Aug. 19, 1969 R. S. EDRIDGE 3,462,022

PORTABLE CONSTRUCTION TRANSPORTERS

Filed March 21, 1967 3 Sheets-Sheet 1

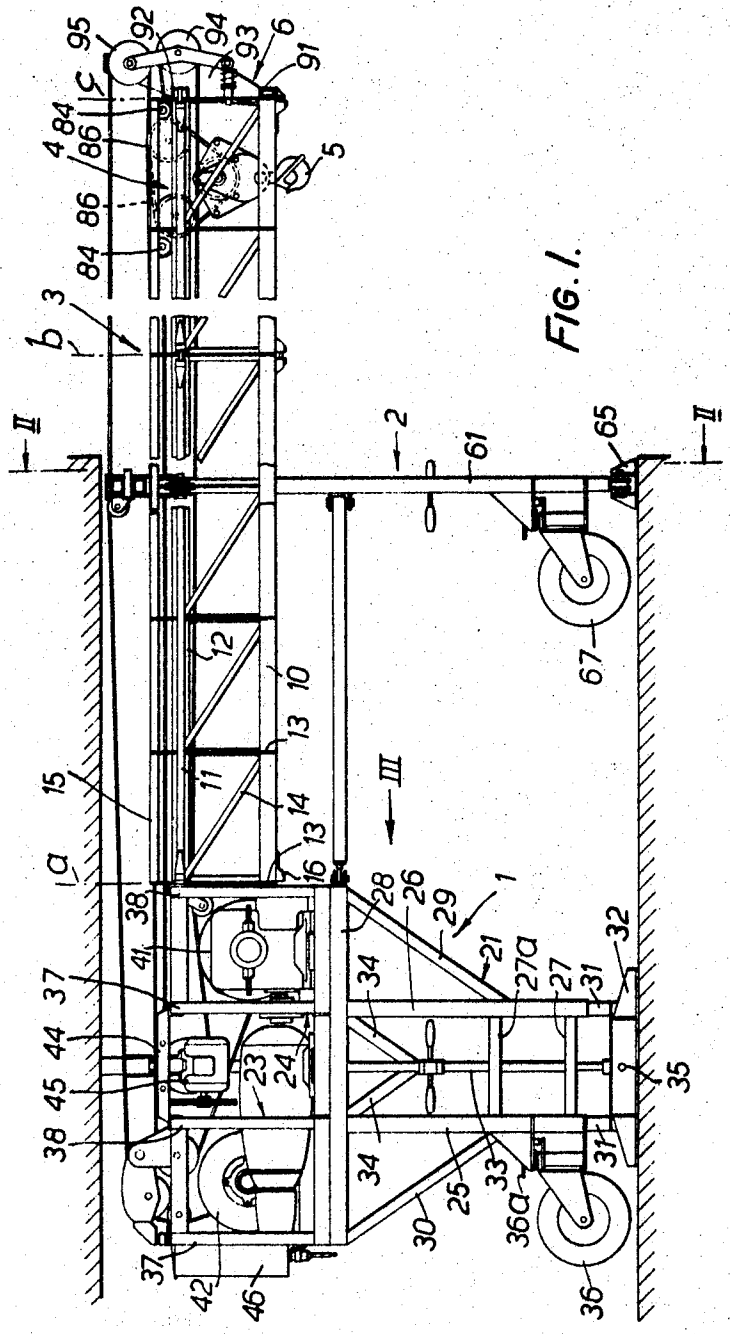

FIG. 1.

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Filed March 21, 1967 3 Sheets-Sheet 2

