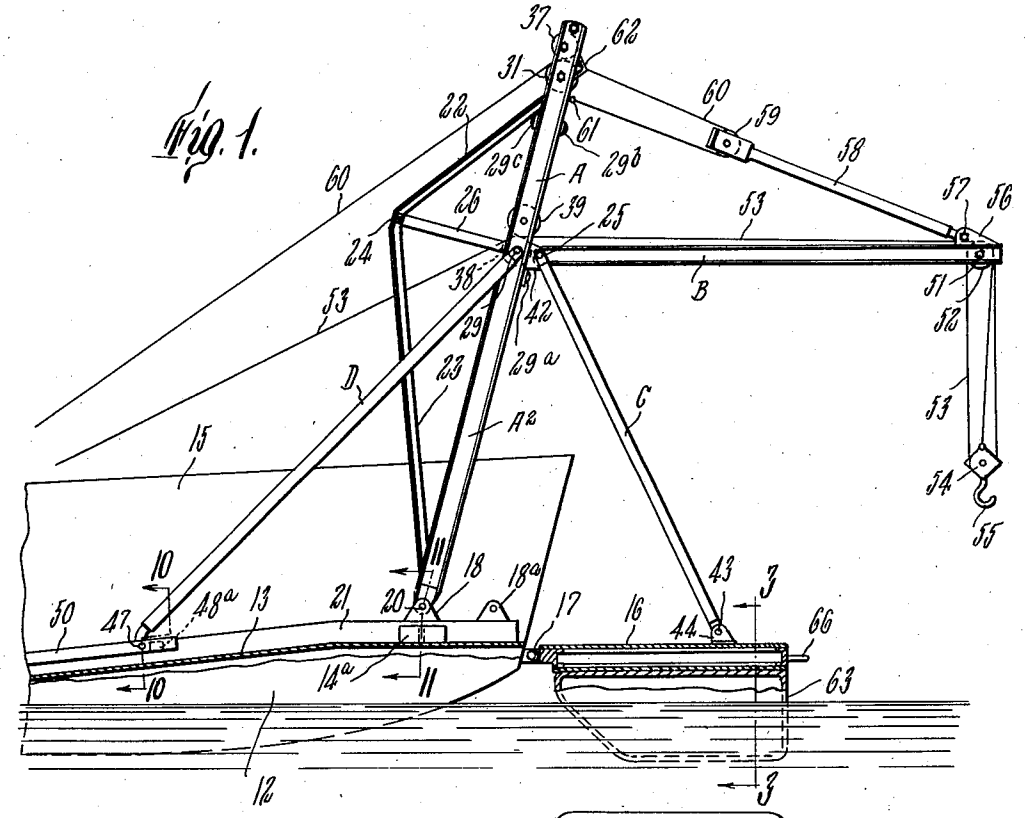
June 12, 1945. R. C. SWANEY 2,378,254

ADJUSTABLE AND COLLAPSIBLE FLOATING CRANE

Filed Dec. 7, 1943 4 Sheets-Sheet 1

Fig. 1.



