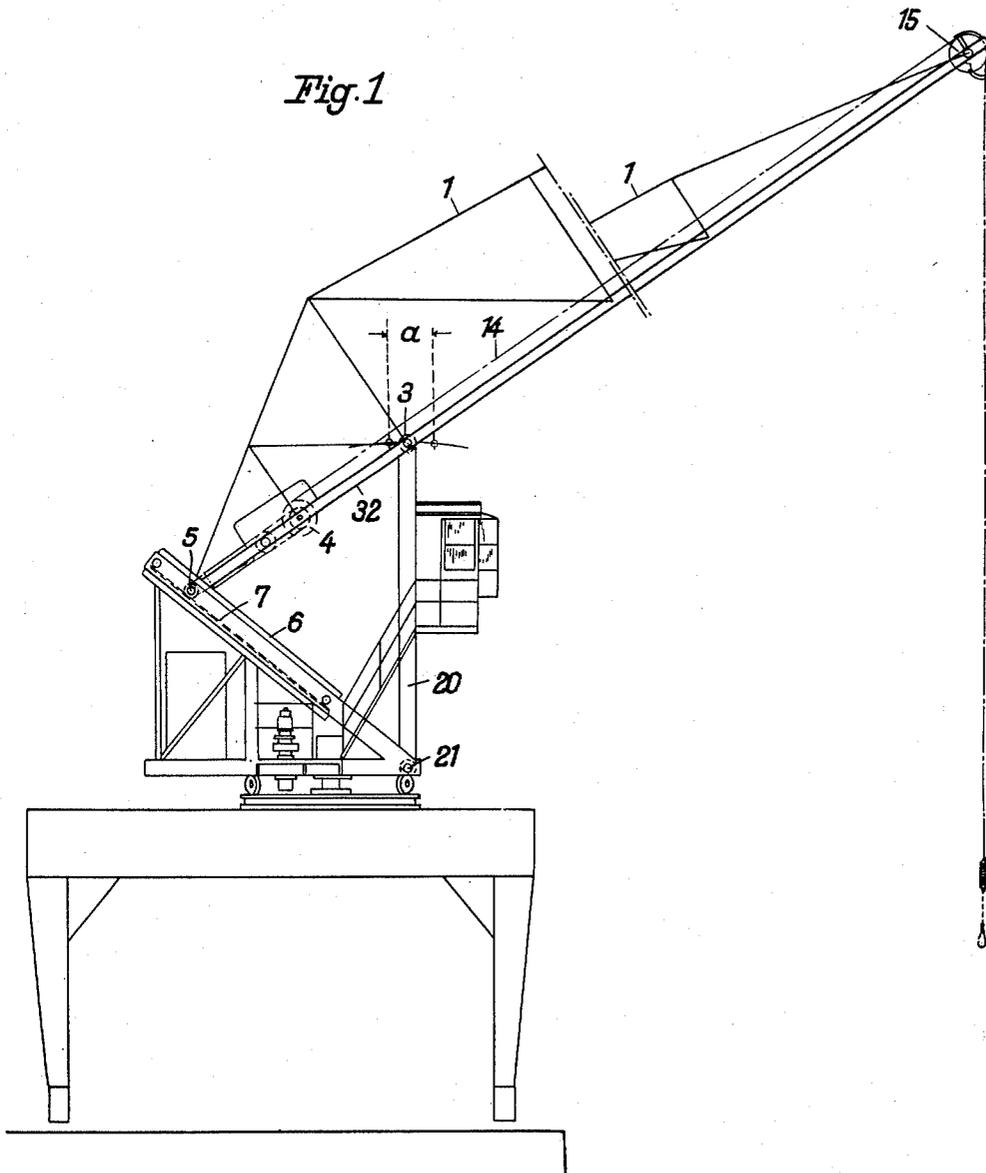
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JIB CRANE

