July 13, 1965 N. E. KERRIDGE 3,194,412

MULTIPLE MAST SECTION TOWER CRANE

Filed July 26, 1963 4 Sheets-Sheet 1

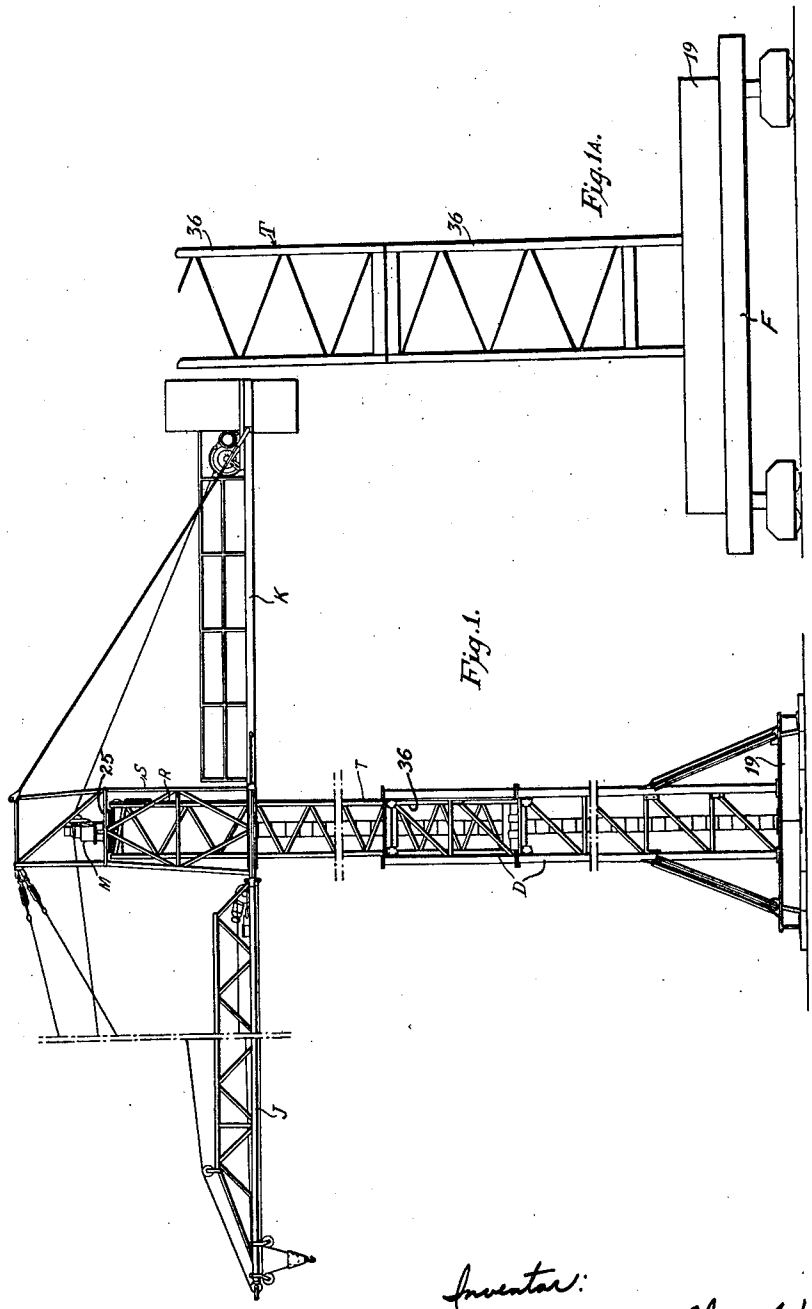


Fig. 1A.

Fig. 1.

