H. SAWYER.

FREIGHT HANDLING CRANE STRUCTURE.

APPLICATION FILED MAY 19, 1913.

1,111,099.

Patented Sept. 22, 1914.

3 SHEETS—SHEET 1.

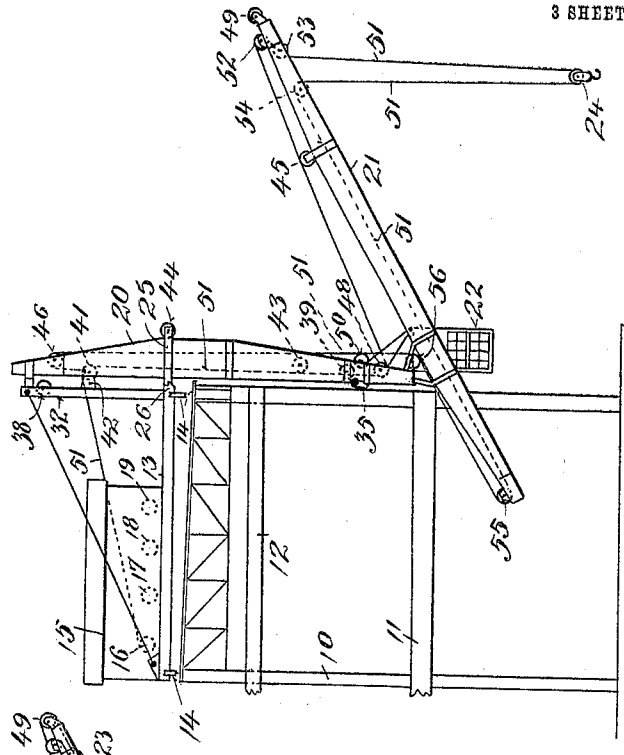


Fig. 2.

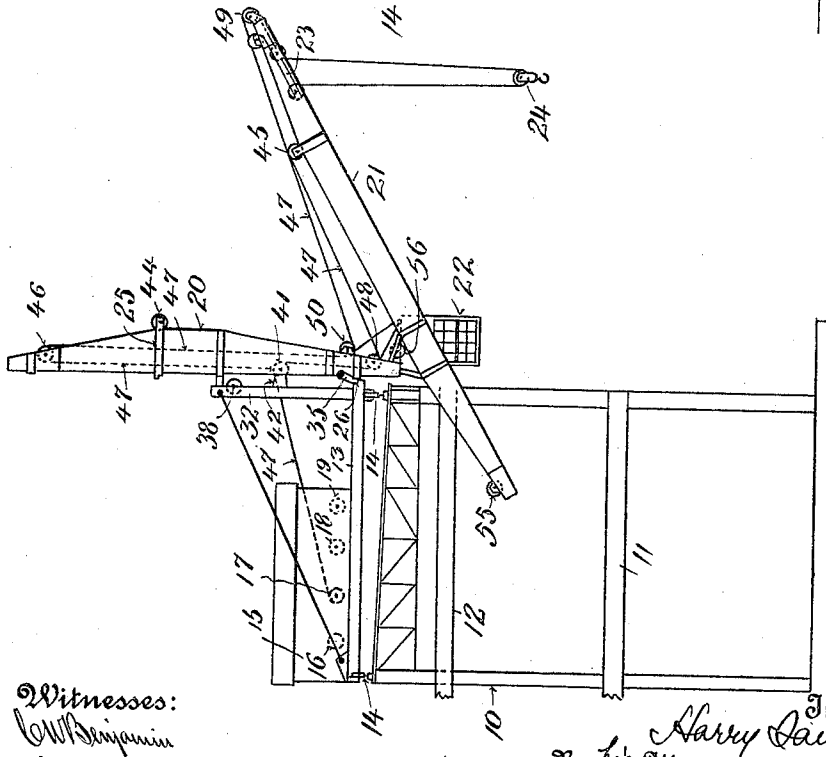


Fig. 1.