Filed April 6, 1932

2 Sheets-Sheet 1



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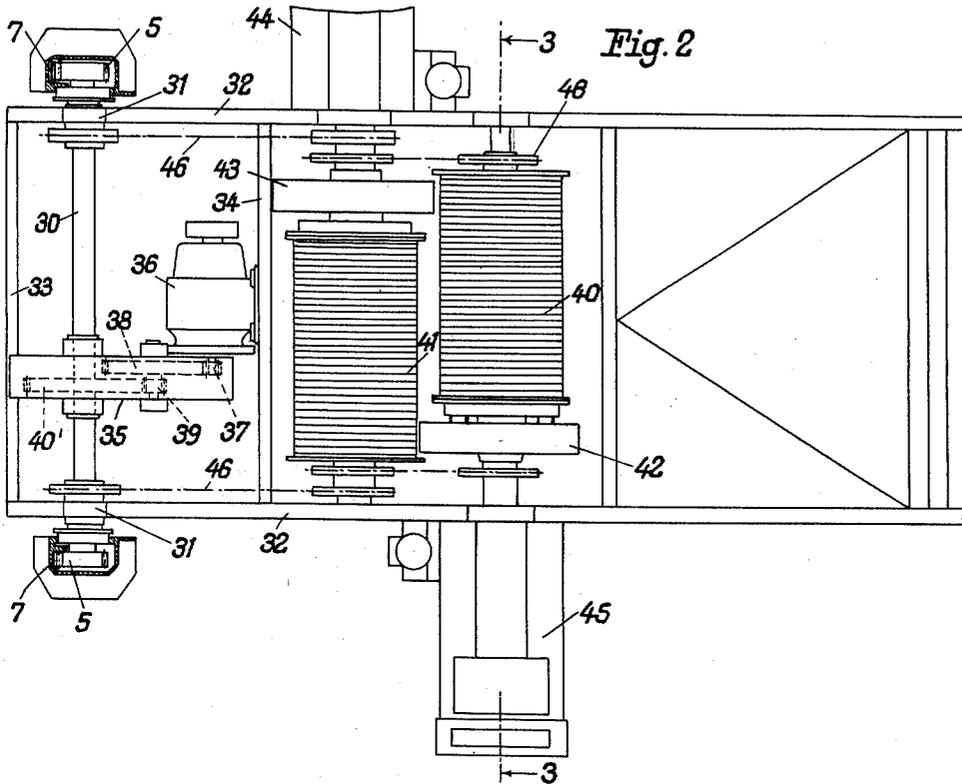


Fig. 2

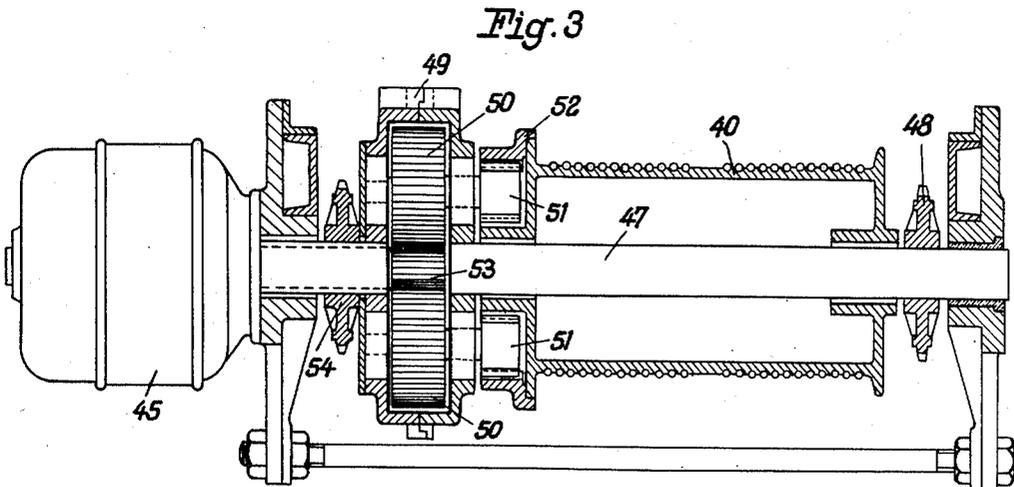


Fig. 3

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JIB CRANE

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My invention relates to a jib crane and more particularly to a crane of the type in which the load may be caused to travel in a substantially horizontal path.

