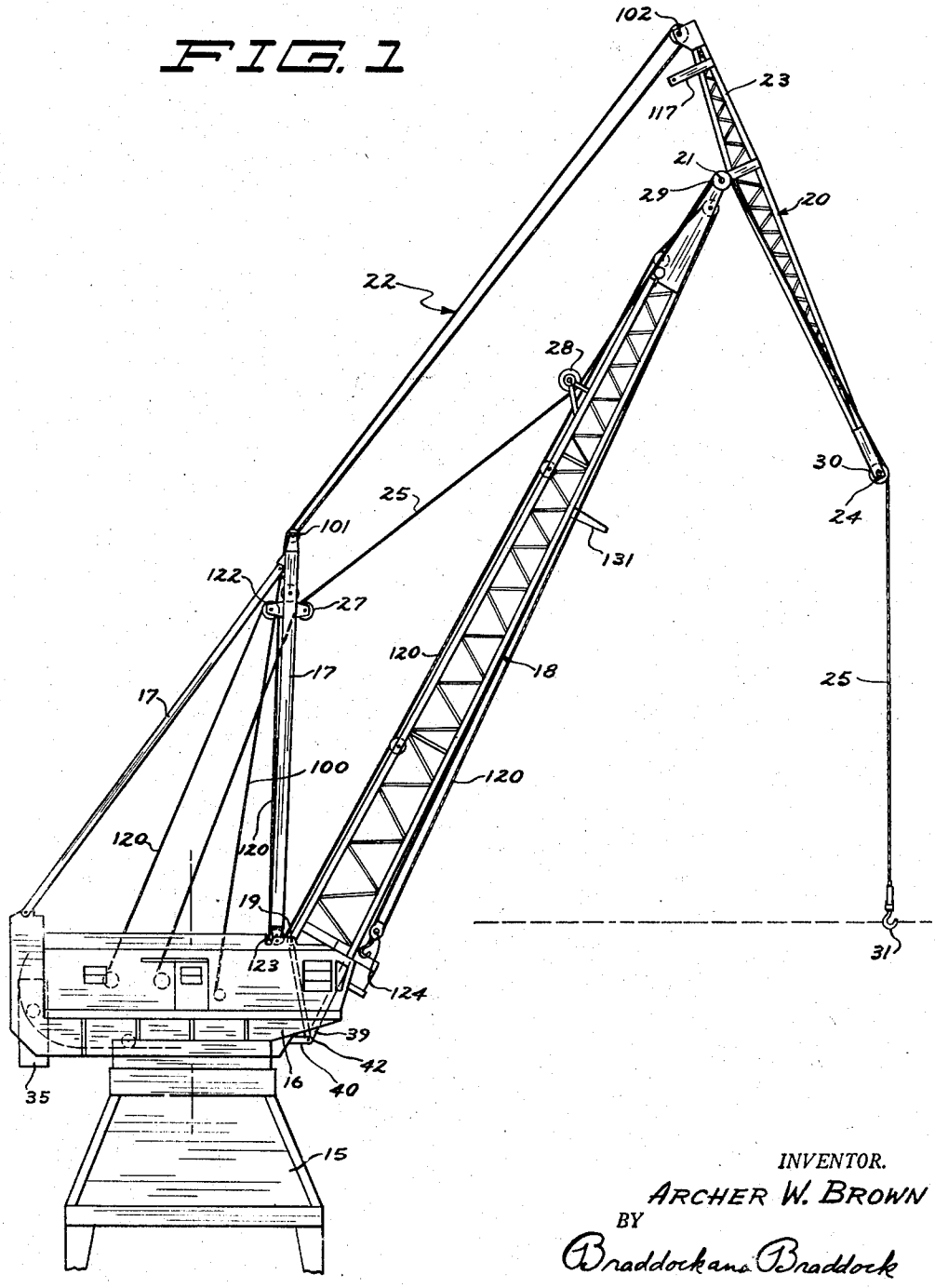
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CRANE

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FIG. 1



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FIG. 2

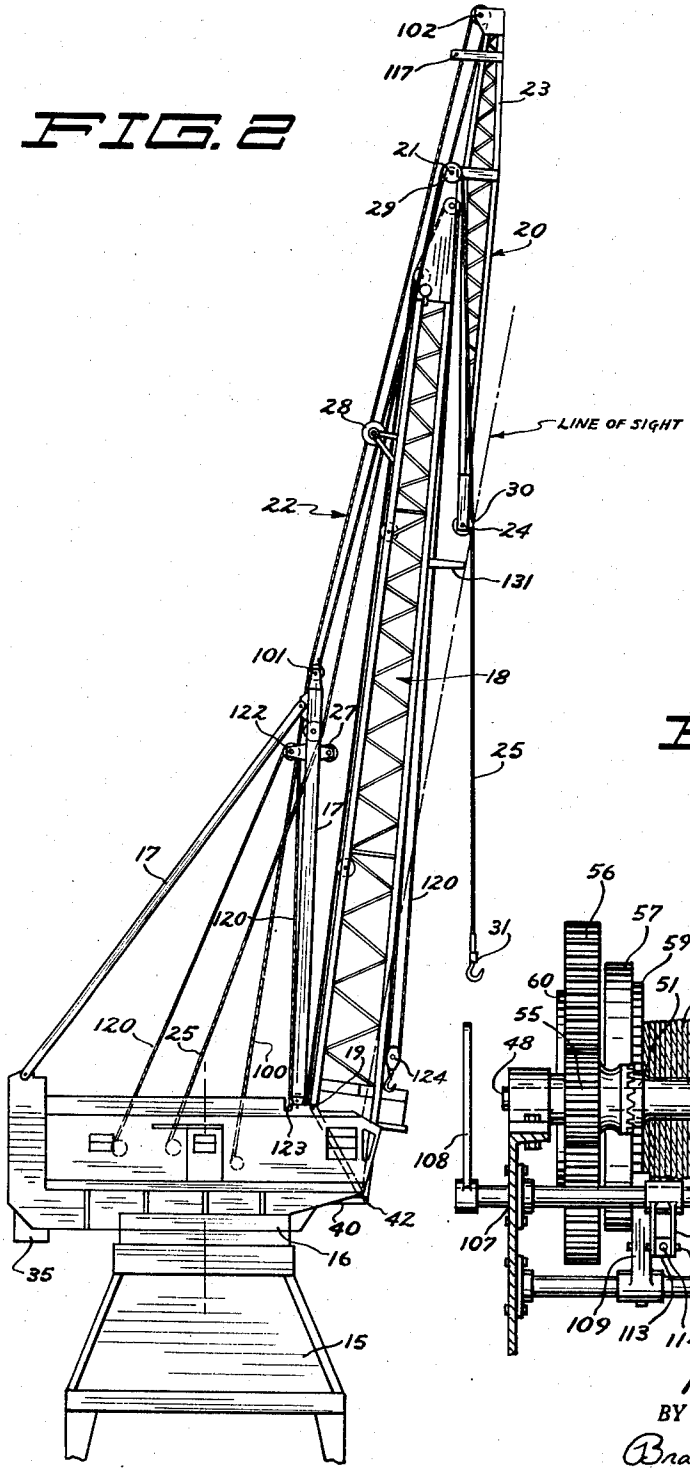
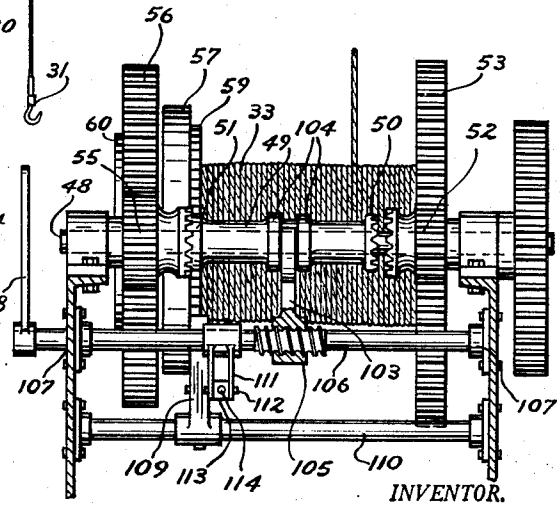