Inventor:
Norman Edward Kerridge
By Baldwin + Wight
Attorneys

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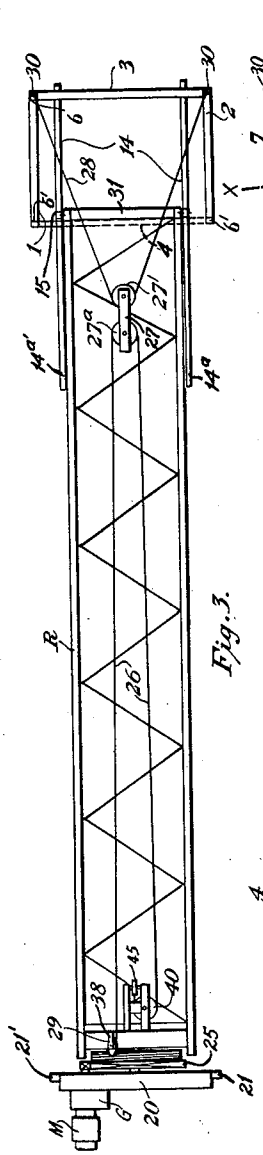


Fig. 3.

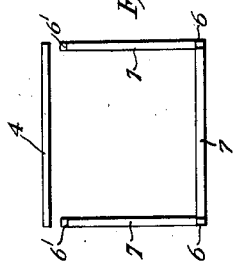


Fig. 6.

Fig. 2.

Inventor:
Norman Edward Kerridge
By Baldwin & Wight
Attorneys

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MULTIPLE MAST SECTION TOWER CRANE

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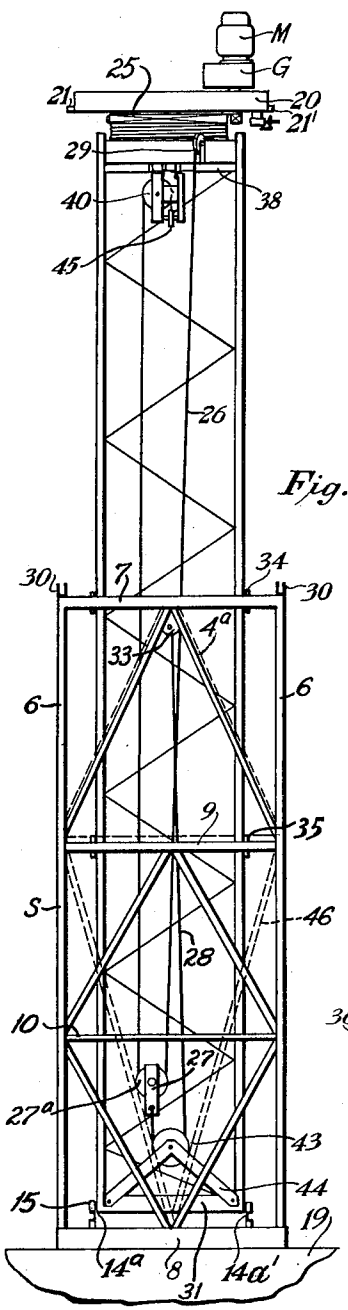


Fig. 4.

