

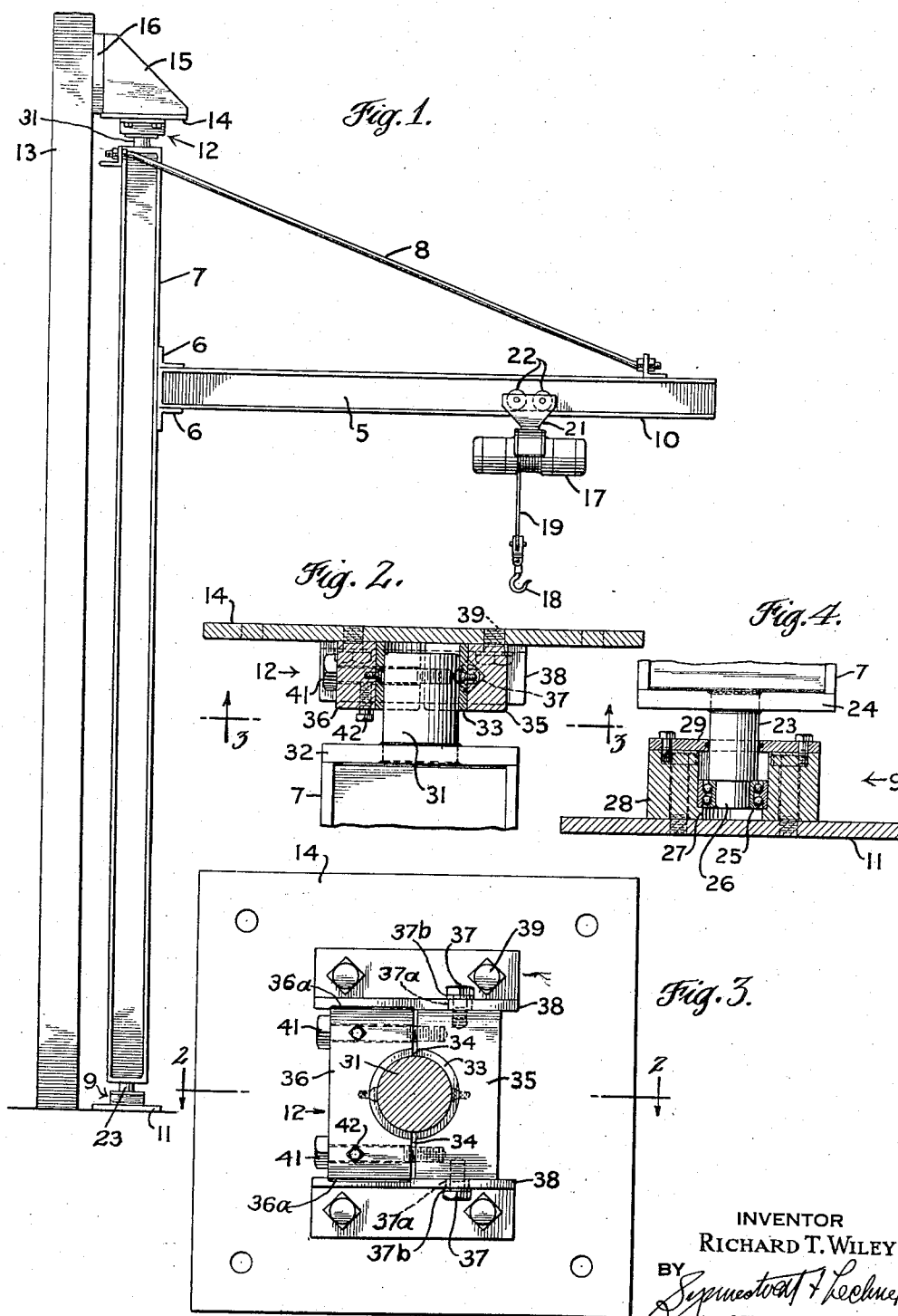
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MANUALLY-OPERATABLE JIB CRANES