FIG. 10



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FIG. 4

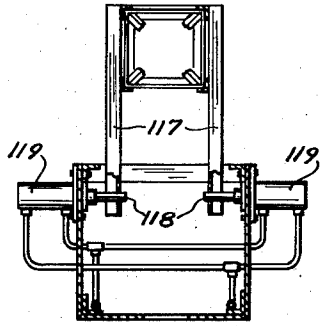


FIG. 3

FIG. 11

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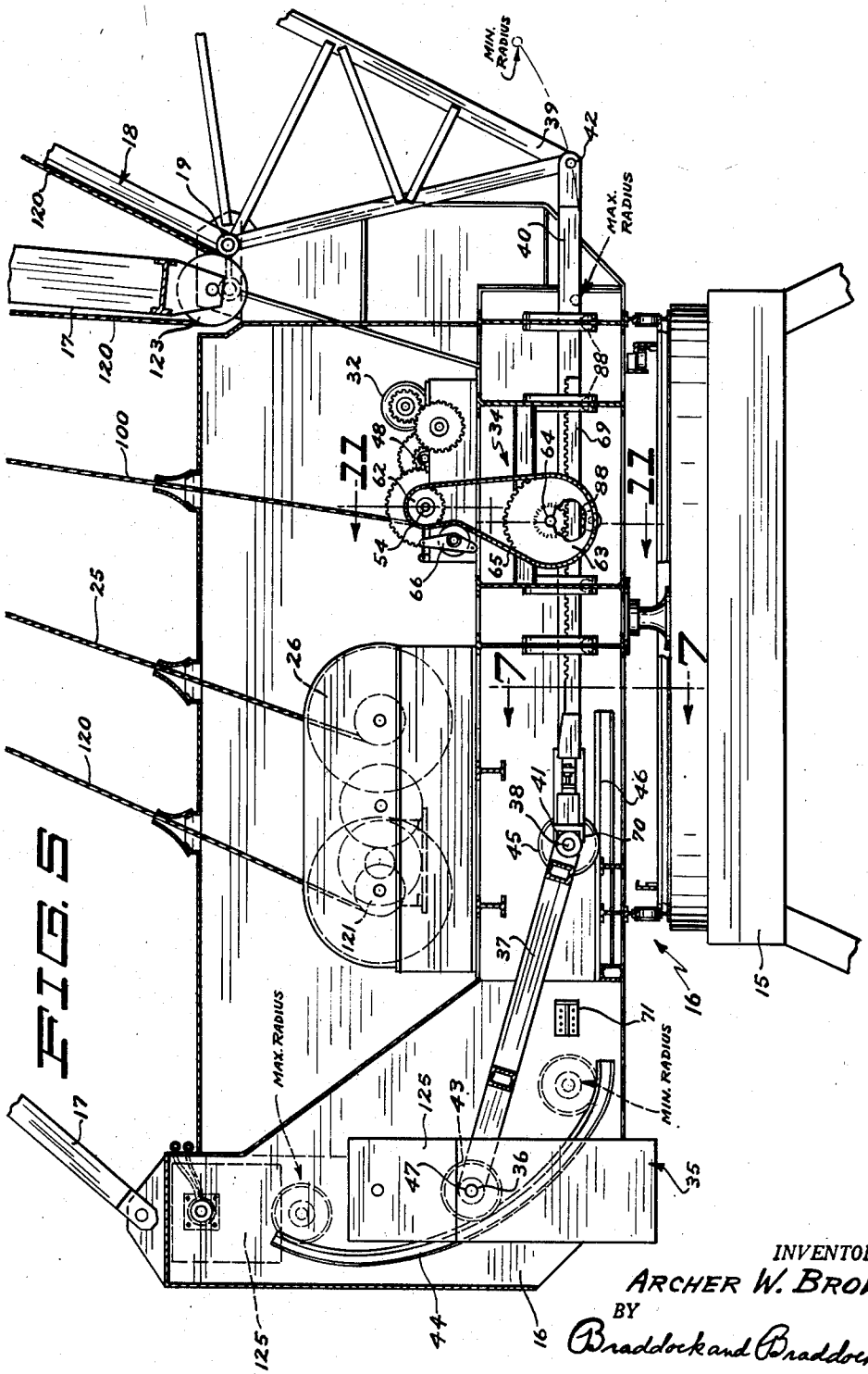


FIG. 5

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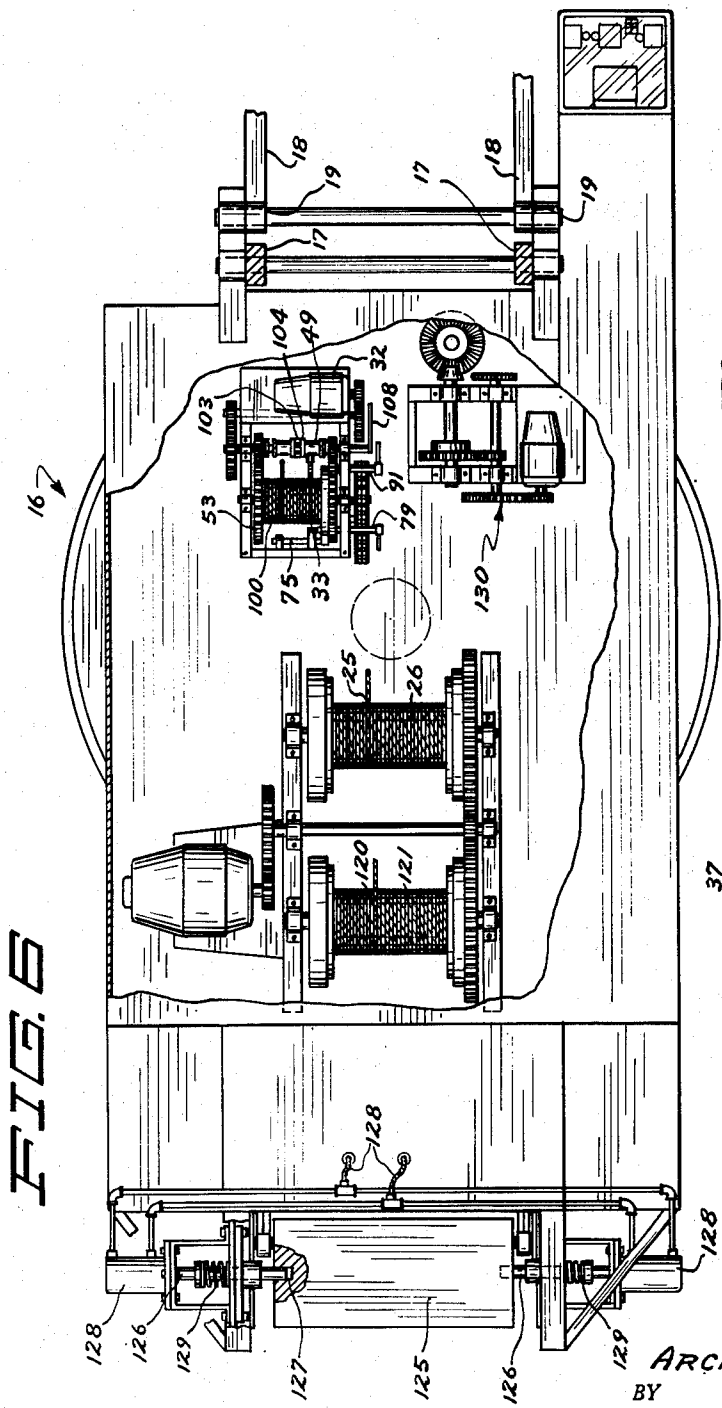


