Oct. 17, 1950 J. R. ESTEY 2,526,071

PORTABLE INCLINED ELEVATOR

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Fig. 2.

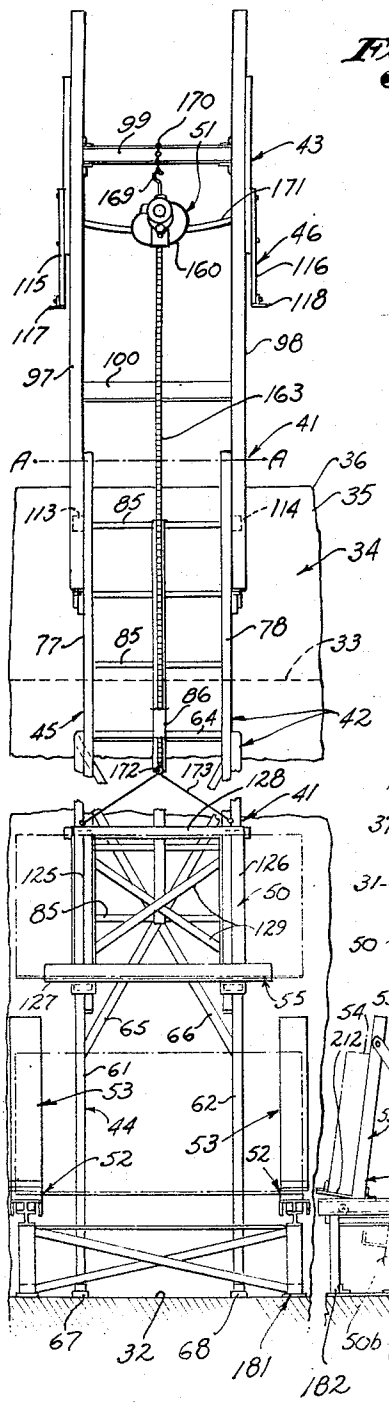
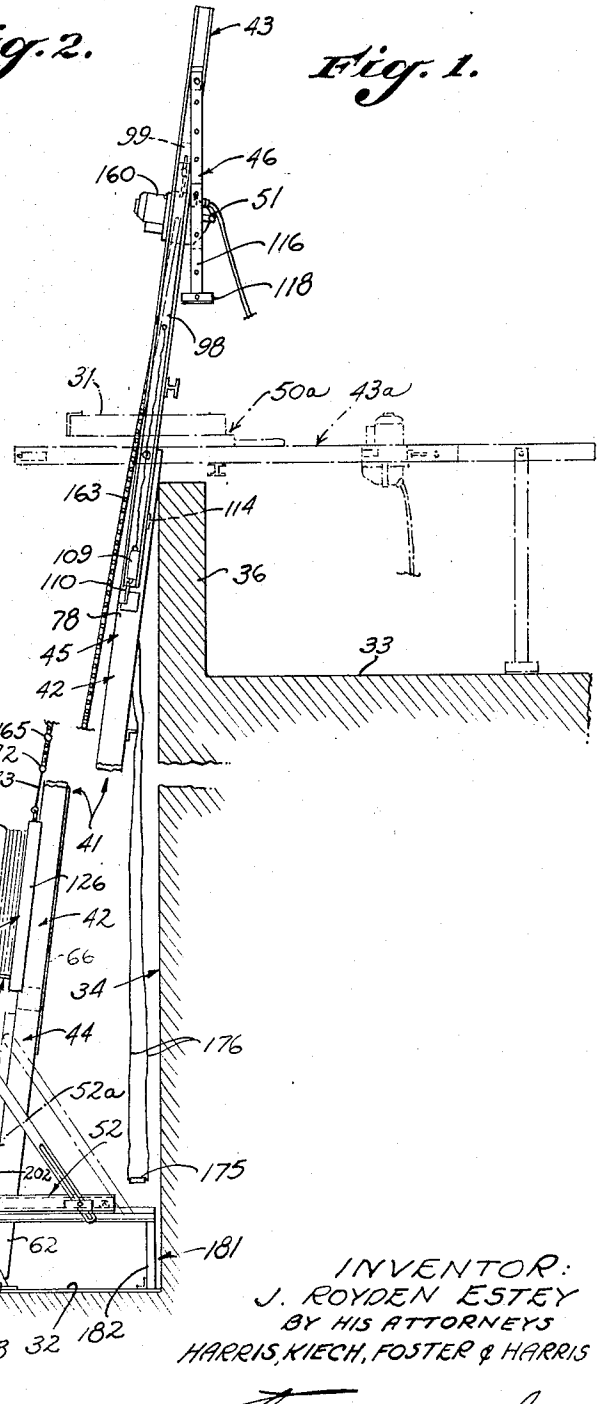


Fig. 1.



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Fig. 3.

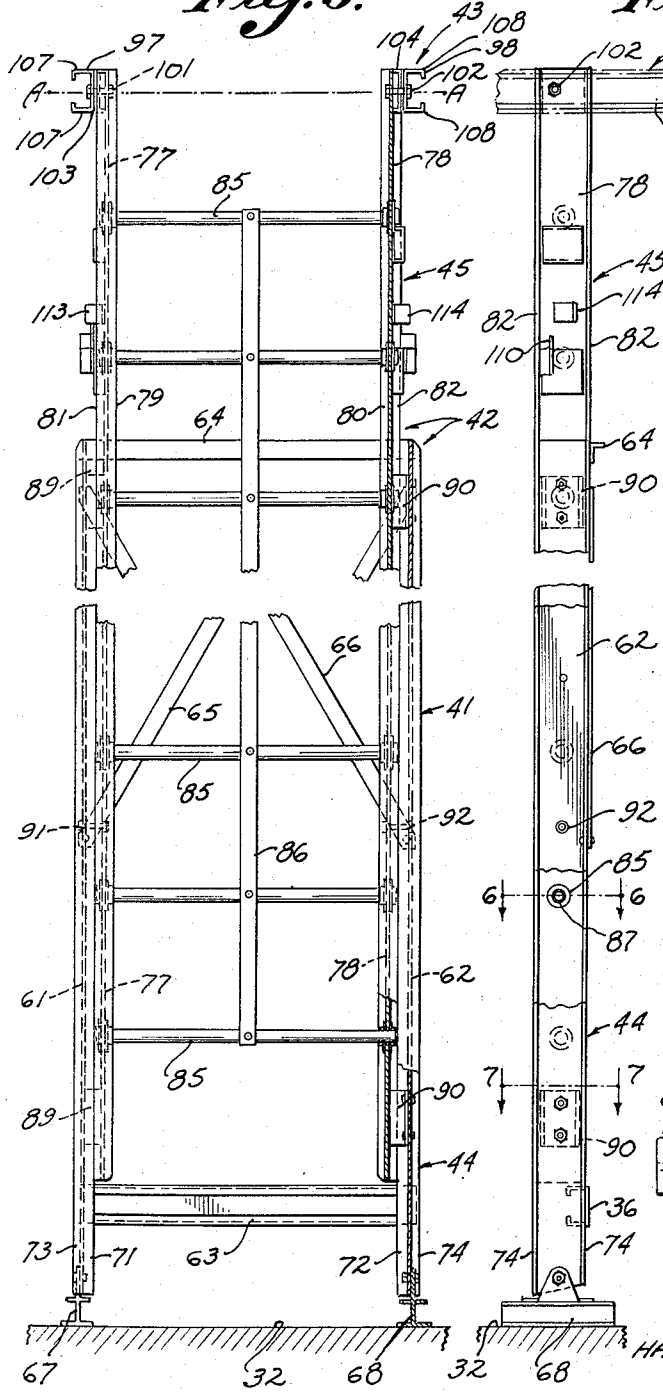


Fig. 4.

Fig. 5.

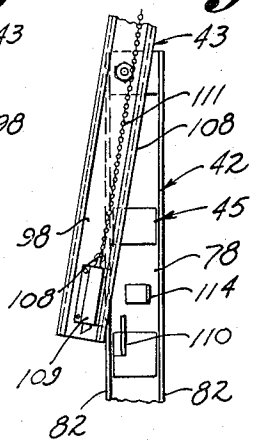


Fig. 6.

