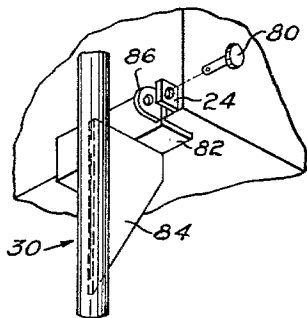


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Filed May 26, 1961

6 Sheets-Sheet 1



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July 6, 1965

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Fig. 2

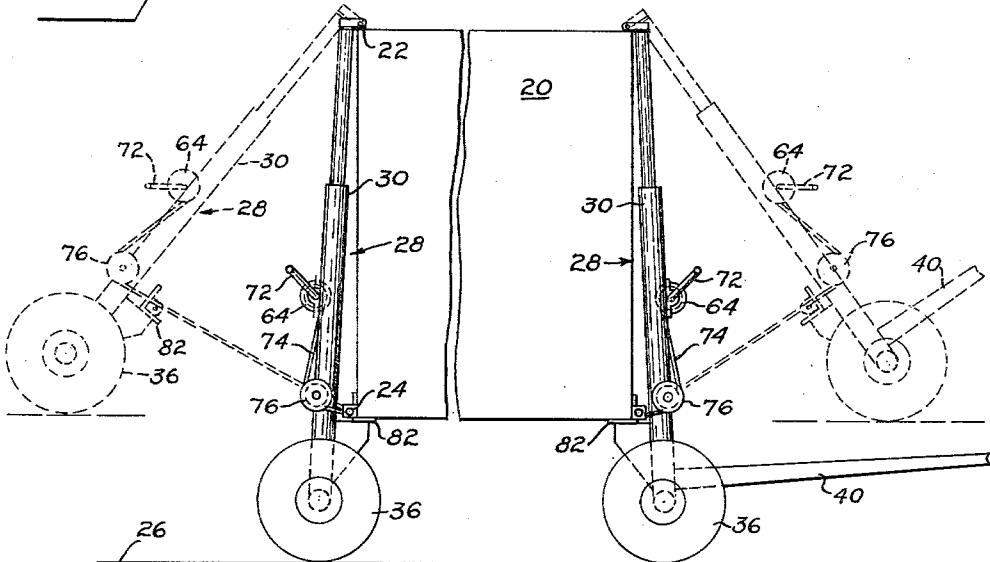
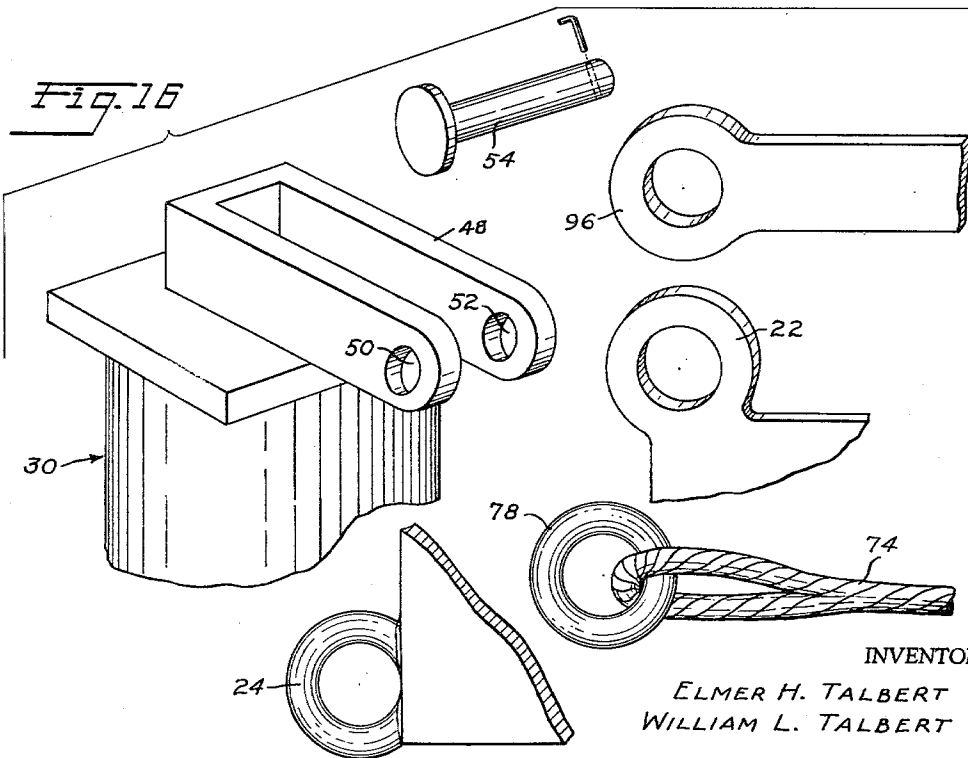


Fig. 16



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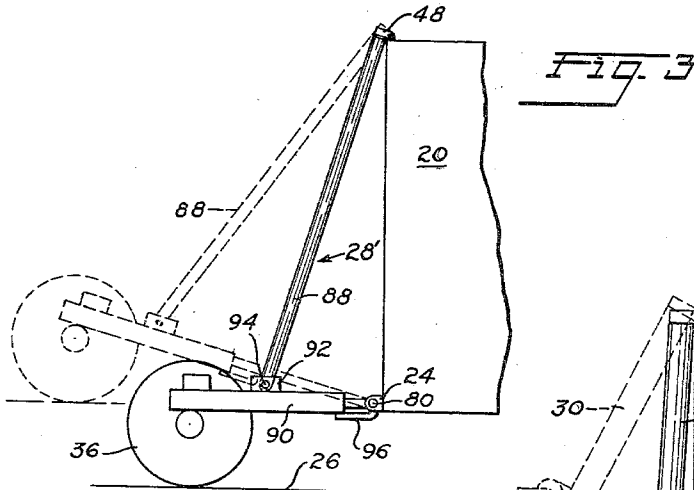


