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F. J. STRNAD

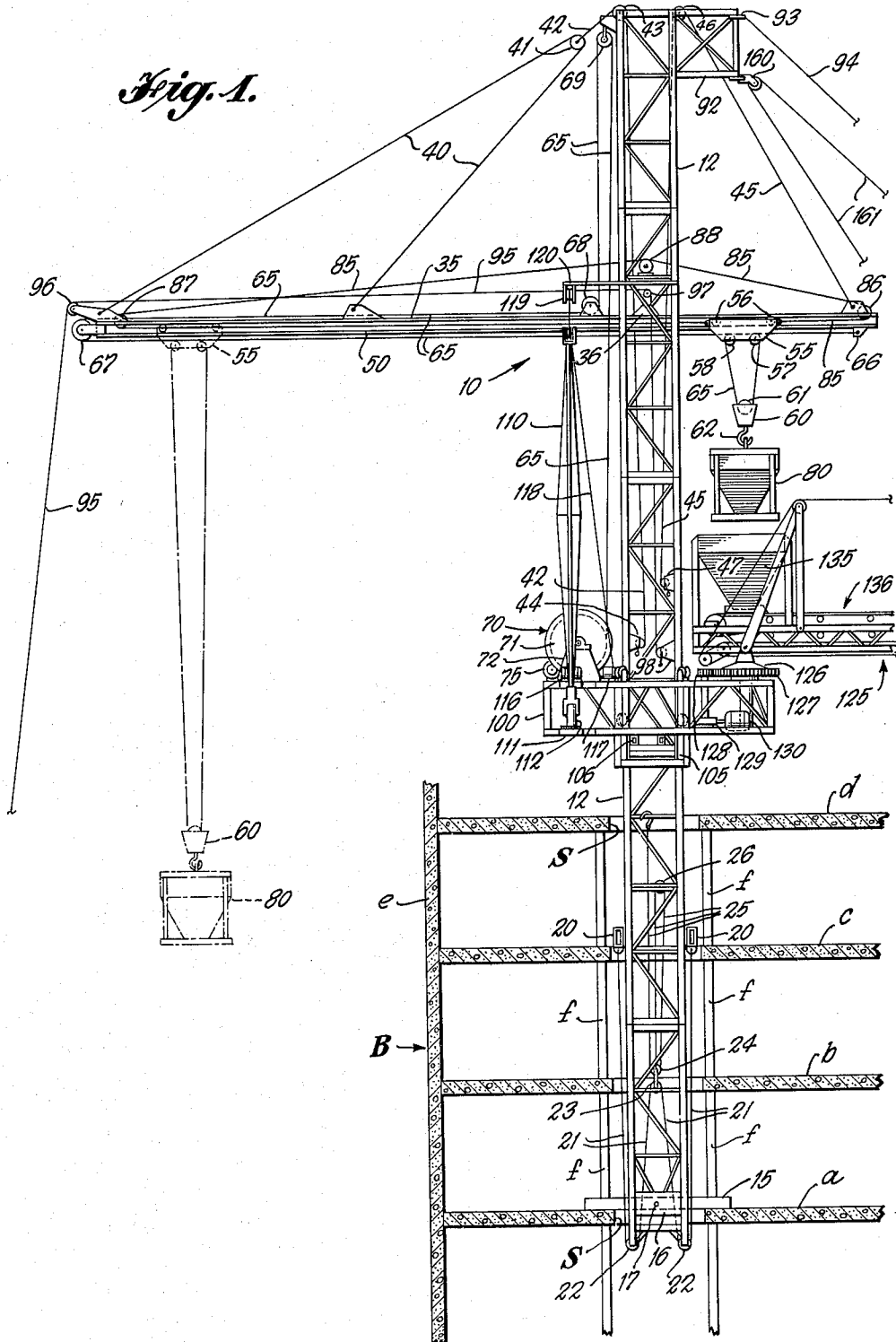
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TOWER CRANE

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Fig. 1.



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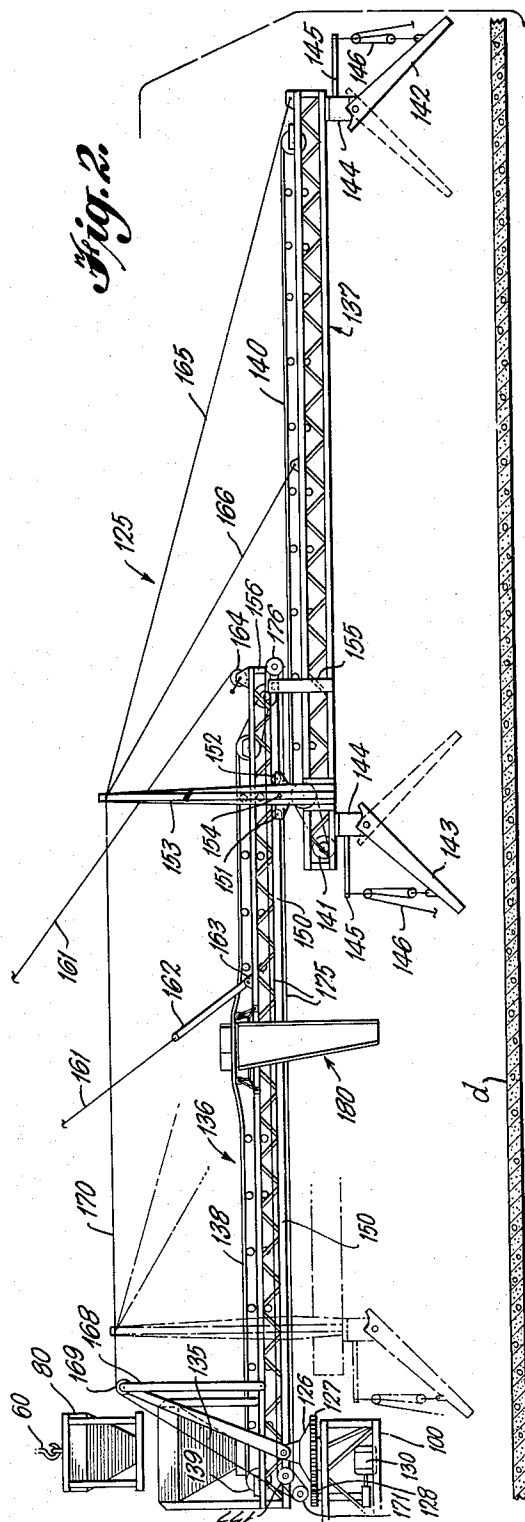
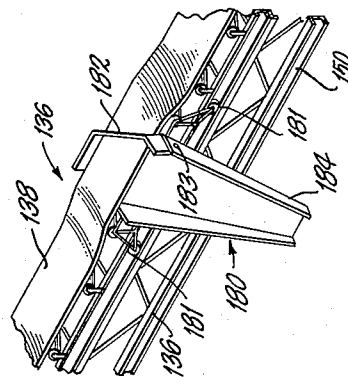
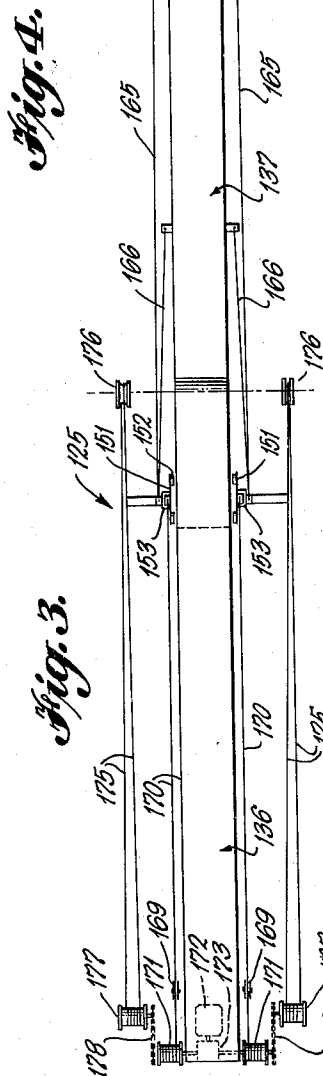
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Fig. 6.

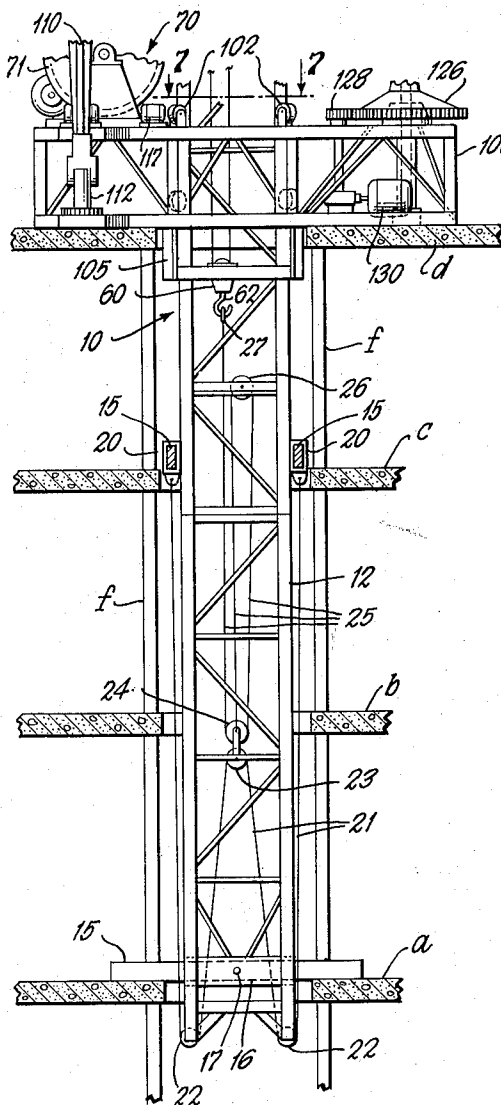


Fig. 5.