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MANUALLY-OPERATABLE JIB CRANES

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1 Claim. (Cl. 212—63)

This invention relates to manually-operatable jib cranes of those types or classes wherein the jib or boom, with its load, may be swung by hand, about a vertical pivot axis, and is particularly concerned with the problem of undesired "drifting" of the boom, especially when loaded, from one angular position to another about the vertical axis, due to slight misalignments of the pivot axis from the true vertical—the primary purpose of the invention being to provide a simple, effective, reliable and inexpensive solution to that problem, particularly by the provision of anti-drift mechanism which will, through years of operation, retain the important characteristic of imposing just enough resistance to drift as to prevent undesired swinging of the loaded boom while yet leaving the crane sufficiently "free" in its operation that the operator may manually swing the boom and its load from any one working angular position to any other (about the vertical pivot axis) without undue physical effort.

The drifting, as is well known in the art, is inconvenient and wasteful of manpower and time, because, for example, when a load is taken onto the crane boom or jib when the latter is at one angular orientation or azimuth, and the operator for instance must go to another location and perhaps arrange a dolly, a vehicle or other means to receive the load, the boom in the meanwhile has swung to some other position, which delays matters; but in addition the tendency to move to the wrong angular position makes more difficult the proper "spotting" of the load at the location where it is ultimately moved by the operator.

It is a further object of the invention to solve the foregoing problems by the provision of crane anti-drift mechanism of substantially minimum required excess resistance to swinging of the crane boom, as by the imposition of a frictional drag on swinging of the boom; and, in the preferred embodiment, to provide variably settable means for imposing such resistance, so that the required minimum necessary imposed drag may be varied with considerable nicety. Such variation may be needed after a long period of use, because of changes in the normal drag on the crane and/or because of changes in the exactness of setting of the vertical pivot axis, which may occur as a result of gradual settling of floors or foundations, warping of walls or columns (where the crane is supported at least in part thereby) or bending of crane or supporting elements due to thermal or other effects, or distortion of elements by virtue of repeated, excessive, or long-sustained loading of the crane, some of these effects being not apparent until after a long period of use of the crane and its anti-drift mechanism in actual operation.

More specifically, the invention contemplates the accomplishment of the foregoing by the provision of anti-drift mechanism associated with one or more of the bearings upon which the crane or its jib or boom is mounted to swing about a generally vertical axis. Still more specifically, in a crane having a foot-bearing and a head-bearing, wherein each takes a radial bearing load—said

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bearings being generally of one or another so-called "anti-friction" type, but which are of course subject to friction whose absolute value varies with loading—the invention contemplates the association with at least one of said bearings of a means for imposing a frictional drag on the swinging operation of the crane boom; and, in the preferred embodiment, a frictional drag on the bearing itself, sufficient, in combination with the normal friction of the bearings under the particular condition of load, to prevent undesired drifting, but insufficient to prevent intentional manual operation of the crane.

Generally, one of the bearings for the vertical axis of the crane takes vertical thrust loads as well as radial loads, and most typically it is the foot-bearing which takes the vertical thrust load, and the invention contemplates the association of the anti-drift mechanism with the other radial bearing, which is generally the head-bearing. One advantage of this association arises from the fact that the combined radial and thrust bearing is desirably a rolling type of bearing, for example a ball-bearing, whereas the other bearing—normally the head-bearing—may conveniently be made of a sleeve- or bushing-type (for example, a bronze bushing) to which I find it simpler to apply the variably settable frictional drag means of the present invention. Further, this bearing, being relieved of the thrust loads, may be more lightly loaded initially, so that the addition of the imposed frictional drag thereon will not result in a total load on the bearing so large as to require a very large or heavy bearing, which might otherwise be the case. Still further, there is the advantage that this association places the anti-drift mechanism in a location where it is less apt to be tampered with or accidentally damaged or misadjusted; this location (i. e. the head-bearing location) being also desirable as being less subject to the collection of debris or foreign matter, which if it should get into the adjustable bearing might interfere with the required nicety of frictional drag setting.