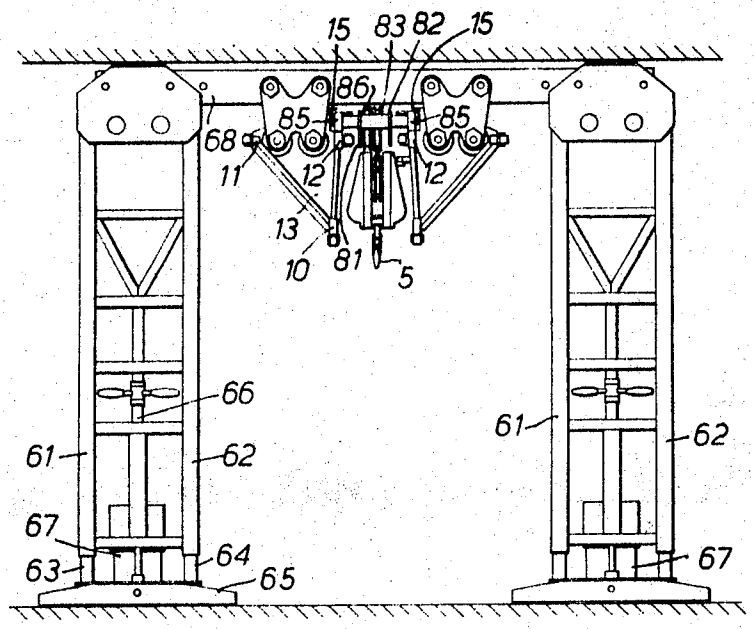

FIG. 2.

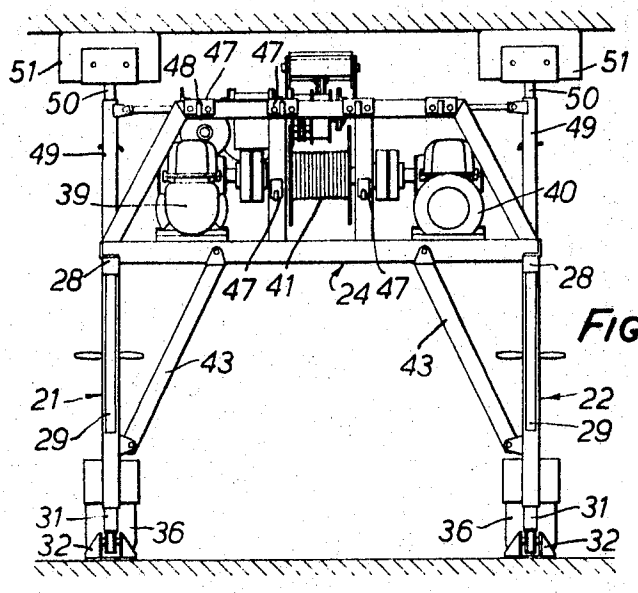

FIG. 3.

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Filed March 21, 1967 3 Sheets-Sheet 3

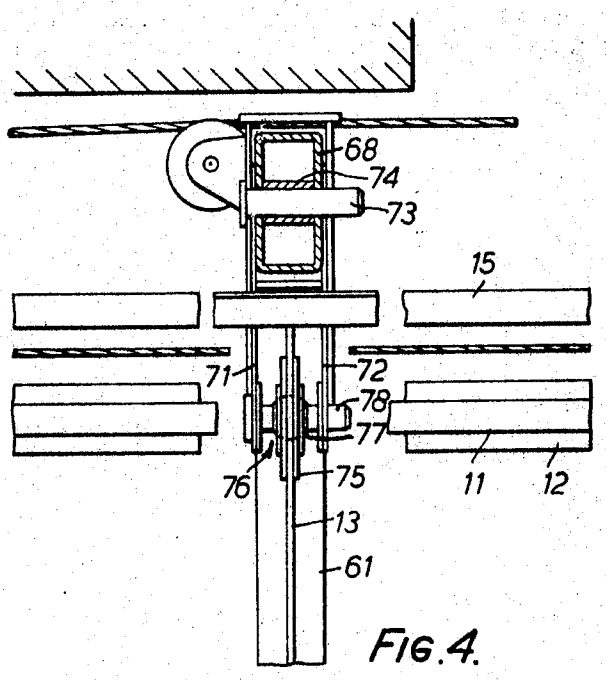

FIG. 4.

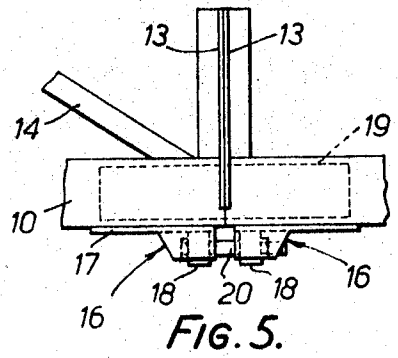

FIG. 5.