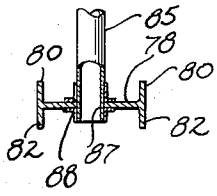
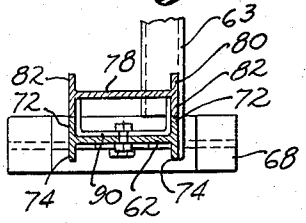


Fig. 7.



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Fig. 8.

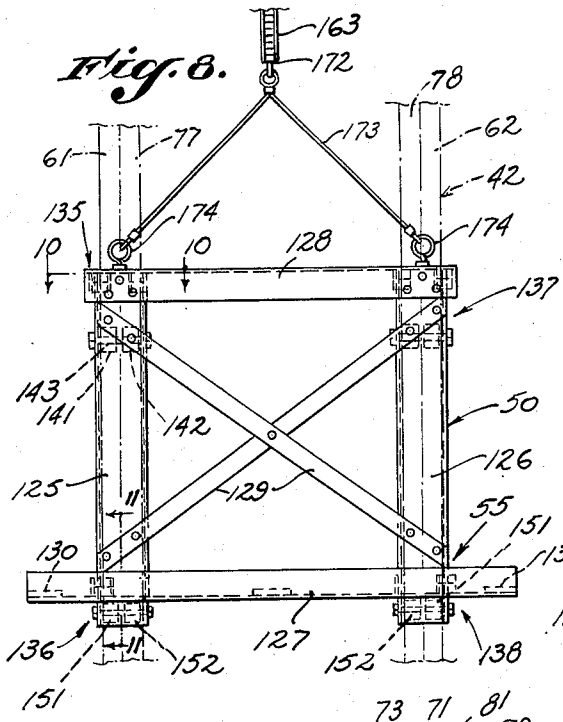


Fig. 9.

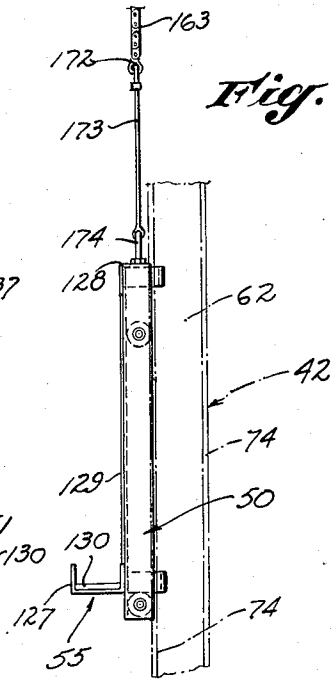


Fig. 10.

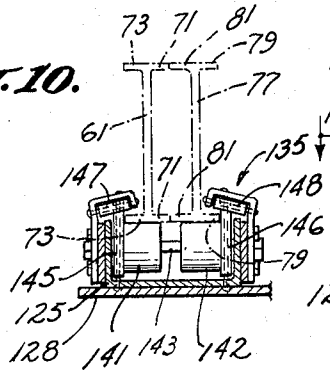


Fig. 11.

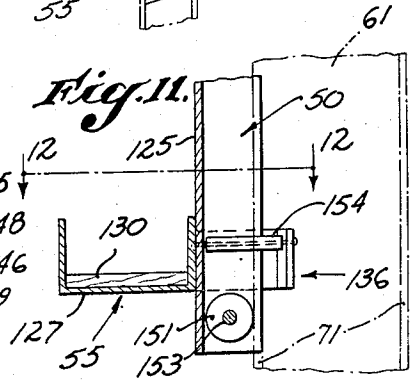
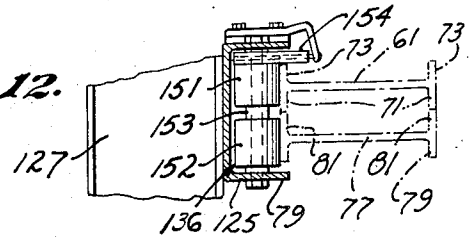


Fig. 12.



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Fig. 13.

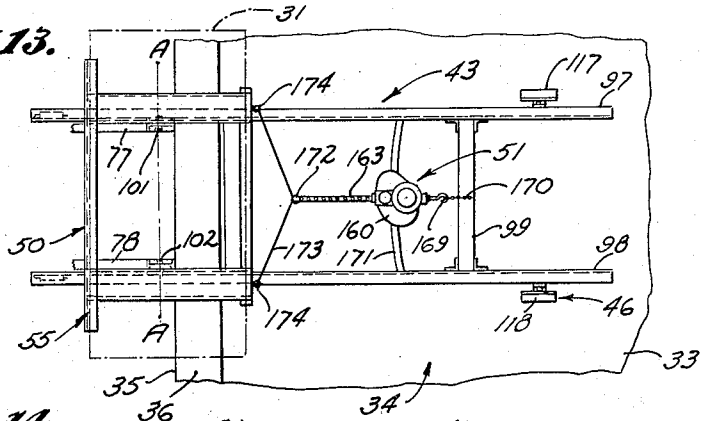


Fig. 14.

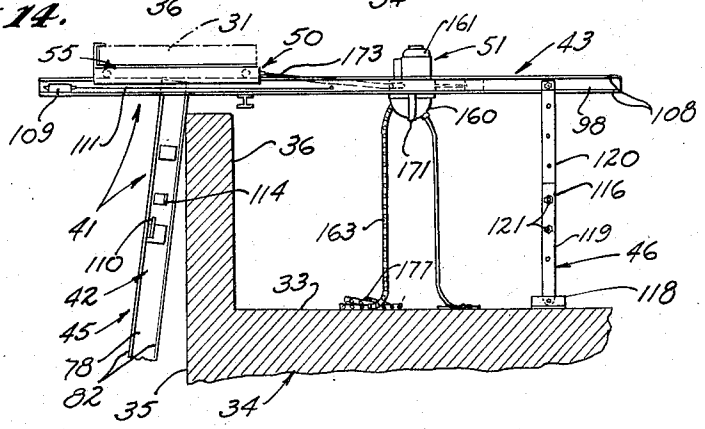


Fig. 15.

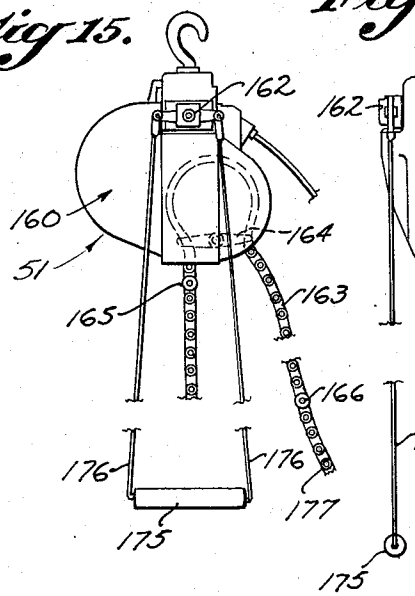
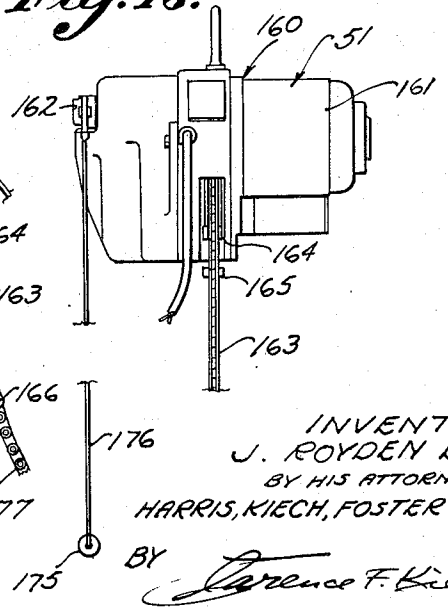


Fig. 16.



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Fig. 17.