Additionally, the invention contemplates improvements in the features of construction and operation of crane anti-drifting mechanism as disclosed in the drawings and/or as set forth in the following description, together with such other features as may be incident to the invention or may occur to those skilled in the art after consideration of this disclosure. In the accompanying drawings:

Figure 1 is an elevational view of a crane embodying the present invention, said crane being supported by a foot-bearing at the floor and by a head-bearing secured by a bracket to an upright wall or column of a building;

Figure 2 is an enlarged fragmentary view of the upper end of the main post, column or axis member of the crane, showing the upper trunnion or pivot pin thereof, and associated therewith (in section) the head-bearing with the variably-settable friction resistance device associated therewith, this view being taken on the line 2—2 of Figure 3;

Figure 3 is a horizontal sectional view through the head-bearing pin, taken on the line 3—3 of Figure 2 and showing, in bottom plan view, the bearing and adjustment parts associated therewith; and

Figure 4 is a view similar to Figure 2, but showing the foot-bearing assembly of the crane.

For illustration of a typical installation embodying the invention, the drawings disclose a mast type jib crane. While the invention is adaptable to numerous other types of cranes, for example with different types or arrangements of mast or other support, with the jib or boom supported in other ways, with the jib separately pivoted, with other types of jib brace than the tension type shown, or with a self-supported jib (having no brace), and/or having various other features, the invention is especially

well adapted for ready and advantageous utilization in types of cranes where the boom or jib is a rigid beam fixed solidly to an upright crane post or other vertical axis member, which in turn is pivoted on a substantially vertical axis, as by a head-bearing and a foot-bearing.

In the illustrated embodiment, the jib or boom 5, of ordinary I-beam section, is rigidly secured at 6 to a similar upright member 7 and is further supported therefrom by one or more tension braces 8 (in this case a pair of them—one on each side of the axis member 7). The mast or post 7 is carried by a foot-bearing generally indicated at 9, which rests upon the floor, through the intermediation of a pad or plate 11, and by a head-bearing, generally indicated at 12, which is secured to a wall or other structural member or support, such as the column 13 of a factory building—through the intermediation of a head-plate 14, a pair of heavy bracket plates 15 and a backing plate 16.

The construction of the head-bearing assembly is shown in Figures 2 and 3 and of the foot-bearing assembly in Figure 4. Before proceeding to the description of said figures, it should be pointed out that the jib 5 may carry a hook or any other means of supporting and/or lifting a load, and in this case it is supplied with an electric hoist 17 which includes a hook 18 raised and lowered by cable 19, and further includes paired brackets 21, each with two wheels or rollers 22, respective pairs of rollers being adapted to ride on the rails formed by the bottom flange 10 of the jib 5.

The jib may be of considerable length, and the load to be lifted and swung by the crane may be of considerable mass, so that the crane itself may at times be deflected slightly, or, for various other reasons set out earlier in this specification, elements of the crane or of the support may be deflected, distorted, or otherwise misaligned, so that the axis of the pivotal supports for the mast 7 may not be always exactly vertical. Under such conditions, the undesired drifting of the boom, hereinbefore discussed, will frequently occur, and it has proven to be quite a problem in some installations, especially where very heavy masses must be readily swung by one man, acting to manually swing the crane and its load.

The total vertical thrust load, and a relatively minor radial load, is taken by the foot-bearing 9. The details of the assembly, as seen in Figure 4, include a pivot pin 23, secured as by welding in the bottom plate 24 of the mast 7; and a double-row ball-bearing 25, of the combined radial and thrust type, the inner race of which surrounds the pin extension 26 (of smaller diameter than pin 23) and takes the thrust from the shoulder thus formed, and the outer race of which rests upon the shoulder 27 of the bearing block 28 which is bolted to the foot-plate 11. A cover-plate 29, bolted in place, and carrying a seal to exclude dirt and retain lubricant, completes the foot-bearing assembly.

