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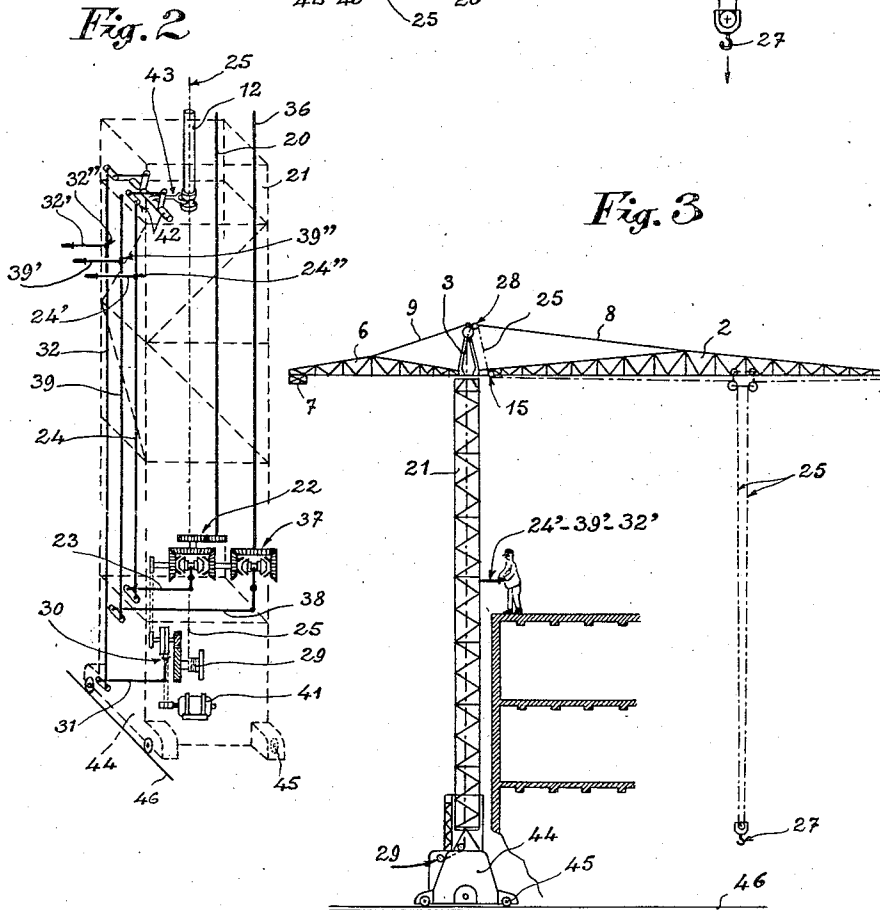
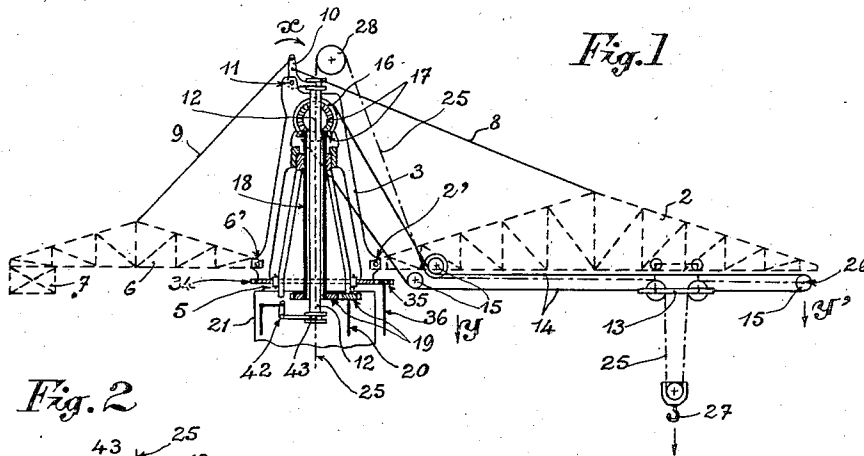
A. FAURE ET AL