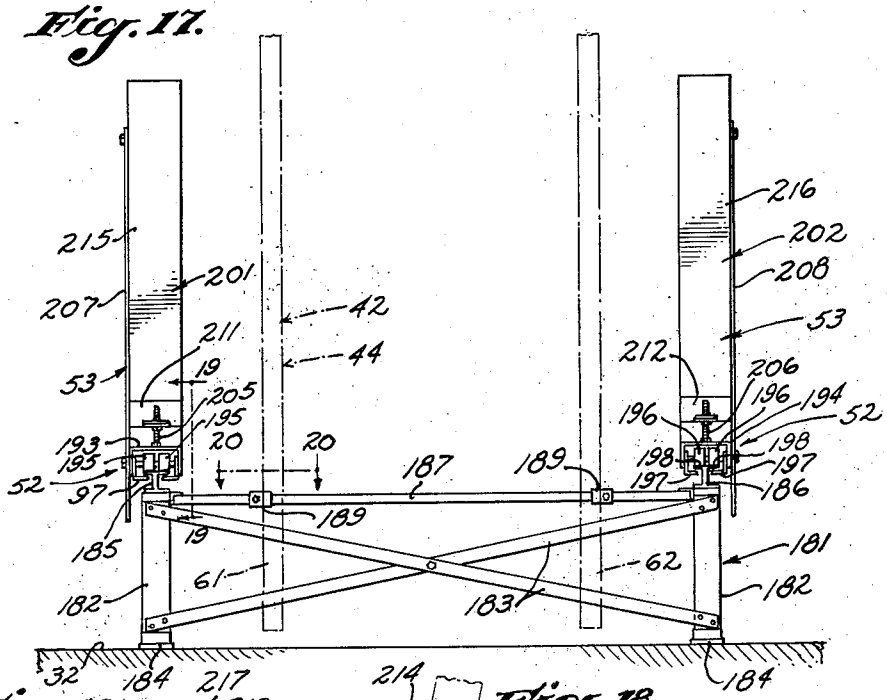


Fig. 19.

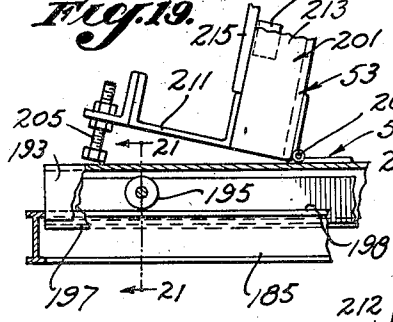


Fig. 18.

Fig. 20.

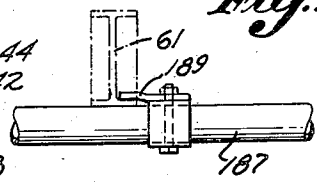
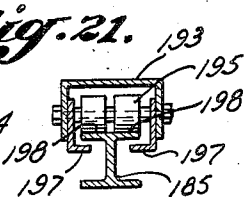


Fig. 21.



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Patented Oct. 17, 1950 2,526,071

UNITED STATES PATENT OFFICE

2,526,071

PORTABLE INCLINED ELEVATOR

James Royden Estey, South Pasadena, Calif., assignor to Aluminex Incorporated, Los Angeles, Calif., a corporation of California

Application September 10, 1948, Serial No. 48,661

22 Claims. (Cl. 214—100)

1

My invention relates in general to hoists and, more particularly, to a semi-portable hoisting apparatus for elevating loads from one level of a building or other structure to another. Since the invention is particularly applicable to and was originally embodied in an apparatus to be used by glaziers for elevating to the roof of a building glass which is to be set in skylights or the like in the roof, I prefer to consider such an application of the invention herein for convenience in disclosing same. However, it will be understood that I do not intend to be limited thereto since, as will be apparent to those skilled in the art, the invention is susceptible to various other applications.

A primary object of my invention is to provide a hoist comprising a ladder-like structure or frame which is adapted to be leaned against a side of the building in a position slightly inclined from the vertical and with the upper end thereof extending above the edge of the roof, and which includes tracks for an elevator for moving a load of glass or other material to the roof.

Another object is to provide a hoist comprising an articulate structure having a base section which is adapted to be leaned against a side of a building with its lower end resting on the ground or other supporting surface, and having an upper, auxiliary section which is pivotally connected to the base section adjacent its upper end for rotation about a substantially horizontal axis, the auxiliary section being rotatable downardly from a position in which it is aligned with the base section to a position in which it is conveniently accessible from the roof of the building.

A further object is to provide a hoist of the foregoing character wherein the base and auxiliary sections of the articulate structure are provided with cooperating tracks which extend substantially from the lower end of the structure to the upper end thereof and which permit movement of the elevator from the base section of the structure onto the pivoted auxiliary section thereof. With this construction, the elevator may be moved upwardly along the tracks on the base section of the structure onto the tracks on the auxiliary section thereof and the auxiliary section may subsequently be rotated downwardly, with the elevator thereon, into a position such that the load of glass or other material carried by the elevator may be removed therefrom readily by an operator on the roof of the building, which is an important feature of the invention.

Other objects in this connection include the provision of cooperating means on the base and

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auxiliary sections of the structure for releasably securing the auxiliary section to the base section to prevent rotation of the auxiliary section, and include the provision of means carried by the auxiliary section and engageable with the roof of the building for supporting the auxiliary section after it has been rotated downwardly with the elevator thereon.

Still another object is to provide a hoist wherein the elevator is movable into a position on the auxiliary section of the structure which is so located with respect to the axis of rotation of the auxiliary section that the latter is substantially balanced, whereby it may be rotated relative to the base section readily, this being another important feature of the invention.

Still another object is to provide a hoist of the foregoing character having actuating means for moving the elevator upwardly along its tracks which is located adjacent the upper end of the hoist structure to minimize the load imposed upon the structure.

A further object of the invention is to provide means controlling the operation of the actuating means for limiting movement of the elevator along its tracks so as to prevent movement thereof beyond the ends of the tracks.

Another object is to provide a hoist structure having a telescoping base section whose length may be varied to permit use of the hoist with buildings of various heights, the base section of the hoist structure being similar to an extension ladder in this respect.

Another object is to provide a hoist structure wherein the tracks on the various sections of the structure are adapted to overlap and wherein the elevator is provided with means thereon for guiding the elevator from the tracks on one section of the hoist structure to the tracks on an adjacent section thereof.

An important object of the invention is to provide a hoist having a loading carriage on which a load to be elevated may be placed while another load is being moved upwardly by the elevator.

Another important object is to provide means on the elevator for automatically removing the load placed on the loading carriage as the elevator moves upwardly along its tracks. A related object is to provide a loading carriage which is movable along substantially horizontal carriage tracks to permit moving the loading carriage out of the path of the elevator as it descends preparatory to picking up another load.

Other objects of the invention include the pro-

vision of a hoist wherein the base section of the hoist structure is pivotable relative to the tracks for the loading carriage, and wherein the loading carriage is provided with load supporting means thereon which is pivotable to permit alignment thereof with the pivotable base section of the hoist structure.

An additional object of the invention is to provide a lightweight hoist which may be moved from one location to another readily.

The foregoing objects and advantages of the invention, together with various other objects and advantages thereof which will become apparent, may be attained through the utilization of the exemplary embodiment which is illustrated in the accompanying drawings and which is described in detail hereinafter. Referring to the drawings:

Fig. 1 is a side elevational view showing a hoist which embodies the invention in position against the side of a building;

Fig. 2 is a front elevational view of the hoist;

Fig. 3 is an enlarged, front elevational view of a base section of an articulate structure or frame which forms part of the hoist;

Fig. 4 is an enlarged, side elevational view of the base section of the articulate hoist structure;

Fig. 5 is an enlarged, fragmentary, side elevational view showing an upper, auxiliary section of the hoist structure pivotally connected to the base section thereof;

Figs. 6 and 7 are fragmentary sectional views taken along the broken lines 6—6 and 7—7, respectively, of Fig. 4;

Fig. 8 is an enlarged, front elevational view of an elevator which forms part of the hoist;

Fig. 9 is an enlarged, side elevational view of the elevator;

Figs. 10 and 11 are fragmentary sectional views which are taken along the broken lines 10—10 and 11—11, respectively, of Fig. 8;

Fig. 12 is a fragmentary sectional view taken along the broken line 12—12 of Fig. 11;

Fig. 13 is a plan view showing the auxiliary section of the hoist structure in a lowered position;

Fig. 14 is a side elevational view showing the auxiliary section in its lowered position;

Fig. 15 is an enlarged, rear elevational view of an actuating means for the elevator;

Fig. 16 is an enlarged, side elevational view of the actuating means;

Fig. 17 is an enlarged, front elevational view of a loading carriage which forms part of the hoist;

Fig. 18 is an enlarged, side elevational view of the loading carriage;

Figs. 19 and 20 are fragmentary sectional views taken along the broken lines 19—19 and 20—20, respectively, of Fig. 17; and

Fig. 21 is a fragmentary sectional view taken along the broken line 21—21 of Fig. 19.