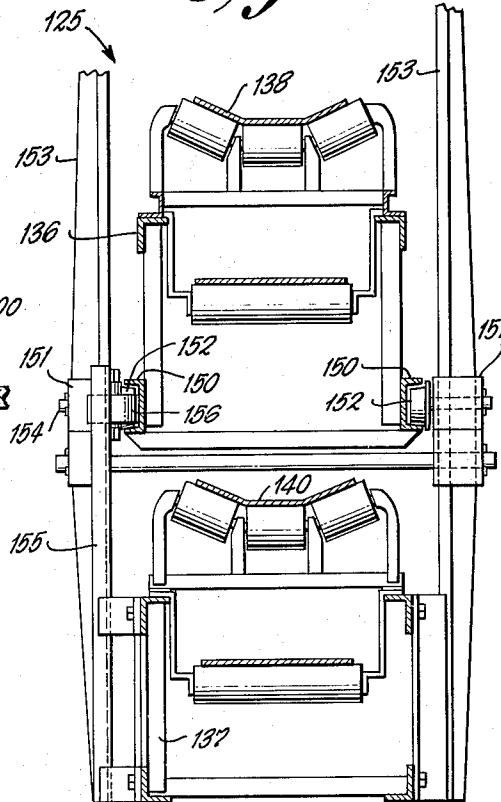
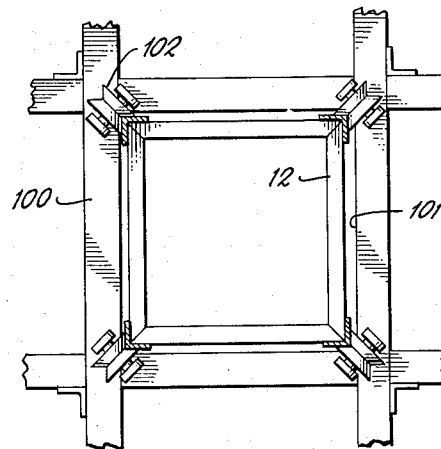


Fig. 7.



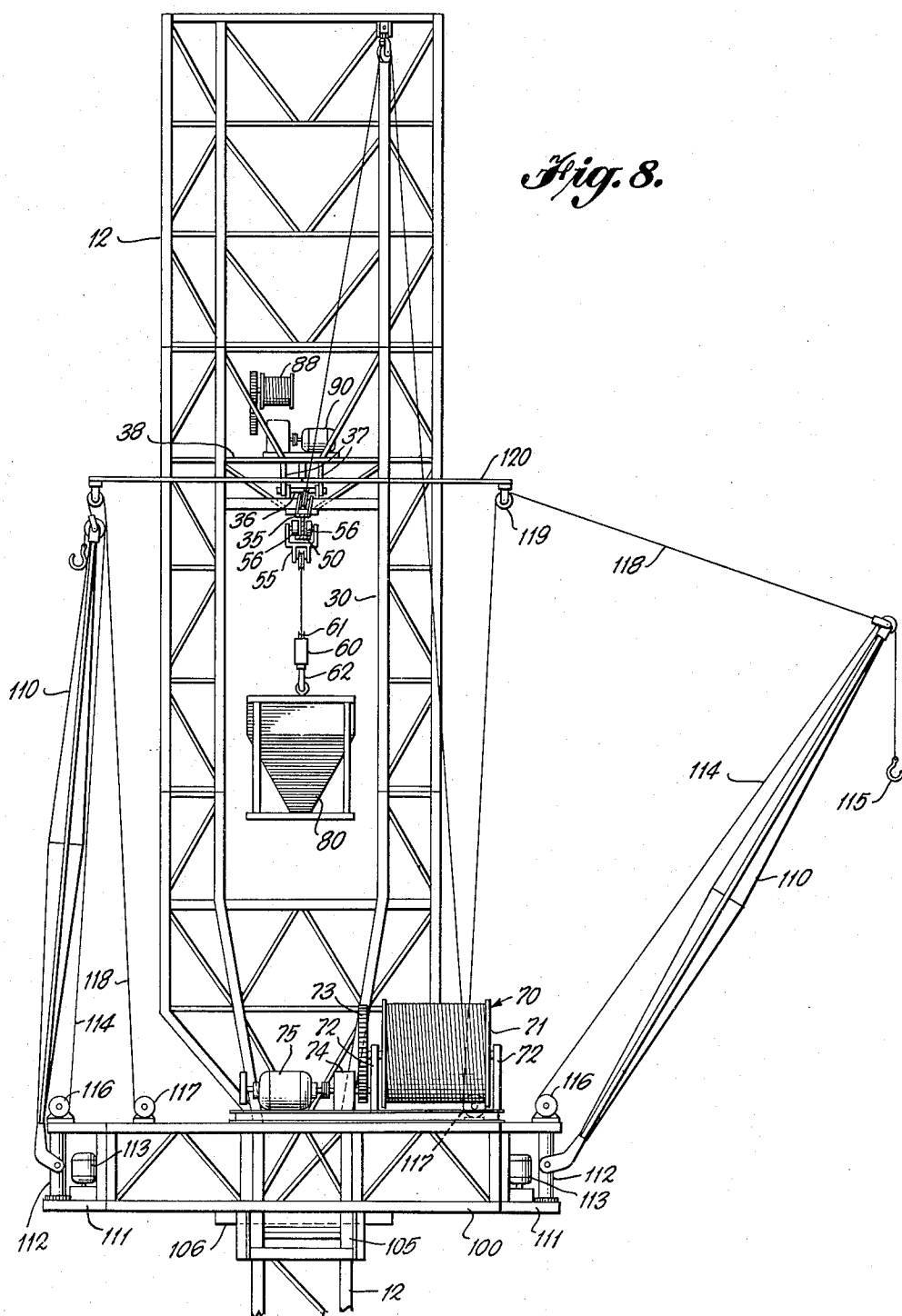
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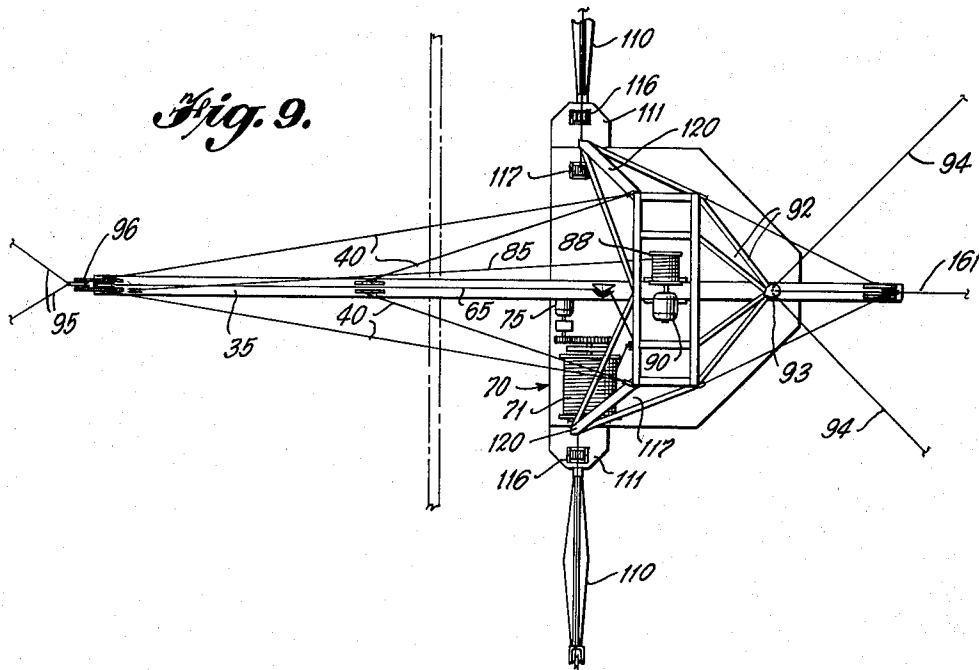
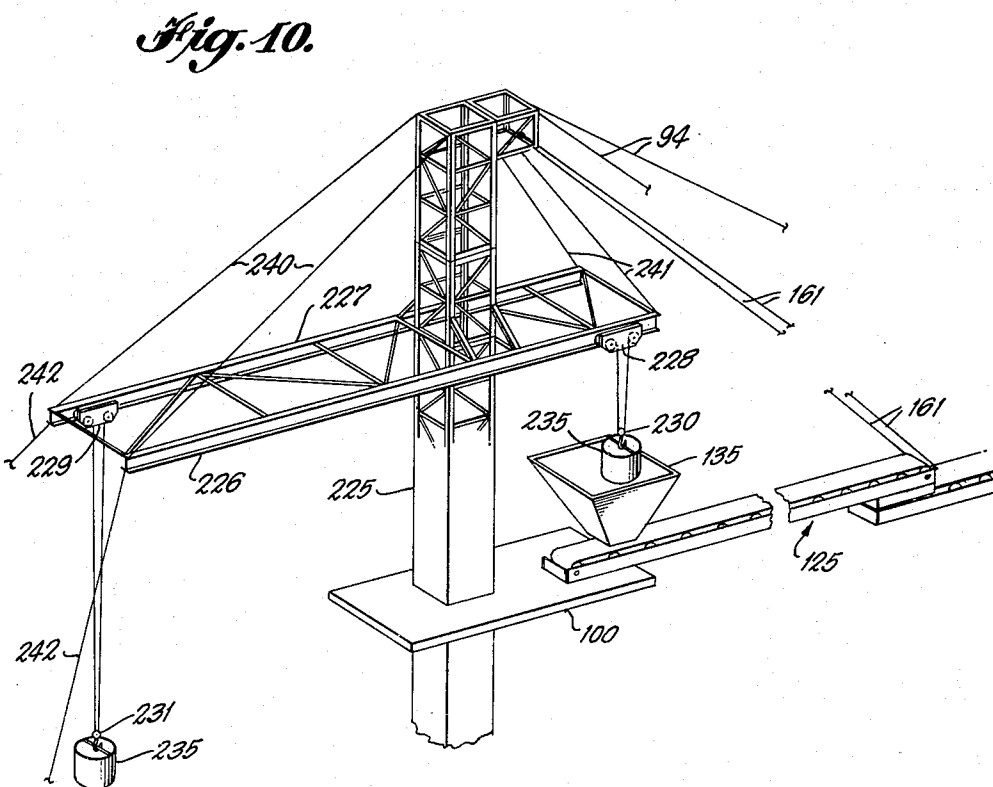
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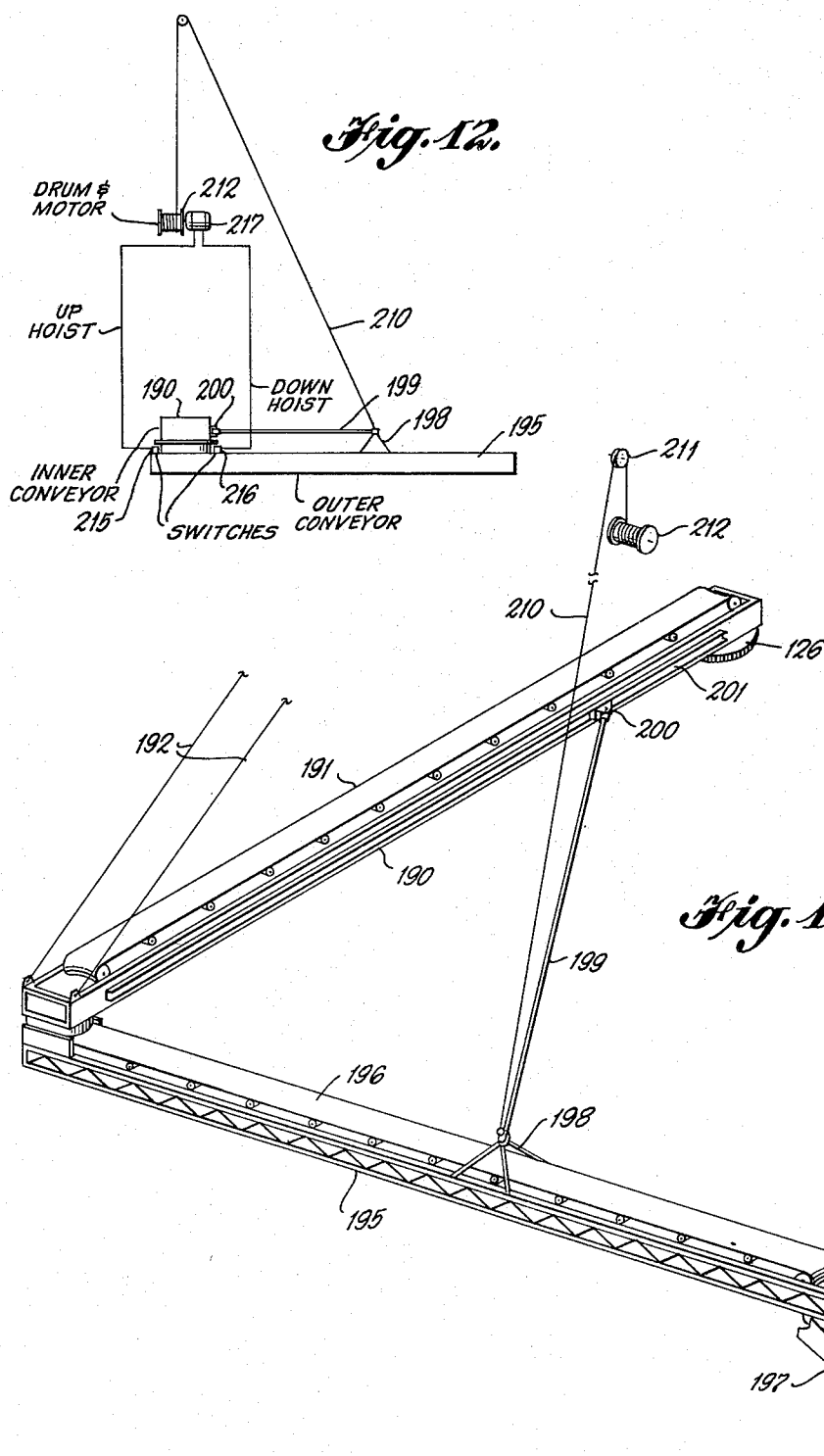
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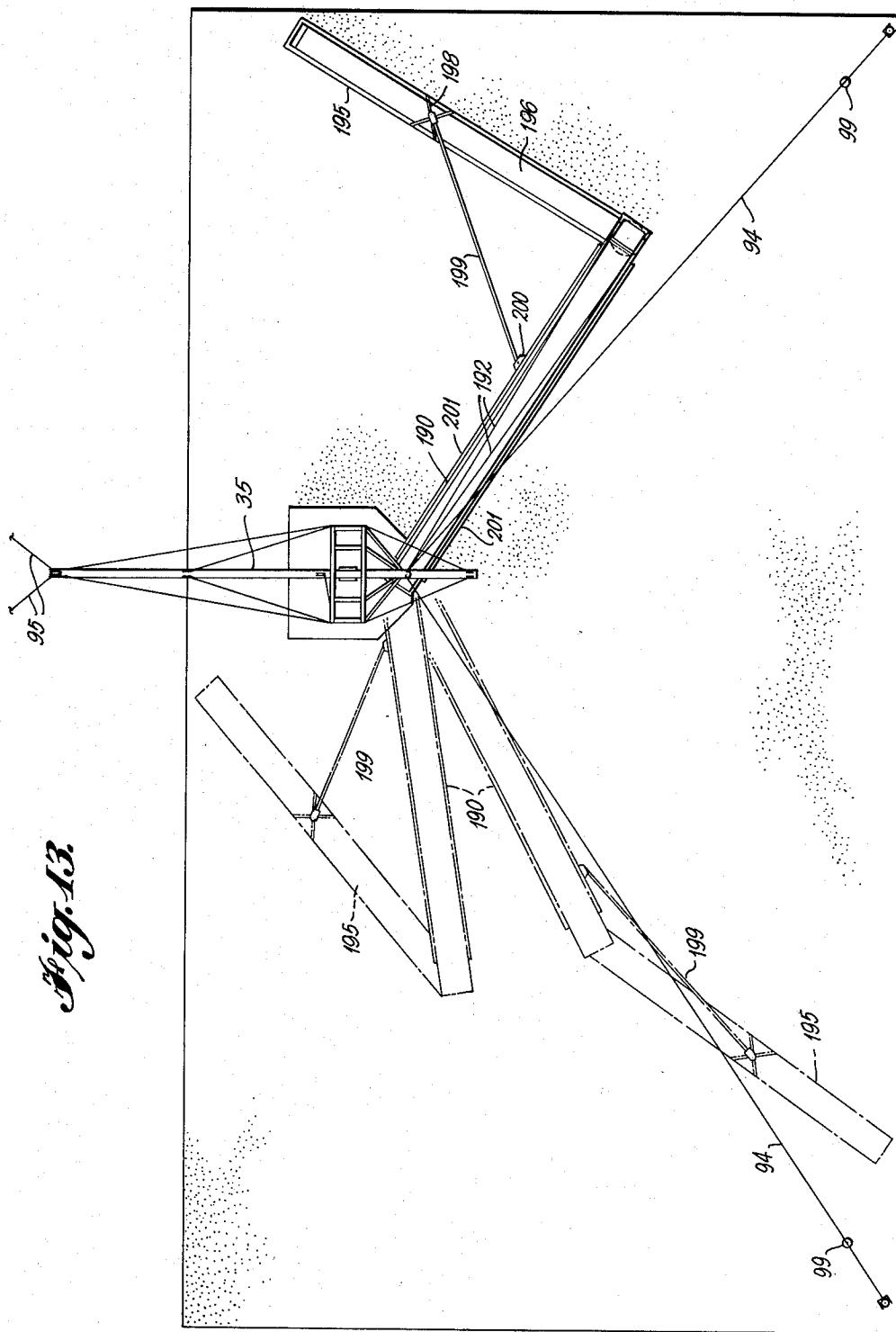
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TOWER CRANE

