

May 13, 1947.

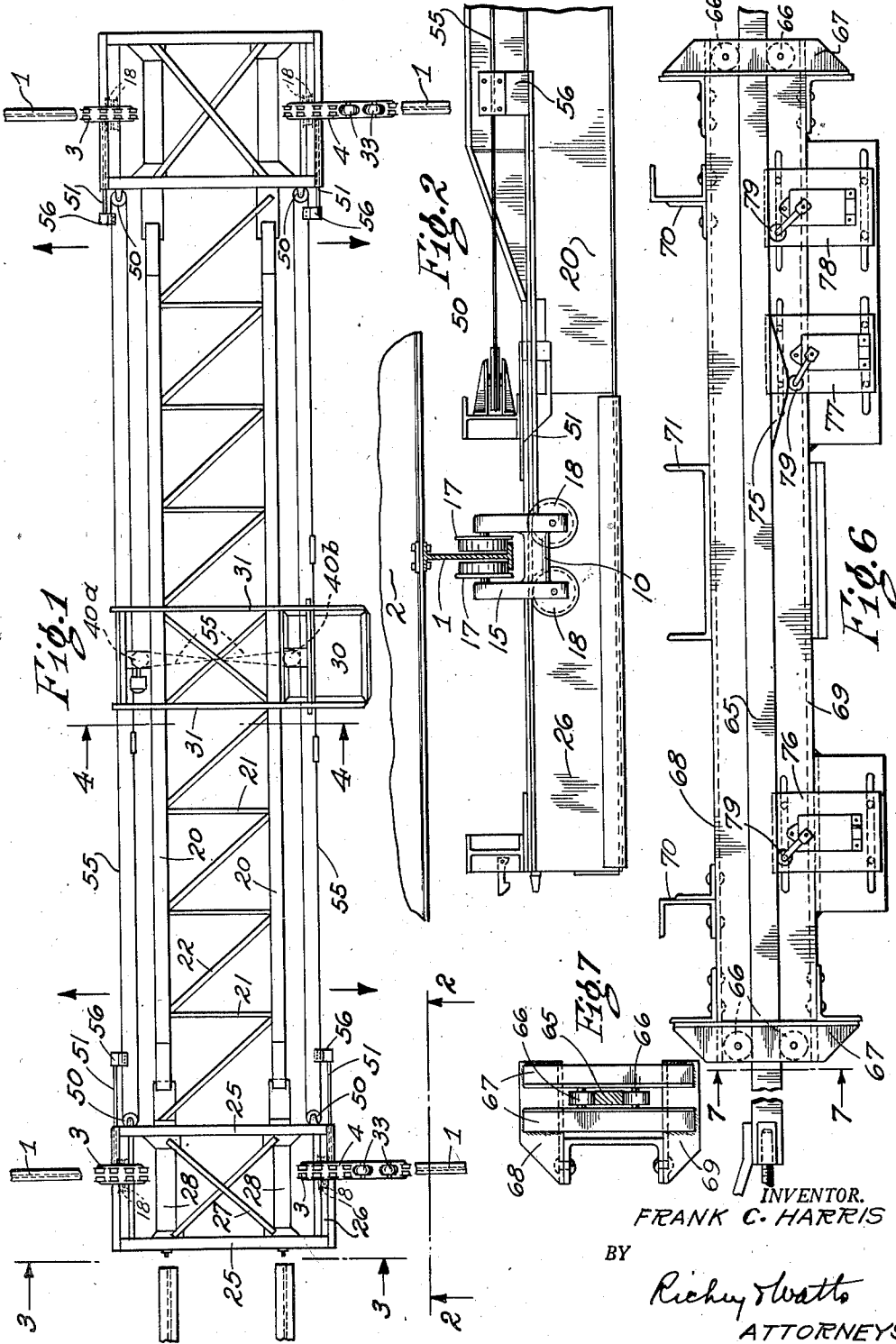
F. C. HARRIS

2,420,595

SHUTTLE CRANE

Filed Dec. 26, 1944

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Fig. 3

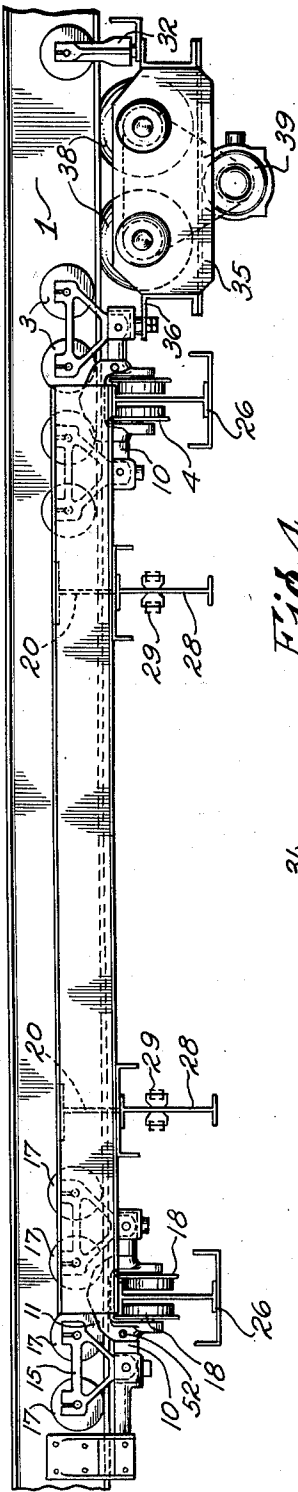


Fig. 4

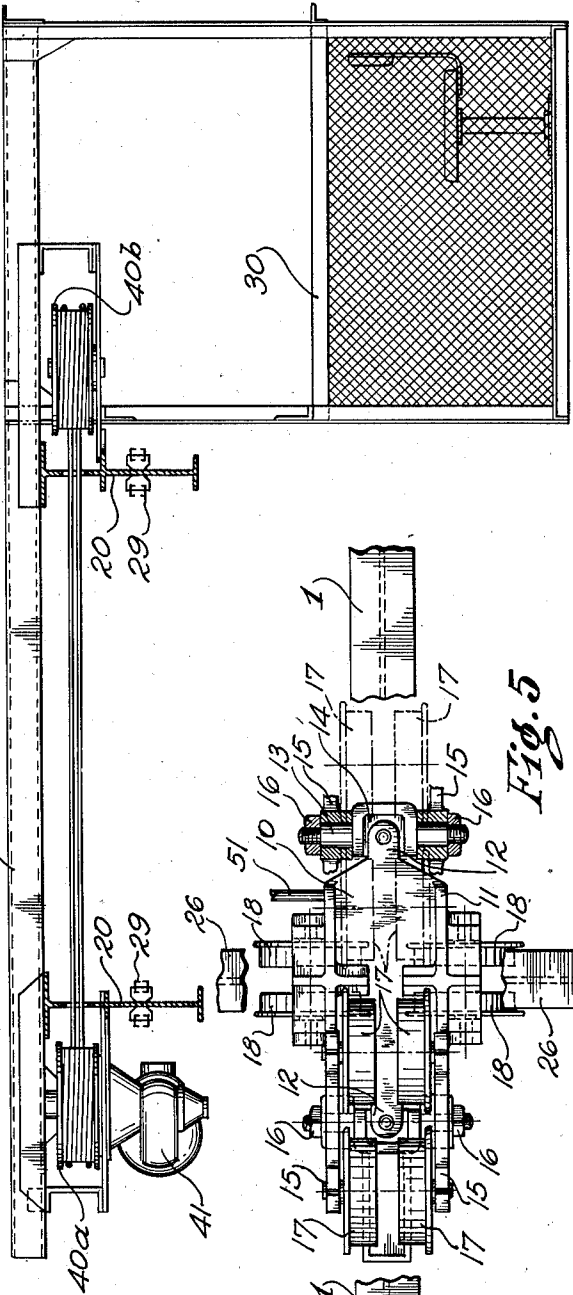


Fig. 5

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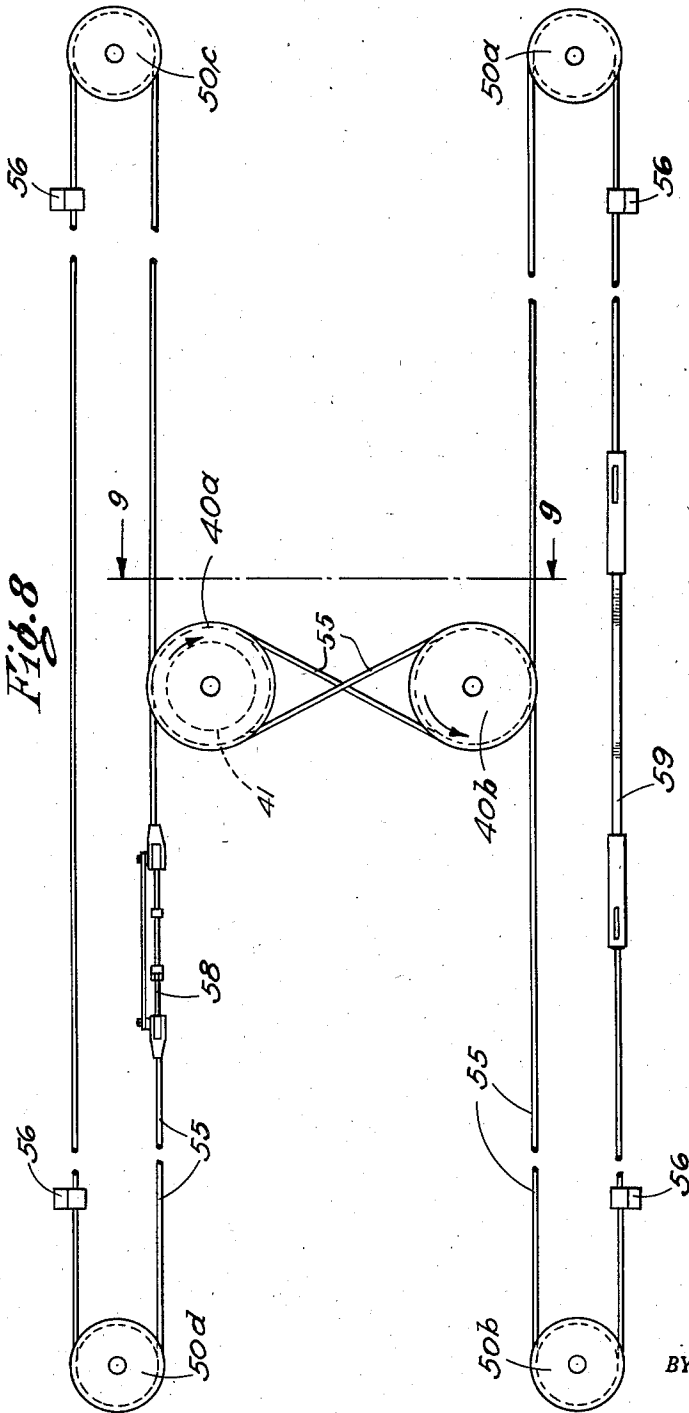
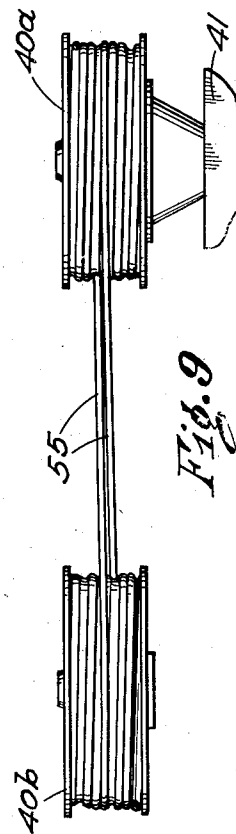
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2,420,595

SHUTTLE CRANE

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16 Claims. (Cl. 104—98)

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The present invention relates generally to the crane art and particularly to a suspended crane which can be moved endwise as well as sidewise.

There are many conditions in which it would be a marked advantage to have a suspended sidewise movable crane which could be moved endwise. An illustration of such a condition is a building in which the crane runways are disposed between two rows of roof supporting pillars beyond one or both of which rows bays are located. If the crane could be moved endwise it could receive a load in one bay, move it past the adjacent row of pillars and discharge the load at some other place, such as in another bay.