Referring particularly to Fig. 1 of the drawings, I show the hoist of my invention as used to elevate a load 31 substantially from an elevation 32, which may be at ground level, for example, to approximately the level of a roof 33 of a building 34, the hoist being leaned against one side 35 of the building in ladder-like fashion. In the particular application of the invention illustrated in the drawings, the roof 33 of the building 34 is flat, i. e., substantially horizontal, and is surrounded by a parapet 36 against which the hoist is adapted to lean. However, it will be understood that my hoist is not limited to use with buildings of this type and that it may be used with buildings of other types and with various structures other than buildings.

As previously indicated, one of many possible uses of my hoist is to elevate glass to the roof of a building such as the building 34 and I prefer to consider the hoist in such connection herein for convenience in disclosing the invention. When my hoist is used for this purpose, the load 31 elevated thereby may comprise a plurality of sheets or panes 37 of glass which are to be set in skylights (not shown), for example, in the roof 33 of the building 34. However, it will be understood that my hoist is shown in use for elevating a load 31 of glass solely for purposes of illustration and that I do not intend to be limited to such use.

Referring particularly to Figs. 1 and 2 of the drawings, the hoist includes, in general, an articulate hoist structure or frame 41 which comprises a lower, base section 42 having an upper, auxiliary section 43 pivotally connected thereto adjacent its upper end for rotation about a subsequently horizontal axis A—A, the base section being adapted to rest on the ground or other supporting surface at the elevation 32 and being adapted to lean against the side 35 of the building 34 in a substantially vertical position with its upper end extending somewhat above the parapet 36 surrounding the roof 33 of the building. It will be understood that if the hoist is to be used in connection with a building having a pitched roof, the base section 42 of the hoist structure 41 will extend somewhat above the eave line of such roof. The base section 42 includes two telescoping parts 44 and 45 which are relatively slidable to permit varying the length of the base section so that the hoist can be used with buildings of various heights, the base section of the hoist structure 41 being somewhat similar to an extension ladder in this respect.

The auxiliary section 43 of the hoist structure 41, being pivotally connected to the base section 42 thereof as previously mentioned, is rotatable from an upright, substantially vertical position (shown in solid lines in Fig. 1 of the drawings) wherein it is aligned with the base section to a lower, approximately horizontal position (shown in broken lines in Fig. 1 and indicated by the numeral 43a) to facilitate removal of a load elevated by the hoist by an operator standing on the roof 33 of the building 34 as will be discussed in more detail hereinafter. As best shown in Fig. 1 of the drawings, the auxiliary section 43 is provided with adjustable means 46 adapted to rest on the roof 33 for supporting the auxiliary section in its lowered position.

The hoist includes an elevator 50 which is movable substantially from the lower end of the hoist structure 41 to the upper end thereof along tracks on the base and auxiliary sections 42 and 43 of the hoist structure, the tracks for the elevator being described in more detail hereinafter. The hoist also includes actuating means 51 for moving the elevator 50 along its tracks, the actuating means being mounted on the auxiliary section 43 of the hoist structure for an important reason which will be discussed hereinafter.

Cooperating with the elevator 50 is a loading

carriage 52 which is movable substantially horizontally relative to the hoist structure 41 from a first position (shown in solid lines in Fig. 1 of the drawings) to a second position (shown in broken lines in Fig. 1 and indicated by the numeral 52a), the loading carriage being provided with load-supporting means 53 thereon on which a load 54 comprising panes of glass or other material may be placed while the load 31, shown as carried by load-supporting means 55 on the elevator 50, is being moved upwardly by the actuating means 51. As will be discussed in more detail hereinafter, the load-supporting means 55 on the elevator 50 is adapted to remove the load 54 from the load-supporting means 53 on the carriage 52 automatically so that there is no necessity for manually placing the load on the load-supporting means on the elevator. This substantially doubles the capacity of the hoist and represents an important feature of the invention.

Considering the hoist in more detail, the lower part 44 of the base section 42 of the hoist structure 41 includes a pair of spaced, parallel frame members 61 and 62 which, as will be discussed in more detail hereinafter, provide tracks for the elevator 50, the members 61 and 62 being referred to hereinafter as track members for convenience. The track members 61 and 62 are rigidly connected, as by transverse frame members 63 and 64 and diagonal bracing members 65 and 66, the members 63 to 66 being suitably secured at their respective ends to the track members 61 and 62. Foot members 67 and 68 are connected to the lower ends of the track members 61 and 62, respectively, and are adapted to rest on the ground or other surface to support the hoist, the foot members being pivotally connected to the track members to permit varying the angle of the hoist relative to the ground or other supporting surface so that its angle with respect to the side 35 of the building 34 may be varied. In the particular construction illustrated in the drawings, the track members 61 and 62 are I-beams each having a pair of inwardly extending, longitudinal flanges and a pair of outwardly extending, longitudinal flanges, the inwardly extending flanges of the track members 61 and 62 being identified by the numerals 71 and 72, respectively, and the outwardly extending flanges thereof being identified by the numerals 73 and 74, respectively. As will be discussed in more detail hereinafter, one of the outwardly extending flanges 73 of the track member 61 and one of the outwardly extending flanges 74 of the track member 62 provide tracks for the elevator 50.

As best shown in Figs. 3 and 4 of the drawings, the upper part 45 of the base section 42 of the hoist structure 41 includes a pair of spaced, parallel track members 77 and 78 which are also I-beams in the particular construction illustrated, the track members 77 and 78 being provided with pairs of inwardly extending, longitudinal flanges 79 and 80, respectively, and being provided with pairs of outwardly extending, longitudinal flanges 81 and 82, respectively. As will be discussed in more detail hereinafter, one of the inwardly extending flanges 79 of the track member 77 and one of the inwardly extending flanges 80 of the track member 78 provide tracks for the elevator 50.

The track members 77 and 78 of the upper part 45 of the base section 42 are rigidly connected by rung-like, transverse frame members 85 which are spaced apart longitudinally of the track members 77 and 78, the frame members 85 being interconnected intermediate their ends by a strap member 86. The frame members 85, which are formed of tubular material in the particular construction illustrated, are connected at their respective ends to the track members 77 and 78 in any suitable manner, one possible connection being illustrated in Fig. 6 of the drawings which shows in detail one of the frame members 85 connected to the track member 78. Referring to Fig. 6, the track member 78 is provided with an opening 87 which receives an end of one of the frame members 85, this frame member being secured to the track member 78 by means of flanged collars 88 pressed on the member 85 on opposite sides of the web of the I-beam forming the track member 78.

The track members 61 and 62 of the lower part 44 of the base section 42 receive the upper part 45 of the base section therebetween as best shown in Fig. 3 of the drawings, the track members 61 and 77 being disposed side-by-side in such a manner that the edges of the inwardly extending flanges 71 of the track member 61 slidably engage, or substantially slidably engage, the edges of the outwardly extending flanges 81 of the track member 77. The track members 62 and 78 are disposed side-by-side in a similar manner. Guide members 89 are disposed between the inwardly extending flanges 71 of the track member 61 and the outwardly extending flanges 81 of the track member 77 to prevent transverse separation of the two parts of the base section 42 of the hoist structure 41. Similarly, guide members 90 are disposed between the inwardly extending flanges 72 of the track member 62 and the outwardly extending flanges 82 of the track member 78 to prevent transverse separation of the two parts of the base section, one of the guide members 90 being shown in detail in Fig. 7 of the drawings. The guide members 89 and 90 may be short channels which are secured to the track members 61 and 62, respectively, as by bolts, for example.