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16 Claims. (Cl. 214-89)

This invention relates generally to the art of tower cranes and to components particularly adapted for use with tower cranes. In its more specific aspects, the invention is directed to tower cranes of the type that are mounted within a vertical shaft of a building during its construction and elevated as successive floors of the building are completed with the crane being useable for hoisting and distributing building materials in conjunction with construction of the building. Although hereinafter in describing the operations and functions of the novel tower crane and features thereof, reference is made to the construction of a building, it is to be understood that this reference is only by way of example of an application or use of the invention and that the invention is applicable generally to the erection of various structures including buildings, dams, bridges, multiple overpasses, etc. and particularly structures of poured concrete construction.

In the construction of large modern commercial buildings to be used for offices, apartments, hotels, etc., the building height and substantial areas of each of the building floors present special problems in maintaining construction costs within reasonable bounds as compared with the cost of construction of smaller buildings having only a few floors with each floor having only a limited area. In such smaller buildings, it is possible to employ conventional crawler or truck mounted cranes which can hoist the building materials from the ground and deposit them at or near the point of use on the building. Even temporary elevators may be used and the concrete carted by use of buggies to pour the limited area of each building floor.

In taller buildings having many stories and in buildings having a substantial floor area for each floor, it is necessary to resort to the use of temporary elevators or other vertical elevating means to carry the building materials such as concrete to the upper levels where it is to be used. This mode of constructing large buildings is costly from the standpoint of both the labor and the equipment required. The concrete must be transported from the temporary elevator over the wide expanse of floor area, requiring numerous wheelbarrows or buggies and operators thereof together with the construction of board runways extending from the location of the elevator to the various points on the floor area where the concrete is to be poured. With this mode of construction, the labor costs include operators for the wheelbarrows or buggies as well as the carpenters required to construct the board runways. Further, this approach for handling the substantial quantities of concrete which must be poured in the construction of each floor of the building is extremely slow.

Tower cranes have heretofore been proposed for use in the construction of large buildings both of the type of tower crane which is mounted on a track or other prepared traveling surface on the ground adjacent the building being constructed and of the type which is elevated as erection

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of the building progresses. The track mounted type tower crane is generally limited in its practical operating height to the same extent as are the long boom crawler or truck mounted cranes. Also, due to its basic design, its lifting capacity for servicing areas on the floors of the building being constructed which are disposed at substantial distances from the tower is limited. Further with this type of tower crane, the necessity for having a track system or other prepared traveling surface is undesirable in congested areas where quite frequently larger modern buildings are to be constructed.