Fig. 3

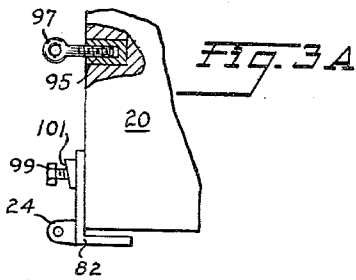


Fig. 3A

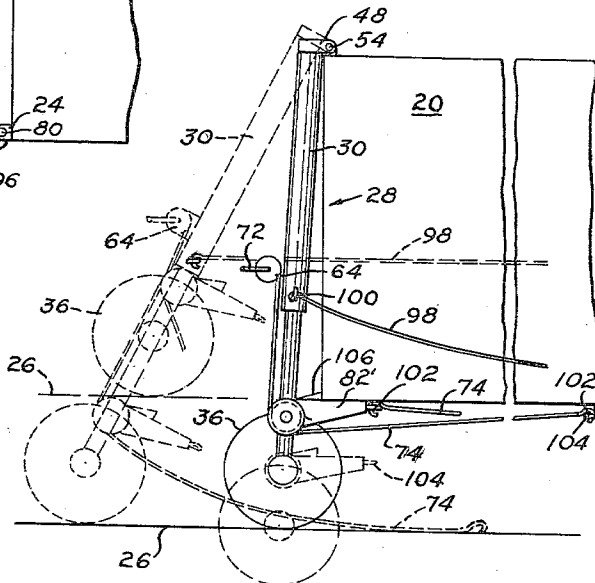


Fig. 4

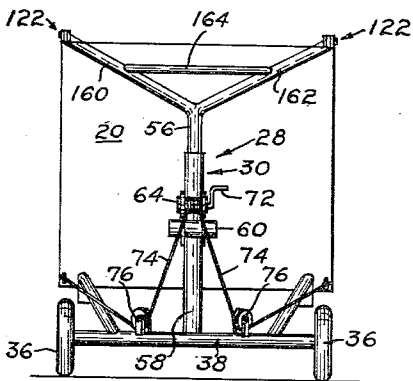


Fig. 14

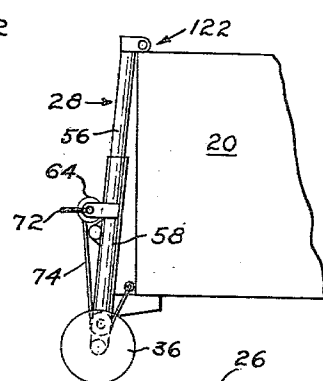


Fig. 15

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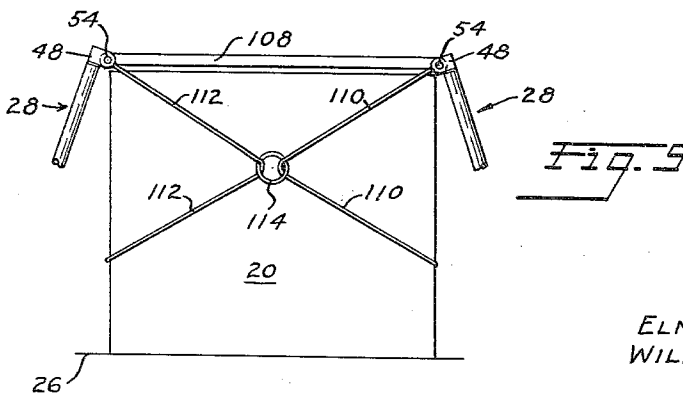
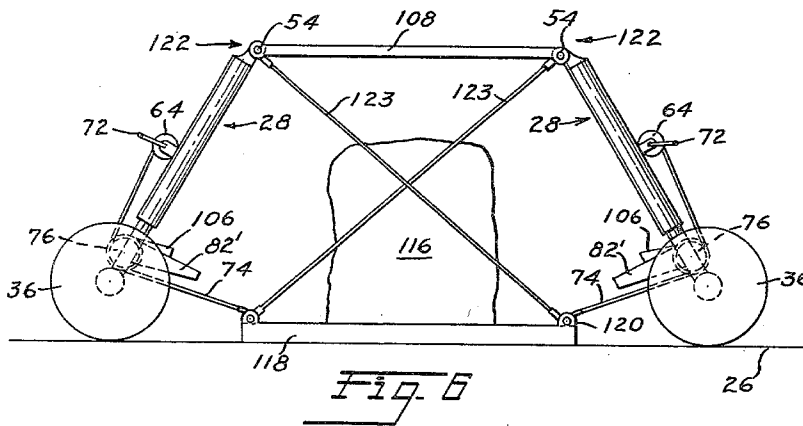
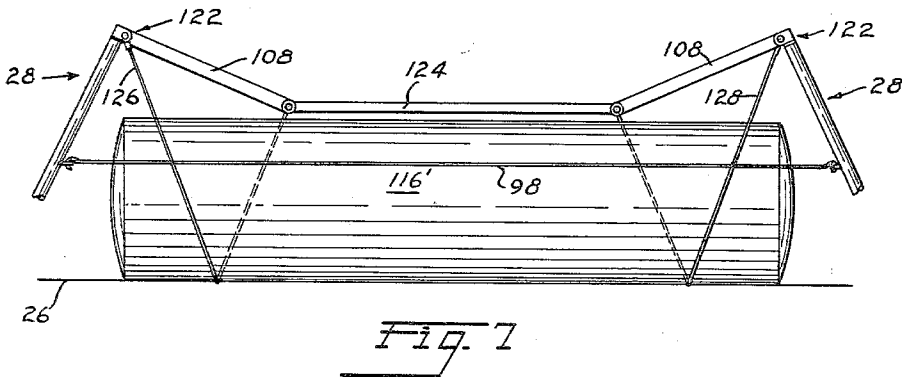
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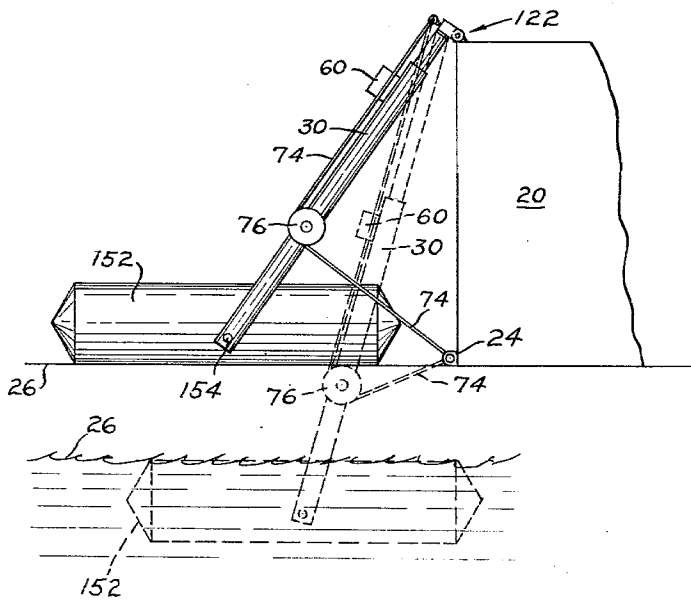