2,413,701

CRANE

Filed Oct. 15, 1942

2 Sheets-Sheet 1



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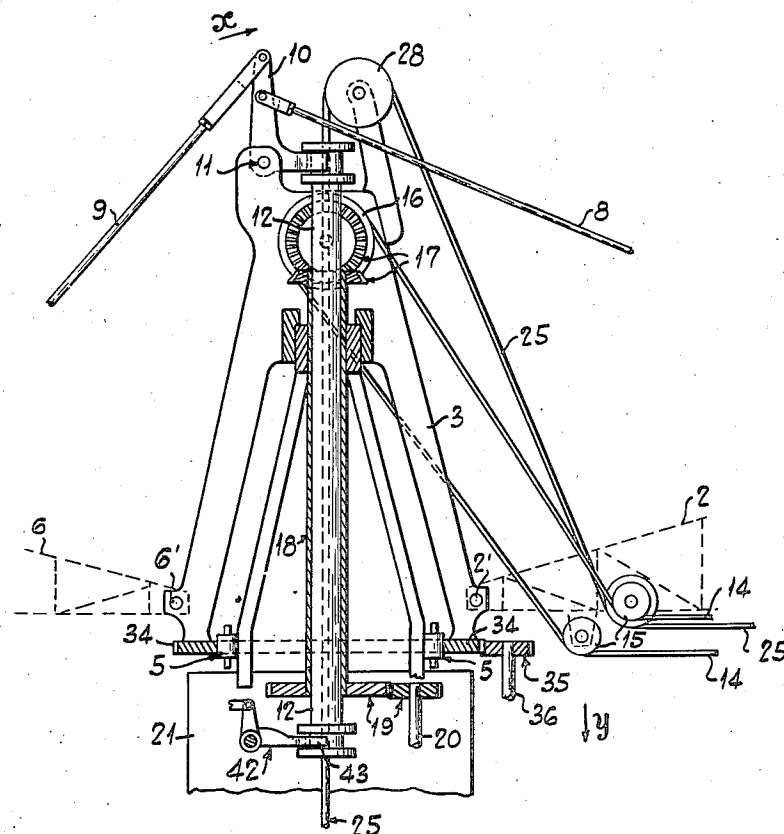
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CRANE

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vested in the Alien Property Custodian

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This invention relates to cranes and more particularly to cranes having a span adjustable between wide limits and is concerned more specifically through non exclusively with those cranes wherein the span may be varied by shifting the lifting point of the load.

One disadvantage of existing cranes particularly those used for lifting materials such as ashlar, girders or joists in the erection of buildings is that the crane operator must remain in a cabin positioned in some cranes at the base of the crane thereby preventing said operator from perceiving the correct position where the load has to be discharged or; in other cranes, midway or at the top of the crane mast, this involving danger for the operator and subjecting him to tiring strains due to jerks and oscillations of the mast during service operation of the crane.

A primary object of the invention is to provide a novel or improved adjustable span crane avoiding the aforesaid disadvantages and incorporating safety means whereby the risk of accidents due to breakage or collapse of the crane may be obviated or minimized where an attempt to lift a load exceeding a prescribed limit consistent with span is inadvertently made.

Another object of the invention is to provide an improved crane as aforesaid wherein the safety means involve the utilisation of those unbalanced conditions which may arise between jib and counterjib due to an unduly large load for stopping the lifting action either by declutching the prime mover from the hoisting gear or by causing said gear to come to an inoperative position.

A further object of the invention is to provide an improved crane as aforesaid wherein the jib and counterjib instead of being united rigidly to a stationary point on the mast head are connected to a lever pivoted to said head, the rocking motion of said lever due to a tilting stress on the jib being transmitted by tripping means so as to instantaneously bring about the required declutching action.