The climbing type tower cranes heretofore proposed have embodied structural features which proved to be disadvantageous in their use for building construction. By their design, they have proved slow and limited in productive capacity. The concentrated weight of the loaded bucket at longer radius of concrete placement imposes high loading on the building under construction, and in use imparts undesirable lateral forces through the crane tower against the recently poured concrete floors through which the tower crane extends. Counterbalancing only partially offsets the lateral forces and adds to the total weight of the crane to be supported by the building under construction. To keep these forces on the building within acceptable limits, lifting capacities of this type crane are usually low, resulting in low rate of concrete placement.

Having in mind the above discussed problems and drawbacks in prior approaches employed in the construction of various structures such as large, multi-story buildings, it is a principal object of the instant invention to provide an improved tower crane construction elevatable within a shaft of a building or other structure being constructed and having substantial load handling capacity for hoisting and distributing building materials in erection of the structure without imparting excessive vertical or lateral stresses to the portions of the structure that support the crane.

Another important object of the instant invention is to provide a tower crane and components particularly adapted therefor capable of rapidly hoisting and distributing large volumes of concrete to substantial radial distances from the crane tower and to a substantial portion of the area encircling the tower with a minimum of load stresses being applied to the building or other structure being constructed and without interference with the area to be poured.

A further object of the invention resides in providing a tower crane constructed to elevate a concentrated load of concrete at a relatively short radial distance from the crane tower and distribute this concrete by conveying it in a relatively light but steady flow to extended radial distances from the tower thereby avoiding in operations concentrated loading at extended radial distances from the tower.

It is also an object of the invention to provide a tower crane elevatable within a shaft of a building being constructed wherein a substantial portion of the weight of the crane is removed from the crane tower during the tower elevating operation and wherein the hoisting means for the building materials is also employed to carry out the tower elevating operation.

Another object of the invention is to provide a tower crane so constructed that the components thereof may be readily assembled and disassembled on the job site and

wherein the hoisting machinery used in hoisting the building materials in building construction is also useable in connection with assembly and disassembly of the crane components.

A further object is to provide an articulated distributing conveyor boom useable with a tower crane to be swingable in a horizontal plane with the outer boom section being guy suspended and having means for automatically tensioning the suspending guys to maintain the outer boom section in a level condition irrespective of the articulated position of the outer section of the boom relative to the inner boom section.

The above and other objects and novel features of the instant invention will be readily apparent from the following description taken in connection with the accompanying drawings. It is to be expressly understood that the drawings are for the purpose of illustration and are not intended to define the limits of the invention but rather to merely illustrate preferred embodiments and structures incorporating features of the instant invention.

In the accompanying drawings forming a part of this specification and wherein like reference numerals are employed to define like parts:

FIGURE 1 is a side elevational view showing the tower crane of the instant invention operatively mounted within a shaft of a building being erected with only a portion of the distributing boom thereof being illustrated.

FIGURE 2 is a side elevational view showing the distributing boom and a portion of its mounting on the structure illustrated on FIGURE 1.

FIGURE 3 is a diagrammatic plan view illustrating the reeving of the suspending and operating cables for the telescoping outer section of the distributing boom of FIGURE 2.

FIGURE 4 is a perspective view showing the mounting relation of the material discharging plow associated with the belt conveyor of the inner section of the telescoping distributing boom of FIGURE 2.

FIGURE 5 is a sectional view through the telescoping distributing boom showing the mounting relationship between the telescoping sections of the boom of FIGURE 2.

FIGURE 6 is an enlarged side elevational view of the lower end of the crane tower.

FIGURE 7 is a sectional view taken on line 7-7 of FIGURE 6 showing the mounting relation between the tower and the platform carrying the distributing boom, hoist machinery, etc.

FIGURE 8 is a front elevational view showing the upper end of the crane tower in relation to the platform carrying the hoist machinery with the auxiliary booms more specifically illustrated.

FIGURE 9 is a top plan view showing the relation of the guying for the tower and hoist jib thereon.

FIGURE 10 is a perspective view with portions shown diagrammatically and illustrating an alternative form of hoist trolley jibs on a tower crane.

FIGURE 11 is a perspective view diagrammatically illustrating an articulated distributing boom for use in place of the telescoping type distributing boom of FIGURE 2.

FIGURE 12 is a schematic view illustrating the control system employed with the articulated distributing boom of FIGURE 11 to obtain proper tensioning of the guys for the outer section of the boom to maintain it level during use, and

FIGURE 13 is a diagrammatic plan view showing the manner in which the articulated distributing boom is employed in distributing material to essentially all points on the area of a building floor being poured with concrete.

Referring to FIGURE 1, the tower crane of this invention generally designated by the reference numeral 10, is shown mounted in operating position within a vertical open shaft S of a building B being constructed.

The successive floors of the building through which the crane tower extends are designated *a*, *b*, *c* and *d*, while the building face wall *e* extends upwardly along the outer edges of these floors. The diagrammatic representation of the building B and the portions thereof designated by reference characters *a* through *e* are only illustrated to facilitate describing the functioning and use of the tower crane 10 in conjunction with construction of a building of poured concrete construction.

The shaft S within building B may be provided by the elevator shaft or stairwell contemplated as part of the final design of the particular building being erected. Alternatively, a special open shaft may be formed by vertically aligned openings in the successive floors of the building with these openings subsequently being closed with concrete after the tower crane has been elevated within the shaft to be free of or above the openings. As will appear from the description hereinafter, an important factor of the functioning of the tower crane of this invention is its ability to be used not only in hoisting and distributing the concrete for the successive building floors but also the concrete necessary to close the openings below the crane tower and through which the crane has been elevated.

The structural design of the building, particularly where the tower crane is elevated through an elevator shaft or stairwell, may call for sufficient load supporting columns or walls between adjacent floors to provide the necessary strength to the floors to support the load of the tower crane. Where aligned openings forming the shaft are specially provided for use by the tower crane appropriate bracing *f* may be employed adjacent the openings and extending between adjoining floors to distribute the load of the tower crane among several floors. This can be particularly important with respect to the upper floors which have only recently been formed from poured concrete.

The tower crane 10 embodies a skeleton tower 12 which is preferably formed in sections that are bolted together in assembling the tower for use in erection of a building. The skeletonized formation of the sections of tower 12 preferably provides an essentially open passageway extending longitudinally of the tower. This passageway is important in connection with both the tower elevating operation and in hoisting and distributing concrete to close the floor openings forming the shaft in the building below the tower when the shaft is not to remain for ultimate use as a stairwell or elevator shaft.

As shown in FIGURES 1 and 6, the weight of the tower 12 and components carried thereby is supported adjacent the lower end of the tower by means of beams 15 which are shown resting on the upper surface of floor *a* and which extend across the shaft S through open ended pockets 16 secured on the tower 12. A pair of beams 15 and corresponding pockets 16 may be provided extending along the opposite sides of tower 12 immediately inwardly of the vertical corner members of the tower leaving a vertical passage between the pockets 16.

Each beam 15 is secured to its pocket 16 by a load carrying pin 17 and as will be noted, the vertical height of each pocket is greater than the height of the beam 15 which passes therethrough. By pin connecting the beam 15 and its pocket 16, any lateral swaying movements of the tower 12 will not concentrate the tower crane's weight on one or the other ends of the beams 15 and the portion of the building floor on which the beam ends rest.

Although a pin connection has been illustrated between the beams 15 and their pockets 16, it will be appreciated that other means may be employed to interconnect the load supporting beams 15 with the tower 12 to insure that concentrated loading on portions of the floor supporting the tower will not occur in the event of lateral swaying of the tower during erection or in use.

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In the erection of a building such as the poured concrete building B, as successive floors are formed by pouring the concrete, the tower crane 10 is elevated within the building shaft to be operable in conjunction with pouring the next floor. In some instances, it may not be necessary to elevate the crane in conjunction with the pouring of each floor where the height of the crane in conjunction with the pouring of more than one floor may be carried out at one supported position of the crane. In any event the crane is elevated at intervals as construction of the building progresses.

With further reference to FIGURES 1 and 6, the elevating mechanism used in raising the tower 12 may be described. This mechanism employs a pair of beams 20 which rest on the surface of the floor *c* above the floor *a* which supports beams 15 that carry the tower crane weight in use. Cables 21 are connected to the beams 20 and extend downwardly along the outer sides of the tower 12 engaging over sheaves 22 rotatably mounted on the opposite sides of the lower end of the tower. The cables 21 extend upwardly within the tower 12 and pass over a pulley 23. Pulley 23 is suspended from a block 24 which is reeved with a cable 25 extending over a pulley 26 rotatably mounted on the tower 12. One end of cable 25 is fixed to block 24 with the other end of the cable being provided with a suitable connector 27 to be engaged in elevating the tower. As shown in FIGURE 1, the hook may be conveniently retained in readiness for the elevating operation by being engaged with a member of the skeleton tower 12. In FIGURE 6, the connector 27 is shown engaged with the lifting hook of the crane hoist means to elevate the tower as will be described subsequently.

In the embodiment of FIGURES 1 through 9, the upper end of tower 12 is widened to provide a portal opening 30 extending therethrough as shown most clearly on FIGURE 8. A trolley hoist jib 35 is mounted on tower 12 at the upper end of portal opening 30 extending transversely and horizontally through such opening. The jib 35 is connected by a pin 36 to members 37 secured to a cross-member 38 of tower 12.

The jib 35 is guyed in its horizontal position relative to tower 12 by guys 40 connected to points spaced along the forward extended length of jib 35. These guys extend upwardly and outwardly from the jib toward the upper front corners of tower 12. They pass over sheaves 41 which are in turn connected to cables 42 which are threaded over pulleys 43 rotatably mounted at the top of tower 12. Cables 42 extend downwardly through the tower to a hand winch 44 by means of which they may be drawn into appropriately tension the guys 40. The opposite end of jib 35 has guys 45 connected thereto which extend over pulleys 46 rotatably mounted on the top rear corners of tower 12. Guys 45 extend downwardly through the tower to a hand winch 47 whereby they may be suitably tightened in obtaining proper horizontal positioning of the jib relative to tower 12. The various guys for jib 35 may be secured directly to tower 12 if desired. However, the pin connection of the jib to the tower at 36 together with the winches 44 and 47 is advantageous in assembling and disassembling the jib and tower as will be described subsequently.