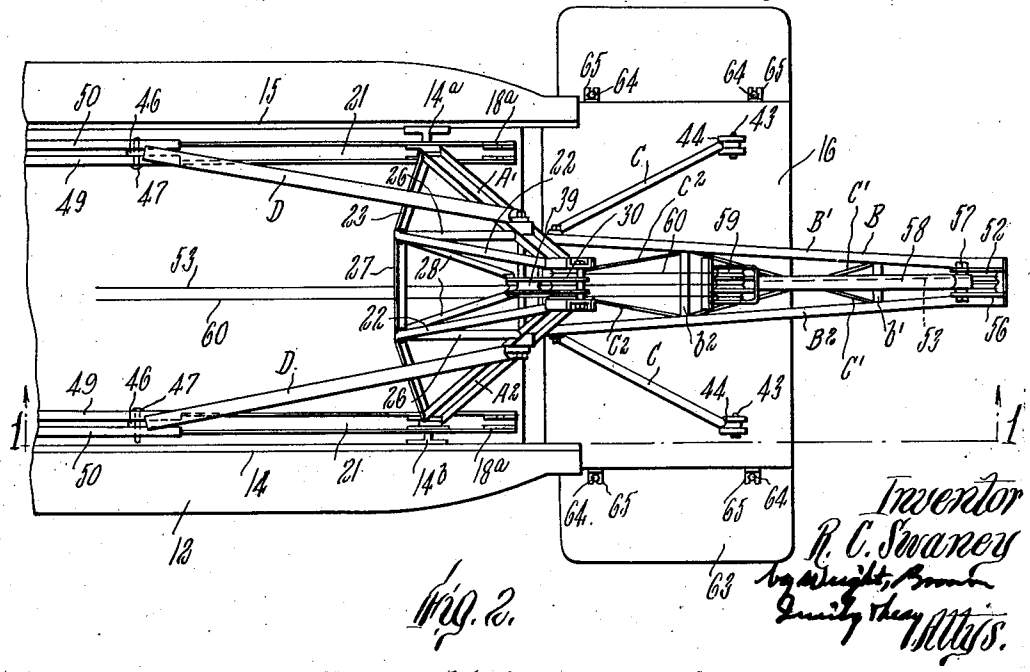


Fig. 2.

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ADJUSTABLE AND COLLAPSIBLE FLOATING CRANE

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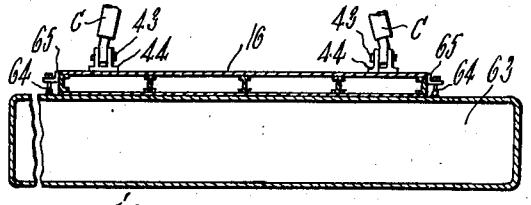


Fig. 3.

Fig. 4.

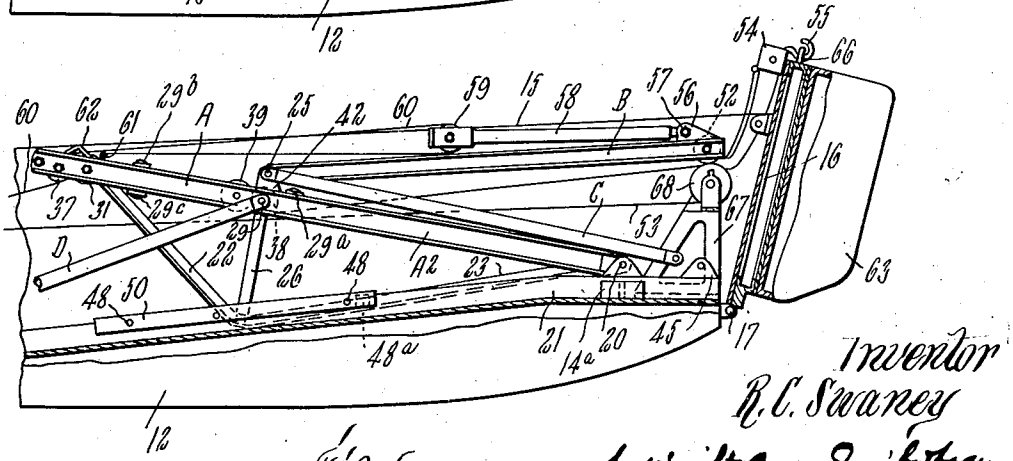


Fig. 5.