Fig. 11

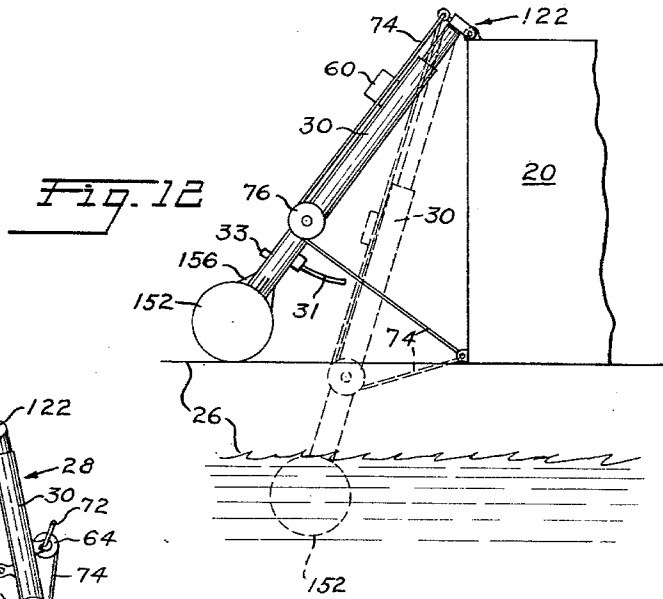


Fig. 12

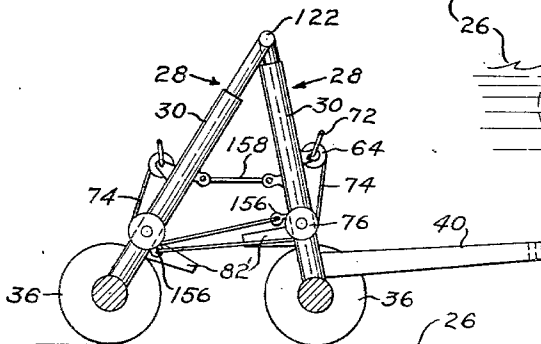


Fig. 13

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Filed May 26, 1961, Ser. No. 112,905

4 Claims. (Cl. 280—43.23)

The present invention relates to universal transporting devices which may be readily attached to a great variety of heavy and cumbersome loads, regardless of shape or dimensions, and which will facilitate the elevation, movement and transportation of said loads for short or long distances, over roads or unimproved terrain, or on amphibious operations, or over ice and snow or loose sand, or water or other problem areas.

Examples of such loads include large shipping containers, conceivably as long as forty or more feet; shelter enclosures; box and body units of all sizes and constructed of various materials such as metals, fibers, plastics, wood or cardboard; large individual pieces or bundles of structural metal; assembled building roof trusses; pallets, including their loads of all sizes and descriptions; irregularly-shaped objects, such as heavy transformers or generators, or very heavy rolls of cable or paper; landing craft used for amphibious operations; machinery of all kinds; unusual body units such as plate glass carriers; small and medium size buildings; large bales of various materials and liquid containers including tanks of various sizes and shapes.

The fact that this invention is particularly adapted for extremely heavy loads, as for example twenty tons, shall not be construed as limiting its application in any way, and its potential uses shall include the elevation, movement and transportation of much smaller loads, such as furnaces, refrigerators, display cases and other items weighing only a few hundred pounds.

One special feature of this invention is that certain combinations of the employed devices may constitute a full trailer, or a semi-trailer, with a platform that can be lowered to the ground, or maintained under load at a pre-determined, designed height for normal transportation, or which can be raised or lowered, within reasonably wide limits for loading and unloading and for unusual transportation requirements. The size, shape and capacity of the trailer or semi-trailer, is limited only to the extent that laws, ordinances and regulations establish, and then only in such instances as these apply. This application includes all types of trailers, regardless of their intended loads.

Other objects of the present invention are as follows:

To provide, with combinations of devices, means for quickly and easily attaching to, for the purpose of elevating and transporting heavy and extremely heavy loads regardless of their shape or dimensions—

(a) When such loads are equipped with conventional lift rings only;

(b) When such loads are equipped with conventional lift rings, plus towing eyes, rings, hooks or similar devices;

(c) When such loads are equipped with special attaching devices, including tapped holes for bolts, receiving devices for pins, special hooks or rings, special fastener receptacles or other conventional attaching devices or combinations thereof;

(d) When such loads are not equipped with any, or are equipped with inadequate attaching devices, capable of being used to support the weight of the load during elevating and transporting and when it is not possible nor feasible nor practicable to add or install such attaching devices on the load;

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(e) When such loads are self-contained, such as body or box units or shelter enclosures;

(f) When such loads are irregularly-shaped or for other reasons can be carried to advantage on pallets or pallet-like devices—

(1) When palletized load is completely self-supporting;

(2) When palletized load is not self-supporting;

(g) When all, or nearly all, parts of certain loads are directly in contact with the area on which the load is resting, so that it is not possible nor feasible nor practicable to insert some sufficient part of the transporter unit under an adequate part of the load, while it is still resting on the original area, thereby making it necessary to elevate the load to some degree before a lip, fork or carrier could be properly inserted under said load;

(h) When such loads are in the nature of landing crafts, and when it is not feasible nor practicable to install holes for fasteners near or below the water line of said load;

(i) When such loads are of a fragile, or semi-fragile nature so that forces required for elevating and transporting can be applied only at the bottom or other specific location on said loads;

(j) When such loads are of an extremely awkward shape to handle, such as, but not limited to long, cylindrical tanks or missiles which will roll or otherwise shift positions and thereby jeopardize their contents or endanger other property.

To provide, with combinations of devices, means of elevating and lowering heavy and extremely heavy loads, after such loads have been suitably attached to the universal transporter of this invention, regardless of the shape, dimensions or characteristics of such loads.