FIG. 6

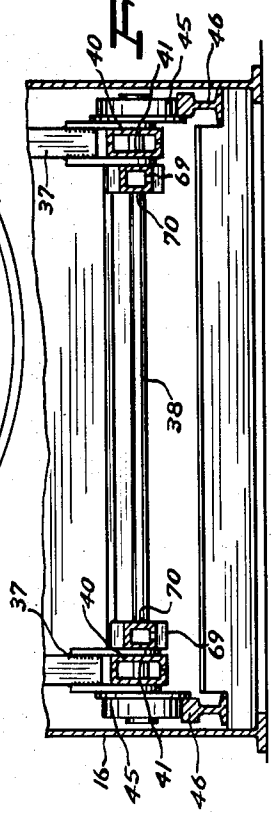


FIG. 7

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FIG. 8

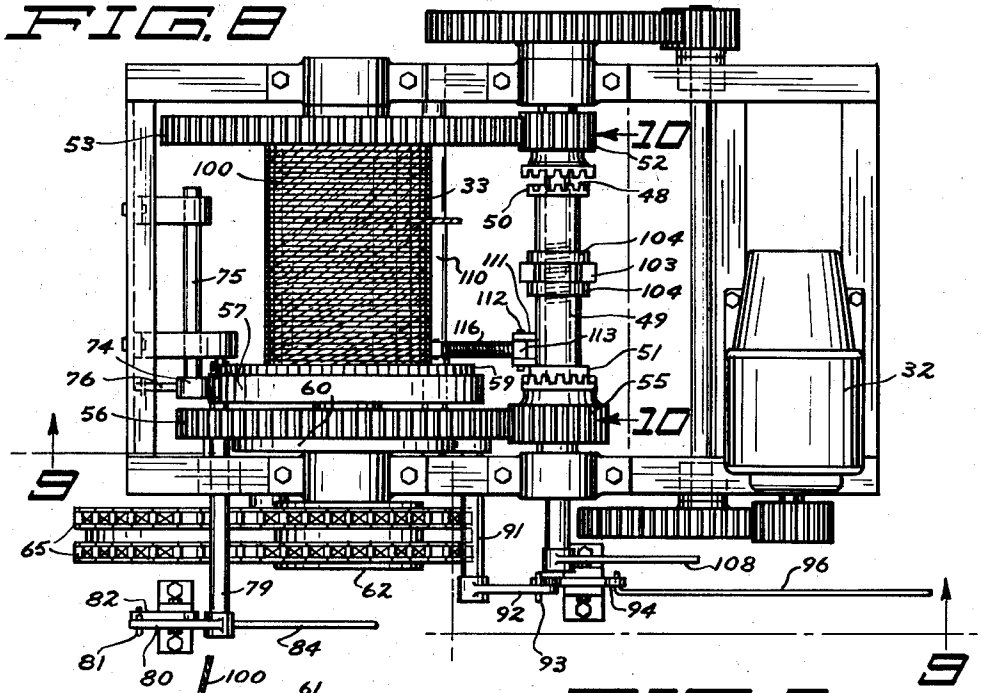
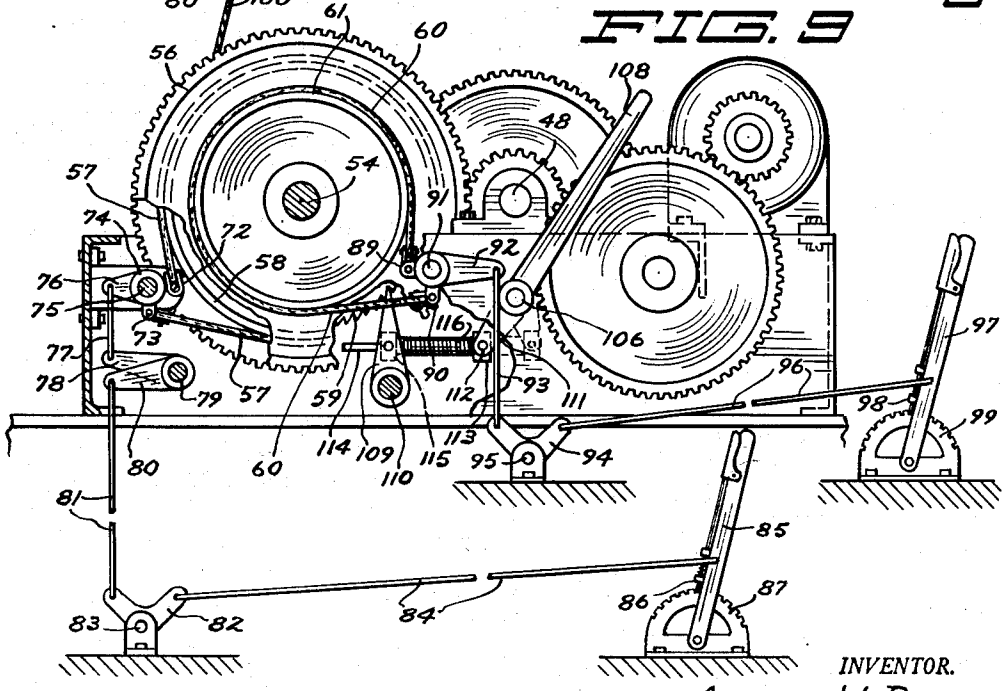


FIG. 9



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United States Patent Office 2,703,180 Patented Mar. 1, 1955

2,703,180

CRANE

Archer W. Brown, Minneapolis, Minn., assignor to American Hoist & Derrick Co., St. Paul, Minn., a corporation of Delaware

Application January 5, 1952, Serial No. 265,133

12 Claims. (Cl. 212—58)

This invention presents a crane of construction to be capable of serving both as a level luffing crane and as a conventional crane. Stated differently, the crane herein illustrated and described incorporates new and improved features and characteristics designed to render it capable of being set up to function as a level luffing crane, commonly employed for high speed motion requirements of duty-cycle work, etc., or of being set up to function as a conventional crane, customarily utilized to accomplish heavy lifts and general purpose work.