A still further object of the invention is to provide an improved crane as aforesaid particularly utilisable for handling materials used for the erection of buildings and having a structure permitting the crane operator to stand on a floor of the building being erected or on an adjacent scaffolding at the most favorable spot for manually controlling the operation of the crane, this possibility being largely due to the provision of the prime mover at the base end of the central mast of the crane and to the arrange-

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ment of adjustable controllers having means such as operating handles movable along bars extending throughout the height of said mast.

Still a further object of the invention is to provide an improved crane as aforesaid wherein the several operations such as angularly adjusting the jib, raising and lowering the load, and varying the span are ensured by a common prime mover located in the lower region of the crane mast and through clutches and gears operable from said adjustable handles.

And a still further object of the invention is to provide an improved crane as aforesaid wherein variation of the load-carrying span is controlled through a drum arrangement whose axis is coincident with the pivotal center of the mast head.

With these and such other objects in view as will incidentally appear hereafter, the invention comprises the novel construction, combination and arrangement of parts that will now be described in detail with reference to the accompanying diagrammatic drawings illustrating a convenient embodiment of the same and forming a part of the present disclosure.

In the drawings:

Figure 1 is a fragmentary detail view showing the mast head mechanism of a crane according to the invention, wherein variations of the load-carrying span is obtained by means of a carriage traversable along a horizontal jib.

Fig. 1A is an enlarged detail of the revoluble mast head and pivoted lever assembly of Fig. 1.

Figure 2 is an isometric view showing the crane mast and operating and controller means associated therewith.

Figure 3 is a view showing on a much smaller scale the crane in its entirety, many parts being omitted for the sake of clearness.

As illustrated, the crane jib 2 which has a lattice structure is hinged at 2' to the mast head 3 revolubly supported between rollers 5. The counterjib 6 also of lattice structure is fitted with a counterweight 7 and is also hinged at 6' to the mast head 3.

Tie or guy rods or wires 8, 9 connected to the jib and counterjib respectively are fastened to a cranked lever 10 pivoted at one end 11 to the top of the mast head and having its stroke limited in both directions by abutments (not shown). The other end of the lever 10 is forked and operatively connected to an upstanding hollow tripping shaft 12.

The jib 2 supports a traversable carriage 13 operated by a cable 14 (hereafter referred to as

the "second cable") passing over jockey pulleys 15, 15. This cable is driven by a transmission (hereafter referred to as the "secondary transmission") which includes a drum 16 actuated through a bevel gear 17 by an elongated sleeve 18 loosely surrounding the shaft 12 and actuated in turn through a straight gear 19 by an upstanding shaft 20. This shaft extends throughout the height of the lattice crane mast 21 (Fig. 2) and is provided at its lower end with a reverser 22 comprising a bevel gear and a clutch of known type. Said reverser is controlled by a suitable rigging 23 linked to and operated by a controller bar 24 extending along the mast 21, said bar being fitted with an operating handle 24' clamped thereto by an adjustable bush 24''.

The drum 16 which drives the cable 14 for traversing the carriage 13 may be formed with a groove for holding said cable. Alternatively, the cable 14 may be so wound as to form several convolutions on the drum 16.

The hoisting cable 25 (hereafter referred to as the "first cable") is secured at one of its ends at 26 (Fig. 1) to the outer end of the jib 2 and carries a hook 27 forming a load grapple. Said cable passes at the top end of the mast head over an overhead pulley 28 and then extends downwardly through the hollow shaft 12 and mast 21. The lower end of the cable 25 is secured to a winch 29 or a similar actuator which may comprise, as shown, fast and loose pulleys 30 forming a clutch and operated by a rigging 31 operated by an upwardly directed controller bar 32 extending along the mast 21 and provided with an operating handle 32' clamped to said bar by an adjustable bush 32''.