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PORTABLE CONSTRUCTION TRANSPORTERS

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U.S. Cl. 212—15 16 Claims

ABSTRACT OF THE DISCLOSURE

A transporter for raising loads up to and then moving them into an upper story of a building and comprising a jib consisting of twin booms and extending from inside the building through a portal frame, to a cantilevered outer end projecting from the building, an anchorage structure at the inner end of the jib and a trolley mounted between the booms and carrying the load-raising hook.

This invention relates to portable construction transporters.

There is considerable need for means by which materials and equipment can be hoisted from the ground up to and into the upper floors of buildings, either during construction or at a later stage, for example during the installation of machinery or modifications to the building. With cranes mounted on the top of the building, it is difficult to unload at an intermediate floor. A small jib crane can be used standing on the floor of the story concerned but because of the limited head room only a very small crane can be used and its lifting power and outreach is severely limited. The limited amount of outreach presents a problem, particularly during the construction of buildings as they are frequently surrounded by scaffolding.

According to the present invention, a portable construction transporter comprises an intermediate support frame, a jib extending from an inner end through the intermediate frame to a cantilevered outer end, the jib being of parallel twin-boom construction, and a trolley mounted on and between the twin booms for travel along the jib. In use the transporter can be mounted with the intermediate frame adjacent the edge of a floor of a building and the jib projecting out of the building. The trolley will carry a hook or other lifting device by which goods may be lifted to the level of the floor from the ground and the trolley then run in through the intermediate frame to a position inside the building where the goods will be unloaded. Preferably the trolley has wheels or rollers which run on tracks on the booms, the tracks being adjacent the upper surfaces of the booms. In this way, it is possible to arrange for the hook to rise partly into the space between the booms so that the load can be lifted until it is almost in contact with the booms thus making the maximum use of the space available between floor and ceiling. The twin-boom construction provides considerable strength and lateral stability for its weight. Preferably the inner ends of the booms are connected to an anchorage structure by which the inner ends of the booms may be held down. The anchorage structure may comprise a framework which includes jacking means by which the structure may be jammed between floor and ceiling of the building. Preferably winding means are provided at the inner end of the boom for the functions of hoisting and trolley travel and the winding means may be mounted on the anchorage structure.

Preferably each boom forms a prism having three longitudinal faces and a cross-section which is approximately a right-angled triangle, each boom having one face which is approximately vertical and one face which is approximately horizontal, the horizontal face being at the top and the vertical faces of the two booms facing one another. Each boom may be made up from three parallel tubes, preferably of rectangular or square cross-section, interconnected by bracing. The bracing preferably comprises spaced plates perpendicular to the tubes and dividing the boom into bays and a diagonal member in each of the three faces of the prism in each bay. Preferably each boom is made up from a number of substantially identical longitudinal sections joined end to end by releasable coupling means. There may be one coupling for each of the three tubes and each coupling means may comprise a spigot extending into the two abutting tubes of the joint and screw-threaded connecting members such as bolts extending parallel with the tubes and joining lugs on the two abutting tubes. Preferably, each lug is generally of channel-section with the flanges cut away at the end remote from the joint and the web formed into a tongue which is welded to a face of the tube and there is a block spanning between the flanges to receive the bolt. These coupling means may be used to connect one end of each of the booms to the anchorage structure and to connect the other end of each of the booms to a connecting unit joining the outer ends of the booms. The connecting unit may carry sheaves for wires for the hoisting and trolley travel functions and also eyes for the attachment of lifting hooks and/or additional load bearing stays to enable part of the load on the jib to be transferred to a building in which the transporter is positioned at a point above or below the floor on which the transporter stands.

Preferably, the intermediate frame straddles the jib which may be connected to the frame by means permitting relative pivotal movement between the jib and the intermediate frame about a horizontal axis perpendicular to the length of the jib. The connecting means may include, for example, spherical bearings. In this way bending moments in the jib are not transferred to the intermediate frame. Where the booms form right-angled triangles in section as described above, the axis of pivotal movement between the jib and frame is preferably approximately in the plane of the upper faces of the prisms formed by the booms. The intermediate frame preferably forms a portal frame and preferably incorporates jacking means by which it may be jammed between the floor and ceiling of a building. The jacking means may also be constructed to permit levelling and uniform load spreading.

In most cases it will be found that a double-fall rope arrangement for the hook is desirable so that the load remains level as the trolley travels and preferably in such cases the winding means incorporates hoisting means including two winding drums each with a separate motor in addition to means for causing the trolley to travel along the jib.

