A drilling rig equipped with two sets of hoisting mechanisms. The two crown blocks are shiftable to enable either block to be positioned over the drill hole. The crown blocks carry depending guides for the two traveling blocks. The guides move horizontally and vertically as the crown blocks are shifted, but are constrained to remain vertical.
This invention relates to an improved shiftable crown-block assembly and associated traveling-block guides for use in a drill rig. It is known to equip a drill rig with two sets of hoisting mechanisms (drawworks, crown U.S. block, etc.,) both used with a single derrick. This arrangement has the advantage of enabling a drilling crew to carry on two operations simultaneously. For example, when the drill string is pulled from the hole, one hoisting mechanism can be used to rack a stand of drill pipe, while the other is raising the next stand. The arrangement requires a crown-block assembly which enables the two blocks to be shifted back and forth horizontally so that either can be positioned over the drill hole while the other is positioned at one side. Reference can be made to Chappell U.S. Pat. No. 2,187,392, for an exemplary showing of a rig of this type, and a more detailed explanation of its operation and advantages.

An object of our invention is to provide an improved crown-block assembly for a drill rig of the foregoing type, which assembly is formed as a unit freely movable on antifriction bearings for positioning either of the two crown blocks over the drill hole.

A further object is to provide a crown-block assembly of the foregoing type in which the unit carries depending guides for traveling two blocks under the respective crown blocks, whereby the traveling blocks and their guides shift uniformly with the crown blocks in a constrained path without swaying or colliding.

In the drawings:

FIG. 1 is a diagrammatic side elevational view of a derrick equipped with our improved crown-block assembly and traveling-block guides, the crown and traveling blocks at the left being positioned over the drill hole,

FIG. 2 is a similar view, but with the blocks at the right positioned over the drill hole;

FIG. 3 is a top plan view of the crown-block assembly with the block at the right removed;

FIG. 4 is a vertical section on line IV—IV of FIG. 3;

FIG. 5 is a vertical section on line V—V of FIG. 3;

FIG. 6 is a side elevational view of one traveling block and the traveling-block guides;

FIG. 7 is a horizontal section on line VII—VII of FIG. 6; and

FIG. 8 is a diagrammatic side elevational view showing how the guides are connected to move with the crown blocks.

FIGS. 1 and 2 show diagrammatically a drilling platform which supports a derrick 12 and a rotary table 13. The rig is equipped with two sets of hoisting mechanisms. The set at the left includes a drawworks, crown block 15, a traveling block 16, a drilling cable 17, and an elevator 18. The set at the right includes similar parts 14, 16a, 17a, and 18a respectively. Except as hereinafter pointed out, these parts per se can be of conventional construction and hence are not shown in detail. The crown blocks 15 and 15a are shiftable horizontally so that either may be positioned over the rotary table 13 and the drill hole beneath. FIG. 1 shows the left crown block 15 positioned over the rotary table 13, and the elevator 18 connected to a stand 19 of drill pipe coming out of the drill hole. The right crown block 15a is shown positioned to the right of the rotary table, and the elevator 18a lowered in readiness to engage the next stand. A stand 19a has been racked at the right side of the derrick 12. FIG. 2 shows the right crown block 15a positioned over the rotary table, and the elevator 18a connected to the next stand. Crown block 15 is shown positioned to the left of the rotary table to rack the stand 19 at the left side of the derrick.

As best shown in FIGS. 3, 4, and 5, derrick 12 includes horizontal water table beams 22 and transverse beams 23 and 23a at its upper end. The upper flanges of beams 22 carry respective linear roller bearings, each of which includes a lower race 24, rollers 25 and an upper race 26 (FIG. 5). The crown blocks 15 and 15a include transverse base members 27 fixed across the upper races 26. Preferably we form the upper races of two sections connected end-to-end with bolts 28 to enable either crown block and the corresponding upper race sections to be removed without disturbing the other. The crown blocks also include the usual guide sheaves 29 and multiple sheaves 30, which are journaled in suitable bearings and around which the cables 17 or 17a are reeved.