The problem of shifting loads across a space between two adjacent conveyors, as from a crane past building pillars to a track beyond the pillars, has existed for a long time and various proposals have been made for solving the problem but, so far as I am aware, no proposals have been made by others which have been entirely satisfactory as a solution for that problem.

In my copending application Ser. No. 481,733, filed on April 3, 1943, I disclosed and claimed apparatus which aimed at the solution of that problem. While the apparatus of that application has been quite satisfactory in use, it possessed certain disadvantages. It consisted of a number of moving parts which were expensive to build and maintain. It required considerable amounts of space or headroom which in certain instances was quite valuable in terms of cost of building construction. Its construction was such that it was limited as to the size of loads it could transfer across such a space and also as to the size of the space which it could span, for the endwise moving parts could not be made resistant to bending and binding when the heavier loads were being handled or when the lighter loads were to be moved across a larger space.

By the present invention I have provided a sidewise movable suspended crane which is movable endwise as a unit, which comprises a minimum number of parts, which avoids the shortcomings of prior cranes and which possesses many advantages not possessed by any suspended crane with which I am familiar.

The present invention will be better understood by those skilled in the art from the following description and the drawings accompanying and forming a part of this specification and in which

Figure 1 is a top plan view of a heavy duty crane embodying the present invention;

Figure 2 is a fragmentary, side elevational

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view, partly in section, taken on line 2—2 of Fig. 1;

Figure 3 is an end elevational view taken on line 3—3 of Fig. 1;

Figure 4 is a vertical sectional view taken on line 4—4 of Fig. 1;

Figure 5 is a fragmentary, top plan view, partly in section, of one set of crane supporting trolleys of Fig. 1;

Figure 6 is a side elevational view of part of the mechanism for controlling sidewise and endwise movement of the crane;

Figure 7 is an elevational view, partly in section, taken on line 7—7 of Fig. 6;

Figure 8 is a plan view of the cable and drums shown in Fig. 1 for moving the crane endwise; and,

Figure 9 is an elevational view taken on line 9—9 of Fig. 8.

Figs. 1 to 5 inclusive show one form of the present invention. Parallel spaced crane runways 1 are suspended between rows of pillars (not shown) in any suitable manner, as for example, by being attached to trusses 2 of the building (Fig. 2). The crane comprises supporting trolleys and a bridge with end frames.

The crane supporting trolleys are mounted in opposed pairs on runways 1. The trolleys of one of such pairs are indicated at 3 in Fig. 1 and those of another pair are indicated at 4 in the same figure. Two of such pairs of trolleys are employed with the crane here illustrated.

All the trolleys of pairs 3 and 4 are alike and hence the description of one will suffice for all. Each of these trolleys comprises a load bar 10 (see Figs. 1, 2 and 5) which is disposed beneath runway 1 and has upwardly extending marginal flanges 11 intermediate its ends and end projections 12 provided with vertical holes. Transversely extending trunnions 13 are pivotally attached to end projections 12 and each trunnion has a central recess 14 in which the end projection 12 is received. Trolley yokes 15 are pivoted on the ends of the trunnions and are secured in place as by nuts 16.

Each yoke 15 carries shafts on which upper trolley wheels 17 are rotatably mounted. The load bar 10 also carries shafts which are at right angles to the shafts of wheels 17 and on which lower trolley wheels 18 are mounted. From what has just been said it will be understood that each crane supporting trolley comprises a load bar which carries two opposed pairs of lower wheels 18 whose axes are disposed parallel to the crane runway 1 and also carries the upper wheels 17

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whose axes are disposed at right angles to runway 1. The wheels 18 are connected in groups of four to the opposite ends of the load bar 10 and their yokes are capable of swiveling motion relative to the load bar. In other words, each trolley includes upper wheels to run on the runways and a lower set of wheels for a purpose presently to be described.