5 The objects of my invention are to provide for a complete balance of the pivotal jib; to reduce the number of bends in the lifting rope to a minimum; to provide for a low point of gravity of the crane and to possibly
10 reduce the number of pivotal joints in the construction.

I attain these and other objects which will appear from the following description by
15 operating the winding or lifting drum with aid of a toothed element in form of a pinion meshing with a second toothed element in form of a rack, one of said elements being carried by the frame of the crane and the other element being cooperatively connected
20 to, preferably carried by the jib. Thus, any pivotal movement of the jib will result in an operation of said pinion, whereby a revolution is imparted to the winding drum sufficient to compensate for the elevational movement of the head sheave. This compensa-
25 tion will be perfect if provisions be made for keeping the rack at an invariable inclination in course of the pivotal movement of the jib and my invention contemplates more particularly the provision of means whereby the
30 arrangement of the rack at an invariable inclination is rendered possible.

In a preferred embodiment of my invention the rack is rigidly mounted in the fram-
35 ing of the crane while the pivotal axis of the jib is movable relatively to the frame in a substantially horizontal path.

While it offers certain advantages to arrange the rack in an oblique position, it may
40 be given any other disposition in the framing and in speaking of "inclination" of the rack, I mean to define the angle of the rack with a horizontal plane without imposing any limitation on the size of said angle.

45 In the alternative event in which the rack is carried by the framing whereas the pinion is carried by the jib I preferably mount the winding drum likewise in the tail end of the
50 jib.

Moreover, I prefer to gear the luffing motor

to the pinion meshing with the rack, thus obtaining the advantage of counter-balancing the jib by both, the luffing motor and the winding or lifting motor.

In the drawings which illustrate a preferred embodiment of my invention,

Fig. 1 is an elevation of the crane,

Fig. 2 is a plan view of the tail end of the jib showing parts of the framing in cross section, and

Fig. 3 is section along the line 3—3 of Fig. 2.

The jib 1 preferably in the customary form of a truss is mounted intermediate its ends on a horizontal pivot 3 carried by the upper ends of upright links 20 pivoted at 21 to the frame 6 of the crane. The frame is mounted on a suitable support in the customary manner for rotation about a vertical central
70 trunnion.

In the lower portion or tail end of the jib 1, there is mounted a winding drum 4 from which the lifting rope 14 extends preferably directly without any bends to the head sheave 15 in the upper end of the jib and thence to the hook carrying the load (not shown). The winding drum is cooperatively connected by an epicyclic gear to be described later with two coaxial pinions 5 carried by the lower end of the jib and suitably kept in permanent
80 mesh with racks 7 mounted in the frame 6.

Preferably I arrange the racks 7 in oblique position as shown in Fig. 1 in which they constitute the basis of a triangle having substantially equal sides converging towards the pivot 3 of the jib. Owing to this arrangement the pivot 3 will move along a very short arc only during the luffing operation of the jib, when the latter is operated between the limits of its movement. The short arc is indicated in Fig. 1 at *a*. Consequently the level of the pivot 3 is subject to negligible variations only, whereby a true horizontal path of the load is approached to utmost perfect-
95 ness.

Figs. 2 and 3 illustrate a preferred embodiment of the luffing gear and the winding or lifting gear. The pinions 5 meshing with the racks 7 are mounted on a common shaft 30 journaled in bearings 31 mounted on the
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longitudinal beams 32 of the truss constituting the jib. The struts 33 and 34 of the jib carry a gear box 35 and the reversible luffing motor 36. The luffing motor has a pinion 37 geared by spur-wheels 38, 39 and 40' to the shaft 30 to rotate the latter in the desired direction of rotation whereby the jib will be turned about its pivot 3 in one or the other sense. As the luffing motor and the gear box are mounted at the extreme end of the jib, their weight serves to counteract and to balance the tilting moment of the jib very efficiently.