It will thus be apparent that the two parts 44 and 45 of the base section 42 of the hoist structure are relatively slidable to permit varying the length of the base section so that the hoist may be used with buildings of various heights, the guide members 89 and 90 preventing transverse separation of the two parts of the base section. The two parts of the base section may be secured in any one of several relative positions to provide various lengths for the base section by means of bolts 91 and 92, for example, respectively connecting the track members 61 and 77 and the track members 62 and 78. Preferably, the track members 61, 62, 77 and 78 are provided with a plurality of holes therein for the bolts 91 and 92 to permit varying the length of the base section 42 of the hoist structure 41 by increments of suitable length.

Referring particularly to Fig. 2 of the drawings, the auxiliary section 43 of the hoist structure 41, which, as previously indicated, is pivotally connected to the base section 42 thereof for rotation about the horizontal axis A—A, includes a pair of longitudinal frame members 97 and 98 which are adapted to be aligned with the track members 61 and 62, respectively, and which also provide tracks for the elevator 50, the members 97 and 98 being referred to hereinafter as track members. The track members 97 and 98 are rigidly connected, as by frame members 99 and 100 connected at their respective ends to the members 97 and 98, and receive the upper part 45 of the base section 42 of the hoist structure there-

between. As best shown in Fig. 3 of the drawings, the track members 97 and 98 are pivotally connected to the track members 77 and 78, respectively, as by bolts 101 and 102, respectively. Bearing members 103 and 104, exemplified as short channels respectively disposed between the outwardly extending flanges 81 of the track member 77 and the outwardly extending flanges 82 of the track member 78, are respectively interposed between the track members 77 and 97 and the track members 78 and 98. In the particular construction illustrated, the track members 97 and 98 are channels having outwardly extending, longitudinal flanges 107 and 108, respectively. As will be discussed in more detail hereinafter, one of the flanges 107 and one of the flanges 108 serve as tracks for the elevator 50.

The auxiliary section 43 of the hoist structure 41 and the upper part 45 of the base section 42 thereof are provided with cooperating means thereon for releasably securing the auxiliary section in its upright position, shown in solid lines in Fig. 1 of the drawings, until such time as it is to be rotated into its lowered position to permit removal of a load from the elevator 50. Referring particularly to Fig. 5 of the drawings, the securing means for the auxiliary section 43 comprises, in the particular construction illustrated, a latch 109 which is mounted on the track member 98 and which is engageable with a latch plate 110 on the track member 78, the latch 109 being disengageable from the latch plate by means of a chain 111, or the like, which may be pulled to disengage the latch from the latch plate by an operator on the roof 33 of the building 34. In order to prevent rotation of the auxiliary section 43 of the hoist structure beyond its upright position in the counterclockwise direction, as viewed in Fig. 1 of the drawings, the track members 77 and 78 of the upper part 45 of the base section of the hoist structure are provided with flanges 113 and 114 thereon against which the respective track members 97 and 98 of the auxiliary section 43 are adapted to seat, the flanges 113 and 114 being shown in Figs. 2 and 3 of the drawings and the manner in which the track member 98 seats against the flange 114 being clearly indicated in Figs. 1 and 5 thereof.

As best shown in Figs. 1, 2, 13 and 14 of the drawings, the means 46 for supporting the auxiliary section 43 of the hoist structure 41 when it is in its lowered position comprises a pair of standards 115 and 116 which are pivotally connected to the track members 97 and 98, respectively, of the auxiliary section. The standards 115 and 116 are respectively provided with pivotable foot members 117 and 118 which are adapted to rest on the roof 33 of the building 34, the foot members being pivotally connected to the standards to permit variations of the angles between the standards and the auxiliary section 43 of the hoist structure and between the auxiliary section of the hoist structure and the base section 42 thereof. Such angular variations may result from variations in the position of the axis of rotation A—A of the auxiliary section 43 relative to the roof 33, variations in the pitch of the roof, etc. Also, the lengths of the standards 115 and 116 are preferably variable to permit further variations in the angle between the auxiliary section 43 of the hoist structure 41 and the base section 42 thereof, each of the standards being formed in two parts which may be overlapped to varying extents to attain this end. As best shown in Fig. 14 of the drawings, the standard 116, for example, is formed in two parts 119 and 120 which are secured together by bolts 121, each of the two parts of the standard 116 being provided with a plurality of holes therein through various combinations of which the bolts 121 may be inserted to vary the length of the standard. A similar construction is employed for the standard 115.

The standards 115 and 116 may swing freely from the auxiliary section 43 of the hoist structure and, as best shown in Fig. 1 of the drawings, normally hang downwardly therefrom when the auxiliary section is in its upright position. When the auxiliary section 43 is rotated into its lowered position, i. e., the position indicated by the numeral 43*a* in Fig. 1 of the drawings, the standards 115 and 116 automatically rotate relative to the auxiliary section into positions such that the foot members 117 and 118 thereon engage the roof 33 to support the auxiliary section in its lowered position.

Referring particularly to Figs. 8 to 12 of the drawings, the elevator 50 comprises an elevator frame or carriage having a pair of spaced, parallel frame members 125 and 126, exemplified as channels, which are rigidly connected by transverse frame members 127 and 128 and diagonal bracing members 129. The transverse frame member 127 provides a shelf which forms the previously mentioned load-supporting means 55 on the elevator 50 and, as best shown in Figs. 9 and 11 of the drawings, comprises an upwardly-facing channel in the particular construction illustrated, the channel 127 being adapted to receive the lower edges of panes of glass or other similar material. Since, as indicated in Fig. 1 of the drawings, the hoist is inclined somewhat in its leaning position against the side 35 of the building 34, the rearmost of the panes of glass or other material carried by the channel 127 will rest against the channels 125 and 126 of the elevator 50 and against the diagonal bracing members 129. As best shown in Figs. 8 and 11 of the drawings, blocks 130 of cushioning material are preferably disposed in the channel 127 to protect the lower edges of panes of glass set therein.

The elevator 50 is provided with means for guiding it along the tracks provided by the various track members 61, 62, 77, 78, 97 and 98, the guiding means comprising roller assemblies 135 and 136 which are carried by the channel 125 and which are engageable with the track members 61, 77 and 97, and comprising roller assemblies 137 and 138 which are carried by the channel 126 and which are engageable with the track members 62, 78 and 98. The roller assemblies 135 and 137 are identical, as are the roller assemblies 136 and 138, so that only the assemblies 135 and 136 will be described in detail.

Referring particularly to Figs. 8 and 10 of the drawings, the roller assembly 135 includes a pair of rollers 141 and 142 carried by a spindle 143 which extends through the flanges of the channel 125, the rollers 141 and 142 being disposed between the flanges of the channel 125. The roller 141 is adapted to engage the forward sides of one of the flanges 71 and one of the flanges 73 of the track member 61 and the roller 142 is adapted to engage the forward sides of one of the flanges 79 and one of the flanges 81 of the track member 77. It will be noted that the width of the channel 125 is somewhat greater than the combined widths of the track members 61 and 77 to permit such engagement between the

rollers 141 and 142 and the track members 61 and 77.

It will be apparent that if the base section 42 of the hoist structure is extended so that the track members 61 and 77 do not overlap throughout their entire lengths, the roller 141 may be disengaged from the track member 61 while the roller 142 is in engagement with the track member 77, or vice versa, the rollers 141 and 142 both engaging their respective track members only in the zone in which the two track members overlap. However, it will be noted that one of the rollers 141 and 142 will always be in engagement with one of the track members 61 and 77. Also, as the elevator 50 is moved upwardly toward the auxiliary section 43 of the hoist structure, the roller 141 is adapted to engage one of the flanges 107 on the track member 97 of the auxiliary section in a manner not specifically shown in the drawings but substantially identical to the manner in which it engages the flanges 71 and 73 on the track member 61. Thus, as the elevator is moved upwardly with the base section 42 of the hoist structure extended, as shown in Fig. 2, for example, the roller 141 will roll along the flanges 71 and 73 of the track member 61 to the point where the track members 61 and 77 overlap. Subsequently, the rollers 141 and 142 will roll along the track members 61 and 77, respectively, to the point where the track members 61 and 77 cease to overlap, the roller 142 thereafter rolling along the track member 77. When the point at which the track member 97 of the auxiliary section 43 and the track member 77 overlap is reached, the rollers 141 and 142 will roll along the track members 97 and 77, respectively. Thereafter, the roller 142 will disengage the track member 77 as it reaches the end of the overlap between the track members 77 and 97 so that only the roller 141 will be in engagement with its track member, i. e., the track member 97, as the elevator 50 approaches the upper limit of its travel. Thus, when the hoist structure 41 is substantially vertical, as shown in Fig. 1, for example, one of the rollers 141 and 142 is always in engagement with one of the track members 61, 77 and 97 throughout the entire range of movement of the elevator 50.