The crane bridge includes spaced parallel beams 20 connected by suitable cross members 21 and braces 22 so that it is a strong, rigid structure. At each end this bridge is securely connected to the end frames. Each end frame consists of a rigid structure formed by side members 25, cross members 26 connected thereto, braces 27 and beams 28. One side member 25 of each frame is connected to the beams 20 of the bridge and the beams 28 of each frame are aligned with and attached to the beams 20 of the bridge. The end members 26 of each end frame are better shown in Fig. 3, where, as will be seen, these members are T-shaped in cross-section with the T inverted so that the flanges normally at the bottom of the T rest on the tops of the lower wheels 18 of the trolleys. Since these end members 26 extend for some distance on either side of each runway, it will be understood that the crane may move endwise as a unit to corresponding extents. Current carrying bus bars 29 may be secured along beams 20 and 28 to be engaged by collectors on load carrying trolleys (not shown) which run on the lower flanges of these beams.

Between the end frames an operator's cab 30 is suspended from cross beams 31 which are secured to the tops of bridge beams 20. This cab 30 may be equipped with the usual electrical control apparatus (not shown).

The crane of Fig. 1 is provided with means by which it may be moved sidewise along runways 1. The means shown includes a carriage 35 (Fig. 3) which has a bracket 36 at one end attached to and supported by the adjacent load bar 10. At its other end, the carriage is connected to a trolley 32 having wheels to run on the runway 1. The carriage 35 mounts two wheels 38 which have deformable treads engageable with the under surface of runway 1 and which are driven by a motor 39 attached to carriage 35. When motor 39 is energized the wheels 38 are rotated and move the crane sidewise along its runways. Preferably, such crane moving means as has just been described is provided at each end of the crane for simultaneous engagement with each runway. In this manner the crane will be moved sidewise along the runways while being maintained perpendicular to each runway.

The crane is also provided with means by which it may be moved endwise. This means is shown in Figs. 1, 2, 4 and 6 to 9 inclusive. Reeling drums 40a and 40b are supported between cross beams 31 and outside of bridge beams 20 to rotate about vertical axes. Drum 40a is driven by motor 41. One end frame of the crane carries two sheaves 50b and 50d and the other frame carries sheaves 50a and 50c. Each load bar 10 of the crane supporting trolleys is connected to a draw bar 51 as at 52 in Fig. 3. Each draw bar 51 is connected to cable 55 by clamps 56. It will be understood that the draw bars 51 are of such length that the adjacent end frame may be moved for the full predetermined length of its travel without interference of the clamps 56 with the adjacent sheaves 50. Cable 55 is endless, in effect, is provided with

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length adjuster 58 and is also provided with a current control bar 59.

As will be better understood by reference to Figs. 8 and 9, cable 55, starting at the righthand end of adjuster 58 threads clockwise around drum 40a, then counterclockwise around drum 40b, thence around sheaves 50a and 50b, thence counterclockwise around drum 40b and clockwise around drum 40a, and then around sheaves 50c and 50d and back to adjuster 58. When drum 40a is actuated by motor 41 to rotate in a clockwise direction, as indicated by the arrow in Fig. 8, the reaches of cable 55 between the drums and the lefthand clamps 56 are shortened with coincident lengthening of the reaches of cable between the drums and the righthand clamps 56. This reeling in and paying out of cable reaches causes the sheaves and the entire crane to move toward the right. Obviously, when motor 41 is reversed and drums 40a and 40b are rotated in the opposite direction, the crane will be moved endwise toward the left in Figs. 1 and 8. Such endwise movement of the crane is freely permitted because it is supported on the tops of the lower wheels 18.

The current controlling means 59 above mentioned is better shown in Figs. 6 and 7. This means comprises a bar 65 which constitutes a part of cable 55 and which is disposed between pairs of rollers 66 carried by a frame attached to the crane. This frame includes vertical end pieces 67, top and bottom members 68 and 69 with angles 70 and channel 71 serving as means of stiffening and for attaching the frame to the crane bridge. The bar 65 has a cam 75 on its lower surface which is engageable with cam rollers 79 of current controllers 76, 77 and 78 adjustably carried by the lower frame member 69. It will be understood that current controller 77 is connected in the electrical circuit which energizes the motors 39 for moving the crane sidewise on runways 1 and that controllers 76 and 78 are in the circuit which energizes motor 41 to move the crane endwise. When the cam follower 79 of controller 77 engages cam 75, as indicated in Fig. 6, motor 39 may be energized, for the crane will then be in a normal or neutral position relative to runways 1. When motor 41 is energized and moves the crane endwise far enough for the follower of controller 77 to move off the high part of cam 75, the circuit to motor 39 will be broken. Thus motor 39 can not move the crane sidewise along the runways when the crane has been shifted endwise out of its normal position relative to the runways. When cam 75 engages the follower of controller 77 or 78 it breaks the circuit of motor 41 and thus deenergizes the motor. Preferably, the circuits of motors 39 and 41 are so interlocked that one circuit is open when the other is closed.