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ADJUSTABLE AND COLLAPSIBLE FLOATING CRANE

Filed Dec. 7, 1943 4 Sheets-Sheet 3

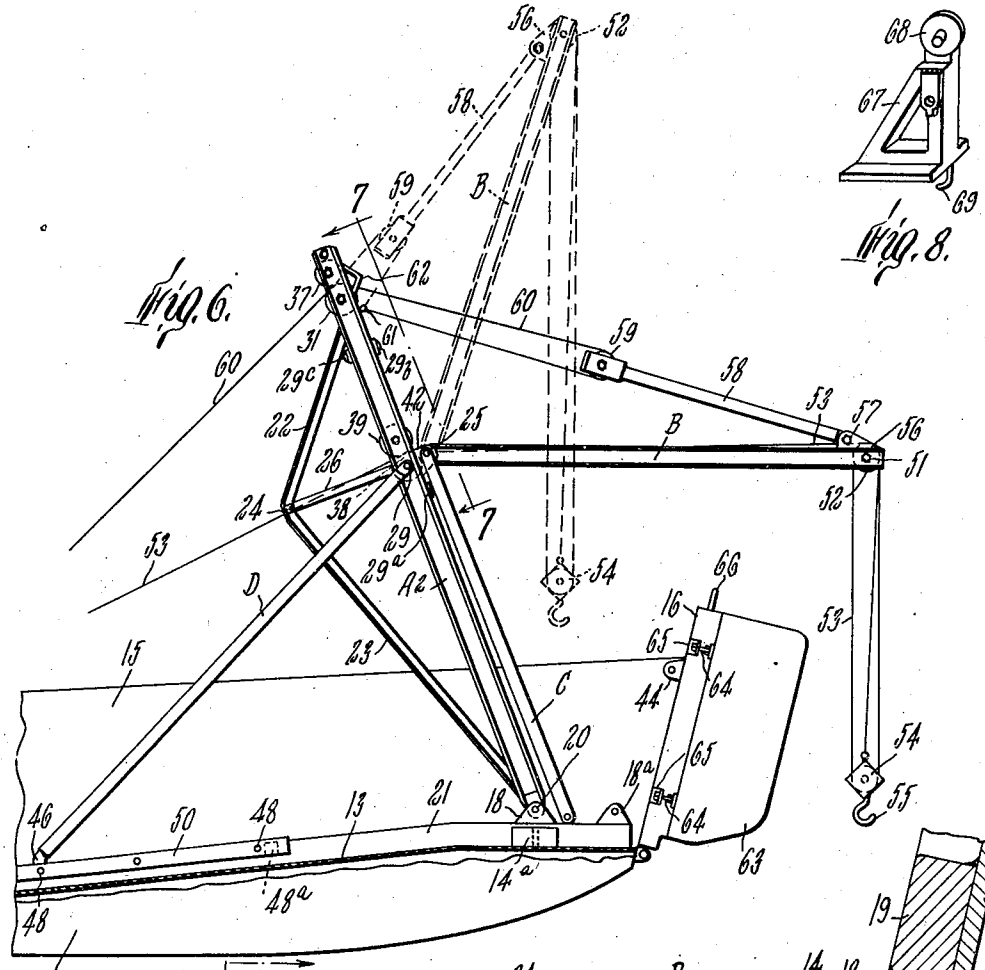


Fig. 6.

Fig. 8.

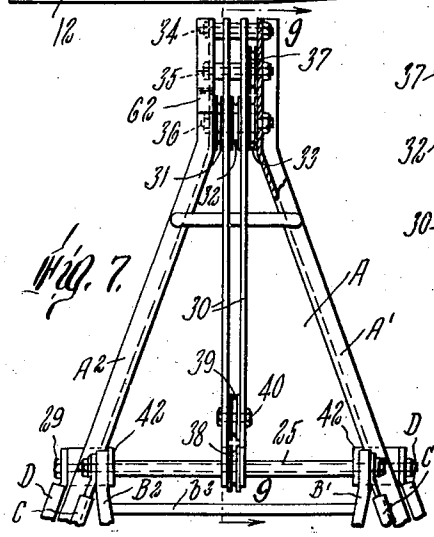


Fig. 7.

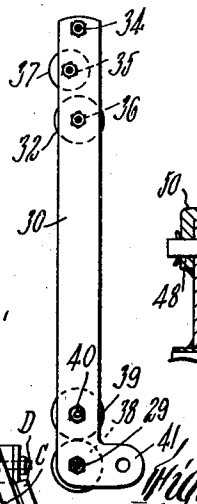


Fig. 9.

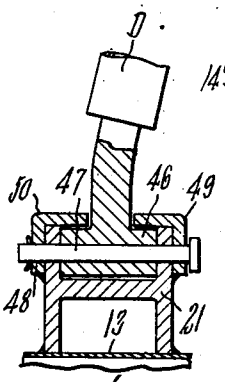


Fig. 10.