Again referring particularly to Fig. 10 of the drawings, the channel 125 carries rollers 145 and 146 which are adapted to engage the track members 61, 77 and 97 to prevent lateral shifting of the elevator 50, the roller 145 being adapted to engage the edge of one of the flanges 73 on the track member 61 and the edge of one of the flanges 107 on the track member 97, and the roller 146 being adapted to engage the edge of one of the flanges 79 on the track member 77. The roller 145 of the roller assembly 135 is paired with a corresponding roller in the roller assembly 137 so that when the roller 145 is in engagement with the edge of one of the outwardly extending flanges 73 and 107 of the track members 61 and 97, the corresponding roller of the roller assembly 137 is in engagement with the edge of one of the outwardly extending flanges 74 and 108 of the track members 52 and 98 to prevent lateral shifting of the elevator 50. Similarly, when the roller 146 of the roller assembly 135 is in engagement with the edge of one of the inwardly extending flanges 79 of the track member 77, a corresponding roller of the roller assembly 137 is in engagement with the edge of one of the inwardly extending flanges 80 of the track member 78 to prevent transverse movement of the elevator 50. Thus the rollers 145 and 146 of the assembly 135 and the corresponding rollers of the assembly 137 prevent lateral movement of the elevator 50 irrespective of its vertical position relative to the hoist structure 41.

The roller assembly 135 is also provided with rollers 147 and 148 for preventing forward movement of the elevator 50 away from the hoist structure in the event that the hoist structure is positioned vertically or nearly vertically, the roller 147 being adapted to engage the rearward side of one of the outwardly extending flanges 73 on the track member 61 and being adapted to engage the rearward side of one of the flanges 107 on the track member 97. Similarly, the roller 148 is adapted to engage the rearward side of one of the flanges 79 on the track member 77. Thus, one of the rollers 147 and 148 is adapted to engage one of the track members 61, 77 and 97 to prevent forward movement of the elevator 50 away from the hoist structure 41. The roller assembly 137 includes corresponding rollers (not shown in detail) which are adapted to engage the track members 62, 78 and 98.

Referring now to Figs. 11 and 12 of the drawings in particular, the roller assembly 136 includes a pair of rollers 151 and 152 which are disposed between the flanges of the channel 125 and which are mounted on a spindle 153, the rollers 151 and 152 being aligned with the rollers 141 and 142, respectively, of the roller assembly 135 which was described previously. Thus, the roller 151 is adapted to engage the track member 61, or the track member 97, and the roller 152 is adapted to engage the track member 77. The roller assembly 136 also includes a roller 154 which is aligned with the previously discussed roller 145 of the assembly 135, the roller 154 being adapted to engage the edge of one of the flanges 73 on the track member 61 and the edge of one of the flanges 107 on the track member 97. The roller 154 cooperates with a corresponding roller in the roller assembly 138 to prevent transverse movement of the elevator 50, thus supplementing the action of the rollers 145 and 146 of the roller assembly 135 and the corresponding rollers of the roller assembly 137.

Referring particularly to Figs. 13 to 16 of the drawings, the actuating means 51 includes a hoisting device 160 which is largely conventional so that only a general description thereof is necessary herein, the hoisting device 160 per se forming no part of the present invention. In the particular construction illustrated, the hoisting device 160 includes a reversible electric motor 161 which is controlled by a reversing switch 162 and which is adapted to drive a sprocket (not shown) having a roller chain 163 trained thereon. The hoisting device 160 also includes a limit switch 164 for de-energizing the motor 161 whenever it is engaged by one of a pair of projections 165 and 166 on the chain 163. As will be discussed in more detail hereinafter, the projections 165 and 166 on the chain 163 are adapted to actuate the limit switch 164 to limit movement of the elevator 50 along its tracks, the projection 165 being adapted to actuate the switch 164 to limit upward movement of the elevator and the projection 166 being adapted to actuate the limit switch to limit downward movement of the elevator.

Preferably, the projection 165 is adjustable to compensate for variations in the length of the base section 42 of the hoist structure when the base section is lengthened or shortened for use

with buildings of different heights. This may be accomplished by making the projection 165 detachable so that it may be moved from one point on the chain 163 to another.

As best shown in Figs. 2 and 13 of the drawings, the hoisting device 160 is secured to the frame member 99 of the auxiliary section 43 of the hoist structure 41, as by a hook 169 on the hoisting device engaging a chain 170, or the like, which encircles the frame member 99. The hoisting device is also supported by a strap 171 which extends between the track members 97 and 98 of the auxiliary section 43 of the hoist structure, the primary function of the strap 171 being to support the hoisting device against sagging when the auxiliary section 43 is rotated into its lowered position. As best shown in Figs. 2, 8 and 13, one end 172 of the chain 163 is connected to a bail 173 the ends of which are connected to eye bolts 174 connected to the transverse frame member 128 of the elevator 50, the projection 165 on the chain for limiting upward movement of the elevator being disposed between the elevator and the hoisting device 160. In the particular construction illustrated in the drawings, the hoisting device 160 is designed to be controlled by an operator on the roof 33 of the building 34 and a handle 175 accessible to such an operator is provided, the handle 175 being connected to the reversing switch 162 by cords 176. Thus, by rocking the handle 175 to actuate the reversing switch 162 through the cords 176, the operator may cause the hoisting device 160 to raise or lower the elevator 50, or he may stop the elevator in any desired position. Preferably, the projections 165 and 166 on the chain 163 are so located that they actuate the limit switch 164 to stop the elevator 50 automatically at upper and lower positions, which is an important feature of the invention. The projection 166 serves another function in that it actuates the limit switch 164 to de-energize the motor 161 so as to prevent running the upper end 177 of the chain 163 through the hoisting device inadvertently. As indicated in Fig. 14 of the drawings, the chain 163 may be allowed to coil up on the roof 33 of the building 34 as the elevator 50 ascends, although a suitable take-up mechanism (not shown) for the chain may be provided if desired.

It will be understood that although I have described the hoisting device 160 as being controllable by an operator on the roof 33 of the building 34 by means of the handle 175 connected to the reversing switch 162, the hoisting device may be made controllable from the ground or other supporting surface on which the hoist structure 41 rests. For example, this may be accomplished by extending the cords 176 so as to permit locating the handle 175 in any suitable position adjacent the lower end of the hoist structure 41, as indicated in Fig. 1.

It will also be understood that although I have described the hoisting device 160 as electrically operable, a hoisting device which is not electrically operable may be used if desired. For example, a manually operable hoisting device may be used.

An important feature of my invention resides in mounting the hoisting device 160 on the auxiliary section 43 of the hoist structure 41. This results in reducing the load imposed on the hoist structure 41 by the weight of the material carried by the elevator 50 to approximately one-half the load which would be imposed thereon if the hoisting device were located at the bottom of the hoist structure. The reason for this is, of course, that, if the hoisting device 160 were located adjacent the bottom of the hoist structure 41, it would be necessary for the hoisting device 160 to exert a downward pull on the chain 163 equal to the downward pull exerted thereon by the weight of the load carried by the elevator 50, thus doubling the load imposed on the hoist structure 41.

Referring particularly to Figs. 17 to 21 of the drawings, the loading carriage 52 is mounted on a frame, indicated generally by the numeral 181, which surrounds the lower end of the base section 42 of the hoist structure 41 and which is adapted to rest on the ground or other supporting surface on which the foot members 67 and 68 at the lower end of the base section of the hoist structure rest. The frame 181 is rectangular in the particular construction illustrated and is provided with a vertical frame member 182 at each corner, the frame members 182 being interconnected by transversely extending, diagonal bracing members 183 and by forwardly and rearwardly extending frame members 184 which are adapted to rest on the ground. The vertical frame members 182 are also connected in pairs by substantially horizontal, forwardly and rearwardly extending frame members 185 and 186, the latter being parallel and providing tracks for the loading carriage 52. For convenience, the members 185 and 186 will be referred to as track members hereinafter.