The winding gear which is likewise carried by the tail end of the jib is constructed in the instant embodiment as a twin motor grab bucket winding gear. Two winding drums 40 and 41 are journaled between the beams 32 in parallel relation and are driven by epicyclic gears 42, 43 which are cooperatively connected with the lifting motors 44, 45 on the one hand and by chains 46 with the shaft 30 of the pinions 5 on the other hand. The epicyclic gears 42 and 43 serve to superimpose the rotary motion derived from the pinions 5 to the motion produced by the lifting motors 44, 45.

One of the epicyclic gears is shown in detail in Fig. 3 on an enlarged scale. The lifting drum 40 is rotatably mounted on a shaft 47 having keyed to it a sprocket wheel 48. The sprocket wheel is connected with the shaft 30 of the pinions 5 by suitable chains and the other end of shaft 47 is firmly keyed to the rotary casing 49 of the planetary gears composed of two sections. Within the casing the planetary gears 50 are mounted. The trunnions of these planetary gears project out of the casing 49 and carry pinions 51 arranged in mesh with internal teeth of a ring 52 attached to the winding drum 40. The shaft of the winding motor 45 extends into the casing 49 from the opposite side and is provided with teeth 53 meshing with the planetary gears. Moreover, this shaft carries loosely a sprocket wheel 54 which is suitably attached to the casing 49 and is connected to shaft 30 by chains in a similar manner as the sprocket wheel 48.

The operation is as follows: When the luffing gear is to be driven only while the lifting motors are kept stationary to move the load on a horizontal path in inward or outward direction, the sprocket wheels 48 and 54 are driven by the shaft 30 and through shaft 47 rotation is imparted to the casing 49 carrying the planetary gears engaging the teeth 53 which are kept at rest. Thus, the planetary gears and their pinions 51 are revolved and impart rotation to the ring 52 and the winding drum 40. A similar movement is imparted to the winding drum 41. The amount of rotation thus imparted to the winding drums corresponds to the vertical component of the travel of the head sheave. As the

latter is lifted at a luffing operation, the lifting rope is wound off a corresponding amount, whereby the load is guided in a horizontal path.

When the lifting motor 45 only is operated while the luffing motor is arrested, the sprocket wheels 48 and 54 and the casing 49 are kept stationary. In this event, the rotation of motor 45 is transmitted through the teeth 53, the planetary gears 50 and the pinions 51 to the drum 40. Similarly, the drum 41 may be operated by the motor 44.

When the luffing motor and one or both winding motors are operated at the same time it is apparent that the motions will be combined and transmitted to the winding drums 40 and/or 41.

What I claim is:—

1. A jib crane comprising a frame, a jib arranged thereon for pivotal movement about a horizontal axis, a load lifting drum mounted in said jib near one end thereof, a lifting motor and means adapted to cause the load to travel in a substantially horizontal path, said means comprising a pinion journaled in the jib, a rack arranged in mesh with said pinion, and linked to said frame, whereby said pinion will be rotated by said rack during any luffing movement of said jib, an epicyclic gear cooperatively connecting said drum with said motor and said pinion whereby either one of the latter may operate on said drum independently of and simultaneously with the other a head sheave journaled in the other end of the jib, and a lifting rope adapted to be wound on said drum and leading directly therefrom to said head sheave without any intermediate bends.

2. A jib crane comprising a frame, a jib arranged thereon for pivotal movement about a horizontal axis, a load lifting drum, a lifting motor and means adapted to cause the load to travel in a substantially horizontal path, said means comprising a toothed element in form of a pinion, a toothed element in form of a straight rack arranged in mesh with said pinion and at an invariable inclination, one of said toothed elements being cooperatively connected with said jib and the other toothed element being mounted on said frame, whereby said pinion will be rotated by said rack during any luffing movement of said jib, and an epicyclic gear cooperatively connecting said drum with said motor and said pinion whereby either one of the latter may operate on said drum independently of and simultaneously with the other.