In the accompanying drawings forming a part of this specification,

Fig. 1 is an elevational view of a crane made according to the invention as when set up to serve as a level luffing crane;

Fig. 2 is an elevational view of the crane as when set up to serve as a level luffing crane and having a jib thereof in minimum radius position;

Fig. 3 is an elevational view of the crane as when set up to serve as a conventional crane;

Fig. 4 is a detail sectional view, taken on line 4—4 in Fig. 3;

Fig. 5 is a side elevational view, partially in section and partially broken away, detailing features of the crane;

Fig. 6 is a plan view of the crane, partially in section and partially broken away;

Fig. 7 is a detail sectional view, taken on line 7—7 in Fig. 5;

Fig. 8 is an enlarged plan view of mechanism of the crane disclosed at the upper right in Fig. 6;

Fig. 9 is a detail sectional view, taken on line 9—9 in Fig. 8;

Fig. 10 is a detail sectional view, taken on line 10—10 in Fig. 8; and

Fig. 11 is a detail sectional view taken on line 11—11 in Fig. 5.

Speaking generally, the crane consists of a supporting structure 15, a turntable 16 mounted upon said supporting structure for rotational movement in a horizontal plane, a mast 17 including backlegs upon the turntable, a boom 18 pivotally supported, as at 19, upon said turntable for movement of rotation in a vertical plane, a jib 20 having an intermediate portion thereof pivotally mounted, as at 21, upon the upper end of said boom, an adjustable bail, denoted generally at 22, extending between the mast 17 and the rear end of a tail extension 23 of said jib, a construction and arrangement for securing the jib in fixed, substantially alined as shown, relation to the boom, thus to convert the crane from a level luffing crane into a conventional crane, load manipulating cables, and mechanism for actuating and controlling operative parts of the crane, as well as for accomplishing adjustment of the bail 22 in the operation of conversion of the crane from its set up condition to be capable of functioning as a conventional crane to its set up position to be capable of functioning as a level luffing crane. A load cable 25 is led from a hoist drum 26 over a sheave 27 on the mast 17, then under a bend sheave 28 on the boom, then over a sheave 29 at the boom point, then over a sheave 30 at the jib point, and down to a load supporting hook 31. In order that the crane can function as a level luffing crane, with the jib 20 pivotally supported upon but otherwise disconnected from the boom 18, the mast 17, said boom and jib and the bail 22 are relatively proportioned so that the jib point 24 traverses a downward curve as it is luffed from minimum to maximum radius. The load line sheave 27 is situated at an elevation on the mast 17 to insure that throughout the traverse of the jib 20 with the boom 18.

there will be compensation for the downward movement of the jib point by equal reduction in the length of that part of the load cable 25 which is between the jib point 24 and the hook 31, thus to insure that said hook will be moved along a horizontal line. Employment of a bend sheave, such as 28, is optional; that is, the bend sheave 28 can be omitted without necessity for making substantial changes in the relative proportions of the mast, boom, jib and bail. The most economical crane proportions which will provide satisfactory level luffing are capable of obtainment merely by variation of the relative lengths of the mast, boom, jib, jib tail extension and bail and of the relative positions of the sheaves over which the load cable 25 passes.

The turntable 16 supports an electric motor 32 for driving a bail hoist drum 33, itself supported upon said turntable, and said electric motor 32 also is employed to actuate luffing mechanism, represented at 34, and a counterweight 35 situated within and housed by the turntable.

The counterweight 35 operates in a vertical curved path at the rear of the turntable, and serves both as a boom counterweight and a stability counterweight for the crane as a whole. Said counterweight is suspended from the rear axle 36 of a carriage 37, and the front axle 38 of the carriage is linked to a boom tail extension 39 through the medium of spaced, parallel, horizontal struts 40 having their rearward ends connected, as at 41, to the front axle 38 and their forward ends pivotally connected, as at 42, to parts of said boom tail extension beneath and in spaced relation to the pivotal support 19 for the boom.

The carriage 37 is supported by spaced, rear wheels 43 on the rear axle 36, which ride a pair of spaced, parallel curved rails 44, and by spaced front wheels 45 on the front axle 38, which ride a pair of spaced, parallel straight rails 46. The curved rails 44 are fixed in the turntable 16, extend downwardly and forwardly and support the rear wheels to cause the rearward part of the carriage constantly to lie in a horizontal plane, the straight rails 46 are fixed in said turntable, extend from rear toward front of the turntable and lie in a single horizontal plane, and said curved rails, straight rails and the boom tail extension 39 are in the same vertical plane.

The counterweight 35 is situated between the rear wheels 43 and is rotatably supported, as at 47, upon the rear axle 36 with the center of gravity of said counterweight well below said rear axle so that the counterweight constantly will remain in a vertical position.

The electric motor 32 drives a horizontal clutch shaft 48, suitably and conveniently mounted on the turntable 16, through an intermediate reduction gearing. The clutch shaft has a clutch 49 with two jaws, denoted 50 and 51, respectively. The clutch jaw 50 is adapted to engage a clutch jaw on a first pinion 52 which meshes with a gear 53 integral with the bail hoist drum 33, itself floating on a horizontal shaft 54 suitably and conveniently mounted on said turntable. The clutch jaw 51 is adapted to engage a clutch jaw on a second pinion 55 which meshes with a gear 56 keyed to said horizontal shaft 54. The bail hoist drum 33 is equipped with a friction brake including a brake band 57 upon a cylindrical element 58 rigid with said bail hoist drum, and also is equipped with a circumferentially extending ratchet 59. A friction brake for the luffing mechanism 34 includes a brake band 60 upon a cylindrical element 61 rigid with the gear 56.

A relatively small sprocket 62 keyed to the horizontal shaft 54 drives a comparatively large sprocket 63 keyed to a jack shaft 64 of the luffing mechanism 34 through the instrumentality of a sprocket chain 65 with tightener 66. The jack shaft 64 is suitably and conveniently mounted in spaced bearings 67 rigid with the turntable 16, and pinions 68 fixed on opposite ends of said jack shaft mesh with spaced, parallel, elongated racks 69 disposed in parallel relation to the struts 40. Rearward end portions of the elongated racks 69 are connected, as at 70, to the front axle 38. Desirably, the rack connections to said front axle are fitted with rubber springs to cushion the luffing mechanism against shocks. Bumpers 71 are provided to limit travel of the carriage 37. Rollers 88

retain the elongated racks 69 in engagement with the pinions 68.