To provide, with combinations of devices, means of elevating and lowering heavy and extremely heavy loads, after such loads have been suitably attached to the transporter, whereby the amount of force required to elevate such loads is materially reduced, as compared with the amount of force required to elevate such load by direct jacking.

To provide, with combinations of devices, means of elevating and lowering heavy and extremely heavy loads, after such loads have been suitably attached to the transporter, by direct jacking, when it is not feasible and advantageous to utilize the normal elevating method.

To provide, with combinations of devices, means of elevating and lowering heavy and extremely heavy loads, after such loads have been suitably attached to the transporter, whereby elevating is accomplished by using the principle of the rolling wheel combined with direct jacking, thereby achieving automatic elevating.

To provide, with combinations of devices, means of transporting heavy and extremely heavy loads behind a towing vehicle, after such loads have been suitably attached to the transporter, and subsequently elevated to transporting position, over roads or any terrain, the transporter, operating—

(a) As a full trailer, with a minimum of one axle toward the front and one axle toward the rear of such transporter unit;

(b) As a semi-trailer, with a minimum of one axle toward the rear of such transporter unit, and with a device toward the front of said transporter unit without any axle and capable of transferring part of the load being transported;

(1) Onto a towing hook, towing ball or other device mounted on the towing vehicle;

(2) Onto a fifth wheel assembly mounted on the towing vehicle.

(c) As a tricycle trailer with a minimum of one axle

of longer length to the rear, and a short axle to the front of such transporter unit.

To provide, with combinations of devices, means whereby the elevation of the bottom of the load can be changed quickly and easily from the normal carrying or transporting position in order to negotiate and clear ramps, humps, obstructions and unusual terrain, or to change or shift the center of gravity of the load in its position of transport.

To provide, with combinations of devices, means whereby transporter unit elements may be arranged and so constituted as to devise a semi-trailer, or full trailer of any reasonable length, such as ten feet or forty feet, which said semi-trailer, or full trailer can be used in the same manner as conventional equipment of this nature, and in addition said semi-trailer or full trailer shall have a platform or main frame which can be—

(a) Lowered completely to the ground with

1. Transporter units left attached thereto.

2. Transporter units quickly and easily removed.

(b) Held at any desired, designed elevation for normal transport.

(c) Raised or lowered within wide, designed ranges, quickly and easily to facilitate loading or unloading, or for any other reasons.

To provide, with combinations of devices, means whereby transporter unit elements may be arranged and so constituted as to devise at least two separate portions of a semi-trailer, or full trailer, which said separated portions may be used to elevate and transport long-self-supporting loads, such as metal girders and beams or assembled building roof trusses, in a conventional manner, and in addition said portions shall have platforms or framework which can be—

(a) Lowered completely to the ground with

(1) Transporter units left attached thereto;

(2) Transporter units quickly and easily removed.

(b) Held at any desired, designed elevation for normal transport.

(c) Raised or lowered within wide, designed ranges, quickly and easily to facilitate loading or unloading, or for any other reasons.

To provide, with combinations of devices, means of transporting heavy and extremely heavy loads behind a towing vehicle, after such loads have been suitably attached to the transporter and subsequently elevated to transporting position, over snow and ice-covered areas, over extremely muddy areas, over loose sand and over other problem areas by the use of—

(a) Skids, sleds, crawler track assemblies and other conventional devices on transporter units in lieu of axle and wheel assemblies.

(b) Skids, sleds, crawler track assemblies and other conventional devices on transporter units in combination with axle and wheel assemblies with—

(1) Wheels retractable and extendable above or beneath skids, sleds, etc.

(2) Wheels mounted in fixed, designed position with relation to skids, sleds, etc.

To provide, with combinations of devices, means of transporting heavy and extremely heavy loads behind a towing vehicle, after such loads had been suitably attached to the transporter and subsequently elevated to transporting position, over water by the use of pontoons or other buoyant devices in lieu of axle and wheel assemblies, with the optional feature of being able to make the transporter units automatically self-adjusting, to a degree, to compensate for wave action when more or less fragile loads are being transported.

To provide, with combinations of devices, means of transporting buoyant loads, including landing craft, rafts and boats behind a towing vehicle, after such loads have been suitably attached to the transporter, through surf, across sandy beaches and across all other land areas with optional features of being able to raise and carry

the supporting wheels or skids of the transporter unit free and clear of the water while the load is afloat, and with the additional optional feature of being able to raise and support such loads off of the ground for temporary storage when not afloat.

To provide, with combinations of devices, means of elevating and transporting heavy and extremely heavy loads which permit selection and utilization of many types, forms and sizes of conventional elevating and jacking devices, including but not limited to, air, hydraulic or screw jacks; cable, chain or mechanical winches or hoists; fixed or adjustable struts and stays; fixed or adjustable cable or chain tension members; and similar devices.

To provide, with combinations of devices, means of elevating and transporting heavy and extremely heavy loads which permit selection and utilization of many types, forms and sizes of conventional suspension devices, including but not limited to, coil springs, cantilever springs, platform springs, torsion bar spring assemblies, air or hydraulic suspensions, rubber mounting or any combination of the above, with or without shock absorbers and with conventional linkage.

To provide, with combinations of devices, means of elevating and transporting heavy and extremely heavy loads which permits selection of various types, forms and sizes of brake systems, including but not limited to, air, hydraulic, air over hydraulic, mechanical, electric, magnetic, or any combination of the above brake systems, when such systems are a necessary integral accessory on the transporter units.

To provide, with combinations of devices, means of elevating and transporting heavy and extremely heavy loads which permit selection and utilization of conventional steering systems and devices, when such systems are a necessary integral accessory on some part of the transporter units.

To provide an independently operated lip, fork or shelf which may thus positively sustain directly a substantial portion of the load being elevated and transported.