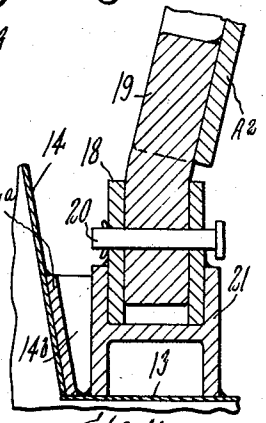


Fig. 11.

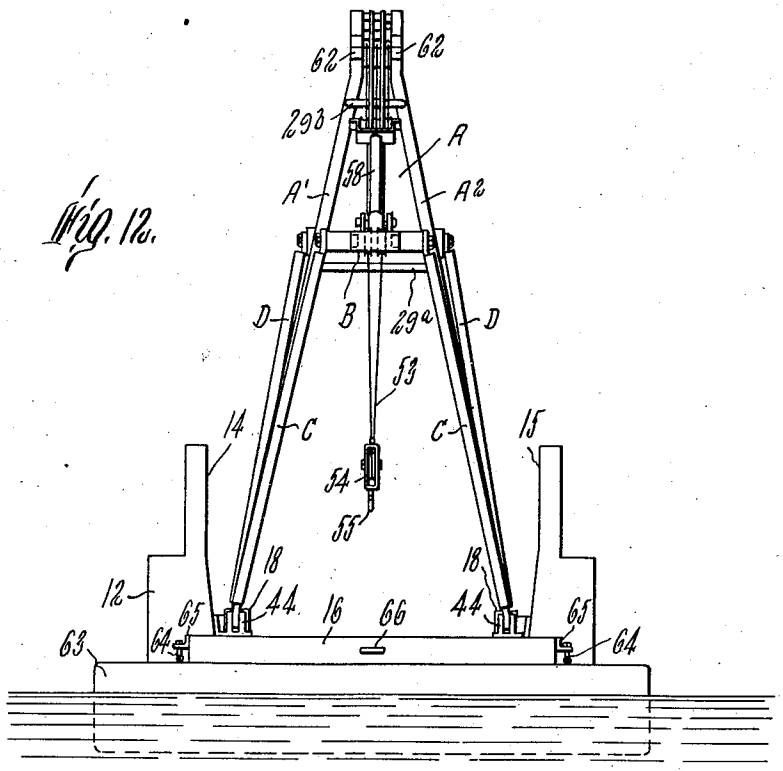
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ADJUSTABLE AND COLLAPSIBLE FLOATING CRANE

Filed Dec. 7, 1943 4 Sheets-Sheet 4

Fig. 12.



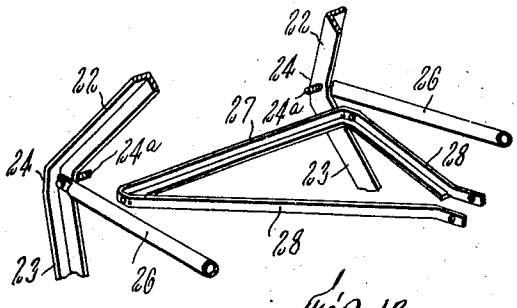


Fig. 13.

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UNITED STATES PATENT OFFICE

2,378,254

ADJUSTABLE AND COLLAPSIBLE FLOATING CRANE

Robert Casper Swaney, Newton, Mass.

Application December 7, 1943, Serial No. 513,266

16 Claims. (Cl. 212—3)

This invention relates to floating cranes. The embodiment chosen for illustration herein has been designed with particular reference to the tank lighters and landing barges used by the army and navy for conveying troops and equipment from ships to beaches, and includes the cooperative association between the crane and the loading ramp with which such craft are commonly equipped. However, it includes principles adapted for use in other situations also, wherever the protection here claimed is not to be construed as limited to the specific use above mentioned.

In its general principles and applications the invention comprises novel means by which the crane can be collapsed and laid down in a recumbent position when not in use, and may be readily and quickly erected for use; and provisions for adjustment. In its more specific application to landing barges it includes cooperative means whereby the crane and ramp coact in erecting and lowering the crane. An important feature of this invention resides in means whereby the crane can be applied to existing tank lighters without reconstruction of the vessel and with the application of a minimum number of structural parts and those few parts of the simplest construction.