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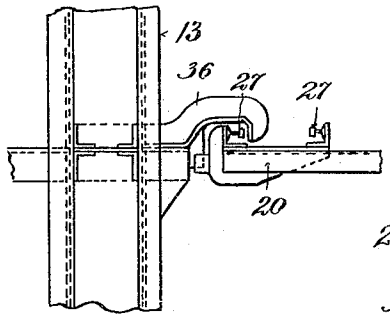


Fig. 7

Fig. 3

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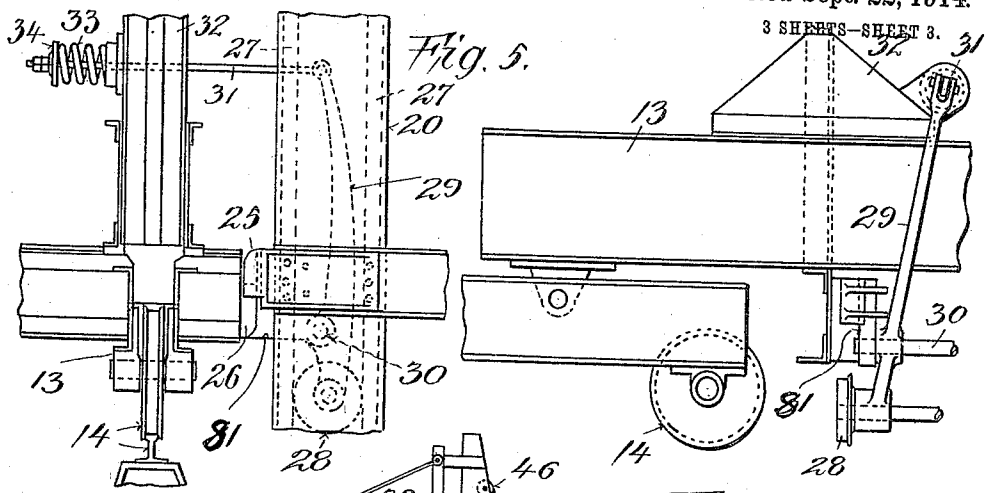


Fig. 5.