In order to permit the mast head 3 to be revolved upon its supporting rollers 5, said head 3 is rigidly girdled by a toothed ring 34 meshing with a pinion 35 actuated by an upstanding shaft 36 extending down to a declutchable reverser 37 similar to the reverser 22. Said reverser 37 forms part of a transmission (hereafter referred to as the "primary transmission") and is operated through a suitable rigging 38 and controller bar 39 from an operating handle 39' clamped to said bar by an adjustable bush 39''.

A single prime mover 41 constituted for example by an electric motor located at the bottom end of the mast 21 drives the winch 29 and the reversers 22, 37.

The controller bars 24, 32 are linked at their upper ends through a tumbler 42 to a fork 43 embracing a portion of the central shaft 12 defined between a pair of flanges thereon and thus operatively connected to said shaft so as to respond to its axial displacements, the latter causing the tumbler 42 to rock about its axis and to impart a translatory motion to the controller bars 24, 32.

It will be understood that the operating handles 24', 32', 39' can be moved along their respective carrier bars 24, 32, 39 owing to the provision of the adjustable bushes and may be clamped thereto at any suitable position so as to suit practical requirements responsive to the particular work to be effected by the crane in each instance, e. g. to match the progress of erection of a building in a yard served by this crane. As shown in Fig. 3, this crane is assumed to be of the travelling type and comprises a base carriage 44 having wheels 45 for rolling on rails such as 46.

The foregoing possibility is illustrated in Fig. 3 which shows diagrammatically a building in the course of erection, assuming three floors to have

already been laid and the crane operator to stand on the uppermost floor whence he can readily supervise the work and control the operation of the crane by means of the operating handles 24', 29', 32'' which are assumed to have been preset on their respective bars 24, 29, 32 to a corresponding level.

The operation of the crane will be readily understood from the foregoing without requiring additional explanation so far as the raising of the hook or grapple 27, the traverse of the carriage 13 along the jib 3, and the rotation of the mast head 3 upon its rollers 5 are concerned.

The safety device incorporated with the crane assembly operates as follows:

Assuming an unduly heavy load to have been grappled by the hoisting hook 27 and a lifting stress to be exerted on it through the cable 25, it will be understood that the balance between jib 2 and counterjib 6 will be broken, whereupon the jib 2 at once tilts to a slight extent, thus pulling the tie rod 8 and rocking the lever 10 clockwise as shown by the arrow x in Fig. 1. This moves the vertical shaft 12 down and through the fork 43 operates the tumbler 42, thus moving the bar 32 as though it were manually controlled by the operating handle 32'. As a result of this, declutching takes place and the winch 29 is brought to a standstill, thus precluding further hoisting stress on the hook 27 and preventing the jib from further tilting and breaking or capsizing the entire crane.

As, moreover, the crane span may be varied by a traverse motion of the carriage 13, a heavier load might be lifted at y than at y' and the motion of the carriage 13 from y to y' might prove to be dangerous since the maximum load must gradually dwindle down during that motion. Here again, the safety means operate in the same way in response to a downward tilt of the jib 2 a corresponding pull on the tie rod 8, a rocking of the lever 10, a lowering of the shaft 12 and an operation of the bar 24, thereby declutching the drive at 22 and bringing the carriage 13 to a standstill prior to its reaching a critical position during its outward stroke along the jib 2.

It will be seen from the foregoing that the numerous objects of the invention are fulfilled in a crane having the aforesaid structure and that while allowing of easy supervision and manipulation of the crane, said structure precludes all accidents arising from overloads on the grapple due regard being paid to the span connoted by the position occupied by the jib carriage when said grapple begins to exert its lifting stress.

Numerous minor constructional details might be varied without departing from the scope of the subjoined claims.