The jib 35 provides a tram rail 50 of I cross-section which supports a trolley 55 by the wheels 56 of the trolley rolling within the channels formed on the opposite sides of the I cross-section of the rail 50. The trolley 55 carries pulleys 57 and 58 from which a pulley block 60 mounting a pulley 61 and having a lift hook 62 is suspended on a cable 65. The trolley 55 and block 60 are rigged by cable 65 being connected at one end to a bracket 66 fixed on the rear end of jib 35, extending over pulley 58 on trolley 55, around pulley 61 on block 60, over pulley 57 on trolley 55 and thence over a pulley 67 mounted at the front end of jib 35. From pulley 67 cable 65 extends inwardly along the upper surface of jib 35 and around a

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sheave 68 mounted on the top of jib 35. The cable passes upwardly over pulley 69 mounted adjacent the top of tower 12 and thence downwardly to the hoist machinery 70.

The hoist machinery 70 is of generally conventional construction including a cable drum 71 on which the cable 65 is wound. The drum 71 is rotatably mounted on suitable supports 72 and is driven by means of gearing 73 connected through a speed reducer 74 to motor 75. Appropriate brake means (not shown) is, of course, provided on the hoist machinery 70 to facilitate control of the raising and lowering of block 60.

The lift hook 62 on block 60 is shown on FIGURES 1 and 8 engaged with a concrete supply bucket 80 of well known construction. Generally, these buckets for handling concrete are provided with an open top to permit introducing the concrete into the bucket while disposed on the ground or positioned to receive concrete from concrete mixing apparatus and are provided with a bottom opening valve such that the contents of the bucket may be released as desired.

It will be readily appreciated that with the cable 65 reeved as described, operation of the hoist machinery 70 to wind in cable 65 will cause the bucket 80 to be lifted. Thus the bucket 80 with concrete therein may be raised from a point beneath the outer end of jib 35 in the path as shown in phantom on FIGURE 1. Once appropriately elevated the trolley 55 may be shifted along tram rail 50 to the position shown in solid lines on FIGURE 1. During this shifting of trolley 55 if the winding drum 71 is held stationary the cable 65 passes along pulleys 57, 58 and 61 without altering the height of bucket 80.

The shifting movements of trolley 55 are controlled by operation of a cable 85 which is connected at its opposite ends to the end of trolley 55 and is threaded over sheave 86 mounted on the rear end of jib 35 and sheave 87 mounted adjacent the front end of jib 35. Cable 85 is wound around drum 88 which is connected to be driven by a reversible motor 90. When the trolley 55 is to be shifted along tram rail 50, the motor 90 is energized to operate winding drum 88 in the proper direction to take in cable 85 from one end of trolley 55 and play out the cable to the other end of trolley 55.

Reference may be made at this point to the guying employed in supporting lateral deflecting loads which may be imparted to the tower crane in use. This guying performs the important function in the invention herein of absorbing these loads thus voiding their being applied to the building floors through which the tower 12 extends. Should excessive lateral deflecting loads be applied through the tower to the building floors and particularly those floors only recently constructed, serious structural damage to these floors might result.

The rear face of tower 12 adjacent its upper end is provided with a frame 92 which provides a mounting 93 for guys 94 and guying for the distributing boom as described later. Guys 94 extend downwardly and away from each other to be appropriately secured to stationary points on the building or on the ground adjacent the building. Take up means, such as hand winches (not shown), may be provided either on the ground or on the tower crane to tighten guys 94 as necessary and play out guy cable length if needed when the crane is elevated.

Guys 95 extend downwardly and away from each other to be fixed to appropriate points on the ground adjacent the face wall of the building. These guys extend across a pulley 96 mounted on the front end of jib 35 and thence inwardly across a pulley 97 mounted within the tower 12 and then downwardly to a hand winch 98 mounted within the tower adjacent hand winches 44 and 47 which are used to tighten the guying for the jib 35.

Struts 99 (see FIGURE 13) may be provided adjacent the stationary connection ends of guys 94 if desired to raise the guys so that the distributing boom may swing beneath the guys without interference with the guys.

Hoist machinery 70 is carried by the tower 12 by being mounted on a platform 100 which is provided with an opening 101 through which the tower 12 is movable. As shown more clearly in FIGURE 7, guide means in the form of rollers 102 mounted at the corners of opening 101 are provided to facilitate relative movement between the platform and tower. Two sets of such rollers are shown, one set being disposed at the upper surface of platform 100 and the other set being mounted adjacent the base of platform 100. These rollers 102 are positioned to rotatably engage with the corner angle elements of tower 12.

The platform 100 is also provided with a frame 105 which extends downwardly from the base of the platform beneath the opening 101. This frame 105 may be formed with suitable angle members to enclose the corner angles of the tower 12 and insure effective guiding and positioning of platform 100 in shaft opening S during the tower elevating operation, at which time the platform 100 is resting on the upper completed floor such as shown in FIGURE 6.

When raised to its working position as shown in FIGURES 1 and 8, the platform 100 is appropriately secured to tower 12 to be retained at such working position during operations of the tower crane in conjunction with building construction. Any suitable means may be provided to retain the platform in this working position on the tower 12. Beam members 106 are illustrated as one suitable retaining means, these members being extended across the tower beneath the platform 100. The beam members rest on structural elements of the tower and transmit the weight of the platform to the tower. Appropriate clamps, bolts, or other retaining means may be employed to perform this function of affixing the platform 100 to tower 12 in its working position.

The platform 100 carrying hoist machinery 70 may be formed of a size to provide a work station for the tower crane operator. In this connection, appropriate controls for effecting the various operations of the tower crane may be conveniently grouped to be accessible to the operator on platform 100 and, if desired, an operator's cab may be provided on this platform to enclose the controls and form the center of operation from which the crane is controlled. Remote, portable controls may of course be provided for improved visibility to the ground.

To augment the functional capabilities of the tower crane and cooperate with the other components of such crane as described herein, auxiliary derricking booms may be provided mounted on the platform 100.

These booms may be most effectively used to hoist from the ground level and deposit at the floor level being worked upon various building materials such as reinforcing steel rods, materials for the concrete forms, etc., necessary in conjunction with construction of the poured concrete floors by use of the concrete hoisted in bucket 80.

As illustrated more clearly in FIGURES 1, 8 and 9, a pair of auxiliary booms 110 are provided, mounted on platform 100 by means of auxiliary boom platform extensions 111 projecting outwardly from the opposite sides of the main platform 100. Each boom 110 is pivotally mounted on a column 112 to be swingable in a vertical plane with the column mounted on platform extension 111 to be rotatable about a vertical axis. The auxiliary boom platform extension 111 is also shown provided with a motor 113 which is appropriately connected to effect rotation of column 112 for swinging the auxiliary boom 110.

A material lifting cable 114 is provided on the auxiliary boom with a lift hook 115 connected to the cable which cable is wound onto a power winch 116 mounted on platform extension 111. A boom luffing winch 117 is mounted on platform 100 to take in the luffing cable 118 which passes over a pulley 119 carried on a support 120

mounted on tower 12. The end of luffing cable 118 is appropriately connected to the outer end of boom 110 to raise and lower the boom in a vertical plane if desired.

The platform 100 also mounts a distributing boom 125 which functions in cooperation with the trolley hoist jib 35 to distribute the concrete as hoisted from the ground level by means of the bucket 80. The construction of distributing boom 125 and its mounting on platform 100 are best shown in FIGURES 1 and 2. Thus, the boom is connected at its inner end to rotating support 126 so as to be swingable in a generally horizontal plane relative to the vertical rotation axis of support 126. The support 126, to which the boom 125 is connected, is shown provided with gear teeth 127 which are engaged by a pinion 128. Pinion 128 is driven through a worm gear speed reducer 129 by a reversible motor 130.

Thus depending upon the direction of rotation of motor 130 the pinion 128 will effect rotation of support 126 to swing the distributing boom 125 connected thereto. By appropriate energization of motor 130 the distributing boom 125 may be swung to extend in the desired radial direction from the tower incidental to distribution of the concrete to particular points spaced radially and circumferentially of the tower.

In the structure as illustrated, the inner end of boom 125 has a hopper 135 mounted thereon with the axis of the hopper generally aligned with the vertical rotation axis of support 126. This hopper is thus positioned to receive and retain a supply of concrete as discharged thereinto from the bucket 80 which is hoisted and shifted on trolley 55. It will be understood that the hopper 135 may be directly mounted on platform 100 if desired as long as the discharge outlet from the hopper is disposed such that concrete may pass onto the distributing boom and be conveyed to the desired point for pouring.

In the embodiment illustrated in FIGURES 1 and 2, the distributing boom 125 includes telescoping inner and outer conveyor sections 136 and 137, respectively. The inner section 136 is provided with a belt conveyor 138 extending therealong and suitably driven by a motor 139. The outer section 137 is provided with a belt conveyor 140 extending therealong and driven by a reversible motor 141. With conveyors 138 and 140 operating, concrete discharged from hopper 135 passes onto belt conveyor 138 and is conveyed outwardly along the inner boom section 136 to be discharged onto the conveying surface of belt conveyor 140 on section 137.

The outer boom section 137 is provided at its ends with chutes 142 and 143. Each of these chutes is rotatably mounted on a bracket 144 and suspended from a jib 145 by tackle 146 to be adjustable as desired in swinging, raising and lowering of the respective chutes to feed the concrete to the desired precise point on the building floor to be poured. The chute 142 is mounted to receive concrete discharged from the outer end of conveyor 140 on section 137 while chute 143 is mounted to receive concrete passing from the inner end of conveyor 140.

It will be recognized that depending upon the direction of rotation of motor 141 the belt conveyor 140 will be driven in one direction or the other and accordingly the concrete will be discharged from one or the other ends of conveyor 140 into either chute 142 or chute 143. The reversibility of motor 141 thus adds flexibility to the functioning of distributing boom 125 in that points beneath the inner boom section 136 may be poured with concrete through chute 143 or when desired points disposed adjacent the outer end of section 137 may be poured using chute 142.

The sections 136 and 137 of the distributing boom as fully shown in FIGURE 2 are telescopically interconnected such that the length of the boom may be adjusted in accordance with the radial distance to which the concrete is to be conveyed for pouring. The telescoping interconnection is illustrated in section on FIGURE 5 in addition to the showing on FIGURE 2.