Fig. 6

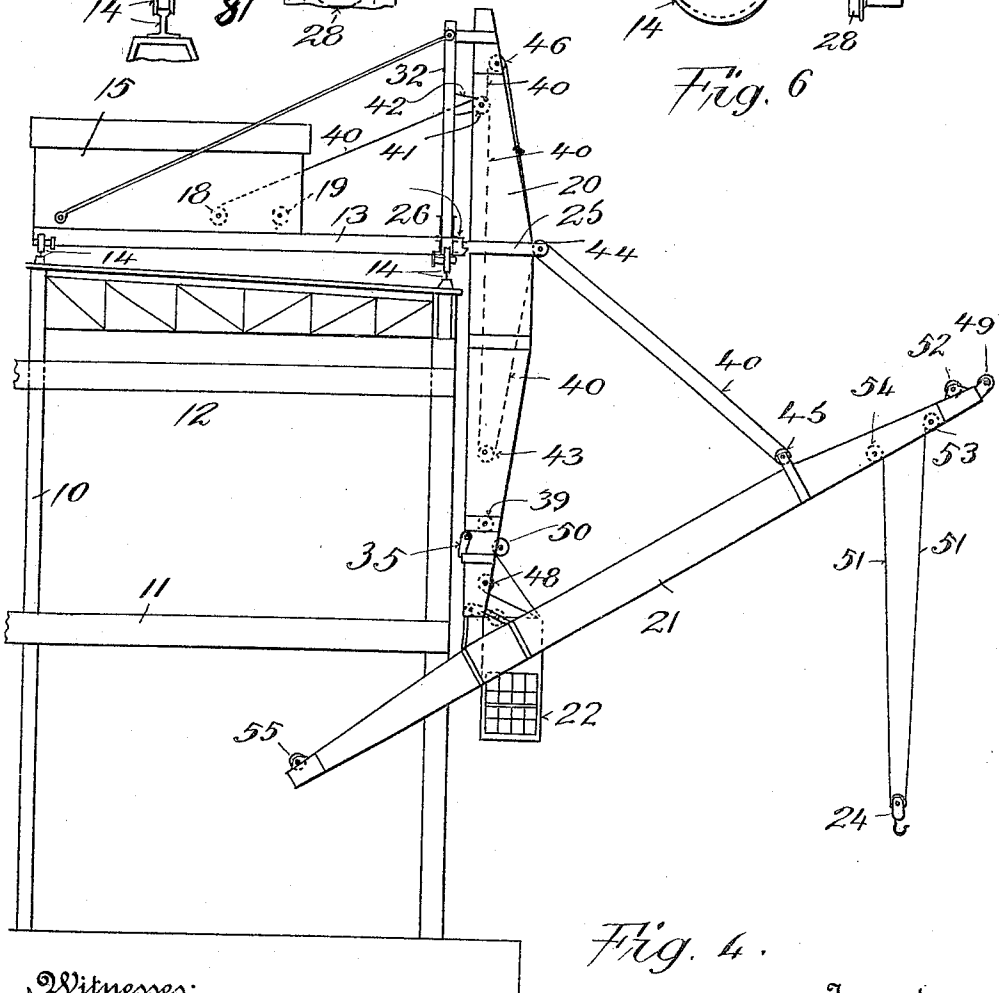


Fig. 4.

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UNITED STATES PATENT OFFICE.

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FREIGHT-HANDLING CRANE STRUCTURE.

1,111,099. Specification of Letters Patent. Patented Sept. 22, 1914.

Application filed May 19, 1913. Serial No. 768,665.

To all whom it may concern:

Be it known that I, HARRY SAWYER, a citizen of the United States, residing at Muskegon, in the county of Muskegon, State of Michigan, have made a certain new and useful Invention in Freight-Handling Crane Structures, of which the following is a specification.

The invention relates to freight handling crane structures and particularly to crane structures employed in connection with docks, piers, freight sheds, buildings or the like for loading, unloading and handling freight from boats, barges and trains.

The object of the invention is to provide a freight handling crane structure arranged to serve different floors of the dock, pier, freight shed, warehouse or other building. In other words, the object of the invention is to provide a crane structure for serving any one of two or more floors at different levels of a building, warehouse or the like.

A further object of the invention is to provide a vertically shiftable support for a swinging boom whereby said boom may be bodily raised or lowered into position to serve any one of two or more floors of a building, shed or the like.

A further object of the invention is to provide means for carrying the weight of the swinging boom and its vertically shiftable support when the latter is in its lowered or in its raised position, thereby relieving the ropes or cables employed in connection with the manipulation and operation of the crane structure of undue load.

A further object of the invention is to provide means for resisting the side thrust on the vertically shiftable support due to the overhanging swinging boom and the load carried thereby when said boom is in position for service.

A further object of the invention is to provide a reeving of the ropes or cables employed in connection with the various freight handling operations and the swinging of the boom, which reeving is such as to relieve the cables of strains thereon, or displacement of the apparatus operated thereby, during the vertical movement of the boom support.

Other objects of the invention will appear more fully hereinafter.

The invention consists substantially in the construction, combination, location and arrangement of parts, all as will be more fully hereinafter set forth as shown in the accompanying drawings and finally pointed out in the appended claims.

Referring to the accompanying drawings and to the various views and reference signs appearing thereon, Figure 1 is a view in elevation of a crane structure embodying the principles of my invention showing the swinging boom support in an elevated position to enable the trolley which operates along the boom to serve say, for instance, the second floor of a pier shed or other building, and also showing the reeving of the cable or rope employed for operating the trolley. Fig. 2 is a similar view showing the boom support in a lowered position for the trolley to serve, for instance, the first floor of a pier shed or other building and also showing the reeving of the cable or rope for operating the trolley hoist. Fig. 3 is a similar view showing the boom support in an elevated position for serving for instance the second floor of the building and showing in dotted lines how the boom is swung vertically preparatory to the vertical shifting of its support and also showing the cable reeving for raising and lowering the boom support. Fig. 4 is a similar view showing the boom support in a lowered position and the arrangement of cable or rope for tilting the boom. Fig. 5 is a broken detailed view in side elevation showing the means for guiding the vertically movable boom support during the movements thereof and the means for resisting side thrust thereon due to the overhang of the boom. Fig. 6 is a similar view in front elevation of the construction shown in Fig. 5, the vertically movable boom support being omitted. Fig. 7 is a similar view showing a portion of the means employed for bracing the vertically movable boom support against a strain of the overhang of the boom.