As best shown in Figs. 17 and 18 of the drawings, the base section 42 of the hoist structure 41 is pivotally connected to the frame 181 which supports the loading carriage 52, the track members 61 and 62 of the lower part 44 of the base section having secured thereto a shaft 187 which is journalled at its ends in bearings 188, only one of which is visible in Fig. 18 of the drawings, carried by the track members 185 and 186 of the frame 181. The track members 61 and 62 are secured to the shaft 187 by clamps 189, one of the latter being shown in detail in Fig. 20 of the drawings.

As best shown in Fig. 17 of the drawings, the loading carriage 52 includes two frame members 193 and 194 which are downwardly facing channels in the particular construction illustrated, the channels 193 and 194 being positioned above the track members 185 and 186, respectively. The channel 193 carries two pairs of rollers 195 which engage the track member 185, and the channel 194 carries two pairs of rollers 196 which engage the track member 186. The loading carriage 52 is retained on the track members 185 and 186 by angles 197 which extend under flanges 198 on the track members, the latter being I-beams in the particular construction illustrated.

The load-supporting means 53 on the loading carriage 52 comprises a pair of load-supporting structures 201 and 202 which are pivotally connected to the channels 193 and 194, respectively, at 203 and 204, respectively, in order to permit varying the angle between the load-supporting means and the carriage in correspondence with variations in the angle between the base section 42 of the hoist structure 41 and the supporting frame 181 for the loading carriage. Forward rotation of the load-supporting structures 201 and 202 is prevented by bolts 205 and 206 which engage the channels 193 and 194, respectively, and rearward rotation thereof is prevented by bracing members 207 and 208 which are pivotally connected to the load-supporting structures 201 and

202, respectively, and which are adjustably connected to the channels 193 and 194, respectively, the bracing members 207 and 208 being slotted to permit such adjustable connections to the channels 193 and 194 in a manner which will be apparent. Thus, the angle between the load-supporting structures 201 and 202 and the channels 193 and 194 of the loading carriage 52 may be varied by adjusting the bolts 205 and 206 and the bracing members 207 and 208.

The load-supporting structures 201 and 202 respectively include shelf members 211 and 212, exemplified as upwardly-facing channels, which are adapted to receive the lower edges of panes of glass or other material, the load-supporting structures 201 and 202 also including supporting members 213 and 214, respectively, against which the rearmost pane of glass is adapted to rest. In the particular construction illustrated, the supporting members 213 and 214 are forwardly-facing channels which receive cushioning members 215 and 216 for protecting the glass or other material carried by the load-supporting means 53. As best shown in Figs. 18 and 19 of the drawings, the lower end of the cushioning member 216 is adapted to seat against the edge of one of the flanges of the channel 212, the member 216 having secured thereto blocks 217 which are insertable into the channel-shaped supporting member 214 to prevent transverse shifting of the member 216. A similar construction may be employed for the cushioning member 215.

Considering the operation of the hoist with particular reference to Figs. 1 and 14 of the drawings, it will be assumed that the elevator 50, with the load 31 thereon, is being moved upwardly by the hoisting device 160. The projection 165 on the chain 163 is preferably so located that as the elevator 50 reaches a position such that the center of gravity of the elevator and the load 31 carried thereby is substantially opposite the pivotal axis A—A of the auxiliary section 43 of the hoist structure 41, i. e., the position shown in broken lines in Fig. 1 and indicated by the numeral 50*a*, the projection 165 actuates the limit switch 164 to stop the motor 161 automatically. With the elevator 50 in this position, the auxiliary section 43 of the hoist structure is substantially balanced so that an operator on the roof, after releasing the latch 109 which secures the auxiliary section 43 of the hoist structure to the base section 42 thereof, may rotate the auxiliary section into its lowered position readily without the expenditure of any appreciable effort. As the operator rotates the auxiliary section 43 into its lowered position, the standards 115 and 116 automatically swing into position to support the auxiliary section.

With the auxiliary section 43 of the hoist structure in its lowered position, the operator on the roof may move the elevator 50 to the right manually, as viewed in Fig. 14 of the drawings, into a more accessible position so that the load 31 may be removed therefrom easily. It will be noted that in Fig. 14 of the drawings, the chain 163 is shown as being permitted to coil up on the roof 33 of the building 34 as the elevator 50 ascends, although, as previously discussed, a suitable take-up mechanism for the chain may be provided if desired.

After the load 31 has been removed from the elevator 50 in the foregoing manner, the operator on the roof restores the auxiliary section 43 of the hoist structure to its upright position, the latch 109 being adapted to engage the latch plate 110 automatically to secure the auxiliary section in its upright position. Thereafter, the operator on the roof moves the reversing switch 162 to a position to permit the elevator 50 to descend to its lowermost position, i. e., the position indicated by the numeral 50*b* in Fig. 1 of the drawings. In the event that the operator fails to stop the motor 161 of the hoisting device 160 when the elevator 50 reaches its lowermost position, the projection 166 on the chain 163 will engage the limit switch 164 to stop the motor automatically.

While the foregoing is taking place, an operator on the ground or other supporting surface on which the hoist rests places another load, e. g., the load 54, on the loading carriage 52, the loading carriage preferably being in its second position, 52*a*, i. e., the position shown in broken lines in Fig. 1 of the drawings. Subsequently, the loading carriage 52 is moved into its first position so that the elevator 50 may move downwardly into its lower position 50*b* without interference, the elevator being insertable between the load-supporting structures 201 and 202 on the loading carriage.

After the elevator 50 reaches its lower position 50*b*, the operator on the ground moves the loading carriage 52 into its second position 52*a*, so as to bring the load 54 on the loading carriage into alignment with the load-supporting means 55 on the elevator. With the loading carriage 52 in its second position, the shelf member or channel 127 forming the load-supporting means 55 on the elevator 50 will align itself with the shelf members or channels 211 and 212 of the load-supporting means 53 on the loading carriage as the elevator moves upwardly between the load-supporting structures 201 and 202 of the load-supporting means on the carriage. Thus, when the operator on the roof 33 of the building 34 moves the reversing switch 162 to a position to cause the hoisting device 160 to move the elevator 50 upwardly, the load-supporting means 55 will automatically remove the load 54 from the load-supporting means 53 on the carriage 52. Thus, the provision of the loading carriage 52 materially increases the capacity of the hoist since the second load may be placed thereon preparatory to being picked up by the elevator 50 while the elevator is ascending, being unloaded, and descending, which is an important feature of the invention.

The foregoing sequence of operations is repeated for each load which is to be transferred from the elevation 32 to the roof 33 of the building 34 or other structure.

I prefer to fabricate the structural components of my hoist, i. e., the hoist structure 41, the elevator 50, the loading carriage 52, and the supporting frame 181 for the loading carriage, of aluminum or aluminum alloys to provide a lightweight hoist which may be moved readily from one location to another as required. It will be noted that the hoist may also be collapsed to facilitate movement thereof from one location to another by telescoping the two parts 44 and 45 of the base section 42 together and by detaching the auxiliary section 43 from the base section.

Although I have disclosed an exemplary embodiment of my invention herein and have suggested a possible application thereof for purposes of illustration, it will be understood that the invention is susceptible to various other applications and that various changes, modifications and substitutions may be incorporated in

the specific embodiment disclosed without necessarily departing from the spirit of the invention. Consequently, I do not intend to be limited to any specific application of the invention and I hereby reserve the right to all changes, substitutions and modifications which come within the scope of the invention as set forth in my appended claims.

I claim as my invention:

1. In an apparatus of the character described for elevating a load from one level of a structure to another, the combination of: an elongated, articulate frame adapted to be leaned against the structure so as to extend between said levels, said frame comprising a base section having an auxiliary section pivotally connected thereto adjacent its upper end, said sections being provided with tracks extending longitudinally of said frame; an elevator movable along said tracks from one of said sections of said frame to the other; and actuating means carried by said auxiliary section for moving said elevator along said tracks.