The inner boom section 136 is provided with parallel outwardly facing channels 150 which extend along the lower outside edges of the section. A trolley 151 provided with wheels 152 is provided at each side of section 136 with the wheels rollingly engaged with one channel 150. These trolleys are connected to struts 153 by means of pins 154. The struts 153 extend upwardly on opposite sides of the boom section 136 to support the guying for outer section 137 as will be described hereinafter with the lower ends of the struts being secured to the sides of the outer boom section 137.

In addition to the trolleys 151, members 155 are fixed to the sides of section 137 outwardly of struts 153 and extending upwardly on the outsides of channels 150 on section 136. Each member 155 rotatably mounts at its upper end, a roller 156 which engages with the web of the adjacent channel 150. Thus, the rollers 156 on opposite sides of the boom sections assist in maintaining these sections in longitudinal alignment.

It may be noted that in connection with the description hereinabove, the sectional view shown in FIGURE 5 illustrates on its left side the relation of roller 156 as it cooperates with the adjacent channel 150, showing that this roller is positioned outwardly of the trolley carrying wheels 152. The right side of FIGURE 5 shows in section, with the roller 156 and its mounting member 155 cut away, the connection of one trolley 151 with its strut 153.

In order to avoid any interference with the working area or areas of recently poured concrete beneath the distributing boom, the boom is suspended from tower 12 with no supports extending down to the building floor being constructed. The frame 92 on tower 12 swingably mounts a sheave 160 supporting a guy 161 which extends outwardly and downwardly and is connected with boom section 136. The swing axis of sheave 160 is vertically aligned with the rotation axis of support 126 such that as the boom 125 swings, the guy 161 will maintain the boom section 136 horizontal.

One end of guy 161 is connected to a bail member 162 which bridges the belt conveyor 138 and is connected to the framework of boom section 136 at 163. The other end of guy 161, after passing over sheave 160, is wound onto a hand winch 164. Thus, the tension on guy 161 may be appropriately adjusted by means of winch 164.

The outer section 137 of the distributing boom is suspended by guys 165 that extend from the opposite sides of the outermost end of section 137 to the upper end of the respective struts 153. Additional guys 166 extend from the opposite sides of the section at points intermediate the length of section 137 to the upper ends of the respective struts 153.

The inner end of section 136 is provided with stanchions 168 extending upwardly from each side of the boom section with a pulley 169 rotatably mounted at the upper end of each stanchion. A cable 170 on each side of the boom section 136 extends from strut 153 over pulley 169 and downwardly to a take-up drum 171. As shown more clearly in the diagrammatic view of FIGURE 3, the take-up drums 171 on opposite sides of the boom section 136 are connected to be simultaneously driven by a motor 172 through a speed reducer 173.

To drive the outer section 137 inwardly and outwardly in telescoping the distributing boom 125, a cable 175 is provided at each side of the boom section 136. The cable on each side has one end connected to the trolley 151 and extends outwardly over a pulley 176 rotatably mounted on the outer end of section 136 and thence back to a winding drum 177 where the cable passes around the drum and back to the same trolley 151.

Rotation of the winding drums 177 will cause the cables 175 on the opposite sides of the conveyor section 136 to move the trolleys 151 in or out along the channels 150 of section 136 depending upon the direction of rotation of drums 177. Trolleys 151 being connected to the struts

153 on boom section 137 by means of pins 134 will thus extend or retract the boom section 137. The winding drums 177 are appropriately coupled to be driven together with the drums 171, such coupling being illustrated in the form of chain drive 178, drivingly interconnecting the pairs of drums on the opposite sides of the distributing boom.

With the intercoupling of the winding drums to be simultaneously driven by energization of motor 172, it will be appreciated that as the drums 177 turn, drawing in on the ends of cables 175 that are directly connected to the trolleys 151, the boom section 137 will be drawn in to shorten the overall length of boom 125. At the same time, the drums 171 will take up on cables 170 to continuously maintain tension on these cables which support the struts 153 and guys 165 and 166 connected to the struts. It follows that upon reverse driving of motor 172, the turning of drums 177 will pull on cables 175 around pulleys 176 to extend the boom section 137 while, at the same time, the drums 171 will play out cables 170 in accordance with the rate of extension of section 137. In this manner, the outer section 137 will be maintained horizontal as the boom length is shortened or extended.

It will be appreciated that the distributing boom may take a number of different forms. As described above in connection with the form of distributing boom shown in FIGURES 1 and 2, the boom has a pair of telescoping sections. If desired, the boom might be constructed with more than two telescoping sections. As important to the ability of the tower crane of the instant invention to distribute concrete at substantial radial distances from the crane tower, the use of a conveyor which distributes the weight of the concrete material along its length is important. Thus, the distributing boom does not involve high load concentrations as are encountered where a quantity of material is transported as a unit load to the outer end of a boom for pouring.

In some instances, the telescoping of a boom such as described hereinabove may be inconvenient or not desired at a particular time in the pouring of a floor under construction. Also particularly in smaller buildings, it may be unnecessary to provide the length available with a telescoping type conveyor. In such situation, the outer conveyor section 137 may be dispensed with and a single section such as 136 used alone. In connection with its use, a chute such as 142 or 153 will be rotatably mounted beneath the outer end of conveyor 138 to assist in guiding and distributing the concrete from the end of the distributing boom.

With such a single length distributing boom, areas inwardly of the end of the boom present a problem for pouring concrete. To remove the concrete and pour it at areas between the tower and the end of the single length conveyor distributing boom, a removable discharge plow 180 may be employed appropriately mounted in association with the belt conveyor 138 as shown on FIGURES 2 and 4.

The plow 180 is mounted on the structure of boom section 136 by means of rollers 181 engaged with channels disposed along the sides of the belt conveyor 138 beneath the belt supporting rollers. The plow 180 includes a diverter plate 182 extending diagonally across the top of the conveyor belt and mounted as by means of pin 183 on the frame of the plow which is supported on rollers 181. A chute 184 receives the material which is diverted from the upper surface of belt 138 by plate 182 and guides it to the desired point of discharge beneath the distributing boom.

In operation, the plow raises the conveyor belt to pass immediately beneath the diverter plate 182. Thence, as the belt moves outwardly, the material will be carried against the diverter plate and diverted to chute 184. The plow 180 may be moved along the length of boom section 136 to be positioned at the desired point below which the concrete floor is to be poured. This approach thus

provides a convenient method for discharging concrete to areas being poured that are between the tower 12 and the outer end of the section 136 particularly where an outer section 137 with a reversible belt conveyor thereon is not provided in the assembly. This plow might also be useful in combination with the telescoping distributing boom 125 on buildings where some obstruction limits extending the outer conveyor section 137.

A further modified form of distributing boom which may be employed in place of the telescoping boom described hereinabove is illustrated on FIGURES 11 and 12 in the form of an articulated distributing boom. Such an articulated type distributing boom has particular advantages by achieving maximum flexibility for the tower crane in effecting distribution of concrete to all points surrounding the location of the crane tower. FIGURE 13 illustrates the manner in which an articulated distributing boom may be employed to distribute concrete not only to areas remote from the crane tower but also to areas disposed between the tower and the face wall of the building, across which the concrete is hoisted on jib 35.

The articulated distributing boom as shown on FIGURE 11 embodies an inner conveyor section 190 which is to be mounted in place of boom 125 on the rotatable support 126 carried by the platform 100. Section 190 has a belt conveyor 191 which functions in the same manner as belt conveyor 138 in carrying the concrete outwardly to the end of the conveyor section. Appropriate guys 192 extend from the outer end of section 190 upwardly to the frame 92 on tower 12 to support the conveyor section similar to the manner in which boom 136 is supported as described hereinabove.

A second conveyor section 195 is pivotally connected to the outer end of section 190. Section 195 has a belt conveyor 196 which conveys the concrete as received from the end of the belt conveyor 191 outwardly to the end of section 195. A chute 197 similar to the chutes 142 and 143 is rotatably mounted beneath the end of section 195 to enable accurate placement of the concrete in the pouring operation.

The pivotal connection between the ends of sections 190 and 195 permits the distributing boom to be articulated such as to the position shown in FIGURE 11 where the two boom sections extend at substantially right angles to each other. Several other positions of articulation that the two boom sections may assume are illustrated in the plan view of FIGURE 13.

To control articulating movements of the section 195 relative to section 190, a frame 198 is provided on section 195. This frame bridges the belt conveyor 196 and has an operating rod 199 pivotally connected thereto. The opposite end of rod 199 is connected to a block 200 slidably guided in a track 201 extending along the side of boom section 190. The sliding movements of block 200 in track 201 may be suitably controlled by means of a cable, rack or chain (not shown) connected to the block and operable longitudinally of boom section 190 to move the block 200 in or out along the section depending upon the direction of movement of the cable, rack or chain.

It will be appreciated that movements of block 200 in an outward direction relative to boom section 190 will, through rod 199, cause boom section 195 to swing toward a straight line relation to boom section 190. A second block 200 and track 201 with the block connected to an operating cable, rack or chain will preferably be provided on the other side of boom section 190 so that should it be desired to swing the boom section 195 to the opposite side of boom section 190, the rod 199 may be disconnected from one operating block 200 and connected to the operating block 200 on the opposite side of section 190.

As an important feature of the instant invention, the outer section 195 of the articulated distributing boom is

guy suspended with means being provided to insure that the suspending guying for the outer section is adjusted in length to maintain section 195 horizontal irrespective of its position of articulation relative to the inner section.

Thus a guy 210 is connected to bracket 198 and extends upwardly across a pulley 211 which may be suitably mounted on section 190 or on tower 12 and thence downwardly to a power driven winding drum 212. As shown in FIGURE 12, the boom section 190 and boom section 195 are at right angles to each other. A limit switch 215 is mounted between the pivotal connection of sections 190 and 195 at the inner end of section 195. A second limit switch 216 is mounted on the opposite side of the pivotal connection with the two switches being disposed generally on the longitudinal axis of boom section 195. The winding drum 212 is driven by a suitable reversible electric motor 217 with limit switch 215 being connected in the control circuit for such motor to operate the motor in one direction when it is actuated and switch 216 connected in the motor control circuit to operate the motor in the opposite direction when switch 216 is actuated.

When block 200 on boom section 190 moves outwardly tending to extend the length of the boom by swinging section 195 toward a straight-line relation to section 190, the boom section 195 will tend to rise at its outer end if guy 210 remains of a fixed length. This action affects the pivotal connection between the boom section resulting in actuating switch 216. Thereupon motor 217 will be started to unwind cable 210 from drum 212 thereby lowering the outer end of section 195 until switch 216 is actuated in a direction to de-energize the motor.