We attach carriers 32 and 32a to the undersides of the base members 27 of the respective crown blocks 15 and 15a. A double-acting movable hydraulic cylinder 33 extends through the two carriers and is attached thereto (FIG. 4). We attach hollow stationary piston rods 34 and 34a to the transverse beams 23 and 23a. The piston rods extend into opposite ends of cylinder 33 through stuffing boxes 35 and 35a. The ends of the piston rods within the cylinder carry pistons 36 and 36a. Each piston rod has a port adjacent its end communicating with the portion of the cylinder between the piston and stuffing box for admitting or discharging hydraulic fluid. We connect the outer ends of the piston rods to suitable sources of hydraulic fluid, not shown. When we admit fluid to cylinder 33 through piston rod 34, the crown blocks 15 and 15a shift toward the left from the position shown in FIG. 1 to the position shown in FIG. 2. When we admit fluid through the piston rod 34a, the crown blocks shift the other way. It is apparent we could use other means for shifting the crown blocks, such as a screw or a rack and pinion.

We journal left and right pairs of sprockets 38 and 38a to the outboard ends of carriers 32 and 32a respectively. We attach a pair of longitudinally extending straps 39 between the transverse beams 23 and 23a. We anchor respective left and right pairs of chains 41 and 41a (four altogether) to the undersides of straps 39 and run these chains over the corresponding sprockets 38 and 38a as shown diagrammatically in FIG. 8. We connect the depending ends of the two pairs of chains 41 and 41a to the upper ends of left and right guides 43 and 43a for the traveling blocks 16 and 16a respectively. We pivot a plurality of links 44 to the frame of derrick 12 and to each guide 43 and 43a, as best shown in the diagrammatic views of FIGS. 1 and 2. When the crown-block assembly shifts in either direction, the sprockets 38 and 38a of course shift with it, but the upper ends of chains 41 and 41a are anchored to the stationary straps 39. Consequently guides 43 and 43a move both horizontally and vertically through distances equal to the distance through which the crown-block assembly moves, in accordance with well known principles of pulley mechanisms.

As the guides move, the links 44 constrain their motion so that they always remain vertical.

As best shown in FIGS. 6 and 7, guide 43 includes a pair of vertically extending rails 45, preferably in the form of H-beams, and cross bars 46 connecting the rails. The links 44 preferably are double and are pivoted to the corner members of the derrick and to the cross bars 46. A carriage 47 is attached to the side face of the traveling block 16. Rollers 48 are journalled to carriage 47 and ride on inner faces of the flanges of rails 45 as the traveling block moves up and down. Thus the guide assures that the traveling block always moves in a truly vertical path and does not sway to either side. The guide 43a is of similar construction; hence we have not shown it in detail.

From the foregoing description it is seen that our invention affords a simple and effective mechanism for shifting a pair of crown blocks back and forth as needed in a rig equipped with two hoisting mechanisms. The traveling blocks are movable along guides which shift with the crown blocks and are constrained to remain always vertical. Thus the traveling blocks cannot sway or collide.

We claim:

1. In a well-drilling rig which is equipped with two sets of hoisting mechanisms used with a single derrick, said mechanisms including two crown blocks supported at the top of the derrick, means operatively connected with said blocks for shifting them horizontally with respect to the derrick, two traveling blocks, and drilling cables suspending said traveling blocks from the respective crown blocks, the combination therewith of: respective vertically extending guides beneath said crown blocks;
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3. A combination as defined in claim 1 in which said crown blocks form part of an assembly which includes shifttable carriers and rotatable elements journaled to the respective carriers, and in which the means connecting said guides with said crown blocks includes flexible members anchored at one of their ends to the top of said derrick, running over the respective rotatable elements; and anchored at their opposite ends to said guides, whereby said guides move equal distances horizontally and vertically as said crown blocks are shifted horizontally.

4. A pair of linear roller bearings, each of which includes a respective lower race fixed to the top of the derrick, rollers riding in said lower race, and a respective upper race riding on said rollers;

dome members on said crown blocks fastened across said upper races;

respective carriers fixed to the underside of said base members;

sprockets journaled to each of said carriers; and

power means connected to said carriers for shifting said crown blocks horizontally as a unit;

said rig also including;

chains having one end anchored with respect to the top of the derrick and running over said sprockets;

a pair of guides for said traveling blocks depending from said chins and movable uniformly horizontally and vertically as said crown blocks are shifted.

5. An assembly as defined in claim 4 comprising in addition links pivoted to said guides and to the derrick constraining the guides to a vertical position as they move.

6. An assembly as defined in claim 4 in which the means constraining said guides to remain vertical include a plurality of links pivoted to said derrick and to said guides.

7. An assembly as defined in claim 4 in which said power means includes a movable fluid-pressure cylinder extending through said carriers and attached thereto, hollow piston rods fixed to the top of the derrick and extending into each end of said cylinder, and pistons on said piston rods within said cylinder.

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