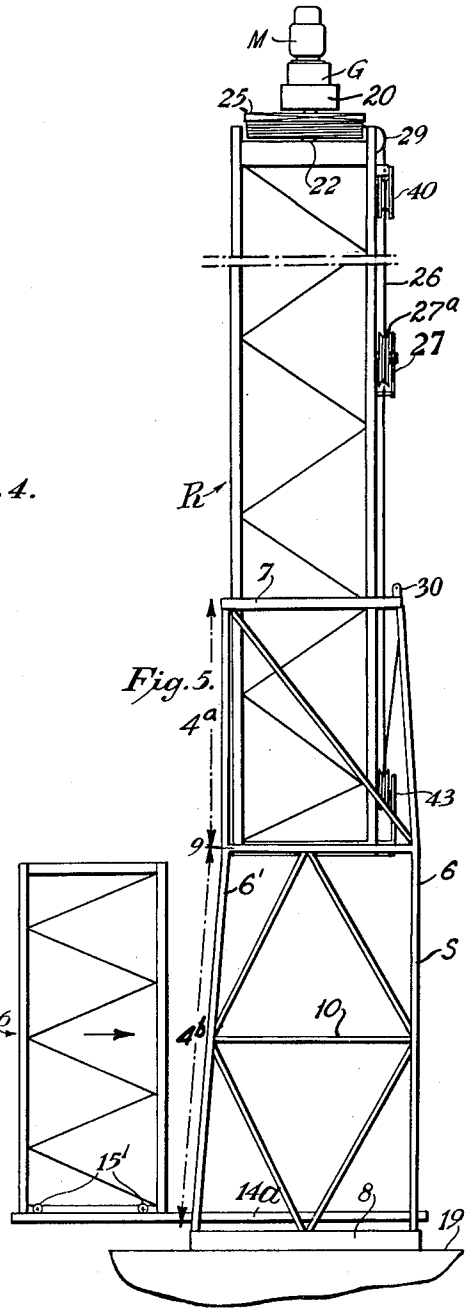


Fig. 5.

Inventor:
Norman Edward Kerridge
By Baldwin & Wight
Attorneys

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MULTIPLE MAST SECTION TOWER CRANE

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Fig. 7.

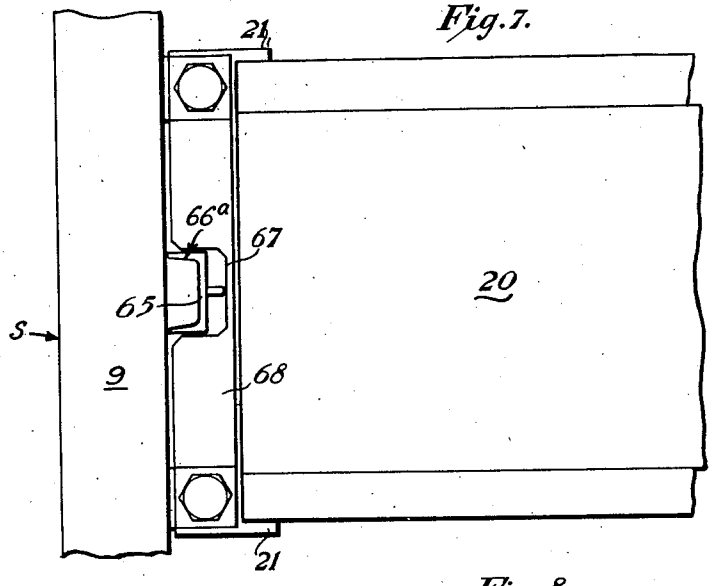
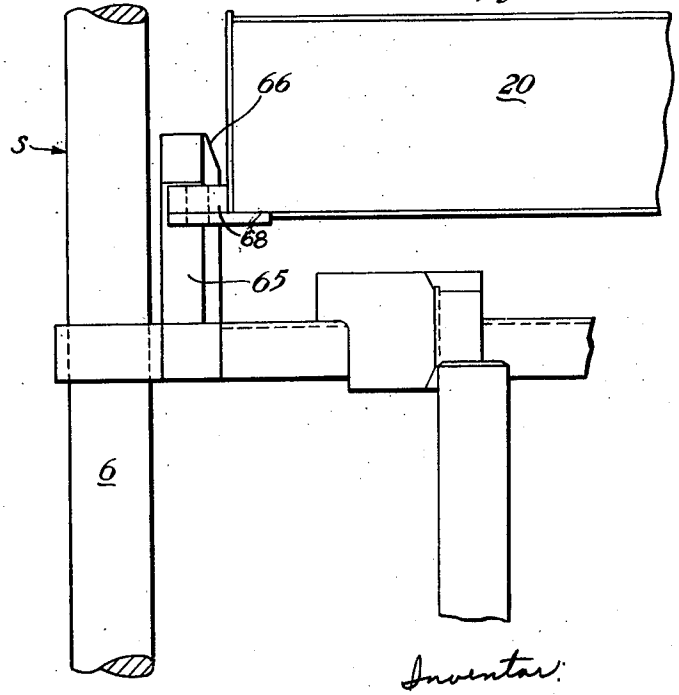


Fig. 8.