The head-bearing assembly, as seen in Figures 2 and 3, includes a pivot pin 31, of larger diameter than the foot-bearing pin 23 because the pin 31 takes the heaviest radial loads in shear—this pin being welded or otherwise secured in place on the post 7 by any suitable means including the top-plate 32. This assembly further includes an anti-friction bushing (for example of bronze) shown at 33, the same providing a gap—in this case a pair of gaps 34, as by being split longitudinally. One portion of the bushing seats against, and is preferably secured to, the fixed backing block 36, and an opposite portion is similarly associated with a movable block 35, forming part of the variably-settable means for imposing an added frictional drag on the bearing. The fixed block 36 is solidly fastened, as by welds 36a—36a, to flanged brackets 38 which are in turn secured by bolts or studs 39 to the head-plate 14. The vertical flanges of the brackets 38 form guideways for the movable block 35, which is secured to, and adjusted relative to the fixed block, by means of the bolts or studs 41, which pass through clear

holes in fixed block 36 and are threaded into movable block 35. Bolts 37 pass through slots 37a in flanges 38 and are threaded into movable block 35. Lock washers 37b are provided for the bolts 37. To ensure the holding of a given setting, set-screws or the like 42 may be provided, these being screwed into the block 36 and pinching the shanks of bolts 41. To adjust the position of movable block 35 and thus the drag on pin 31 it is necessary to loosen bolts 37 and set-screws 42 and then turn bolts 41. Rotating bolts 41 in direction to screw them further into the tapped holes in block 35 will draw block 35 toward block 36 and thus increase the drag on pin 31.

While different types of bearings may be used at the head and foot of the mast, and variably-settable friction means may be associated with both the head-bearing and the foot-bearing, the present arrangement has all the advantages set out in detail at the beginning of this specification, and is the preferred embodiment for this and other reasons. Just for example: although the loading of the head-bearing surface may be quite high with a heavy load on the jib, its unit loading in pounds per square inch is relatively low as compared with the unit loading on the anti-friction ball elements of the combined radial-and-thrust foot-bearing. To the loading of the head-bearing there may thus be added an extra frictional drag which is capable of a rather fine adjustment in relation to the normal friction thereon, and in relation to the drifting tendency of the jib under load.

Because of the very limited duty cycle of the bearing and the very low rate of actual rotation, and also because of the extremely wide variation in the loads imposed on the jib, and for other reasons, it could hardly be predicted that a device such as that herein disclosed could satisfactorily perform under all the imposed conditions, and with sufficiently uniform results over a long period of time; but a full experimental test has shown that the invention effectively accomplishes the purposes and has the advantages set out hereinbefore and gives every indication that a satisfactory performance may be expected throughout the long life characterizing such a crane.

I claim:

In a manually-operatable jib crane, incorporating an upright axis member, a boom adapted when in use to swing about the axis of said member, and a load-carrying device mounted to travel radially of the crane, along said boom between a position adjacent said axis member and an extreme position adjacent the end of the boom, so that undesired drifting of the boom tends to accompany misalignment of the axis of said member relative to the vertical, which tendency is variable in accordance with variations in load and accentuated when said load-carrying device is adjacent the extreme outer end of the boom, an anti-drift mechanism comprising a foot-bearing located adjacent the bottom end of said upright axis member, said foot-bearing adapted to take the chief vertical thrust loads, and being of a rolling anti-friction type with means sealing the same against loss of lubricant and against ingress of foreign matter, and a head-bearing located adjacent the top end of said upright axis member and constructed as a split-sleeve adapted to take the chief radial loads, said head-bearing comprising a fixed backing member for one half of the split-sleeve and a slidable backing member for the other half, together with adjustment means extending through one of said backing members and threaded into the other, and the bearing face area and coefficient of friction of said split-sleeve head-bearing being such that by adjustment of said threaded means a frictional drag may be imposed on said upright axis member sufficient to prevent such undesired drifting of the boom under conditions of maximum load, when the load-carrying device is in its extreme outward position on said boom, but without interfering with intentional manual swinging of said boom by an operator handling such load.

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