In the illustrative drawings furnished herewith

Figure 1 is a partial section of the forward end of a landing barge of the type now commonly used, equipped with a crane embodying this invention and showing the loading ramp of the barge lowered and the crane in erected condition for operation.

Figure 2 is a plan view of the combination shown in Figure 1.

Figure 3 is a detail cross section on line 3—3 of Figure 1.

Figure 4 is a view generally similar to Figure 1, but showing the crane in the course of being collapsed and the ramp of being raised and closed.

Figure 5 is a similar view showing the crane fully collapsed.

Figure 6 is a partial sectional view of the landing barge with the ramp raised and a side elevation of the crane in a position of adjustment suitable for operation when the ramp is raised.

Figure 7 is a fragmentary elevation of the upper portion of the crane showing parts of the structure in section on line 7—7 of Figure 6.

Figure 8 is a perspective view of a removable sheave bracket which is used to aid in erecting the crane from its collapsed position.

Figure 9 shows a connecting member of the crane mast structure as seen from the left of the line 9—9 of Figure 7.

Figures 10 and 11 are sectional views of details of the structure taken on lines 10—10 and 11—11, respectively, of Figure 1.

Figure 12 is a front view of the combination shown in Figure 1.

Figure 13 is a perspective view of parts of the crane disassembled.

Like reference characters designate the same parts wherever they occur in all the figures.

By way of background for the combination of the present invention with landing barges, tank lighters, and the like, I may say that such boats consist of a shallow draft hull 12 of elongated rectangular outline in plane, the bottom of which has a gradual upward and forward slope at the bow end. It has a depressed deck 13 of less width than the hull extending from the engine compartment to the bow for carriage of passengers and cargo. This deck is substantially flat and slopes upward at the forward end so as to be above the water line at the bow when the craft is fully loaded. The space above it is bounded at the sides by longitudinal bulkheads 14, 14 of the hull structure and bulwarks 15, 15 thereon and, at the forward end, by a wall 16 which is hinged to the hull by a pivot 17 at a level near that of the deck. The wall 16 is wider than the space between the bulwarks and is adapted to be swung upward into tight contact with the forward ends thereof and downward into a horizontal, or downwardly inclined position, whereby it may serve as a platform to afford a partial support for the crane, and as a ramp to facilitate unloading and loading when the bow of the craft is grounded on a beach. In the description which follows the forward closure wall 16 will generally be referred to as the ramp.

The crane comprises a mast A, a boom B, and stiff legs or braces C—C and D—D. The mast is of generally arched formation, preferably approximately in the shape of the letter A, having side members or legs A^1 and A^2 pivoted at their lower or foot ends to brackets 18, and connected to each other at their upper ends. Preferably said side members are channel bars. Their connections with the respective foot brackets 18 are made in each instance by a bar 19, shown in Figure 11, which is welded to the channel bar between the web and flanges thereof and extends between the lugs which form the bracket 18. A pivot pin 20 passes through alined holes in the extension bar 19 and the flanking lugs of the bracket. Each bracket is welded between the upper flanges and

central web of a base bar **21** which, in the present illustration is of H section. There are two such base bars located near the bulkheads **14**, and running lengthwise of the boat. They extend forward and aft far enough to provide anchorage points for the mast and the stiff legs or braces D at different locations. They are secured, preferably by welding, to the deck **13**. In order to reinforce them against the spreading effect of the mast legs, a chock is inserted between each base bar and the nearer bulkhead abreast of the mast bracket. These chocks, one of which is shown in some detail in Figure 11, are conveniently made of a plate **14***a* which lies against the bulkhead and a web **14***b* crossing the space between the plate **14***a* and the base bar. The base bars are welded to the deck along their lower edges, the plate **14***a* and web **14***b*, forming the chock, are welded together, the plate **14***a* is also welded to the bulkhead, and the web **14***b* may be welded to the base bar. These chocks are the only parts which may need to be cut and fitted in installing the standard crane assemblage in a boat of a given standard design. Some small variations occur between different boats of the same design as to the width between longitudinal bulkheads, and these variations are compensated for by suitably trimming the chocks.