The same part is designated by the same reference numeral wherever it occurs throughout the several views.

In the use of power operated and controlled cranes for handling cargoes in loading or unloading boats, barges, cars or the like to or from pier or dock sheds, warehouses, freight sheds or the like, it is frequently desirable to handle the cargo or freight to or from different floor levels of the shed or other building. The provision of a crane structure which is capable of serving freight or cargo to or from two

or more floors at different levels introduces difficulties in the way of shifting the crane boom into position to serve the different floor levels and also by reason of the side thrust imposed by the necessary overhang of the boom. Moreover, in effecting the shifting of the boom from one floor level to another it is desirable to avoid relative displacement of the boom trolley or of the trolley hoist or of the relative inclination of the boom itself.

It is among the special purposes of my present invention to provide a crane structure wherein these various objects and purposes are accomplished, wherein the various operations are accomplished by power mechanism and wherein the swinging boom is brought into proper position to serve floors at different levels.

In carrying out my invention, I employ a crane structure designed to be mounted upon an elevated support, say, for instance, the roof of a shed, warehouse or other building, or a support located above the floors to be served and upon this crane structure I carry the power mechanism for effecting the various operations and manipulations necessary in the handling of the freight or cargo. I also propose to mount upon the traveling supporting portion of the crane a vertically movable member to the lower end of which the boom is pivotally connected whereby the supporting member may be vertically moved into position for the swinging boom to be employed to serve floors of the shed or building at different levels.

In the drawing reference numeral 10 designates a portion of a building, pier-shed or the like or an elevated support adjacent to such building and having floor levels indicated respectively at 11, 12. Upon this elevated support which if desired may constitute the roof of the shed or building, or a portion thereof, is mounted a traveling portion 13 of the crane structure, said traveling portion having wheels operating along track rails, as indicated at 14. Upon this traveling portion of the crane structure is mounted the motor mechanism employed for effecting the various operations, namely, the raising and lowering of the boom support, the swinging of the boom, the operation of the boom trolley and the operation of the trolley hoist. This motor mechanism and the housing therefor is indicated at 15, and the trolley hoist operating, the trolley operating, the boom tilting, and the vertical adjustment mechanisms carried thereby are indicated respectively at 16, 17, 18, 19.

Mounted upon the portion 13 of the crane structure is a vertically movable member or support 20 to the lower end of which is pivotally connected the swinging boom 21. Also carried by the vertically movable member 20 is the cage 22 from which the motor mechanisms are controlled. Carried by the boom 21 is the trolley 23, see Figs. 1 and 3, which carries the trolley hoist 24. The vertically movable member 20 is provided with a bracket 25 designed to engage and rest upon the coöperating bracket 26 carried by the portion 13 of the crane structure when said member 20 is in its lowered position as shown in Figs. 2 and 4 whereby the weight of the support 20 and the parts carried by it is taken upon said brackets and the cables or ropes are relieved of such weight. The member 20 is provided with tracks 27, as indicated in dotted lines in Fig. 5 and in full lines in Fig. 7 between which operates a guide roll 28 carried by a rocking lever 29 which is pivotally mounted as at 30 upon a bracket 81 of the portion 13 of the crane structure, the other end of said lever 29 having connected thereto a rod 31 which extends through a vertical standard 32 of the crane structure portion 13 and a strong compression spring 33, see Fig. 5, is interposed between the standard 32 and a collar 34 carried by said rod. This construction affords a pressure against the vertically movable member 20 sufficient to resist the side pressure due to the overhanging parts when the boom is in the raised position, and hold the same off from the frame portion 13 of the crane structure during the vertical movement of said member 20 to avoid injury to the bracket 26 by reason of the member 20 rubbing thereagainst during such movements. The spring pressure is not sufficient to resist the side thrust imposed upon the member 20 by reason of the overhang of the boom 21 when in working position but allows bracket 25 to engage bracket 26 and resist side pressure as well as the vertical load carried by the boom. It will be understood that when the member 20 is to be raised or lowered to shift the boom 21 from position to serve for instance the floor level 12 into position to serve the floor level 11, the boom 21 is tilted into substantially vertical position as indicated in dotted lines in Fig. 3. The boom, however, even when in its vertical position as indicated, has an overhang which imposes a lateral or side thrust upon the supporting member 20 and this is the side thrust which the spring 33 resists. The spring resistance is overcome, however, by the increased overhang due to the rocking of the boom into horizontal position for use and to the load of freight supported thereon. When this increased pressure is imposed on the spring its tension is overcome and a hooked shape bracket 36 at the top of the portion 13 of the crane structure engages over a convenient part of the vertically movable member 20, such, for instance, as one of the guide rails 27, as clearly shown in Fig. 7. This hook engagement at the top and the bracket 26 at the