In a similar respect when the articulated boom is operated to swing the section 195 to an acute angle with section 190, the length of guy 210, while remaining unchanged will permit the outer end of section 195 to drop causing the pivotal connection between the boom sections to change its relation and actuate switch 215. Actuating of this switch will energize motor 217 in a direction to turn drum 212 and take up on guy 210 thereby raising the end of section 195 and reversing actuation of switch 215 so that the boom section 195 remains level.

Referring to FIGURE 10, a modified trolley hoist jib for the tower is illustrated. In this figure, portions of the tower crane are shown diagrammatically where they essentially correspond in construction to the structure described hereinabove with respect to the embodiment of FIGURES 1 through 9. Thus the platform 100 mounting the hoist machinery and swingably supporting the distributing boom 125 and also carrying the hopper 135 correspond to the structures hereinabove described and these details are not repeated on FIGURE 10.

The FIGURE 10 embodiment employs a tower 225, the lower portion of which can be constructed along the lines of tower 12 for purposes of mounting and elevating the tower and to slidably cooperate with the platform 100. The upper portion of tower 225 mounts two parallel trolley hoist jibs 226 and 227. These jibs extend outwardly from the front of the tower and pass across the sides of the tower with the rear ends thereof overlying the hopper 135.

Each of the jibs 226 and 227 provides a tram rail extending therealong with a trolley 228 engaged with the rail of jib 226 and a trolley 229 engaged with the rail on jib 227. Trolley 228 suspends a lift hook 230 and trolley 229 suspends a lift hook 231. The reeving of the cables with the trolleys 228 and 229 to suspend the respective lift hooks 230 and 231 may be similar to the cable reeving described hereinabove with reference to trolley 55 and lift hook 62. The hoisting cables will also be suitably guided by pulleys appropriately mounted on the tower to the hoist machinery on platform 100. Drive means to shift the respective trolleys 228 and 229 along the jibs 226 and 227 will also be provide.

The details of construction of these features are not shown since their characteristics will be well understood by reference to the approaches described in connection with operation of the hoist means on trolley hoist jib 35.

Each of the lift hooks 230 and 231 may be connected with a concrete hoisting bucket 235. The buckets 235 may be of smaller capacity than the bucket 80 mentioned hereinabove since with two smaller buckets a volume of concrete corresponding to that handled by the single bucket 80 may be supplied to hopper 135.

The provision of parallel trolley hoist jibs providing two independent hoisting means has certain advantages over a singular trolley hoist jib construction. First, a lower load concentration at the outer ends of the jibs is possible while supplying an adequate volume of concrete to hopper 135 by using two smaller buckets. Further, bending movements applied to the tower 225 may be minimized by so operating the trolley 228 and 229 that the one is hoisting a filled concrete bucket 235 on its outer end while the other trolley is at the opposite end of its jib, discharging concrete from the bucket 235 carried thereby into hopper 135. This relationship of the trolleys is shown on FIGURE 10.

The parallel jibs 226 and 227 are appropriately guyed to the tower 225 by guys 240 and 241. It will be readily recognized that as in the case of jib 35 and its guying to tower 12 the guys 240 and 241 will preferably be provided with take-up winch means to facilitate tensioning the guys and also to make for easier disassembly of the jibs from the tower. In addition to guys 94 for the tower 225 which are comparable to the tower guys described hereinbefore, the jibs 226 and 227 may be provided with guys 242 extending outwardly and downwardly from the outer ends of these jibs. These guys 242 may also best be provided with suitable take-up means either at their point of stationary connection or mounted on the tower crane.

The procedures for assembling the tower crane at the building site may be readily followed by reference to the description of structure as set forth hereinabove. In such assembly operation, the lower portions of the tower 12 will be initially mounted on a suitable base or foundation assuming that at the outset no floors of the building have been constructed. The platform 100 will be mounted around the tower and the upper portion of the tower completed by appropriately bolting the sections together. At this point, the platform 100 will be resting near the base of the tower with the hoist machinery 70 available to take part in further assembly of the components of the crane.

The jib 35 may then be assembled and moved into position and the reeving for the trolley 55 and lift hook 62 completed including initial winding of cable 65 onto winding drum 71. The guys 40 and guy cables 42 and 45 will be connected with these cables wound onto the hand take-up winches 44 and 47, respectively. Thereafter, by appropriate manipulation of winches 44 and 47, the jib 35 may be raised within portal opening 30 and pin 36 inserted to connect the guy to the tower 12 whereupon the jib guying will be tensioned to stabilize it in its horizontal position on the tower. The tower guying 94 and 95 may now be appropriately tensioned to securely stabilize the tower in a vertical position replacing any temporary guying or other support which may have been employed to initially hold the tower in a vertical position.

With the components assembled to this extent, the drive for effecting shifting of the trolley and the cable therefor may be hooked up. Thereafter, the lifting hook 62 can be employed as needed to hoist and put in place other components of the crane and particularly the components of the distributing boom which are swingably mounted from the platform 100. The lift hook 62 may also assist in the hoisting and placing of the auxiliary booms 110 and their related hoist winches.

As an alternative to the assembly approach described hereinabove one of the auxiliary booms 110 and its associated hoist winches may be mounted on platform 100 and this boom employed in placing the main hoist machinery 70 on the platform 100 whereupon further hoisting operations may be powered through the hoist machinery 70.

Reference may now be had to the operation of the tower crane in use. With the crane assembled, the platform 100 must be elevated to dispose the distributing boom at an appropriate working elevation above the floor to be poured. Elevation of the platform can be accomplished by engaging lifting hook 62 of the trolley hoist jib 35 with the platform 100 and then operating hoist machinery 70 to raise the platform and distributing boom 125 mounted on the platform. It will be appreciated that engagement of hook 62 to effect this lifting can be by means of an appropriate lifting eye (not shown) on the platform or particularly where hopper 135 is mounted directly on the platform, the hook 62 may be engaged with a part of the hopper 135.

Once elevated to the desired height, the platform 100 will be secured to the tower 12 as by means of placing the beam members 106 beneath the platform resting on structural elements of tower 12. Thereafter, the lift hook 62 may be disengaged from the platform placing the equipment in condition for hoisting and distributing concrete in pouring the floor of the building being constructed.

In employing the apparatus to handle the concrete in pouring each floor of the building, the concrete bucket 80 is lowered from trolley hoist jib 35 across the face wall of the building and charged with concrete from suitable mixing apparatus (not shown). Hoist machinery 70 is then operated to raise bucket 80 and once sufficiently elevated, rotation of winding drum 88 is started to shift trolley 55 and carry bucket 80 through the portal opening 30 of tower 12 and dispose it above hopper 35. Then the discharge valve of bucket 80 is opened to dump the bucket contents into hopper 135.

This operation of the trolley hoist and bucket 80 may be automatically controlled in accordance with an operating cycle wherein the hoisting of bucket 80 is stopped at an upper limit of travel, the shifting of trolley 55 is initiated shortly before bucket 80 has reached this upper limit, the trolley shifting is stopped with the bucket 80 over hopper 135 and thereupon the discharge valve of the bucket automatically opened to dump its contents into hopper 135. The cycle control of these operating steps may be effected by use of limit switches appropriately positioned on the tower crane as would be well recognized would cause the the starting and stopping of the winding drums, etc. to achieve this desired cycle.

With the hopper 135 supplied with concrete by the operations of hoisting and shifting bucket 80, the distributing boom 125 may come into operation to carry the concrete outwardly from the tower for distribution at desired points spaced radially and circumferentially of the tower in conjunction with pouring a building floor. The motors 139 and 141 will drive the conveyors 138 and 140 to carry the concrete from hopper 135 to the particular chute 142 or 143 to be fed. In manipulating distributing boom 125, motor 130 may be energized to swing the boom 125 horizontally to the appropriate radial direction and motor 172 operated to extend or retract the length of the boom with either chute 142 or 143 employed to accordingly guide and discharge the concrete at the precise location desired during pouring.

Where the articulated distributing boom is used in place of the telescoping type boom, the swinging of the boom as a whole will be obtained by energizing motor 130 while changing the articulated relation between the boom sections will be achieved by driving actuating block 200 out or in along track 201 to pivot the sections relative to each other through rod 199. In using the removable plow 180, it will be obvious from the prior description that it may be

placed as desired along the length of the conveyor sections to divert the concrete or be removed entirely if not needed.

After the completion of distributing the concrete to the various points in forming a poured concrete floor of the building, elevation of the tower may be necessary incidental to pouring the next floor of the building. Of course, an appropriate drying time for the setting up of each building floor must be allowed and thereafter proper concrete forms constructed to be used in pouring the floor thereabove.

In elevating the tower, the platform 100 is first released from its connection with tower 12 and lowered onto the surface of the completed floor below it. This operation thereby relieves a substantial portion of the weight of the tower crane from having to be elevated along with the tower 12, since the total weight of the hoist machinery, auxiliary booms, distributing boom 125 and hopper 135 will be resting on the completed building floor while only the weight of the tower 12 and trolley hoist jib 35 are elevated.

Beams 20 are positioned on a floor above the lower end of the tower 12 and the cable 21 connected to these beams and to pulley block 23. The lift hook 62, with the trolley 55 positioned directly above the vertical passageway through the tower 12 is lowered and engaged with connector 27 on the end of cable 25 in the manner as shown in FIGURE 6. Operation of the hoist machinery 70 is then effective through cable 25 and the tackle connected therewith to raise the tower 12 while platform 100 remains stationary. During this elevating of the tower the guys 94 and 95 are disconnected, slacked off or payed out. Once the tower 12 has been elevated one or more floors by this operation, the beams 15 which were removed as the lifting operation started, are replaced extending across the tower at the new elevated position and reconnected by pins 17 to support the tower at its new elevated position.

Hook 62 is then disengaged from connector 27 and reconnected with the platform 100 to raise the platform on the now elevated tower 12 to position it and the distributing boom 125 carried thereby in working position for pouring the next floor. Once appropriately raised, the members 106 or other retaining means will be applied to retain the platform at its elevated position on tower 12.