3. In a jib crane comprising a frame and a pivotal jib arranged thereon, means adapted to cause the load to travel along a substantially horizontal path, said means comprising a load lifting drum, a toothed element in form of a pinion, means to gear said pinion to said drum, and a toothed element in form of a straight rack arranged in mesh with said

pinion and at an invariable inclination, one of said toothed elements being cooperatively connected with said jib and the other toothed element being mounted on said frame.

5 4. A jib crane comprising a frame, a straight rack and a pivot both mounted on said frame for substantially horizontal relative movement away from and towards each other, a jib journalled on said pivot, a pinion carried by said jib and arranged in spaced parallel relationship to said pivot and in permanent mesh with said rack and a load lifting drum geared to said pinion.

10 5. A jib crane comprising a frame, a straight rack and a pivot both mounted on said frame for substantially horizontal relative movement away from and towards each other, a jib journalled on said pivot, a pinion carried by said jib and arranged in permanent mesh with said rack, a lifting motor and a lifting drum mounted in said jib and an epicyclic gear connecting said drum with said motor and said pinion, whereby either one of the latter may operate on said drum independently of and simultaneously with the other.

20 6. A jib crane comprising a frame, a straight rack and a pivot both mounted on said frame for substantially horizontal relative movement away from and towards each other, a jib journalled on said pivot, a pinion carried by the one end of said jib and arranged in permanent mesh with said rack, a lifting motor and a lifting drum mounted in said jib, an epicyclic gear connecting said drum with said motor and said pinion, whereby either one of the latter may operate on said drum independently of and simultaneously with the other, a head sheave journalled in the other end of the jib, and a lifting rope adapted to be wound on said drum and leading directly therefrom to said head sheave without any intermediate bends.

30 7. A jib crane comprising a frame, a straight rack and a pivot both mounted on said frame for substantially horizontal relative movement away from and towards each other, a jib journalled on said pivot intermediate its ends, a pinion carried by the lower end of said jib and arranged in permanent mesh with said rack, a lifting motor and a lifting drum mounted in said jib, an epicyclic gear connecting said drum with said motor and said pinion, whereby either one of the latter may operate on said drum independently of and simultaneously with the other, a head sheave journalled in the other end of the jib, a lifting rope adapted to be wound on said drum and leading directly therefrom to said head sheave without any intermediate bends, and a luffing motor geared to said pinion and carried by said jib, said drum and said motors being mounted in the lower end of said jib to counter-balance the upper portion thereof.

65 8. A jib crane comprising a frame, a

straight rack carried thereby and a pivot mounted on said frame for substantially horizontal relative movement away from and towards said rack, a jib journalled on said pivot, a pinion carried by said jib and arranged in spaced parallel relationship to said pivot and in permanent mesh with said rack, a lifting drum mounted in said jib and means to gear said pinion to said drum, whereby said drum will be rotated during any luffing movement of said jib.

70 9. In a jib crane comprising a frame, a pivot and a jib mounted on said pivot between its ends, the provision of means adapted to cause the load to travel in a substantially horizontal path, said means comprising a straight rack rigidly mounted in said frame in oblique position so as to constitute the basis of a triangle having substantially equal sides converging towards said pivot, means for guiding said pivot along a substantially horizontal path, a pinion carried by the one end of said jib and arranged in permanent mesh with said rack, a lifting motor and a lifting drum mounted in said jib, an epicyclic gear for connecting said drum with said pinion and said motor, a head sheave journalled in the other end of said jib and a lifting rope adapted to be wound on said drum and leading directly therefrom to said head sheave without any intermediate bends.

85 10. A jib crane comprising a frame, a jib pivoted therein at a point intermediate its ends, a lifting motor, a lifting drum and a luffing motor, said drum and said motors being geared to each other and mounted in one end of said jib, and a head sheave journalled in the other end of said jib.

In testimony whereof I affix my signature.
JOHANN FRIEDRICH HEINRICH LANGE.

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