The mast is stiffened by a truss structure consisting of tension members **22** and **23** and a strut **26** connected to each mast leg, and an intermediate brace. The tension members of each mast leg, which may be made of a single length of structural steel, are attached to the leg at points near its head and foot, respectively, and joined together at an elbow **24** abreast of the boom pivot **28**; the strut **26** extending from said elbow to the leg. The intermediate brace comprises a bar **27** to the ends of which are connected tie members **28**, said bar and tie member being conveniently made of a single piece of structural steel bent into triangular outline. The base angles of this triangular structure are connected to the elbows **24** of the respective mast leg trusses by bolts **24***a*, by which also the struts **26** are connected to the trusses at one end, and the ends of the tie members **28** are connected detachably with a rod **29** which extends across between the mast legs A^1 and A^2 beside the boom pivot **25**. A cross tie **29***a* is detachably secured to the two mast legs below the boom pivot, and upper cross ties **29***b* and **29***c* are secured to the mast legs at the forward and rear sides thereof near their upper ends.

The upper ends of the mast legs are parallel to one another and spaced apart a distance sufficient to receive the upper ends of two links **30**, **30** and sheave pulleys **31**, **32** and **33** in the spaces between the links and side members. Bolts **34**, **35** and **36** connect the side members A^1 and A^2 together and support the links **30**. Spacer sleeves surrounding the several bolts maintain the prescribed spacing between members and links. Those on bolt **36** provide bearings for pulleys **31**, **32** and **33**; and that on bolt **35** between the mast member A^1 and the nearer link provides a bearing for a fourth sheave pulley **37** which is above and in the same plane with pulley **33**. A sheave pulley **38** is mounted on the rod **29** between the lower ends of the links **30**, and a guide pulley **39** is mounted between the links just above pulley **38** on a pivot **40**. The links are formed on their lower end with a forward lug **41** which receives and supports the middle portion of the boom pivot **25**, the ends of said pivot being held in forwardly projecting brackets **42** on the side members of the mast.

The boom B is of V form constructed of side members B^1 and B^2 with intermediate transverse braces b^1, b^2, b^3 and diagonal tie members c^1, c^1, c^2, c^2. The side members may be of channel section like the legs of the mast. The free ends next to the mast are apertured to receive the pivot rod **25** and are placed on the pivot rod outside of the brackets **42**. The upper ends of the forward stiff legs C receive the extremities of the pivot **25** at the outer sides of the boom members and are retained thereon by nuts so applied and locked on the pivot rod as to permit the boom and also the stiff legs to swing on the pivot rod when necessary. The rear stiff legs D—D have pivotal connections with the extremities of the rod **29** at the outer sides of the respective mast legs A^1 and A^2.

The lower ends of the stiff legs C are adapted to be connected by coupling pins **43** with brackets **44** on the ramp, as in Figures 1, 2, 4 and 12. The rear stiff legs D, however, carry at their lower ends apertured slides **46** which are adapted to travel in the upper channels of the respective base bars **21**, and to be anchored by pins **47** passed through one or another of a row of holes **48** in the base bars. Angle bars **49** and **50** are secured to each base bar, substantially as shown in Figure 10, so as to overlie the lateral extremities of the slide **46** to retain it in the channel as it travels therein when the mast is erected and lowered. Stops **48***a*, conveniently made from blocks of metal welded in the guide channels are preferably located forward of the foremost hole **48** to limit the forward movement of the slide. Preferably the stop is at a correct distance from that hole to arrest the slide when the holes therein and in the base bar are in register. The stiff legs may be made of steel pipe having rods secured in opposite ends to furnish the eyes and slides by which they are connected, respectively, to the mast and foot brackets.

The boom carries at its outer end a pivot **51** on which pulleys **52** are mounted. A load line **53**, from which a pulley block **54** (equipped with a hook **55**) is suspended passes from the block around one of the pulleys **52**, thence under the sheave of block **54**, over the other pulley **52** and over the guide pulley **38** to an operating winch located at an operating station in the after part of the boat. The pulley **39** overlies the load line, serving to retain the line in engagement with the pulley **38** when the mast is lowered. The outer end of the boom is provided also with lugs **56** holding the ends of a pivot **57** by which one end of a rigid bar constituting a bridle **58** is connected to the boom. The other end of bridle **58** carries a group of sheave pulleys **59**. A boom topping line **60**, anchored to the mast at **61**, passes around the pulleys **59**, **31** and **32** in a number of stretches and finally passes over pulley **33** to a second winch at the operating station.