In disassembly of the tower crane after completion of the building, the main hoist machinery 70 again is called into service. Initially, the lift hook 62 controlled through machinery 70 may be employed to lift off the distributing boom 125 and transport the parts thereof to a point beyond the face wall of the building where it may be lowered to the ground. Also any other components may be lowered by use of the trolley jib mounted lift hook 62. It can be desirable to retain one or both of the auxiliary booms 110 for use in final disassembly and lowering of the tower crane components.

When the trolley jib 35 has completed its function, the pin 36 is removed and the jib 35 swung inwardly and lowered on guy cables 42 and 45. The relation of these cables will permit swinging of the jib back onto the building where it may be easily disassembled and the parts thereof separately lowered to the ground as by use of the auxiliary boom 110. With the platform 100 resting on the surface of the last completed floor of the building, the sections of the tower 12 may be disassembled and removed to be lowered to the ground including those sections which in normal operation of the crane extend down through and below platform 100. Thereafter, the remaining portions of the crane may be disassembled to the extent appropriate and these parts lowered to the ground level.

It is to be understood that the forms and embodiments of this invention herewith shown and described are to be taken as preferred examples of the same and that various changes in shape, size and arrangement of the parts

may be resorted to without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. In a tower crane for hoisting and distributing building materials such as concrete in conjunction with the construction of a building or other structure, the combination of a tower provided with means adjacent the lower end thereof for supporting it within a vertical open shaft of the structure being constructed, elevating means associated with the lower end of said tower for raising said tower within the shaft as construction progresses, a generally horizontal hoist jib mounted on said tower and extending laterally primarily from one side of the front of said tower to overlie an area beyond a face wall of the structure, said jib providing a tram rail extending therealong, a trolley engaged with said rail to be shiftable along the jib and having hoist means associated therewith for hoisting building materials from the area beyond the face wall of the structure, a material receiving hopper carried by said tower on generally the opposite side of said tower from the primary lateral extent of said jib and at a level below said jib to receive material elevated by said hoist means and shifted on said rail to discharge into said hopper, a distributing boom carried on the said opposite side of said tower and mounted to be swingable in a generally horizontal plane, said distributing boom including a conveyor having one end disposed to receive material discharged from said hopper and extending outwardly from the tower along said distributing boom to carry the material outwardly from the tower for distribution at desired points spaced radially and circumferentially of the tower in conjunction with constructing the structure.

2. In a tower crane, the combination as recited in claim 1 wherein said support means includes beam members resting on the supporting surface and said tower is pivotally connected to said beam members to preclude concentrating loads adjacent one end of said beam members in the event of lateral swaying of said tower.

3. In a tower crane, the combination as recited in claim 1 wherein said hoist jib is connected by a pin to said tower, guys are connected between said jib and said tower above said jib to maintain said jib in a generally horizontal position, means associated with said guys for tightening said guys and for loosening the guys to lower the jib when said pin is removed in disassembly of the crane, and stabilizing means are provided for said tower including guy cables extending radially outwardly and downwardly from the upper portion of said tower, said guy cables being connectible to stationary points spaced from the vertical axis of said tower, each of said guy cables having means associated therewith to tension said cables for stabilizing said tower and to play-out cable length in conjunction with elevation of said tower.

4. In a tower crane, the combination as recited in claim 1 wherein said distributing boom is elongatable including telescopically interconnected sections with each section having a conveyor thereon, the inner end of the inner section of said boom being disposed to receive material discharged from said hopper, and said sections having the conveyors thereon disposed to transfer material from one section to the next outer section.

5. In a tower crane, the combination as recited in claim 1 wherein there are a pair of hoist jibs mounted on said tower, each jib providing a tram rail extending therealong, a trolley engaged with the rail on each jib to be shiftable along the jib and having hoist means associated therewith, and said hopper is positioned to receive material elevated by the two hoist means and shifted on the rails on said jibs to discharge into said hopper.

6. In a tower crane, the combination as recited in claim 1 wherein said conveyor has a belt and a discharge plow is disposed intermediate the ends of said conveyor for diverting material from said belt, said plow being positionable at selected positions along the length of said conveyor and having a material directing chute for guiding the

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material diverted from the belt to the desired point in conjunction with constructing the structure.

7. In a tower crane, the combination as recited in claim 1 wherein said boom includes pivotally interconnected conveyor sections with the inner end of the inner section disposed to receive material discharged from said hopper, a material directing chute swingably mounted beneath the discharge end of the outermost conveyor section and said section having the conveyors thereon disposed to transfer material from one section to the next outer section for distribution at desired points spaced radially and circumferentially of the tower in conjunction with constructing the structure.

8. In a tower crane, the combination as recited in claim 3 wherein said stabilizing means includes guy cables extending from the outer extended end of said jib and guy cables extending from said tower outwardly and downwardly in planes diverging from the axis of said jib.

9. In a tower crane, the combination as recited in claim 4 wherein the outermost section of said boom has the conveyor thereon reversibly driven, and said outermost section has a swingably mounted material directing chute disposed beneath each discharge end of the conveyor thereon.

10. In a tower crane, the combination as recited in claim 4 wherein there are a pair of telescopically interconnected sections with the conveyor on the outer section being reversibly driven, and said outer section has a swingably mounted material directing chute mountable beneath either discharge end of the conveyor thereon.

11. In a tower crane, the combination as recited in claim 7 wherein means are provided between said conveyor sections for controlling articulation of said boom including an actuating rod connected to one section and connected with operating means slidable longitudinally of the adjacent section whereby movements of said operating means will cause swinging of said one section relative to said adjacent section to different articulated positions as desired.

12. In a tower crane, the combination as recited in claim 7 wherein means are provided for controlling articulation of said boom and suspension means for one conveyor section relative to another including a suspending cable connected to support said one conveyor section and connected to reversibly driven drum means, and switch means mounted relative to the pivotal connection between the conveyor sections, said switch means being connected to control said reversibly driven drum means to take-up on said cable upon lowering of the outer end of said one conveyor section below a predetermined level and play-out on said cable upon raising of said outer end above a predetermined level.

13. In a tower crane for hoisting and distributing building materials such as concrete in conjunction with the construction of a building or other structure, the combination of a tower provided with means adjacent the lower end thereof for supporting it within a vertical open shaft of the structure being constructed, elevating means associated with the lower end of said tower for raising said tower within the shaft as construction progresses, a material hoisting jib carried by said tower and extending generally horizontally laterally from said tower, hoisting means on said jib including a cable and load engaging means for hoisting building materials from a point below said jib, a platform provided with an opening having guide means slidably receiving said tower, means for releasibly retaining said platform at a selected position relative to the length of said tower, hoist machinery mounted on said platform and including a cable drum for winding said cable of said hoisting means, said load engaging means being alternatively connectible to hoist building material from a point below said jib and to operate said elevating means for raising said tower within the building shaft, a material receiving hopper supported from said platform below said jib to receive building

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material hoisted by said hoisting means, a distributing boom mounted on said platform to be swingable in a generally horizontal plane, said distributing boom including a conveyor having one end disposed to receive material discharged from said hopper and extending from the tower along said distributing boom to carry the material outwardly from the tower for distribution at desired points spaced radially and circumferentially of the tower in conjunction with constructing the structure.

14. In a tower crane for hoisting and distributing building materials such as concrete in conjunction with the construction of a building or other structure the combination of a tower provided with means adjacent the lower end thereof for supporting it within a vertical open shaft of the structure being constructed, elevating means associated with the lower end of said tower for raising said tower within the shaft as construction progresses, a generally horizontal hoist jib carried by said tower and extending generally horizontally laterally from said tower, said jib providing a tram rail extending therealong, a trolley engaged with said rail to be shiftable along the jib and having a hoist cable suspending load engaging means from said trolley for hoisting building materials from a point beneath said jib, a platform provided with an opening having guide means slidably receiving said tower, means for releasibly retaining said platform at a selected position relative to the length of said tower, hoist machinery mounted on said platform and including a cable drum for winding in said cable to raise said load engaging means, said load engaging means being alternatively connectible to hoist building material from a point below said jib and to operate said elevating means for raising said tower within the building shaft, a material receiving hopper supported from said platform below said jib to receive building material hoisted by said load engaging means, a distributing boom mounted on said platform to be swingable in a generally horizontal plane, said distributing boom including a conveyor having one end disposed to receive material discharged from said hopper and extending outwardly from the tower along said distributing boom to carry the material outwardly from the tower for distribution at desired points spaced radially and circumferentially of the tower in conjunction with constructing the structure.

15. In a tower crane for hoisting and distributing building materials such as concrete in conjunction with the construction of a building or other structure, the combination of a skeleton tower defining an essentially open passageway longitudinally therethrough, means adjacent the lower end of said tower for supporting it within a vertical open shaft of the structure being constructed, elevating means engageable between the tower and previously constructed portions of the structure for raising said tower within the shaft as construction progresses, a portal opening in the upper portion of said tower, a hoist jib mounted on said tower to extend horizontally through said portal opening and laterally from said tower, said jib providing a tram rail extending therealong and across said passageway, a trolley engaged with said rail to be shiftable along the jib, a hoist cable suspending load engaging means from said trolley, said load engaging means being alternatively connectible to hoist building materials from a point below said jib and to operate said elevating means for raising said tower within the building shaft, said passageway beneath said jib rail permitting lowering of building materials through said tower to effect closing of the open shaft beneath the elevated position of said tower, a material receiving hopper carried by said tower disposed to one side of said open passageway and at a level below said jib to receive material elevated by said hoist means and shifted on said rail to discharge into said hopper, a distributing boom carried by said tower and mounted to be swingable in a generally horizontal plane, said distributing boom including a conveyor having one end disposed to receive material discharged from

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said hopper and extending outwardly from the tower along said distributing boom to carry the material from the tower for distribution at desired points spaced radially and circumferentially of the tower in conjunction with constructing the structure.

16. In a tower crane, the combination as recited in claim 15 wherein said elevating means includes pulley means mounted adjacent the lower end of said tower, cable means engaged with said pulley means and having means at the ends thereof for engagement with a portion of the structure above the lower end of said tower, pulley block means engaged with said cable means within said tower passageway, and block and tackle connected between said pulley block means and said tower, said load engaging

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means being connectible to the cable of said block and tackle to effect elevation of said tower through tension on said hoist cable of said trolley.

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