The above and other objects and attending advantages of the present invention will be apparent upon the consideration of the following description when made in conjunction with the accompanying drawings wherein similar reference characters refer to similar parts throughout the several views and in which:

FIG. 1 is a perspective view of a body unit equipped with conventional lift rings and towing rings, to which one form of transporter unit constructed in accordance with this invention has been attached;

FIG. 1A is a detail view in perspective of a portion of the construction of FIG. 1;

FIG. 2 is a side view of the body and transporter units of FIG. 1, the initial positions of the transporter units being shown in dotted lines;

FIG. 3 is a partial side view of one end of a body unit, equipped with conventional lift rings and towing rings, to which a modified form of this invention may be attached, with the initial position of the transporter unit being shown by dotted lines;

FIG. 3A is a modification of FIG. 3 and illustrates a portion of a container which is provided with tapped openings for receiving fastening devices to which the transporter units are pivotally secured.

FIG. 4 is a partial side view of one end of portions of a body unit, equipped with conventional lifting rings but without towing fasteners of any description, to which one form of this invention, complete with optional stay cables, has been attached, with varying positions of certain elements of this invention being shown by dotted lines;

FIG. 5 is a side view of a box or bale unit, equipped with neither lifting rings nor towing rings and resting directly upon the ground so that no form of carrier can

be inserted under the unit, showing portions of the transporter units in proper position;

FIG. 6 is a side view of an irregularly-shaped load on a self-supporting frame, pallet or platform equipped with combination lifting and towing rings, to which one form of this invention has been attached;

FIG. 7 is a side view of a long, cylindrical tank, equipped with neither lifting rings nor towing hooks, showing portions of the transporter units in proper position;

FIG. 8 is a partial side view of a body unit equipped with conventional lift rings and towing rings, to which a further form of this invention has been attached showing an arrangement whereby lengthening of the vertical strut automatically actuates the primary elevator assembly, and showing varying positions of the transporter unit in dotted lines;

FIG. 9 is a side view of a self-supporting platform or trailer deck assembly equipped with combination lifting and towing rings, to which two different, representative forms of this invention have been attached to constitute a semi-trailer, and with additional, optional elements of the transporter units in place;

FIG. 10 is a partial side view of a landing craft or bridge pontoon equipped with special attaching, lifting and towing rings or fasteners, to which a special form of this invention has been attached, and showing varying positions of certain elements of this invention by dotted lines;

FIG. 11 is a partial side view of one end of a body unit equipped with conventional lifting and towing rings, to which another special form of this invention has been attached, and showing varying positions of certain elements of the invention by dotted lines;

FIG. 12 is a rear view of one side of a body unit equipped with conventional lifting and towing rings, to which a special form of this invention has been attached and showing varying positions of certain elements of the invention by dotted lines;

FIG. 13 is a side view of two transporter units connected together for transport without any kind of load;

FIG. 14 is a view of one end of a body unit supported by a modified form of transporter unit employing a single vertical supporting strut;

FIG. 15 is a side view of the form of the invention shown in FIG. 14, and

FIG. 16 illustrates various types of lift and towing rings and other connections which may be employed in the various assemblies of FIGS. 1-15.

The present invention is illustrated in FIGS. 1 and 2 as comprising an elevating and transporting system for a load in the form of a body unit 20 of the type including upper lifting eyes 22 and lower towing eyes 24, see also FIG. 16. The body unit is also of the type which rests directly upon the ground or other supporting surface 26. As shown a pair of similar transporter units 28 are provided for the opposite ends of the body unit and each transporter is constructed and arranged in a novel manner such that the body unit may be readily elevated above the surface 26 and transported to a desired location.

More particularly, each of the transporter units 28 includes a pair of similar and substantially vertical struts 30 which may be connected by a horizontal member 34, the lower end portions of the struts being connected to and supported by conventional running gear including wheels 36 and a suitable housing and axle assembly 38. One of the transporter units may be provided with a towing arm 40 for moving the body unit when the parts are in the elevated and supported position shown in FIG. 1 and in the solid line position of FIG. 2, and in the form of the invention illustrated, the arm 40 is connected with the housing 38 by any suitable connector 42 and is also associated with the wheels 36, through conventional steering linkages 44 and 46. It will be understood that

suitable braking mechanisms may be used in connection with the wheels 36 and controlled in any suitable manner well known in the art.

The upper ends of the struts 30 are provided with suitable connections whereby such ends may be secured to the lifting eyes 22, and as shown, such means may take the form of a clevis 48, see also FIG. 16, which is rigidly attached to said upper ends and is provided with openings 50 and 52 for receiving a locking pin 54 after said openings have been aligned with the eye 22. As shown, each strut may be extendible and may be formed as a hydraulic or screw jack provided with telescoping sections 56 and 58 which may be extended in a well-known manner through the operation of a hydraulic pump 60, or a screw jack mechanism which may be manually or power operated and which may conveniently be mounted on the member 34 and connected by conduits 61 with the struts 30. Manually operated winches 62 and 64 are secured to a shaft 66 which is suitably rotatably mounted on the lower strut sections 58 as by means of bearings 68 and 70, the shaft 66 having an operating crank 72 and each winch having a cable 74 which passes over rotatable pulleys 76 to be securely connected with the towing eyes 24 or to other suitable points as by means of rings 78, see FIG. 16, and locking pins 80.

In order to help support the body unit 20 in the position illustrated in FIG. 1 and in the full line position of FIG. 2, each of the struts 30 may be provided adjacent its lower end portion with a shelf, ledge or lip 82 which is carried by a web member 84 which latter is attached to the strut 28 in any suitable manner. Each shelf 82 includes an eye 86 which may be secured to the towing eye 24 by the pin 80.

In operation and with the body unit resting upon the surface 26, the first step, with the invention in the form shown in FIG. 1, is to secure the upper end portions of each of the struts 30 of each transporter unit 28 to the lifting eyes 22 at the top of the body unit 20 through the connections 48 and 54 heretofore described, it being understood that one transporter unit is associated with each of the opposite ends of the body unit as shown in FIGS. 1 and 2. It will be also understood that the eyes 78 at the ends of cables 74 are secured to the towing eyes 24 by the pins 80, as above set forth, following which the winches 62 and 64 are locked in position to maintain the transporter units in approximately the dotted line position illustrated in FIG. 2 and with the wheels 36 resting upon the supporting surface 26. It is then only necessary to extend the struts 30 of each transporter unit through suitable manipulation of the hydraulic pumps 60 of each unit whereupon the body unit will be elevated from the supporting surface until such unit reaches the approximate position shown in full lines in FIG. 2. Thereafter, it is only necessary to shorten the cables 74 of each transporter unit through operation of the cranks 72 and the winches 62 and 64 to pivot each unit about the pins 54 in order to bring them into the full line supporting position of FIG. 2 so that the opposite lower edges of the body unit may be supported on the shelves 82, whereupon the pins 80 may be moved to lock the eyes 86 to the towing eyes 24. The body unit 20 and the assembled transporter units 28 then constitutes a unitary trailer construction which may be readily transported by manually pulling the towing handle or arm 40 or by connecting such arm to a suitable towing vehicle. It is desired to point out here that each shelf 82 is so positioned with respect to the strut 30 which supports it that when the transporter unit is in load supporting position, the wheel 36 is spaced outwardly of the vertical end of the body unit, as clearly shown in full lines in FIG. 2. This construction permits easy lowering of the body unit upon the supporting surface 26 since a relatively slight force is required to pivot the transporter units outwardly toward the dotted line position during unloading and shortening of the struts 30.