bottom of standard 32, in connection with the springs 33 and guide rollers 28 serve to resist any tendency of the member 20 to move sidewise under the influence of the overhanging weight of the boom and its load when the boom is in horizontal position. Pivotally mounted upon the supporting member 20 near its lower end is a pivoted bracket 35, which when said supporting member is moved to its higher limit of movement engages over the brackets 26, as clearly shown in Figs. 1 and 3, thereby forming a support for the vertically movable member 20 and the parts carried by it to take the weight thereof and to relieve the cables of unnecessary strains. When it is desired to lower the vertically movable supporting member 20, the bracket 35 is disengaged from bracket 26 in any suitable manner so as to permit the member 20 to be lowered.

It will be understood that the wheel 28, its carrying arm and compression spring may be duplicated if found necessary.

It is obvious that the particular structure of the boom, of the boom trolley and of the trolley hoist is not of consequence so far as my present invention is concerned and these parts may be of the usual and well known construction. The same is true of the hoisting mechanism employed and the method of controlling the same.

In order to permit the boom supporting member to be adjusted vertically to carry the boom into position to serve different floor levels without affecting the angle of the boom or the position of the trolley in the boom or the height of the lower block of the trolley hoist 24 as the member 20 is moved up and down, it is necessary to provide means whereby the ropes or cables employed for tilting the boom, for operating the trolley and for operating the trolley hoist be neither tightened nor slackened during the vertical movement of the member 20. In order to accomplish this result, I have shown a special reeving of the cables or ropes referred to, which I will now describe, and to avoid confusion in illustration, I have indicated only one of the ropes or cables concerned in each of Figs. 1, 2, 3 and 4 respectively.

In Fig. 3, I have shown the cable employed for raising and lowering the member 20. This cable is indicated at 37 as being operated by the motor mechanism 19. From the motor mechanism 19, cable 37 passes over a sheave 38, carried near the upper end of the standard 32, thence down and around a sheave 39 mounted in the movable frame 20 in the lower end thereof and thence back around another sheave 38 or secured stationarily to the adjacent supporting member. With this arrangement, by operating the motor mechanism 19, the bight of the cable 37 which contains the sheave 39 is shortened or lengthened thereby raising or lowering the vertically movable member 20. As many sheaves 38, 39, may be used as necessary to secure the lifting power required; this arrangement is shown in Fig. 3.

I will now describe the reeving of the cable employed for tilting the boom 21 about its pivotal connection with the lower end of the vertically movable member 20. This arrangement is shown in Fig. 4 wherein the motor mechanism 18 operates a cable 40 which passes over a sheave 41 carried by a bracket 42 extending from the standard 32 and thence down and around a sheave 43 carried by the member 20, thence up and around a sheave 44 on the member 20, thence down and around a sheave 45 on the boom 21, thence around another sheave 44, thence over a sheave 46, at the upper end of the member 20 and from there cable 40 leads to the bracket 42 where it is anchored. Sheaves 44 and 45 may be multiplied as required to get the necessary lifting power. By suitably operating the motor mechanism 18, the bight of cable 40 which carries the sheave or sheaves 45 on the boom 21 is shortened or lengthened thereby tilting the boom about its pivotal connection with the lower end of member 20. Moreover, by this arrangement of reeving of cable 40 when member 20 is raised the bight of that portion of cable 40 which includes the sheave or sheaves 45 is neither lengthened nor shortened since to the same extent that the upper sheave 46 pays out or takes up the cable 40 to exactly the same extent the sheave 43 takes up or pays out said cable and consequently the supporting member 20 is moved up and down without varying the inclination of boom 21.