It will be readily apparent that by taking up and paying off the boom line, the outer end of the boom may be raised and lowered; while by similarly utilizing the load line **53** the block **54** may be raised and lowered. When the boom line is taken up as far as possible the boom is raised to the position shown in Figure 4 and the end of the bridle **58** is brought up against a bracket **62** on the mast, said bracket and the end of the bridle having abutting faces which are then substantially perpendicular to the length of the bridle. In this situation, and while tension is

maintained in the line by the winch, the boom, bridle and top part of the mast make a rigid structure.

For use when the ramp is lowered, the stiff legs C are connected with the brackets **44** on the ramp. Preferably the ramp is provided with a float element **63** connected with its under or outer side, which I call a "false bow." This is a water tight cell having sufficient volume to give substantial buoyancy and support to the crane when lowered into the water. It is preferably wider than the beam of the boat to give lateral stability to resist capsizing of the boat when a heavy load is hoisted to a high level. In such a situation the load exerts a powerful turning moment if it is not vertically over the center line of the boat. This float or false bow is preferably connected detachably with the ramp, having a suitable number of hinged bolts **64** arranged to be passed through slots in anchor lugs **65** on the ramp and to be secured therein by nuts on their ends. It may be detached when the boat is to be run up on a beach head-on so that the ramp may rest on the ground in the ordinary way. It is not a standard part of landing barges, but is a feature of my invention and is important in that it enables the crane to be used while the boat is clear of the shore, with greater effectiveness than would be possible without it. When the crane is employed with the boat fully afloat and the false bow secured to the ramp, the latter may be tied or braced in the horizontal position shown in Figure 1, or an approximation of that position, by chains or rods coupled at their ends with the bulwarks and the outer portion of the ramp.

With the stiff legs C connected as shown in Figures 1 and 4, the crane and ramp partially counterbalance each other in lowering and erecting the mast. When the mast is to be lowered into its retracted or collapsed position, the hook **55** is passed into engagement with an eye **66** on the outer edge portion of the ramp, and the boom line **60** is taken up until the bridle **58** abuts against the abutment **62**, the load line **53** being paid out as needed to permit the consequent rise of the boom. At this time, or at least before the legs C are uncoupled from the ramp, a standard or bracket **67** carrying a snatch pulley **68** is placed on the deck forward of the mast and the load line **53** is passed around and under the snatch pulley. The bracket or standard **67** is anchored detachably by a hook or equivalent means **69** to the deck and is suitably constructed and braced to withstand the pull applied to it by the load line in lowering and raising the mast.

After the bridle has been brought up to the abutment **62**, the crane mast is swung rearwardly by taking up on the boom line until the ramp is brought up against the bulwarks of the boat (the foot ends of legs D then sliding along the base bars **21**, their anchor pins **47** having been removed). During this movement the stiff legs C raise the ramp and the weight of the ramp counterbalances that of the crane more or less after the center of gravity of the latter has passed the vertical. The ramp is then made fast by the coupling means with which such craft are provided, and the stiff legs C are disconnected from the ramp. At that time the center of gravity of the crane combination is aft of the foot pivots **20**, and the load line, being held by connection with the ramp and its controlling winch, prevents the crane from falling to the deck and causing damage. The load line is gradually paid out to lower the crane gently until the truss frames **23** rest on the deck, and the boom line also is paid out to permit the boom to occupy the collapsed position shown in Figure 5.

In erecting the crane the lines are taken up and paid out in reverse order. In both these proceedings the snatch pulley **68** provides a necessary fulcrum for the load line.