Altho the present invention has been described in some detail in connection with a heavy duty, cab carrying crane, it will be obvious to those skilled in the art that the invention is not limited to such a crane. The cab may be omitted if desired. Also, the crane may be much lighter and embody only a single beam 20. In that case one beam 20 may be omitted and the end frames shortened, if desired, and disposed symmetrically with respect to that beam, each end frame having a single beam 28 aligned with and connected to bridge beam 20.

It will be understood by those skilled in the art that the present invention provides a crane which may be of a wide range of load carrying

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capacity, which is simple in construction, which is movable endwise as a unit, which is capable of receiving or discharging loads beyond a row of columns and which is practically fool-proof as regards the possibility of fouling a column when being moved sidewise.

Having thus described my invention so that others skilled in the art may be able to understand and practice the same, I state that what I desire to secure by Letters Patent is defined in what is claimed.

What is claimed is:

1. A suspended crane comprising trolleys having upper wheels to run on spaced parallel runways and having lower wheels, a bridge to extend transversely between and beyond both runways and having rails to run on the tops of said lower wheels, and means for moving said bridge endwise on said lower wheels, said means including a drum on said bridge and flexible means connected to said trolleys and operatively engaging said drum.

2. A suspended crane comprising trolleys having upper wheels to run on spaced parallel runways and having lower wheels, a bridge to extend transversely between and beyond both runways and having rails to run on the tops of said lower wheels, means including a drum on said bridge and a cable windable about said drum and connected to said trolleys for moving said bridge endwise on said lower wheels, and means engaging one of said runways for moving said crane sidewise along said runways.

3. A suspended crane comprising trolleys having upper wheels to run on spaced parallel runways and having lower wheels, a bridge to extend transversely between and beyond both runways and having rails to run on the tops of said lower wheels extending from end to end thereof, and means for moving said bridge endwise on said lower wheels, said means including a drum on said bridge, anchors connected to said trolleys and flexible means attached to the anchors and windable about said drum.

4. A suspended crane comprising trolleys having upper wheels to run on spaced parallel runways and having lower wheels, a bridge to extend transversely between and beyond both runways and having rails to run on the tops of said lower wheels, and means for moving said bridge endwise on said lower wheels, said means including cooperating members connected to the bridge and to the bridge supporting trolleys.

5. A suspended crane comprising trolleys having upper wheels to run on spaced parallel runways and having lower wheels below said runways, a bridge to extend transversely between and beyond both runways, having parallel spaced rails to run on the tops of said lower wheels and having spaced parallel trolley tracks between said portions and extending from end to end of said bridge, and means for moving said bridge endwise on said lower wheels, said means including rotatable drums on said bridge, means on the bridge for rotating one of said drums, anchors on said trolleys, and cables connected to said anchors and windable about said drums.

6. A suspended crane comprising trolleys having upper wheels to run on spaced parallel runways and having lower wheels below said runways, a bridge to extend transversely between and beyond both runways, having parallel spaced rails to run on the tops of said lower wheels and having spaced parallel trolley tracks between said portions and extending from end to end of said

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bridge, and means for moving said bridge endwise on said lower wheels, said means including an endless, movable cable connected to said bridge and anchors connected to the bridge supporting trolleys and to said cable.

7. A suspended crane comprising trolleys having upper wheels to run on spaced parallel runways and having lower wheels, a bridge to extend transversely between said runways including end frames to run on the tops of said lower wheels and a trolley track extending from end to end of the bridge and end frames, and means for moving said bridge and end frames as a unit endwise on said lower wheels, said means including anchors attached to said trolleys, a drum on said bridge and a cable connected to said anchors and operatively engaging said drum.