I will now describe the reeving of the cable employed for operating the trolley 23. This arrangement is shown in Fig. 1 wherein the motor mechanism 17 operates a cable 47 which operates over a sheave 41 on bracket 42 and thence down around a sheave 48 carried in the lower end of member 20 and thence over a guide sheave 49 at the end of boom 21 and thence to and around a sheave 53, see Figs. 2, 3 and 4, in the trolley 23, thence back around another sheave 49 on the end of boom 21, thence back around a sheave 50 on the member 20, at its lower end, thence up to and around a sheave 46 at the upper end of member 20 and thence to the bracket 42 where the end of the cable is anchored. By operating the motor mechanism 17 the bight of this cable which is connected to the trolley is lengthened or shortened thereby permitting the trolley to operate along the boom, when however the supporting member 20 is raised or lowered the bight of cable 47 which is connected to the trolley is neither lengthened or shortened for the same reasons above pointed out with reference to cable 40.

I will now describe the reeving of the cable or rope employed for operating the trolley hoist. This cable is controlled by motor mechanism 16 from which the cable 51 extends over a sheave 41 on bracket 42 (see Fig. 2), thence down and around a sheave 48 at the lower end of the member 20, thence around a guide sheave 52 at one end of boom 21, thence around a guide sheave 53 on the trolley truck, thence into a bight which contains the block 24 of the hoist, thence over a guide sheave 54 on the trolley, thence around a guide sheave 55 at the lower end of the boom, thence around a guide sheave 56 on the boom and near the lower end of member 20, and thence up and around a sheave 46 at the upper end of member 20, the end of said cable being anchored to bracket 42 or other convenient stationary part. By operating motor mechanism 16 the bight of cable 51 which contains the block or pulley 24 of the trolley hoist is lengthened or shortened. However, the length of this bight is not affected by raising and lowering the supporting member 20 because of the arrangement of reeving and guides of said cable as above explained, consequently, the vertical movements of member 20 do not vary the height of the pulley 24 of the hoist relative to the boom.

From the foregoing description it will be seen that I provide a simple and efficient crane structure, the operation and manipulation of which is under efficient control through power mechanism and wherein loading or unloading to or from different floors of a building, pier, shed or the like, may be easily accomplished.

Having now set forth the objects and nature of my invention and a construction embodying the principles thereof, what I claim as new and useful and of my own invention and desire to secure by Letters Patent is:—

1. In an apparatus for handling freight, an elevated support, a vertically movable supporting member mounted adjacent to the edge of said elevated support, means for raising and lowering said member, a boom pivotally suspended intermediate its ends from and supported by said vertically movable member, to permit one end of said boom to extend underneath said elevated support, and a trolley operating from end to end of said boom.

2. In an apparatus for handling freight, a vertically movable supporting member, a boom wholly supported by said member and pivotally suspended intermediate its ends from the lower end thereof, a trolley operating from end to end of said boom, means for raising and lowering said vertically movable support and a guide for said supporting member during its movements.

3. In an apparatus for handling freight, a vertically movable member, a boom pivotally suspended therefrom, means for raising and lowering said member and a guide for said member during its vertical movements, said guide mounted to yieldingly resist the thrust of the overhang of the boom.

4. In an apparatus for handling freight, a vertically movable member, an overhanging boom pivotally suspended from such member, means for raising and lowering said vertically moving member and means for yieldingly resisting the side thrust of the overhanging boom.

5. In an apparatus for handling freight, a vertically movable member, an overhanging boom pivotally suspended therefrom, means for raising and lowering said member and yieldingly mounted means for engaging said vertically movable member to resist the thrust due to the overhang of said boom.

6. In an apparatus for handling freight, a vertically movable supporting member, an overhanging boom pivotally suspended from said member and means for yieldingly resisting the side thrust due to the overhang of said boom.