The invention may be carried into practice in various ways and one transporter embodying the invention will now be described by way of example with reference to the accompanying drawings, in which:

FIGURE 1 is a side elevation of the transporter with certain parts broken away;

FIGURE 2 is a section on the line II—II of FIGURE 1 and showing the trolley in a different position from that of FIGURE 1;

FIGURE 3 is a front elevation of the winding and anchorage structure viewed in the direction of the arrow III in FIGURE 1;

FIGURE 4 is a detail view to a larger scale of the boom support as indicated by the arrow I in FIGURE 1; and

FIGURE 5 is a detail view to a larger scale of one of the boom connections.

The transporter which is intended to be positioned within the 8 ft. head room normally available between the floor and the ceiling of a modern building comprises a winding and anchorage structure **1**, an intermediate frame **2**, a jib **3** and a trolley **4** which travels on the jib **3** and from which a hook **5** is suspended.

The jib has twin booms which extend parallel to one another and are connected only by the winding structure **1**, the intermediate frame **2** and an outer end unit **6**. Each boom is made up of a number of units rigidly connected end to end, the number of units depending upon the outreach and inreach required. A single unit of a boom is shown in elevation in FIGURE 1 extending from *a* to *b* and another unit (part of which has been omitted) from *b* to *c*. The jib can be extended either inwards or outwards by the addition of further units. Two units can be seen in section in FIGURE 2. Each unit comprises three parallel rolled hollow tubes **10**, **11**, **12**, the tubes **10** and **12** being rectangular and the tube **11** being square in cross-section. The tubes are connected together by five equally spaced generally triangular spacer plates **13** which are perpendicular to the length of the tubes and divide the unit into four bays. As can be seen from FIGURE 2 each boom forms a prism which is approximately a right-angled triangle in cross-section with one face between the tubes **11** and **12** horizontal and a second face between tubes **12** and **10** approximately vertical. In each bay between adjacent plates **13** there are three diagonal bracing members **14**, one lying in each face of the prism. The plates **13** project somewhat above the level of the tubes **11**, **12** and support a longitudinally extending angle **15** which, with the tube **12**, defines a channel in which wheels of the trolley can run as will be explained in more detail below. At each end of each of the tubes **10**, **11**, **12** there is a connecting bracket **16** a pair of which are shown to a larger scale in FIGURE 5. The bracket is formed from a short length of channel section the web of which is shaped to a tongue **17** which is welded around the edges to a face of one of the tubes. A block **18** having an aperture therethrough is welded between the flanges of the channel. Adjacent sections of the booms are connected end-to-end by solid spigots **19** and by bolts **20** which extend between the blocks **18** of adjacent connecting brackets **16**.

The winding structure **1** (FIGURES 1 and 3) forms a bridge having two vertical end frames **21** and **22** connected by two horizontal bridge frames **23** and **24**. Each vertical end frame comprises two upright tubes **25** and **26** joined by a lower cross-member **27**, an intermediate cross-member **27***a* and an upper cross-member **28** which extends beyond each of the upright tubes and the ends of which are connected to the upright tubes by braces **29** and **30**. Tubes **31** connected by a shoe **32** are telescoped within the upright tubes **25** and **26**. Between the upright tubes is a screw jack **33** which is supported by the lower and intermediate cross-members **27** and **27***a* and by diagonal braces **34** and which is connected to the shoe by a pivot **35**. Each of the uprights **25** carries a broad-treaded wheel **36** which, when the shoe is lowered, is raised above the ground, and which is so mounted that it can be directionally turned about a vertical axis by a hand lever **36***a* and subsequently locked by that lever in any required direction so that the structure can be moved about when the shoe is raised. Each of the horizontal bridge frames **23** and **24** comprises a pair of trusses **37**, **38** which are connected by horizontal members. Each bridge frame carries an electric motor **39**, **40** respectively and a winding drum **41**, **42** respectively.

The winding structure thus comprises four main units, the end frames **21**, **22** and the bridge frames **23**, **24** each of which can be handled relatively easily on its own. The units can easily be assembled into the winding structure and subsequently can be easily disassembled and removed

to another location. When assembled, the structure is stiffened by diagonal braces **43** and longitudinal members **44** which connect the four trusses together. When assembled the winding structure also carries means **45** for moving the trolley along the jib and the usual control and safety systems **46** which will not be described in detail.