One end of the brake band 57 is secured, as at 72, to the hoist bed, and the other end of said brake band 57 is secured to an ear 73 integral with an actuator 74 rotatably supported upon a shaft 75 parallel to the horizontal shaft 54. An arm 76 rigid with said actuator 74 is connected to a link 77 itself connected to an arm 78 rigid with a shaft 79 rotatably supported within the turntable 16. An arm 80 also rigid with said shaft 79 is connected by a link 81 with a first arm of an L-lever 82 rotatably supported, as at 83, within said turntable. A second arm of the L-lever 82 is connected by a link 84 with a pivotally supported actuator arm 85 having a dog 86 for releasably engaging a quadrant 87. The construction and arrangement are such that the actuator arm 85 can be swung toward the right in Fig. 9 and there retained by the dog 86 and the quadrant 87 to cause the brake band 57 to be tightened upon the cylindrical element 58, or toward the left in said Fig. 9, with the dog 86 released from the quadrant 87, to cause said brake band 57 to be released from said cylindrical element 58.

The opposite ends of the brake band 60 are secured to spaced ears 89 and 90 integral with an actuator fixed upon a shaft 91 parallel to the horizontal shafts 54 and 75 and rigidly supporting an arm 92 connected by a link 93 with one arm of an L-lever 94 rotatably supported, as at 95, within the turntable. A second arm of the L-lever 94 is connected by a link 96 with a pivotally supported arm 97 having a dog 98 for releasably engaging a quadrant 99. The construction and arrangement are such that the arm 97 can be swung toward the right in Fig. 9 and there retained by the dog 98 and the quadrant 99 to cause the brake band 60 to be tightened upon the cylindrical element 61, or toward the left in said Fig. 9, with the dog 98 released from the quadrant 99, to cause said brake band 60 to be released from said cylindrical element 61.

A bail cable 100, wrapped upon and about the bail hoist drum 33, has one of its ends secured to said bail hoist drum. Said bail cable is fed from the bail hoist drum over a first sheave on an axis 101 at the top of the mast 17, out to a first sheave on an axle 102 at the rear end of the jib tail extension 23, back to a second sheave on the axle 101, out to a second sheave on the axle 102, and then back to a dead end on the mast. The part of the length of the bail cable 100 on and between the sheaves upon the axles 101 and 102 constitutes or provides the adjustable bail 22 hereinbefore mentioned.

A shifter for the clutch 49 includes a bifurcated arm 103 having an upper portion thereof situated between spaced collars 104 upon said clutch and a lower annular portion 105 thereof provided with an internal thread engaging an external thread on a shaft 106 parallel with the clutch shaft 48 and rotatably mounted, as at 107, in the turntable. A manually actuable crank 108 upon an end of the shaft 106 is situated to be accessible to an operator of the crane. The construction and arrangement are such that when the crank 108 is rotated in one direction, the external thread on the shaft 106 will be rotated in the internal thread in the annular portion 105 of the bifurcated arm 103 to cause said bifurcated arm to be moved toward the right in Fig. 10 thus to cause the clutch 49 to be slid toward the right and the jaw 50 and the clutch jaw on the first pinion 52 to be interengaged, while the jaw 51 and the clutch jaw on the second pinion 55 are disengaged, and when said crank is rotated in opposite direction, said external thread on said shaft 106 will be rotated in said internal thread in said annular portion 105 to cause said bifurcated arm 103 to be moved toward the left in said Fig. 10 thus to cause said clutch 49 to be slid toward the left and the jaw 51 and said clutch jaw on said second pinion 55 to be interengaged, while said jaw 50 and said clutch jaw on said first pinion 52 are disengaged.

A dog 109, rotatably mounted upon a shaft 110 itself suitably and conveniently supported within and upon the turntable 16, includes a pointed end portion to be engaged with teeth of the circumferentially extending ratchet 59 to preclude rotation of the bail hoist drum 33, especially in direction to unwind the bail cable 100, or disengaged from said circumferentially extending ratchet to permit rotational movement of said bail hoist drum.

An arm 111, fixedly secured on the shaft 106 and extending downwardly therefrom, has its free end pivotally connected, as at 112, to a head 113 on the adjacent end of a horizontal rod 114 having its opposite end portion slidably arranged in a collar 115 rigid with an intermediate portion of the dog 109. A coil spring 116 on the horizontal rod 114 has its end which is adjacent to the arm 111 secured to the head 113 and its other end secured to said collar 115. The construction and arrangement are such that when the manually actuable crank 108 is swung from left toward right in Fig. 9, to cause the jaw 51 and the clutch jaw on the second pinion 55 to be interengaged, the coil spring 116 will be placed under compression to cause the dog 109 to be urged into resilient engagement with the circumferentially extending ratchet 59, and when said crank 108 is swung from right toward left in said Fig. 9, to cause the jaw 50 and the clutch jaw on the first pinion 52 to be interengaged, said coil spring 116 will be placed under tension to cause said dog 109 to be released from said circumferentially extending ratchet, upon relief of load from the bail cable 100, and hence from the pointed end portion of the dog. Stated differently, the dog 109 is set to engage the ratchet 59, thus to lock the bail hoist drum 33 against rotational movement, in response to actuation of the crank 108 to cause the clutch jaw 51 and the clutch jaw on the second pinion 55 to be interengaged, and to be disengaged from said ratchet, thus to release said bail hoist drum for rotational movement, in response to actuation of said crank to cause the clutch jaw 50 and the clutch jaw on the first pinion 52 to be interengaged.

To convert the crane from a level luffing crane, as in Fig. 1, to a conventional crane, as in Figs. 3 and 4, the adjustable bail 22 is shortened, in response to winding the bail cable 100 upon the bail hoist drum 33, until the jib tail extension 23 points directly toward the top of the mast 17, as in said Fig. 3. With the jib 20 in such position, extension pieces 117 secured to and projecting from the jib tail extension are secured, through the instrumentality of pins 118, to the boom 18. The jib thus becomes a rigid cantilever extension of the boom. The pins 118 can be situated in and removed from apertures through the extension pieces 117 in response to actuation of hydraulic means denoted generally at 119.

A heavy hook load cable 120 is lead from a rear drum 121 on the turntable over a sheave 122 near the top of the mast, under a sheave 123 adjacent to the pivotal support 19 for the boom, up along the top surface of said boom, over one of sheaves in an open throat of the boom to a main load block 124, stowed against the underside of said boom at the turntable level when not in use, and back and forth for the desired number of parts. The heavy hook load cable is led under the sheave 123 adjacent to the pivotal support 19 so that the length of reeving will not be affected by changes in inclination of the boom. It is thus made possible that the main load block 124 can be stowed in the position as disclosed in Figs. 1, 2 and 3.

Provision is made for stowing a part of the counterweight 35 when the crane is converted to conventional use. That is, an upper part 125 of said counterweight is adapted to be detached from the remainder thereof when the crane is to function as a conventional crane so that there will be a resulting unbalanced weight of the boom 18 and jib 20, or overall weight of said boom and jib in excess of the weight of the counterweight 35 with the part 125 removed, sufficient to overhaul the bail cable 100.