7. In an apparatus for handling freight, a vertically movable supporting member, a boom supported at the lower end of said member and pivotally suspended therefrom, a trolley carried by said boom, cable connections for controlling said trolley, means for raising and lowering said supporting member and guides for said cable connections arranged to permit said supporting member to be raised and lowered without displacing said trolley upon said boom.

8. In an apparatus for handling freight, a vertically movable supporting member, a boom wholly supported by said member and pivotally suspended therefrom, hoisting devices carried by said boom, cable connections for controlling said hoisting devices, means for raising and lowering said supporting member and guides for said cable connections arranged to permit said supporting member to be raised and lowered without displacing the relation of the hoisting mechanism and boom.

9. In a freight handling apparatus, a building or shed having a plurality of floors, a crane structure including a vertically movable supporting member, a boom wholly supported upon said member and pivotally suspended intermediate its ends from the lower end thereof, a trolley operating from end to end of said boom, and means to move said vertically movable member into position for said boom to serve any one of said floors.

10. In a freight handling apparatus, an elevated supporting structure having trackways, a crane structure portion movable along said trackways, a vertically movable member carried by said crane structure portion, a boom carried by and pivotally

suspended intermediate its ends from said vertically movable member to permit one end thereof to extend underneath said supporting structure, and a trolley operating from end to end of the boom.

11. In a freight handling apparatus, an elevated supporting structure, a crane structure portion carried thereby, a vertically movable member having a vertical guide way, a wheel carried by the crane structure portion and engaging in said guideway and a boom pivotally suspended from said vertically movable member.

12. In a freight handling apparatus, an elevated supporting structure, a crane structure portion carried thereby, a vertically movable member having a vertical guide way, a wheel yieldingly supported on said crane structure portion and engaging in said guide way, and a boom pivotally suspended from said vertically movable member.

13. In a freight handling apparatus, an elevated supporting structure, a crane structure portion carried thereby, a vertically movable member having a guideway, means carried by said crane structure portion for moving said member vertically, means carried by said crane structure portion to engage in said guideway, a hook member also carried by said crane structure portion to engage said member, and a boom pivotally suspended from said member.

14. In a freight handling apparatus, a crane structure portion, a vertically movable member, means carried by the crane structure portion to raise and lower said member, a boom pivotally supported upon said member, a cable operated from said crane structure portion to rock said boom and sheaves carried by said vertically movable member and over which said cable operates, said sheaves arranged to permit said member to be raised or lowered without changing the angle of said boom.

15. In a freight handling apparatus, a crane structure portion, a vertically movable member, means carried by the crane structure portion to raise and lower said member, a boom pivotally suspended from said member, a trolley operating along said boom, a cable operated from said crane structure portion to move said trolley, sheaves carried by said vertically movable member and over which said cable operates, said sheaves arranged to permit said member to be raised or lowered without causing the position of the trolley on the boom to be shifted.

16. In a freight handling apparatus, a crane structure portion, a vertically movable member, means carried by the crane structure portion to raise and lower said member, a boom pivotally suspended from said member, a hoisting mechanism carried by said boom, a cable operated from said crane structure portion for actuating said hoisting mechanism, sheaves on said vertically movable member over which said cable operates, said sheaves arranged to permit said member to be raised or lowered without affecting the position of the hoisting mechanism.

17. In an apparatus for handling freight, a vertically movable member, means for raising and lowering said member, a boom pivotally suspended from said member, cable connections for tilting said boom about its pivotal axis, and stationarily supported means for operating said cable, said cable connections arranged to be unaffected by the raising or lowering movements of the vertically movable member.

18. In a freight handling apparatus, a crane structure arranged to move along track ways, a vertically movable member carried by said crane structure, and a boom entirely supported upon and pivotally suspended intermediate its ends from the lower end of said vertically movable member to permit one end of said boom to extend underneath said crane structure and track ways, and a trolley operating from end to end of said boom.

In testimony whereof I have hereunto set my hand in the presence of the subscribing witnesses on this 10th day of May, A. D. 1913.

HARRY SAWYER.

Witnesses:
J. L. HAGA,
OTTO ALBERT.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."