FIG. 3 shows a modified form of the invention wherein each transporter unit 28' which may be associated with the opposite ends of the body unit 20 includes a pair of vertical struts 88 which may be of fixed length and a pair of substantially horizontal members 90 of the variable length. The upper ends of the vertical struts are secured to the lifting eyes at the top of the body unit in the same manner as in FIGS. 1 and 2 while the lower ends are connected to the horizontal members 90 by means of suitable brackets 92 and pivot pins 94. It will be understood that the members 90 include telescopic parts which may be relatively moved to shorten or lengthen such members by hydraulic pumps 60 or their equivalent and that the free ends of the members are provided with eyes 96, see FIG. 16 which are connected with the towing eyes 24, as shown. With the transporter units connected with the body unit 20, as described and with the parts occupying the dotted line position of FIG. 3, it is only necessary to operate the pumps 60 to shorten the members 90. As this action takes place, the body unit will be gradually elevated until the transporter unit reaches the full line position whereupon the body unit is fully supported for transportation to another location. If desired, a connector 96' secured to each member 90 and having an eye similar to eye 96, FIG. 16, to be connected with the towing eye 24, may be employed to prevent any tendency of the body unit 20 from moving relative to the transporter unit during transport.

In FIG. 3A the body unit 20 may be provided with tapped openings in the side thereof in combination with suitable fasteners to which the transporter units of FIG. 3 may be pivotally attached. More particularly, the upper tapped openings 95 are adapted to receive fasteners such as eye bolts 97 for receiving the connectors 48. Similar tapped openings are provided adjacent the lower edges of the body unit for receiving bolts 99 which latter secure the shelves 82 to the body unit. Preferably, a cam surface 101 is carried by each shelf so that the latter is positively moved upwardly, as the bolt is turned, to bring the lower lip of the shelf into firm supporting position against the bottom of the body unit. Each shelf is provided with an eye 24 to which the struts 90 are pivotally secured. It will be understood that after the transporter units are assembled, as above described, the body unit may be elevated and transported as described heretofore in connection with FIG. 3.

FIG. 4 illustrates a form of the invention which is generally similar to the form of FIGS. 1 and 2 but which is especially adapted for elevating and transporting body units 20 which are provided with lifting rings 22 at the top of the units but are not equipped with any towing eyes or similar connecting devices at the bottom of the units. It will be understood that each end of the unit is adapted to be equipped with similar transporter units except that one unit may be provided with a towing arm and steerable wheels as in FIGS. 1 and 2. More particularly, the transporter units 28 of FIG. 4 are generally similar to those of FIGS. 1 and 2 except that, because of the lack of towing eyes or similar connectors on the body unit 20, the free ends of the cables 74 of each respective transporter unit are adapted to be connected with the transporter unit at the opposite end of the body unit and stay cables 98 are employed for connecting opposite transporter units to each other during extension of the struts 28. As shown in dotted lines and with the wheels 36 contacting the supporting surface 26 upon which the body unit 20 rests, transporter units 28 at opposite ends of the body are interconnected by a pair of stay cables 98 on opposite sides of the body unit, the said cables being connected to the units 28 by suitable hook and eye connections 100. Such cables prevent outward movement of the transporter units 28 with respect to the body unit 20 during extension of the struts 30 through manipulation of the hydraulic pump 60, as in FIG. 1, and the body unit 20 is thus elevated to the approximate full

line position of FIG. 4. As shown, each free end of the cables 74 is provided with a suitable connecting device, herein shown as a hook 102 and the forward edges of the shelves 82' may be provided with an eye 104. With such an arrangement, after elevation of the body unit as above described, the hooks 102 of the cables of each respective transporter unit are connected with the eyes 104 of the opposite transporter unit, as shown in full lines in FIG. 4 whereupon manipulation of the cranks 72 of each transporter unit will operate the associated winches 64 to shorten the cables 74, as in FIG. 1, to bring the shelves or ledges 82' into the full line supporting position with respect to the bottom edges of the body unit 20, with suitable stops 106, carried by the shelves engaging the body unit to maintain the transporter units spaced outwardly at the lower end portions with respect to the body unit. Thereafter, the winches 64 are locked in position so that the body unit may be readily transported to another location.

In the event it is desired to elevate and transport a body unit which is not equipped with lifting or towing eyes, or other lifting or towing connections, the construction of FIG. 4 may be associated with the body unit in the manner shown in FIG. 5. As shown therein, a pair of stay bars 108, one only being shown, are provided with suitable eyes 96, see FIG. 16, at opposite ends thereof for receiving the clevis connections 48 of the transporter units 28, the latter being similar to the units 28 of FIG. 4. A pair of supporting cables 110 and 112, the ends of which are provided with rings 78, see FIG. 16, for connection with the eyes 96 and connections 48, by suitable locking pins 54, are assembled around the body unit and through equalizing rings 114 on opposite sides of the body unit. It will be understood that the opposite ends of the cable 110 are connected with the respective clevises of the two struts of a transporter unit 28 at one end of the body unit while the cable 112 is similarly connected with the transporter unit at the other end of the body unit. The operation of this form of the invention is similar to that of the construction of FIG. 4, it being pointed out that the arrangement of stay bars 108, cables 110 and 112 and the rings 114 forms an effective sling which frictionally grips the body unit 20 so that the latter may be elevated and transported without danger of slipping.