The upper part 125 of the counterweight 35 is supported upon an upper, rearward part of the turntable 16 when detached from the remainder of said counterweight. Pins 126 upon said turntable can be situated in apertures 127 in opposite side surfaces of the counterweight part 125, thus to support said counterweight part, in response to actuation of hydraulic means indicated generally at 128, and springs 129 can be employed to remove the pins 126 from said apertures 127.

Slewing mechanism for rotating the turntable 16 is denoted generally at 130.

The main hoist mechanisms, including the drums 26 and 121, and the slewing mechanism 130 are of typical construction, as is also the mast 17 with backlegs.

When the crane is in use as a level luffing crane, the clutch 49 will engage the second pinion 55, and the dog 109 will be engaged with the ratchet 59. The bail

22 will be of fixed length bearing the desired and predetermined relation to the length of the boom 18, the jib 20 and the jib tail extension 23, as well as the desired and predetermined relation to the positioning of the sheaves over and under which the load cable 25 is ridable. Said bail 22 will remain at fixed length, by reason of interengagement of the dog 109 and the rack 59, as long as the crane is set up to function as a level luffing crane. The boom 18 will be luffed out from minimum radius position and in from maximum radius position in response to actuation of the electric motor 32, which is reversible. That is, the jack shaft 64 will be rotated, selectively in opposite directions, in response to operation of said electric motor 32, through the instrumentality of the reducing gear drive, the clutch shaft 48, the clutch 49, the second pinion 55, the gear 56, the horizontal shaft 54, the sprocket 62, the chain 65 and the sprocket 63. The bail hoist drum 33 will, at the same time, be held stationary by reason of interengagement of the dog 109 and the ratchet 59. Rotation of the jack shaft 64 in opposite directions will cause the elongated racks 69, the struts 40, the carriage 37 and the counterweight 35 to be moved in direction to correspond. The boom tail extension 39 and the carriage 37 are interconnected by the struts 40, and the elongated racks 69 and the counterweight 35 also are connected to said carriage. With rearward swinging movement of said boom tail extension, the carriage 37 is moved rearwardly and the counterweight 35 is moved upwardly and rearwardly, and with forward swinging movement of the boom tail extension, said carriage is moved forwardly and said counterweight is moved downwardly and forwardly. The construction and arrangement are such that the counterweight not only balances the overall weight of the boom and jib, but also meets counterweight requirements for the stability of the crane as a whole. The boom tail extension 39, the struts 40, the carriage 37 and the curved rails 44 are so proportioned that the work done by the dead weight of the boom and jib in luffing from one point to any other point is exactly equal to the work done in elevating the counterweight 35 between corresponding points. As a result, the entire mechanism is in equilibrium at all level luffing positions. The brake including the brake band 60 will be employed as a parking brake.

When the crane is in use as a conventional crane, the clutch 49 will engage the first pinion 52, and the dog 109 will be disengaged from the ratchet 59. The boom 18 can now be luffed in and out by changing the length of the bail cable 100, in response to rotational movement of the bail hoist drum 33 accomplished by the electric motor 32 through the instrumentality of the reducing gear drive, the clutch shaft 48, the clutch 49, the first pinion 52 and the gear 53 rigid with said bail hoist drum. Stated differently, the boom 18 with jib extension 20, when the crane is employed as a conventional crane, will be swung inwardly in response to actuation of the electric motor 32 causing the boom cable 100 to be wound upon the bail hoist drum 33, and will be swung outwardly by reason of gravity, with unwinding of said boom cable from said bail hoist drum. The brake including the brake band 57 will be employed as a service brake for controlling outward swinging movement of said boom with jib extension.

Removing the upper part 125 of the counterweight from the remainder thereof and storing said upper part in an upper, rearward part of the turntable when the crane is to function as a conventional crane, accomplishes two advantageous results. The counterweight minus its upper part 125 is of insufficient mass to interfere with outward swinging by gravity of the boom 18 with appurtenances, and said upper part 125 is situated at a most advantageous position to cause the crane as a whole to be properly balanced when functioning as a conventional crane.

When the bail hoist drum 33 is connected to the electric motor 32 to be driven thereby, the level luffing mechanism, including the jack shaft 64, etc., is disengaged from said electric motor and free to float with the boom position.

To convert the crane from a level luffing crane to a conventional crane, and assuming use of the crane for heavy hook service by employment of the cable 120, as well as for ordinary service by employment of the cable 25, an operator will first luff the boom in to its minimum radius position and will release the block 124 from its stowed position. Next he will luff the boom out to maximum radius position and will fasten the part 125 of the counterweight in its stored position on the pins 126. The clutch 49 will then be shifted to disengage the jaw 51 and the second pinion 55 and release the dog 109 from the ratchet 59, and to engage the jaw 50 and the first pinion 52. The bail cable 100 and its reeving will be taken up to rotate the jib until the jib tail extension 23 is situated to aline the apertures in the extension pieces 117 with the pins 118, and said pins will be inserted in said apertures.

To convert the crane from a conventional crane to a level luffing crane, the procedure above described will be reversed. As a final step in converting the crane to be serviceable as a level luffing crane, the jib 20 will be adjusted with respect to a gage 131 protruding from an undersurface of the boom 18, thus to adjust the bail 22 to its intended and proper length. Stated otherwise, when converting the crane to serve as a level luffing crane, it is necessary to adjust the reeving between the mast 17 and the rear end of the jib tail extension 23 to have a predetermined length bearing fixed relation to other part of the crane before the dog 109 is engaged with the rack 59. Such adjustment can be readily and easily accomplished by adjusting the jib to a minimum radius where it has a fixed relation to the gage 131. See Fig. 2 of the drawings.

The crane can be converted to be serviceable for level luffing two line bucket operation by leading a closing line from the drum 26 over near-side level luffing line sheaves, and by leading a holding line from the drum 121 over far-side sheaves.

The crane herein illustrated and described was conceived especially to meet the needs of the construction industry for mass concrete dams. In dam construction work the principal function of a crane is to move buckets of concrete from trestles to forms as rapidly as possible in continuous material handling operations. Level luffing cranes excel in this type of work because of their straight line motion and accurate and sure control over loads both on trestles and in forms. From time to time, a crane employed for dam construction work is called upon to perform other essential functions such, for example, as erecting trestles, mixing plants and other cranes; handling forms, reinforcing steel and other materials; handling heavy sections of penstocks, gates, power generating equipment; etc. Frequently, these secondary operations come as interruptions in the concrete placing operation, and, as a consequence, the speed of changing rigging is of considerable importance. The crane of the invention can be readily and easily and quickly converted. It can perform all of the services of a level luffing crane, and can be employed as a conventional crane to accomplish both ordinary and heavy duty work. Extra heavy loads can be suspended from the boom point upon the cable 120, and the jib can be used, when secured to the boom to constitute or provide a cantilever extension thereof, to handle loads suspended on the cable 25 equally as heavy as level luffing loads which said cable 25 is capable of supporting from the jib point. The construction and arrangement as in Fig. 3, where the cable 25 is disclosed supported from the sheave upon the upper end of the jib 20 functioning as an extension of the boom 18, is provision for a high reach useful for erection work.