2. In an apparatus of the character described for moving a load from one elevation to another, the combination of: an articulate structure adapted to be uprightly positioned to extend between said elevations and comprising pivotally connected, lower and upper sections, said sections being provided with tracks extending substantially from the lower end of said structure to the upper end thereof; an elevator movable along said tracks from one of said sections of said upper section to the other; and actuating means carried by said structure and connected to said elevator for moving said elevator along said tracks from a lower position to an upper position.

3. An apparatus as set forth in claim 2 including means controlling the operation of said actuating means for limiting movement of said elevator as it approaches the ends of said tracks.

4. In a hoist, the combination of: an elongated frame adapted to be leaned against a supporting structure and provided with tracks extending substantially from the lower end thereof to the upper end thereof; an elevator movable along said tracks; and actuating means carried by said frame and connected to said elevator for moving said elevator along said tracks, said actuating means being positioned substantially at the upper end of said frame.

5. In a hoist, the combination of: an articulate structure comprising a base section and an upper, auxiliary section pivotally connected to said base section adjacent the upper end thereof, said sections being provided with tracks extending substantially from one end of said structure to the other; an elevator movable along said tracks from one section of said structure to the other, said elevator including a frame and including means on said frame and engageable with said tracks for guiding said elevator along said tracks; and actuating means carried by said auxiliary section and connected to said elevator for moving same along said tracks.

6. In a hoist, the combination of: an articulate, elongated structure comprising a base section and an upper, auxiliary section pivotally connected to said base section, said base section comprising two parts which are movable relative to each other longitudinally of said structure to permit varying the length of said base section, said parts of said base section and said auxiliary section being provided with tracks which extend substantially from one end of said structure to the other; an elevator movable along said tracks; and actuating means carried by said auxiliary section and connected to said elevator for moving same along said tracks.

7. In a hoist for elevating a load to a roof of a building, the combination of: an articulate structure including a base section adapted to be leaned against a side of the building in a substantially vertical position and adapted to extend above the edge of the roof of the building, said structure including an auxiliary section pivotally connected to said base section adjacent the upper end thereof, said auxiliary section being rotatable relative to said base section from a first position wherein it is substantially aligned with said base section to a second position wherein it extends transversely of said base section; tracks carried by said base and auxiliary sections of said structure and extending substantially from the lower end of said structure to the upper end thereof; adjustable means pivotally connected to said auxiliary section and adapted to engage the roof of the building for supporting said auxiliary section in said second position; an elevator movable along said tracks; and actuating means connected to said elevator for moving same along said tracks.

8. A hoist according to claim 7 including cooperating means on said base and auxiliary sections of said structure for releasably securing said auxiliary section in its said first position.

9. In an apparatus of the character described, the combination of: a carriage adapted to support a load and movable along a substantially horizontal path from a first position to a second position; an elevator movable along a substantially vertical path which intersects the path of said carriage from a lower position to an upper position; and means on said elevator for removing the load from said carriage during upward movement of said elevator from its lower position with said carriage in its second position.

10. In an apparatus of the character described, the combination of: a carriage movable from a first position to a second position along carriage tracks disposed in a substantially horizontal plane; an elevator movable from a lower position to an upper position along elevator tracks disposed in a generally upright plane which intersects said plane of said carriage tracks; load-supporting means on said carriage; and load-supporting means on said elevator adapted to register with said load-supporting means on said carriage when said carriage is in its second position for removing a load carried by said load-supporting means on said carriage during upward movement of said elevator from its lower position.

11. An apparatus as set forth in claim 10 wherein said load-supporting means on said carriage includes a pair of spaced, aligned shelf members and wherein said load-supporting means on said elevator includes a shelf member which is insertable between and adapted to be aligned with said shelf members of said load-supporting means on said carriage.

12. In an apparatus of the character described, the combination of: an articulate, elongated structure adapted to be uprightly positioned and comprising a base section having an auxiliary section pivotally connected thereto, said sections being provided with elevator tracks extending substantially from the lower end of said structure to the upper end thereof; an elevator mov-

able along said elevator tracks from a lower position on said base section of said structure to an upper position on said auxiliary section thereof; actuating means for moving said elevator along said elevator tracks; substantially horizontal carriage tracks adjacent the lower end of said structure; a carriage movable along said carriage tracks from a first position to a second position; load-supporting means on said carriage; and load-supporting means on said elevator adapted to register with said load-supporting means on said carriage when said carriage is in its second position for removing a load carried by said load-supporting means on said carriage during upward movement of said elevator from its lower position along said elevator tracks.

13. In an apparatus of the character described, the combination of: a first frame section comprising a pair of spaced, substantially parallel first track members each of which is provided with an inwardly extending, longitudinal track flange; a second frame section movable relative to and adapted to overlap said first frame section, said second frame section comprising a pair of spaced, substantially parallel second track members which are adapted to receive said first frame section therebetween and each of which is provided with an outwardly extending, longitudinal track flange; a carriage; and means on said carriage comprising a plurality of rollers adapted to engage said track flanges on said first and second track members for guiding said carriage along said first and second track members.

14. An apparatus as set forth in claim 13 wherein said rollers of said means for guiding said carriage along said first and second track members are adapted to engage the edges and sides of said track flanges on said first and second track members.

15. In an apparatus of the character described, the combination of: a first track member having thereon a first longitudinal track flange which extends transversely in one direction; a second track member adapted to be positioned adjacent and substantially parallel to said first track member and adapted to overlap said first track member, said second track member having thereon a second longitudinal track flange which extends transversely in the opposite direction from said first track flange; a carriage; and means on said carriage for guiding same along said first and second track members, said guiding means comprising a first pair of rollers which are adapted to engage the edges of said first and second track flanges, respectively, comprising a second pair of rollers each of which is adapted to engage one side of one of said track flanges, and comprising a third pair of rollers each of which is adapted to engage the opposite side of one of said track flanges.

16. An apparatus as set forth in claim 10 wherein said carriage tracks and said elevator tracks are pivotally connected to permit varying the angle between said planes of said carriage and elevator tracks.

17. An apparatus as set forth in claim 10 wherein said load-supporting means on said carriage is pivotally connected to said carriage to permit varying the angle therebetween.

18. In an apparatus of the character described, the combination of: an articulate structure adapted to be uprightly positioned and comprising a base section having an auxiliary section pivotally connected thereto adjacent its upper end; tracks carried by said base and auxiliary sections of said structure and extending substantially from the lower end of said structure to the upper end thereof; an elevator movable along said tracks; and actuating means carried by said auxiliary section of said structure and connected to said elevator for moving said elevator along said tracks.

19. An apparatus according to claim 18 including means adapted to de-energize said actuating means for limiting movement of said elevator along said tracks.

20. An apparatus as set forth in claim 2 wherein the center of gravity of said elevator is substantially opposite the pivotal connection between said sections when said elevator is in its said upper position.

21. In an apparatus of the character described, the combination of: a first frame section comprising a pair of spaced, substantially parallel first track members each of which is provided with an upper side and an inner edge, said inner edges facing inwardly of said first frame section and toward each other; a second frame section movable relative to and adapted to overlap said first frame section, said second frame section comprising a pair of spaced, substantially parallel second track members which are adapted to receive said first frame section therebetween and each of which is provided with an upper side and an outer edge, said outer edges facing outwardly of said second frame section and away from each other; a carriage; and means on said carriage comprising a plurality of rollers adapted to engage said sides and said edges of said first and second track members for guiding said carriage along said first and second track members.

22. An apparatus as set forth in claim 21 wherein said first and second track members are provided with lower sides and wherein said means for guiding said carriage along said first and second track members includes additional rollers adapted to engage said lower sides of said first and second track members.

J. ROYDEN ESTEY.

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Certificate of Correction

Patent No. 2,526,071 October 17, 1950

JAMES ROYDEN ESTEY

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 4, line 27, for the word "subsequently" read *substantially*; column 15, line 34, for "upper section" read *structure*; line 35, for "structure" read *upper section*; column 16, lines 22 and 25, strike out the words and semicolon "adjustable means pivotally connected to said auxiliary section and adapted to engage the roof of the building for supporting said auxiliary section in said second position;" and insert the same before "tracks" in line 19, same column;

and that the said Letters Patent should be read as corrected above, so that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 19th day of December, A. D. 1950.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.