The form of the invention illustrated in FIG. 6 is similar to the form shown in FIGS. 1 and 2 and is especially adapted for use in connection with loads 116 of irregular shape which may be supported by a pallet or base 118 provided with pairs of combined lifting and towing eyes or connections 120 at opposite ends of the base. As shown, the struts of the respective transporter units 28 may be connected at their upper ends to opposite ends of a pair of stay bars 108 by means of connecting devices 122 similar to those heretofore described and including locking pins 54. A pair of supporting cables or truss members 123 are positioned on opposite sides of the load 116 for connection at their lower ends to the eyes 120 and at their upper ends to the pins 54 while the free ends of the cables 74 are provided with hooks or other suitable connectors to be connected with the eyes 120, as shown. With such a supporting arrangement and as in the form shown in FIG. 1, the winches 64 are first locked and thereafter, extension of the struts of the transporter units 28 will elevate the base 118 and load 116 to the height necessary to bring the sleeves 82 into supporting position with the base. It will be understood that after this operation, the cables 74 may be employed for interconnecting the two transporter units 28 in the manner shown in FIG. 4 or connections similar to 86 of FIG. 1 may be utilized for connecting the respective shelves 82' to the eyes 120 if desired. When elevated and supported, as above described, the load 116 may be readily transported.

The transporter units 28 of FIG. 7 are similar to those

of FIG. 4 and operate in the same manner. This form of the invention is especially adapted to handle a load 116' which is of unusual shape, such as a tank or other object of elongated form. As shown, the support for the load 116' includes stay bars 108 connected at 122 to one end to the respective struts of the oppositely disposed transporter units 28, and connected at the opposite ends to the ends of stay members 124. As in FIG. 4, stay cables 98 connect opposite struts of the two transporter units 28 together and the load is supported between the units by a sling construction which includes a pair of cables 126 at one end of the load and another pair of cables 128 at the other end of the load. The cables 126 are respectively connected at one end thereof to the respective struts of one transporter unit 28 and connected at their opposite ends to the respective ends of the members 124. The cables 128 are similarly connected to the opposite ends of members 124 and the respective struts of the other transporter unit 28. With the load 116' securely supported in this manner, it is only necessary to operate the units 28 in the manner set forth in detail in connection with FIG. 4 to elevate the load 116 for transport.

Many types of body units may be more readily elevated by arranging the elements of the transporter units 28 in such a manner that as the struts of such units are extended, the units will be automatically moved to the load supporting position. Such an arrangement is shown in FIG. 8 wherein the transporter units 28, only one of which is illustrated, is generally similar to that of FIG. 1 except that the stationary portions 58 of the struts 32 are connected to the lifting eyes 22 and the winch or equivalent cable control devices 130 are also connected with the stationary portions 58. With the parts connected as shown in dotted lines and with wheels 36 resting upon the surface 26, and cable control devices 130 in locked position, it will be clear that as the struts 30 are extended by manipulation of the hydraulic pump 60, the cables will automatically pull the lower portions of the struts toward the supporting and transport position shown in full lines. The relationship between the compound movements of extension and pivoting of the struts 30 may be varied to suit individual requirements and to form different patterns of travel by varying the length of the cable prior to or after extension of the struts by operation of the auxiliary control devices 130.

The form of the invention shown in the left portion of FIG. 9 is generally similar to that shown in FIG. 8 but is especially adapted for use in forming a deck 132 into a trailer. As shown, the deck 132 is provided with a pair of combined lifting and towing eyes 134 for receiving the ends of the cables 74 and the ends of support cables 135, and is also provided with a pair of eyes 136 for respective pivotal connection with the lower ends of a pair of stay bars 138, the upper ends of which are pivotally connected at 122 with the upper ends of the struts 30 of the transporter unit 28. The opposite ends of the support cables 135 are also connected at 122. It will be readily understood that as in the case of FIG. 8, extension of the struts 30 will elevate the deck 132 and during such operation the transporter unit will automatically be moved to the supporting and transport position with the shelves 82' beneath the bottom edge of the deck.

The form shown at the right portion of FIG. 9 is generally similar to the embodiment just described except that it is particularly adapted to raise the deck to a position where the towing arm 40 may be connected to a towing vehicle. Thus, the two constructions shown in FIG. 9 may be employed for converting the deck 132 into a trailer wherein the right hand portion is connected with the towing vehicle and the left hand portion is wheel supported.

More particularly, the transporter unit 28 at the right portion of FIG. 9 may be provided with a pair of stay members 140 which are respectively connected at their

upper ends at 122 with the struts 30 and connected at their lower ends with the towing arm 40 in any suitable manner. Struts 30 are extendible, as in the forms previously described, the extending portions being formed as rigid arms 142 which engage the surface 26 to raise the towing arm 40 and deck 132 during extension of the struts. As in the case of FIG. 8, during this operation, the transporter unit 28 will be automatically moved to the supporting position with the shelves 82 moved beneath the bottom edge of the deck. If desired, the shelves 82 may be vertically adjustable by means of hydraulic jacks 144 respectively mounted on the struts 30. It will be understood that after the towing arm 40 is connected with the towing vehicle, the struts 30 are operated to retract the arms 142.

FIG. 10 discloses an adaptation of the invention which may be particularly adapted for use in connection with a load 117 which is buoyant, in the nature of landing craft, pontoons, rafts and similar constructions. As shown, the transporter unit is generally similar to those heretofore described and includes a pair of extensible struts 30, only one of which is illustrated and at only one end of the load 117. The latter is provided with eyes 24 to which the respective ends of cables 74 are connected and the ends of a pair of stay cables 146 are also connected with the eyes 24. The upper ends of cables 146, stay bars 108 and the struts 30 are all connected together at 122 while the lower ends of the stay bars are respectively connected to eyes 148 attached to the load. Cables 74 are trained around pulleys 76 and connected with winches 64 operated by the cranks 72.

After assembly of the parts as just described the struts 30 of the unit may be extended to raise the load 117 to the desired height after which the winches 64 are operated to bring the transporter unit to the dotted line position where the eyes 120 may be attached to the eyes 24. With the transporter unit 28 at the other end of the load operated in a similar manner, the load may be readily transported over land to the body of water for subsequent transportation by any suitable means.