The usefulness of the new and improved crane will not be confined to the construction industry. Said crane will find advantageous use in any situation where versatility is important. In dockside work, for example, the crane would be ideal for handling light loads and bulk materials, and also could be employed for the occasional heavy lifts required.

What is claimed is:

1. A crane comprising a supporting structure, a boom pivotally mounted upon said supporting structure for swinging movement in a vertical plane, a jib, means pivotally supporting an intermediate part of said jib on an upper part of said boom for swinging movement of the jib in a vertical plane, a mast, a first sheave supported upon said mast, a second sheave supported at a location between said boom and jib, a third sheave upon the jib at a location in spaced relation to said second sheave at a side thereof opposite said mast, a load manipulating drum upon said supporting structure, a load line upon said drum and said first, second and third sheaves, a bail

hoist drum rotatably mounted upon said supporting structure, a bail cable upon said bail hoist drum and having a portion of the length thereof reeved upon and situated between sheaves upon an upper part of said mast and a part of said jib in spaced relation to said second sheave at a side thereof adjacent the mast, means for retaining said bail hoist drum against rotation thus to fix the overall length of said bail cable, means for securing said jib in fixed relation to said boom to constitute a cantilever extension thereof, a power unit, first mechanism to be actuated by said power unit while said bail hoist drum is retained against rotation for causing said boom to be swung between minimum and maximum radius, second mechanism to be actuated by said power unit while the bail hoist drum retaining means is inoperative and said jib is secured to said boom to constitute a cantilever extension thereof to cause said bail cable to be wound upon said bail hoist drum, and devices for selectively operatively connecting said power unit with either said first or said second mechanism.

2. A crane comprising a supporting structure, a boom pivotally mounted upon said supporting structure for swinging movement in a vertical plane, a jib, means pivotally supporting an intermediate part of said jib on an upper part of said boom for swinging movement of the jib in a vertical plane, a mast, a first sheave supported upon said mast, a second sheave supported at a location between said boom and jib, a third sheave upon the jib at a location in spaced relation to said second sheave at a side thereof opposite said mast, a load manipulating drum upon said supporting structure, a load line upon said load manipulating drum and said first, second and third sheaves, a bail hoist drum rotatably mounted upon said supporting structure, a bail cable upon said bail hoist drum and having a portion of the length thereof reeved upon and situated between sheaves upon an upper part of said mast and a part of said jib in spaced relation to said second sheave at a side thereof adjacent the mast, means for retaining said bail hoist drum against rotation thus to fix the overall length of said bail cable, means for securing said jib in fixed relation to said boom to constitute a cantilever extension thereof, a power unit, first mechanism including a pinion to be driven by said power unit while said bail hoist drum is retained against rotation and a rack assembled with the boom for causing said boom to be swung between minimum and maximum radius, second mechanism including a gear rigid with said bail hoist drum to be driven by said power unit while the bail hoist drum retaining means is inoperative and said jib is secured to said boom to constitute a cantilever extension thereof to cause said bail cable to be wound upon the bail hoist drum, and means for selectively operatively connecting said power unit with either said pinion or said gear.

3. A crane comprising a supporting structure, a boom pivotally mounted upon said supporting structure for swinging movement in a vertical plane, a jib, means pivotally supporting an intermediate part of said jib on an upper part of said boom for swinging movement of the jib in a vertical plane, a mast, a first sheave supported upon said mast, a second sheave supported at a location between said boom and jib, a third sheave upon the jib at a location in spaced relation to said second sheave at a side thereof opposite said mast, a load manipulating drum upon said supporting structure, a load line upon said load manipulating drum and said first, second and third sheaves, a bail hoist drum rotatably mounted upon said supporting structure, a bail cable upon said bail hoist drum and having a portion of the length thereof reeved upon and situated between sheaves upon an upper part of said mast and a part of said jib in spaced relation to said second sheave at a side thereof adjacent the mast, means for retaining said bail hoist drum against rotation thus to fix the overall length of said bail cable, means for securing said jib in fixed relation to said boom to constitute a cantilever extension thereof, a power unit, first mechanism to be actuated by said power unit while said bail hoist drum is retained against rotation for causing said boom to be swung between minimum and maximum radius, a counterweight movable in direction away from said boom with swinging thereof toward maximum radius and toward the boom with swinging thereof toward minimum radius, second mechanism to be actuated by said power unit while the bail hoist drum retaining means is inoperative and said jib is secured to said boom to constitute a cantilever extension thereof to cause said bail cable to be wound upon said bail hoist drum, and means for selectively operatively connecting said power unit with either said first or said second mechanism.

4. A crane comprising a supporting structure, a turntable thereon, a boom pivotally mounted upon said turntable for swinging movement in a vertical plane, a jib, means pivotally supporting an intermediate part of said jib on an upper part of said boom for swinging movement in the plane of the boom, a mast, a first sheave supported upon said mast, a second sheave supported at a location between said boom and jib, a third sheave upon the jib at a location in spaced relation to the second sheave at a side thereof opposite said mast, a load manipulating drum upon said turntable, a load line upon said load manipulating drum and said first, second and third sheaves, a bail hoist drum rotatably mounted upon said turntable, a bail cable upon said bail hoist drum and having a portion of its length reeved upon and situated between sheaves upon an upper part of said mast and a part of said jib in spaced relation to said second sheave at a side thereof adjacent the mast, means for retaining said bail hoist drum against rotation thus to fix the overall length of said bail cable, means for securing said jib in fixed relation to said boom to constitute a cantilever extension thereof, a power unit, first mechanism to be actuated by said power unit while said bail hoist drum is retained against rotation for causing said boom to be swung between minimum and maximum radius, second mechanism to be actuated by said power unit while the bail hoist drum retaining means is inoperative and said jib is secured to said boom to constitute a cantilever extension thereof to cause said bail cable to be wound upon said bail hoist drum, and devices for selectively operatively connecting said power unit either with said first or said second mechanism.

5. A crane comprising a supporting structure, a turntable thereon, a boom pivotally mounted upon said turntable for swinging movement in a vertical plane, a jib, means pivotally supporting an intermediate part of said jib on an upper part of said boom for swinging movement of the jib in the plane of the boom, a mast, a first sheave supported upon said mast, a second sheave supported at a location between said boom and jib, a third sheave upon the jib at a location in spaced relation to said second sheave at a side thereof opposite said mast, a load manipulating drum upon said turntable, a load line upon said load manipulating drum and said first, second and third sheaves, a bail hoist drum rotatably mounted upon said turntable, a bail cable upon said bail hoist drum and having a portion of the length thereof reeved upon and situated between sheaves upon an upper part of said mast and a part of said jib in spaced relation to said second sheave at a side thereof adjacent the mast, means for retaining said bail hoist drum against rotation thus to fix the overall length of said bail cable, means for securing said jib in fixed relation to said boom to constitute a cantilever extension thereof, a power unit, first mechanism including a pinion to be driven by said power unit while said bail hoist drum is retained against rotation and a rack assembled with the boom for causing said boom to be swung between maximum and minimum radius, second mechanism including a gear rigid with said bail hoist drum to be driven by said power unit while said bail hoist drum retaining means is inoperative and said jib is secured to said boom to constitute a cantilever extension thereof to cause said bail cable to be wound upon the bail hoist drum, and means for selectively operatively connecting said power unit with either said pinion or said gear.