What is claimed is:

1. A crane comprising a mast surmounted by a revoluble head including a toothed ring, a jib and a shorter counterweighted counterjib both oppositely hinged to said head, a lever pivoted to the head top and connected by ties to the outer ends of the jib and counterjib, a carriage traversable along the jib and supporting a flexible member carrying a load grapple, a prime mover at the lower end of the mast, a primary transmission including a declutchable reverser between the prime mover and mast head toothed ring, a secondary transmission including a declutchable gear between the prime mover and jib carriage, intermediate means on the mast head guiding the flexible member, a declutchable actuator for

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said member operated by the prime mover, controllers including handles adjustable heightwise along the crane mast and respectively connected to said declutchable gear, actuator and reverser, and tripping means interconnecting said lever and those controllers serving the jib carriage operating gear and grapple actuator to automatically bring the last-named controllers into declutching position responsive to unbalance between jib and counterjib.

2. A crane comprising a mast surmounted by a revoluble head including a peripheral toothed ring, a jib and a counterjib mutually balanced and both oppositely hinged to the head, a lever pivoted to the top of the mast head and connected by tie rods to the outer ends of the jib and counterjib, a carriage traversable along the jib and supporting a cable carrying a load grapple, a prime mover at the base end of the mast, a primary transmission including a declutchable reverser between the prime mover and mast head ring, a secondary transmission including a declutchable gear between the prime mover and jib carriage, intermediate means on the mast head guiding the cable, a declutchable actuator for said cable operated by the prime mover, manually operable controllers adjustable heightwise along the crane mast and connected respectively to said declutchable gear, actuator and reverser, and tripping means including a shaft and tumbler interconnecting said lever and those controllers serving the jib carriage operating gear and grapple actuator to automatically trip the last-named controllers into declutching position responsive to unbalance between jib and counterjib.

3. A crane comprising a mast surmounted by a revoluble head, a jib and a counterjib mutually balanced and oppositely hinged to the head, a lever pivoted to said head and tied to the outer ends of the jib and counterjib, a carriage traversable along the jib and supporting a cable carrying a load grapple, a motor at the base of the mast, a rotary element coaxial with the mast axis and a declutchable gear between the motor and jib carriage, a pulley guiding the cable on the mast head, a declutchable winch for said cable operated by the motor, controllers including handles adjustable heightwise along the crane mast and linked respectively to said declutchable gear and winch, and tripping means interconnecting said lever and controllers to automatically bring these controllers into declutching position responsive to unbalance between jib and counterjib.

4. A crane comprising a mast surmounted by a revoluble head, a jib and counterjib mutually balanced and oppositely hinged to the head, a lever pivoted to said head and tied to the outer ends of the jib and counterjib, a carriage traversable along the jib and supporting a first cable carrying a load grapple, a motor at the base of the mast, a transmission including a second cable passing over a drum coaxial with the mast axis for driving the jib carriage from the motor, said transmission including a declutchable reversing gear, a pulley guiding the first cable on the mast head, a declutchable winch for said first cable operated by the motor, controller bars extending vertically along the crane mast, said bars being respectively linked to said declutchable gear and winch, a handle adjustable along each of said vertical bars and tripping means interconnecting said pivotable lever and bars to automatically bring these bars into declutching position responsive to unbalancing of the jib and counterjib under an undue load on the grapple.

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5. A crane comprising a mast surmounted by a revoluble head having a peripheral gear ring, a jib and a counterjib mutually balanced and oppositely hinged to the head, a lever pivoted to said head and tied to the outer ends of the jib and counterjib, a carriage traversable along the jib and supporting a first cable carrying a load grapple, a motor at the base of the mast, a primary transmission including a declutchable reverser between the motor and mast head ring, a secondary transmission including a second cable passing over a drum coaxial with the mast axis for driving the jib carriage from the motor, said secondary transmission further including a declutchable reversing gear, a pulley guiding the first cable over the mast head, a declutchable winch for said first cable operated by the motor, three controller bars including handles clamped thereto and adjustable thereon along the crane mast, two of said bars being respectively linked to said declutchable gear and winch while the third bar is linked to the declutchable reverser operating the mast head ring, and tripping means interconnecting said pivotable lever and said first-named two bars so as to automatically trip these bars into declutching position responsive to unbalance between jib and counterjib under an undue load on the grapple, said tripping means including a shaft coincident with the mast axis and having projections engaged by a fork on the pivotable lever and another fork on a tumbler linked to said two bars.