If it is now desired to remove the wheel and axle assembly completely out of the water, a novel arrangement is provided for pivoting the transporter unit about the eyes 24. For this purpose, the lower ends of the stay bars 108 are disconnected from the eyes 148 and the cables are removed from the eyes 24 and trained over alternate pulleys 150 with the free ends thereof connected with the eyes 148. Operation of the winches 64 will then pivot the struts 30 about the eyes 24 until they are horizontally disposed as illustrated in dotted lines. Thereafter, the stay bars 108 may be manually pivoted about the connection 122 so that they may be arranged parallel to and against the struts 30.

A further form of the invention is shown in FIG. 11 which is particularly adapted for supporting a load 20 in water and for elevating the load so that the bottom surface thereof may be maintained above the level of the mean water surface if desired. In this form, the transporter units 28, only one of which is illustrated, although four or more may be used, are generally similar to those of FIG. 8 except that pontoons of necessary buoyancy may be substituted for the wheel and tire assemblies 36. The lower ends of the struts 30 may be pivotally connected in any suitable manner at 154 to the pontoons after which the struts may be extended as in FIG. 8 to the position shown in dotted lines, it being understood that as the struts are extended, the cables 74 will automatically move the transporter units toward the body unit 20. The latter may thus be supported above the water surface 26 for ready transportation, it being noted that due to the nature of the construction including the pivotal connections 154, the transporter units are automatically self-adjusting to a degree to compensate for wave action.

FIG. 12 is similar to the form shown in FIG. 11 except that a single pontoon 152 is arranged on each side of the body unit 20 and the two struts 30 of each transporter

unit 28 are connected to the respective pontoons by suitable connections 156.

It is also desired to point out that if desired, the hydraulic pumps 60 may be omitted and all the extendible struts 30 interconnected to form a closed hydraulic system. In such case the two struts of each transporter unit hydraulically communicate with each other, as in FIG. 1, and the struts of the two transporter units may be interconnected by a detachable conduit 31 to form the closed hydraulic system. A suitable fitting 33 is provided on one strut, as shown, in order that the closed system may be charged with fluid under pressure and the body unit so elevated as in FIG. 11. It will be understood that such a closed system may also be used in the forms shown in FIGS. 8 and 11.

With the above arrangement, the body unit 20 is so supported by the transporter units as to be automatically maintained in a substantially level position irrespective of wave action when pontoons 152 are employed as supports, and irrespective of irregularities in the terrain in the event that wheels or other ground effect equipment are used as supports. This will be clear from FIG. 12 for example, when it is borne in mind that any extension or retraction of the struts 30 of a transporter unit 28 will automatically pivot the struts about the connections 122 to vary the load supporting positions thereof, it being understood that the closer the struts are moved toward the body unit, the greater load they will sustain.

Referring to FIG. 13, two transporter units 28 are illustrated therein as being connected in pairs for ease and convenience in transporting them with a towing vehicle when they are not used in connection with a load. As therein shown, the upper ends of the units are connected together at 122 and the ends of the cables 74 of each transporter unit 28 are connected with eyes 156 on the other unit. The respective struts 30 are then interconnected by stay bars 158 and the winches 64 operated to tighten the cables 74 after which the winches are locked in position. In this manner the two units 28 constitute in effect a unitary and mobile construction wherein the towing arm 40 may be connected with a towing vehicle, it being understood that the unit 28 which is provided with the towing arm, is also provided with steerable wheels as FIG. 1.

FIGS. 14 and 15 illustrate a further form of the invention which is similar to the form shown in FIG. 1 except that only one vertical strut 30 is included in each transporter unit 28. In such case the upper portion of the strut 56 is provided with two arms 160 and 162 connected by an arm 164, the arms 160 and 162 being pivotally connected with the body unit at 122 while a single winch 64 may be utilized for controlling both cables 74. It will be understood that the lower strut portion 58 is suitably connected to the axle and housing assembly 38 while the wheels 36 of one transporter unit may be steerable and the unit provided with a towing arm 40 as in the case of FIG. 1. This modified form operates to elevate and transport the body unit 20 in the same manner as the form heretofore described and illustrated in FIGS. 1 and 2.

From the foregoing, it will be readily understood that the present invention provides a novel type of universal combined elevating and transporting construction which is adapted for use in connection with a wide variety of loads for transporting the same over various types of surfaces. While the various arrangements disclosed herein are highly efficient in operation and may be effectively used in connection with extremely heavy loads, the

constructions are relatively simple and of such nature that relatively slight forces are necessary to elevate the loads for subsequent transport. This invention is especially adapted for use in connection with loads resting directly upon a supporting surface and of such nature that such loads are required to be elevated before supporting shelves or ledges may be engaged with the bottom surfaces thereof. It will be understood that any of the transporter units heretofore described may be power propelled if desired rather than being towed by a separate vehicle, and that the extendible struts may be operated either by mechanical or by fluid pressure means.

While several forms of this invention have been shown and described herein with considerable particularity, it will be readily understood by those skilled in the art that other modifications may be resorted to without departing from the spirit of the invention. Reference will therefore be had to the appended claims for a definition of the limits of the invention.

What is claimed is:

1. A transporter unit for elevating and transporting a load supporting body unit, comprising a pair of extendible struts each of which includes relatively movable upper and lower portions, said upper portions each being provided at their upper ends thereof with means for attaching them to the upper portion of said body unit at spaced-apart points, a wheel connected with each of said lower portions at the lower ends thereof, a cable associated with each strut, each cable being provided at the free end thereof with means for connecting it to said body unit at spaced-apart points adjacent the lower portion of the body unit to maintain said wheels spaced outwardly from said body unit, means for extending the relatively movable portions of each strut to elevate the body unit from its supporting surface, and cable tightening means mounted on said struts for thereafter shortening said cables to move the struts toward the body unit to a transporting position.

2. A transporter unit as set forth in claim 1 wherein each of said struts is provided with a shelf for engaging and supporting said body unit when said struts are moved to said transporting position.

3. A transporter unit as set forth in claim 2 wherein each of said struts is provided with a stop member for engaging the lower side of the body unit for maintaining said struts in a position where the lower positions thereof are spaced outwardly from said body unit when the struts are moved to the transporting position.

4. A transporter unit as set forth in claim 1 wherein the lower portions of the struts are provided with means for connecting them to the lower portion of the body unit when the struts are moved to the transporting position.

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