One of the trusses **38** carries six brackets **47** by which the inner ends of the booms of the jib can be secured to the winding structure. Each bracket has a spigot **48** which can enter the end of one of the tubes of the jib which can then be secured to the bracket by a bolt extending between the bracket **47** on the truss and the adjacent bracket **16** on the tube. Thus the tubes are connected to the winding structure in a manner similar to that adopted for connecting together adjacent units of the booms.

The ends of the bridge frame **23** support two upwardly extending tubes **49** having tubes **50** adjustably telescoped therein. The tubes **50** have forked upper ends carrying wooden blocks **51**. The winding structure can be firmly anchored between the ceiling and floor by adjusting the position of the tubes **50** in the tubes **49** and by operation of the jacks **33** on the end frames **21** and **22**.

The intermediate frame which can be seen in front elevation in FIGURE 2 is a portal frame having two uprights each of which consists of two tubes **61** and **62** in which are telescoped tubes **63** and **64** carrying a shoe **65**. The shoes can be raised or lowered by screw jacks **66** similar to the screw jacks **33**. The intermediate frame also carries wheels **67** which are similar to the wheels **36** of the winding structure and which are raised from the floor when the shoes are lowered by the jacks **66**. The two uprights are connected by a strong horizontal beam **68** of hollow rectangular cross-section.

The two booms of the jib are supported from the beam **68** by horizontal pivots formed by connections which can be seen in FIGURES 1 and 2 and one of which is shown to a larger scale in FIGURE 4.

The connection for each boom comprises a pair of suspension plates **71** and **72** fastened to opposite sides of the beam **68** by bolts **73** which pass through stiffening tubes **74** within the beam **68**. The generally triangular spacer plate **13** of the boom has bolted to it the outer member **75** of a pair of spherical or ball mountings **76** the inner members **77** of which are carried on pins **78** passed through apertures in the plates **71** and **72**. By this means bending of the boom when it is placed under load will not be transmitted to the intermediate frame **2**.

The trolley **4** consists of two sides plates **81** and **82** rigidly connected by tubes **83** containing fixed axles **84** the ends of which carry rollers **85** which run in the tracks previously referred to which are formed by the tubes **12** and the angles **15** of the booms. The trolley is guided horizontally in these tracks by guide wheels (not shown) mounted on the trolley about vertical axes by spring loaded and screw-adjusted mountings. Also mounted on axles extending between the plates **81** and **82** are sheaves **86** from which the hook **5** is suspended by a wire rope.

The outer ends of the booms are connected together by the outer unit **6** which includes two horizontal transverse members **91** and **92** which are bolted to the brackets **16** of all six of the tubes **10**, **11**, **12** of the booms by means not shown but similar to those used for coupling the other ends of the boom to the winding structure. A plate **93** lying in a vertical plane projects outwardly from the members **91** and **92** and two pulleys **94** and **95** are rotatably mounted thereon.

When the transporter is installed in a building with the intermediate frame **2** secured near the edge of a floor of the building and the jib projecting from the building, the trolley can be run out on the jib to the position shown in FIGURE 1 and a load raised from the ground by the hook until it is suspended immediately below the trolley. The trolley can then be run in along the jib with the load passing through the intermediate frame to a position between the intermediate frame and the winding structure where it can be unloaded. The bridge arrangement of

the winding structure facilitates access to the load. For example, if the load is a skip of concrete, a barrow or truck can be wheeled under the bridge to a position under the skip and withdrawn when it has been filled from the skip.

The transporter is assembled from a number of units each of which is relatively easy to transport. It will be realised that arrangements differing from that described can be made up from the basic units. For example, the inreach and outreach can be increased by incorporating additional boom units in the jib. The various parts of the assembly are connected together by means which enable fastenings to be made and released quickly and, wherever possible, linch, clevis and spring ring pins are used.