6. A crane comprising a mast, a mast head revoluble on rollers at the top of the mast and having a peripheral gear ring, a jib and a counterjib mutually aligned and balanced and hinged to opposite points of the mast head, a cranked lever pivoted to the top of said head and tied to the outer ends of the jib and counterjib, a carriage traversable lengthwise of the jib and supporting a first cable carrying a load grapple, an electric motor in the lower region of the mast, a primary transmission including a declutchable reverser and an upstanding shaft carrying a pinion interconnecting the motor and mast head gear ring, a secondary transmission including a second endless cable guided over jockey pulleys on the jib and over a drum on the mast head, said drum being coaxial with the mast and operated through a bevel gear having a sleeve extension carrying a straight gear operatively connected to the motor by a shaft and a declutchable reversing gear, a pulley guiding the first cable over the mast head, a declutchable winch for the first cable operated by the motor, a set of three vertical coplanar controller bars including handles clamped to said bars and adjustable thereon along the crane mast, two of said bars being respectively linked to said declutchable gear and winch while the third bar is linked to the declutchable reverser operating the mast head gear ring, and tripping means interconnecting said cranked lever and said two bars so as automatically to bring these bars into declutching position responsive to unbalance of the jib and counterjib under an undue load on the grapple, said tripping means including a hollow shaft loosely housed in said sleeve extension and having flanges engaged by a fork on the lever and another fork on a tumbler linked to said two bars, the first cable being freely led through said hollow shaft.

7. A crane comprising a mast surmounted by a head, a jib and a counter jib mutually balanced and oppositely hinged to said head, a lever pivoted

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to said head and tied to the outer ends of the jib and counter jib, a carriage traversable along the jib and supporting a flexible member carrying a load grapple, a prime mover adjacent the base of the mast, a transmission including a declutchable gear between the prime mover and jib carriage, intermediate means guiding the flexible member on the mast head, a declutchable actuator for said member operated by the prime mover, tripping means operated by said pivoted lever, a link and lever connection extending heightwise along the mast between said tripping means and declutchable gear, and a second link and lever connection extending heightwise along the mast between said tripping means and declutchable actuator whereby the unbalancing of said jib relative to the counter jib will actuate said lever, tripping means and connections to automatically bring said gear and actuator into declutching position.

8. A crane according to claim 7 further comprising manual control means adjustable heightwise along said connections.

9. A crane comprising, a mast, a jib and a counter jib oppositely hinged to the mast, hoisting means carried by said jib, driving means for said hoisting means, means including an interconnecting tie for mutually balancing said jibs, said means permitting simultaneous movement

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of the free ends of the jibs in opposite vertical directions, and means controlled by the movement of said tie means for automatically disconnecting said driving means from the hoisting means.

10. A crane comprising, a mast, a jib and a counter jib oppositely hinged to the mast, means including a tension cable interconnecting the free end portions of said jibs for mutually balancing the latter, whereby upward pivotal movement of one jib will permit downward pivotal movement of the other jib, hoisting means carried by said jib, driving means for said hoisting means, and means controlled by the movement of said tension cable for automatically disconnecting said driving means from the hoisting means.

11. A crane comprising, a mast, a jib and a counter jib oppositely hinged to the mast, means including a tension cable for mutually balancing said jibs whereby upward pivotal movement of one jib will permit downward pivotal movement of the other jib, hoisting means carried by said jib, means for operating said hoisting means, and means responsive to a predetermined movement of said cable by said jib for rendering ineffective said hoist operating means.

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