8. A suspended crane comprising trolleys having upper wheels to run on spaced parallel runways and having lower wheels, a bridge including frames at each end thereof to run on the tops of said lower wheels and a track for trolleys depending from the bridge and end frame and extending for the full length of the bridge and end frame, and means for moving said crane bridge endwise on said lower wheels, said means including drums on said bridge, a cable operatively engaging said drums and cable anchors attached to said trolleys.

9. A suspended crane system comprising spaced parallel runways, crane supporting trolleys having upper wheels to run on said runways and having lower wheels, a crane extending transversely between and beyond both runways and including rails to run on the tops of said lower wheels, and a trolley track extending for the full length of the crane, means including a drum on said crane, a cable on said drum, and means for anchoring the cable to said trolleys for moving said crane endwise on said lower wheels, and means for moving said crane sidewise along said runways, said means including a driven wheel engaging the under side of one of said runways.

10. A suspended crane system comprising spaced parallel runways, crane supporting trolleys having upper wheels to run on said runways and having lower wheels, a crane extending transversely between and beyond both runways and including rails to run on the tops of said lower wheels, and a trolley track extending for the full length of the crane, means for moving said crane endwise on said lower wheels, means for moving said crane sidewise along said runways, said endwise moving means including a member anchored to one of said crane supporting trolleys, a movable member cooperating with said anchored member and connected to said crane, and means for actuating said movable member.

11. A suspended crane system comprising spaced parallel runways, crane supporting trolleys having upper wheels to run on said runways and having lower wheels, a crane extending transversely between and beyond both runways and including rails to run on the tops of said lower wheels, and means for moving said crane bridge endwise on said lower wheels, said means including rods anchored to said trolleys, sheaves and drums on the crane, an endless cable clamped to said rods and partly encircling said sheaves and drums, and means for rotating one of said drums and thereby shifting the position of the sheaves along said cable.

12. A trolley for a sidewise and endwise movable suspended crane comprising load bars to be positioned beneath crane runway rails, trun-

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nions pivotally attached to said load bars, yokes on said trunnions, upper trolley wheels rotatably carried by said yokes to run on flanges of runway rails for sidewise movement of the crane, and lower wheels rotatably connected to said load bars to engage under rail surfaces of the crane and support the latter for endwise movement.

13. A suspended crane system comprising two parallel, spaced runways having trolley tracks, two trolleys on each runway, each of said trolleys including a load bar beneath a runway, yokes pivoted to said bar, upper wheels rotatably connected to said yoke and resting on said runway tracks, and lower wheels rotatably connected to said load bar to rotate on axes parallel to the runways, a crane extending transversely between and beyond both of said runways and including rails each resting on the lower wheels of trolleys on said runways and a load carrying trolley track between said rails and extending for the full length of said crane, and means for moving said crane endwise, said means including a pair of sheaves near each end of said crane drums on the crane between said pairs of sheaves, an endless cable threaded partly around each sheave and drum, means to rotate one of the drums, and clamps attached to each load bar and to the cable.

14. A suspended crane system comprising spaced parallel runways, crane supporting trolleys having upper wheels resting on said runways and having lower wheels, a crane extending transversely between and beyond both runways and having rails resting on the tops of said lower wheels, means to move said crane sidewise along said runways with said crane supporting trolleys, means to move said crane endwise relative to said trolleys, and control means operatively associated with both of said crane moving means to prevent sidewise movement of the crane when it is in an endwise actuated position.

15. A suspended crane system comprising spaced parallel runways, crane supporting trolleys having upper wheels resting on said runways

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and having lower wheels, a crane extending transversely between and beyond both runways and having rails resting on the tops of said lower wheels, electrical means including a switch for moving said crane sidewise along said runways with said crane supporting trolleys, electrical means including switches for moving said crane in either direction endwise into and out of its normal position and relative to said trolleys, and means for actuating said switches one at a time, and for actuating the switch in the sidewise moving electrical means only when the crane is in its normal position.

16. A suspended crane system comprising spaced parallel runways, crane supporting trolleys having upper wheels resting on said runways and having lower wheels, a crane extending transversely between and beyond both runways and having rails resting on the tops of said lower wheels, electrical means including a switch for moving said bridge sidewise, electrical means including switches for moving said crane endwise, and a switch actuating cam engageable with said switches one at a time, the switch of the sidewise moving means being located between the other said switches.

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