Inventor:
Norman Edward Kerridge
By Baldwin & Slight
attorneys

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3,194,412

MULTIPLE MAST SECTION TOWER CRANE

Norman Edward Kerridge, Saltford, near Bristol, England, assignor to Stothert & Pitt, Limited, Bath, England, a company of the United Kingdom

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Claims priority, application Great Britain, July 31, 1962, 29,467/62, 29,468/62, 29,469/62, 29,470/62
3 Claims. (Cl. 212—46)

This invention relates to tower cranes having a tower built up from a number of standard sections which when erected support a superstructure carrying a jib and counter-jib.

One of the problems in the erection of so-called builders' or tower cranes is how desirably to avoid the use of an independent crane, when assembling the several tower sections.

The present invention is particularly concerned therefore with the erection of a free-standing tower crane and provides a crane structure including a superstructure, the consrtuction of which permits the self-erection and extension of the tower from the bottom, i.e. at or near ground level, the superstructure serving both as a guide and as a means for erecting the uppermost tower section and for introducing subsequent tower sections as they are added one by one.

According to the present invention in a tower crane structure having a tower built up from a number of sections arranged end-to-end and having a superstructure for mounting a jib, which superstructure, when the tower is erected, surrounds the upper end of the tower and is supported therefrom for slewing movements, the superstructure comprises a substantially rectangular cage having three sides arranged to define a lateral opening to permit, during erection, the introduction of the uppermost tower section and further comprises a detachable fourth side for partly closing said opening whilst leaving a reduced lateral aperture therein through which one or more further tower sections can be introduced one after another, guide means carried by the three sides of the superstructure cage and the fourth detachable side, enabling the superstructure, when completed by the attachment thereto of the fourth side, to serve as a guide, during raising of the uppermost tower section, to permit the sideways introduction of the said subsequent sections beneath the uppermost tower section; and the tower having a single drive motor for raising the tower within the superstructure, for hoisting the superstructure up the tower and for imparting slewing movement to the superstructure relative to the tower.

The invention is described with reference to the accompanying drawings in which:

FIGURE 1 is an elevation of a tower crane having an inner tower fixed into an outer tower, the inner tower being constructed in accordance with a preferred embodiment of the invention;

FIGURE 1A is an elevation of the lower portion of the tower of a mono-tower crane, the upper portion of which is similar to the embodiment shown in FIGURE 1;

FIGURE 2 and FIGURE 3 are respectively an elevation and plan view showing a preliminary stage in the course of erection of the crane, with the superstructure erected to receive the first or uppermost tower section;

FIGURE 4 is an elevation showing a subsequent stage of erection with the upper tower section erected and the superstructure at ground level;

FIGURE 5 is an elevation at right angles to FIGURE 3 showing a later stage, with the upper section of the tower lifted to a position clear of the ground, preparatory to receiving the second tower section;

FIGURE 6 is a detail plan of the upper end of the superstructure; and

FIGURES 7 and 8 are respectively a plan and elevation showing in enlarged detail the connection between the superstructure and the upper tower section.

Referring to FIGURE 1 of the drawings, there is shown a tower crane structure comprising an inner tower T, hereinafter referred to as the tower, the lower portion of which is telescopically mounted within an outer tower, the latter being built up of sections D. The present invention is concerned with the tower T and its erection, since the outer tower D, which serves only to increase the height of the tower T, is not an essential feature and may be omitted as depicted, for example, in FIGURE 1A wherein the tower T is shown mounted on a base frame **19** supported by a traveling carriage F.