6. A crane comprising a supporting structure, a turntable thereon, a boom pivotally mounted upon said turntable for swinging movement in a vertical plane, a jib, means pivotally supporting an intermediate part of said jib on an upper part of said boom for swinging movement in the plane of the boom, a mast, a first sheave supported upon said mast, a second sheave supported at a location between said boom and jib, a third sheave upon the jib at a location in spaced relation to said second sheave at a side thereof opposite said mast, a load manipulating drum upon said turntable, a load line

upon said load manipulating drum and said first, second and third sheaves, a bail hoist drum rotatably mounted upon said turntable, a bail cable upon said bail hoist drum and having a portion of the length thereof reeved upon and situated between sheaves upon an upper part of said mast and a part of said jib in spaced relation to said second sheave at a side thereof adjacent the mast, means for retaining said bail hoist drum against rotation thus to fix the overall length of said bail cable, means for securing said jib in fixed relation to said boom to constitute a cantilever extension thereof, a power unit, first mechanism to be actuated by said power unit while said bail hoist drum is retained against rotation for causing said boom to be swung between minimum and maximum radius, a counterweight upon said turntable movable in direction away from said boom with swinging thereof toward maximum radius and toward the boom with swinging thereof toward minimum radius, second mechanism to be actuated by said power unit while the bail hoist drum retaining means is inoperative and said jib is secured to said boom to constitute a cantilever extension thereof to cause said bail cable to be wound upon said bail hoist drum, and means for selectively operatively connecting said power unit with either said first or said second mechanism.

7. In a crane, a supporting structure, a boom pivotally mounted upon said supporting structure for swinging movement in a vertical plane, a jib, means pivotally supporting an intermediate part of said jib upon an upper part of the boom for swinging movement of the jib in the plane of said boom, a mast, a bail hoist drum upon said supporting structure, a bail cable upon said bail hoist drum and having a portion thereof received upon and situated between sheaves upon an upper part of said mast and a part of said jib in spaced relation to said second sheave at a side thereof adjacent the mast, means for retaining said bail hoist drum against rotation thus to fix the overall length of said bail cable, means for securing said jib in fixed relation to said boom to constitute a cantilever extenstion thereof, a power unit, first mechanism to be actuated by said power unit while said bail hoist drum is retained against rotation for causing said boom to be swung between minimum and maximum radius, second mechanism to be actuated by said power unit while the bail hoist drum retaining means is inoperative and said jib is secured to said boom to constitute a cantilever extension thereof to cause said bail cable to be wound upon said bail hoist drum, and means for selectively operatively connecting said power unit with either said first or said second mechanism.

8. In a crane, a supporting structure, a boom pivotally mounted upon said supporting structure for swinging movement in a vertical plane, a jib, means pivotally supporting an intermediate part of said jib on an upper part of the boom for swinging movement of the jib in the plane of said boom, a mast, a bail hoist drum rotatably mounted upon said supporting structure, a bail cable upon said bail hoist drum and having a portion thereof reeved upon and situated between sheaves upon an upper part of said mast and a part of said jib in spaced relation to said second sheave at a side thereof adjacent the mast, means for retaining said bail hoist drum against rotation thus to fix the overall length of said bail cable, means for securing said jib in fixed relation to said boom to constitute a cantilever extension thereof, a power unit, first mechanism including a pinion to be driven by said power unit while said bail hoist drum is retained against rotation and a rack assembled with the boom for causing said boom to be swung between minimum and maximum radius, second mechanism including a gear rigid with said bail hoist drum to be driven by said power unit while the bail hoist drum retaining means is inoperative and said jib is secured to said boom to constitute a cantilever extension thereof to cause said bail cable to be wound upon the bail hoist drum, and means for selectively operatively connecting said power unit with either said pinion or said gear.

9. The combination as specified in claim 7, and a counterweight movable upwardly and in direction away from said boom with swinging thereof toward maximum radius and downwardly and toward the boom with swinging thereof toward minimum radius.

10. The combination as specified in claim 7, a counterweight movable upwardly and in direction away from said boom with swinging thereof toward maximum radius and downwardly and toward the boom with swinging thereof toward minimum radius, a part of said counterweight being removable from the remainder thereof to reduce the weight of the counterweight, and means for detachably supporting said removable part of said counterweight upon said supporting structure at a position to cause said crane to be balanced when said jib is secured to said boom to constitute a cantilever extension.

11. A crane comprising a supporting structure, a turntable thereon, a boom pivotally mounted upon said turntable for swinging movement in a vertical plane, a jib, means pivotally supporting an intermediate part of said jib on an upper part of said boom for swinging movement in the plane of the boom, a mast, a first sheave supported upon said mast, a second sheave supported at a location between said boom and jib, a third sheave upon the jib at a location in spaced relation to the second sheave at a side thereof opposite said mast, a load manipulating drum upon said turntable, a load line upon said load manipulating drum and said first, second and third sheaves, a bail hoist drum rotatably mounted upon said turntable, a bail cable upon said bail hoist drum and having a portion of its length reeved upon and situated between sheaves upon an upper part of said mast and a part of said jib in spaced relation to said second sheave at a side thereof adjacent the mast, means for retaining said bail hoist drum against rotation thus to fix the overall length of said bail cable, means for securing said jib in fixed relation to said boom to constitute a cantilever extension thereof, a power unit, first mechanism to be actuated by said power unit while said bail hoist drum is retained against rotation for causing said boom to be swung between minimum and maximum radius, second mechanism to be actuated by said power unit while the bail hoist drum retaining means is inoperative and said jib is secured to said boom to constitute a cantilever extension thereof to cause said bail cable to be wound upon said bail hoist drum, devices for selectively operatively connecting said power unit either with said first or said second mechanism, a counterweight movable upwardly and in direction away from said boom with swinging thereof toward maximum radius and downwardly and toward the boom with swinging thereof toward minimum radius, a part of said counterweight being removable from the remainder thereof to reduce the weight of the counterweight, and means for detachably supporting said removable part of said counterweight upon said supporting structure at a position spaced from the remainder of the counterweight.

12. A crane comprising a supporting structure, a boom pivotally mounted on said supporting structure for swinging movement in a vertical plane, a jib, means pivotally supporting an intermediate part of said jib on an upper part of said boom for swinging movement of said jib in a vertical plane, a mast, a first sheave supported upon said mast, a second sheave supported at a location between said boom and jib, a third sheave upon the jib at a location in spaced relation to said second sheave at a side thereof opposite said mast, a first drum upon said supporting structure, a load line upon said first drum and said first, second and third sheaves, a bail adjustably secured between an upper part of said mast and a part of said jib in spaced relation to the second sheave at a side thereof opposite said third sheave, a second drum upon said supporting structure, a fourth sheave upon said mast, a fifth sheave adjacent a pivoted support for said boom, a sixth sheave upon said boom, a heavy load cable upon said second drum and extending over said fourth, fifth and sixth sheaves, and a block supported upon said heavy load cable and situated at an under, outer side of said boom.

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