What I claim as my invention and desire to secure by Letters Patent is:

1. A portable construction transporter comprising: a portal frame; a jib extending from an inner end through the portal frame to a cantilevered outer end, the jib consisting of two parallel booms spaced horizontally from one another and connected to the portal frame by connecting means affording relative pivotal movement about a horizontal axis perpendicular to the length of the jib between the booms and the portal frame; a trolley mounted on and between the booms for travel along the jib between the inner and outer ends thereof, the bottom of said trolley being above the level of the bottoms of said booms; an anchorage structure connected to the inner end of said jib and comprising two vertical members and at least one horizontal member releasably connected to the upper ends of said vertical members to form a portal, said anchorage structure carrying at least one winding drum and at least one electric motor drivingly connected to said drum; and a cable extending from said winding drum, through said trolley to a hook depending on said cable from said trolley.

2. In a portable construction transporter comprising an intermediate portal frame, a horizontal jib having a cantilevered outer end, said portal frame supporting said jib at a position intermediate the length of said jib, an anchorage structure supporting said jib at the inner end thereof, a trolley mounted on said jib for travel along the length thereof, load-raising means depending from said trolley, and winding means on said anchorage structure for travelling said trolley and varying the height of said load-raising means, the improvements which comprise:

said jib including two parallel booms of open lattice construction spaced horizontally from one another,

said booms carrying horizontal rail means extending along said jib, and

said trolley being mounted for travel on said rail means between said booms with the bottom of said trolley above the level of the bottoms of said booms.

3. A transporter as claimed in claim 2 in which each boom comprises three parallel tubes interconnected by bracing members.

4. A transporter as claimed in claim 3 in which the bracing members include spaced plates perpendicular to the tubes and dividing the boom into bays and a diagonal member in each of the three faces of each bay.

5. A transporter as claimed in claim 4 in which each boom is made up from a number of substantially identical longitudinal sections joined end to end by releasable coupling means.

6. A transporter as claimed in claim 5 in which there is a coupling for each of the three tubes, each coupling comprising a spigot extending into two abutting tubes from the two sections to be joined and screw threaded connecting members extending parallel with the tubes and joining lugs on the two abutting tubes.

7. A transporter as claimed in claim 2 in which, the jib is connected to the intermediate frame by connecting means permitting a pivotal movement between the jib and the intermediate frame about a horizontal axis perpendicular to the length of the jib.

8. A transporter as claimed in claim 7 in which the connecting means include spherical bearings.

9. A transporter as claimed in claim 7 in which the intermediate frame is supported on shoes connected to the intermediate frame by vertical jacking means and the intermediate frame mounts wheels by which the intermediate frame may be supported by retraction of the shoes by the jacking means.

10. A transporter according to claim 2 in which each boom forms a prism of generally triangular cross-section with an inner vertical face facing the corresponding face of the other boom, said rail means comprising a rail on each boom adjacent the top of the vertical face of said boom.

11. A transporter according to claim 2 wherein said load-raising means is raisable towards said trolley to a position in which at least part of said load-raising means is above the level of the bottoms of said booms.

12. A portable construction transporter comprising: a portal frame positioned near the edge of an upper story of a building; a jib extending from an inner end through said portal frame to a cantilevered outer end projecting outwardly from the building, said jib consisting of two parallel booms spaced horizontally from one another and connected to said portal frame by connecting means affording relative pivotal movement about a horizontal axis perpendicular to the length of said jib between said booms and said portal frame; a trolley mounted on and between said booms for travel along said jib between said inner and outer ends thereof; load-raising means depending from said trolley; an anchorage structure connected to said inner end of said jib and comprising two end frames joined by two bridge frames to form a portal, each of said two bridge frames mounting a winding drum, a wound cable on said drums and extending via said trolley to said load-raising means, and at least one electric motor mounted on said anchorage structure and drivingly connected to said winding drums.

13. A transporter as claimed in claim 12 in which the anchorage structure comprises jacking means jamming said anchorage structure between the floor and ceiling of the structure.

14. A transporter as claimed in claim 12 in which each boom has a cross-section which is approximately a right-angled triangle and has one face which is approximately vertical and one face which is approximately horizontal, the horizontal face being at the top and the vertical faces of the two booms facing one another.

15. A transporter as claimed in claim 14 in which the trolley has rollers and the booms carry tracks adjacent their top faces and on which the rollers run.

16. A transporter as claimed in claim 12 in which the intermediate frame is supported on shoes connected to the intermediate frame by vertical jacking means and the intermediate frame mounts wheels by which the intermediate frame may be supported by retraction of the shoes by the jacking means.

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U.S. Cl. X.R.

212—73; 254—142