The tower T comprises a rectangular uppermost or pintle section R and a plurality of rectangular standard sections **36**, and when assembled and erected, supports a superstructure S for slewing movement relative thereto. The superstructure S supports a jib J and a counter jib K. The pintle section R carries a driving mechanism consisting of a winch drum **25** driven through gearing G by a motor M, which mechanism is used for the erection of the tower T and the elevation of the superstructure S and attached jibs J and K, and also for imparting slewing motion to the superstructure and jibs. The driving mechanism forms the subject matter of my co-pending application No. 297,796.

The superstructure S which serves as a guide and a means for assembling the individual sections **36**, R from which the tower T is built up, is constructed in the form of a rectangular open ended cage made up of three fixed sides and a fourth side which is detachable. In FIGURE 3 the fixed sides are indicated at **1**, **2** and **3** and a fourth side to complete the rectangular cage is denoted, in broken lines, by reference **4**. The superstructure includes uprights **6**—**6**, **6'**—**6'** (see FIGURE 6) at each corner, joined to one another at their upper ends by cross-beams **7** at the sides **1**, **2** and **3**, at intermediate levels respectively by beams **9** and **10** at the sides **1**, **2** and **3**, and at their lower ends on all four sides by cross-beams **8**.

A yoke **20** (FIGURE 4) is supported for rotation on a pintle **22** mounted on the pintle section R of the tower. The yoke **20** has at its opposite ends brackets **21**, **21'** by which, when the tower has been erected to its full height and, as hereinafter explained, the superstructure S is hoisted to the top of the tower, the superstructure can be connected to the yoke and thus indirectly to the tower by bolting it to the brackets **21**, **21'** at each end of the yoke **20**.

The manner in which the superstructure S is utilized to erect the tower of the crane will now be described with particular reference to FIGURES 2–5.

The superstructure S is first mounted upon a base frame **19**, in an upright attitude as shown in FIGURE 2. The detachable side **4** of the superstructure which comprises upper and lower panels **4*a*** and **4*b*** respectively (FIG-4), is removed and the pintle section R of the tower is laid upon its side with its foot adjacent the base of the superstructure. The positions of panels **4*a*** and **4*b*** when attached are indicated in broken lines in FIGURES 4 and 5.

The section R is then run in toward and into the open side of the superstructure S, utilizing for this purpose tower erection ramps **14** and rails **14*a***, **14*a'*** for engagement by rollers **15** which are detachably secured to the bottom end of the section R.

The winch drum **25** carries a rope **26** which is passed

over a pulley 29, mounted upon a bracket 38 at the upper end of the tower pintle section R, thence around a pulley 27*a* in a sheave block 27, which carries a second sheave 27*b*, and back over a pulley 40 to engage block 45 which is pivotally connected to the tower pintle section R.

The sheave block 27*b* is anchored to brackets 30 located respectively at two opposite sides of the superstructure, by means of a straining rope 28 extending between the brackets 30 and passing over the pulley 27*b*.

The motor M is then used to rotate the winch drum 25 and to wind in the rope 26, and after the rollers 15 have contacted stops 15*a* on the rails 14*a*, 14*a*′ to raise the section R to a nearly vertical position as denoted by the dash-dot line X–X′ in FIGURE 2 which it will be noted is at a small angle to the vertical.

At this stage, the center of gravity of the section R has just passed the rollers 15, and its lower and inner end, indicated at 31 in FIGURE 2, then rests upon screw jacks, one of which is indicated at 32, and by means of which the end 31 of the section R is furthered lowered so that the section R becomes vertically erect as shown in FIGURE 4.

The upper panel 4*a* of the detachable side 4 is then secured in position as shown in FIGURE 4, closing the upper portion of the open side of the superstructure, but leaving an opening beneath the panel 4*a* of a height and width sufficient to permit the subsequent introduction of additional tower sections 36, one at a time, in upright attitudes, laterally into the superstructure.

It is thereafter necessary to raise the pintle section R relative to the superstructure S in order to permit a second tower section 36 to be hoisted and run into position beneath the section R. To achieve this, the part of sheave block 27 containing the sheave 27*b* is detached and one end of the straining rope 28 (or another rope of suitable length) is attached to the sheave block 27, the rope 28 then passes around a pulley 43 carried by a chair 44 attached to the lower end of the section R and the free end of the rope 28 is anchored to the top of the superstructure at 33.

By attaching the second tower section 36 by a sling to the pintle section R, the raising of the latter by operation of the winch drum 25, will simultaneously raise the second section 36 from the ground to a height at which it may be run in on the guide rails 14*a*, 14*a*′ in a horizontal direction beneath the pintle section R. When the section 36 has been inserted beneath the pintle section R, the latter is then lowered a short amount and bolted to the section 36.

Further tower sections 36 may be added to the tower in the manner just described until the tower has reached the required height, The superstructure cross-beams 7 and 9 are fitted with guides 34 and 35 respectively, for guiding the first and subsequent sections of the tower while they are raised to permit the insertion of further sections.

The lower panel 4*b* of the detachable side 4, which had previously been removed, is now bolted into position and the jib J together with the counterjib K and other equipment carried by the jib are attached to the bottom of the superstructure.

The superstructure S is thereafter hoisted up the tower by anchoring a part of the sheave block 27 to an anchorage point at the base of the superstructure utilizing the winch rope 26 on the winch drum 25, to wind in the rope 26 until the superstructure reaches the top of the tower when it is secured to the yoke 20 at the top of the pintle section R. The guides 34, 35 steady the superstructure S during its hoisting up the tower.

The lower end of the superstructure S, at the level of the cross-beams 8, is furnished with tower guides which form an integral part of a roller path, mounted within the base of the superstructure.

Referring now to FIGURES 7 and 8, the superstructure S is further provided with auxiliary guides 65, attached to the laterals 9, which guides have lead-in taper surfaces 66 for engagement with slots 67 in a bracket plate 68 at each end of the yoke 20. The auxiliary guides 65 are also formed with lead-in surfaces 66*a* for guidance in directions perpendicular to that provided by the surfaces 66. As the guides 65 engage with the yoke 20, the guides 35 pass out of engagement with the tower pintle section R, thus permitting the superstructure to rotate with the yoke 20.

What is claimed is:

1. A tower crane having a tower built up from a number of sections arranged end-to-end and having a superstructure for mounting a jib, which superstructure when the tower is erected, surrounds the upper end of the tower, means for supporting said superstructure on the upper end of said tower for slewing movements, said superstructure comprising a substantially rectangular cage having three sides of which two opposed sides define a lateral opening to permit, during erection, the introduction of the uppermost tower section into said cage and further comprising a detachable fourth side for partly closing said opening while leaving a reduced part of said opening still open to permit introduction of one or more further tower sections one after another into said cage, guide means carried by said three sides of the superstructure cage and the fourth detachable side, enabling the superstructure cage, when completed by the attachment thereto of the fourth side, to serve as a guide during raising of the uppermost tower section, and to permit the sideways introduction of the said further sections beneath the uppermost tower section; and the tower having power operated means including a single drive motor for raising the tower within the superstructure, for hoisting the superstructure up the tower and for imparting slewing movement to the superstructure relative to the tower.

2. A tower crane according to claim 1 comprising a pintle shaft supported on the uppermost tower section at the center of the tower, a yoke member supported on said pintle shaft for rotation about said tower center, and a winch drum mounted on said pintle shaft for rotation thereon and forming part of said power operated means.

3. A tower crane according to claim 1 in which the detachable side comprises an upper and a lower component, said guide means being provided on said upper component.

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SAMUEL F. COLEMAN, *Primary Examiner.*

ANDRES H. NIELSEN, *Examiner.*