The crane may be operated to pick up and heave in comparatively light loads without having the ramp lowered, and in that mode of use the mast may be swung aft when the load has been lifted above the ramp so as to swing the load inboard without requiring snatch lines. The mast will be arrested at the forward limit of its swinging movement by the stops **48***a*, and in its rearward swinging movement by pins set into the holes **48** at the desired limit of rearward movement. As the slides **46** on the braces D bring up against the stop elements so located, they of course arrest the movement of the mast. If desired, the mast may be stepped elsewhere than in the position here shown, and for that purpose other brackets may be mounted at any desired locations on the base bars **21**. By way of illustration one such bracket is shown at **18***a* in the drawings.

The crane thus described supplies a vital need in salvaging equipment dropped overboard in the course of landing men, vehicles and other supplies on beaches, and for salvaging the engines of boats which are injured by shell fire or by the action of surf on a beach or are carried by boats which have been wrecked in shallow water. Boats which carry such cranes can go anywhere that tank lighters and landing barges can go and the cranes can be utilized in any such localities where the water is not too deep. The construction of the crane, with the wide spread between its legs and the supporting connections of such legs being near the sides of the cargo space, leave a clear central space through which men may pass and heavy articles may be carried when the crane is erect. This fact is illustrated by Figure 12.

The crane equipment of this invention is adapted to be packed piecemeal for shipment and readily mounted in boats at any places where they are in service. Each leg of the mast with its associated truss members **22**, **23** and **26** is a unit separate from the other, the intermediate brace **27** is a separate unit, and the boom and stiff legs are also separate and separable units. These parts can be crated in compact packages and shipped, along with the base bars **21** and other equipment to any place where boats needed to be equipped with cranes are in service. Then at the place of use, the crane is installed in its boat by welding the base bars to the deck of the boat, with the use of welding equipment with which practically all bases are supplied. The mast legs are assembled to make the complete mast by passing the rod **29** through them and through the ends of the tie members **28**, by bolting the truss elbows of the mast legs to the brace **27**, and by attaching the cross ties **29***a*, **29***b* and **29***c*. The stiff legs D are connected to the outer ends of the rod **29**, the boom pivot **25** is coupled with the mast brackets **42**, the boom, and the stiff legs C, and the various pulleys, the links **30** and the bridle **58** are applied and coupled by the various pins and pivots shown and described. Such assemblage is simple and quickly effected.

The crane is compact, not only in its capacity for packaging and shipment, but also in its relation to the boat when lowered and collapsed. In

that condition it is wholly within the cargo space of the boat and below the tops of the bulwarks, as illustrated by Figure 5. The mast truss then rests on the cargo deck, with the head of the mast, the boom, and the bridle all below the bulwarks.

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

1. A floating crane comprising the combination with a boat having a cargo space opening through its bow and a ramp hinged to the boat hull at the bow end below the cargo space and adapted to be raised to close the forward opening of the cargo space and lowered to substantially horizontal position, of a mast constructed with separated legs pivoted at their lower ends to the hull adjacent to the sides of the cargo space, braces connected to the mast for connection with the ramp at points separated from the pivot thereof and with the hull at points in rear of the mast, and a boom pivoted to the mast at the forward side thereof.

2. The combination with a boat hull of base bars secured to the deck of the hull and spaced apart from each other and extending fore and aft, of a crane comprising mast legs separated from one another at their foot ends and being nearer together at their head ends, said foot ends being pivoted each to one of said base bars at a substantial distance from the rear ends of the bars, said mast being movable between a position lying on the deck and an upright position, braces connected adjacent to one of their ends with the mast and detachably connectible at their other ends with the base bars for holding the mast erect, said detachable ends being in slidable engagement with the bars, and a boom pivoted to the mast on an axis transverse to the length thereof and adapted to swing about its pivot through nearly 90° in each direction from a position perpendicular to the mast.

3. A crane construction comprising a mast having two legs spaced apart at their bottom ends and detachably connected at their upper ends, a truss structure comprising tension members and a strut in connection with each leg and a brace between the truss members and their respective legs, a boom pivoted to the mast, a bridle pivoted to the outer end of the boom, and a boom topping line passing around pulleys on the mast head and bridle, respectively, for raising and lowering the boom.

4. A crane construction as set forth in claim 3 and in which the mast and bridle have abutting faces substantially perpendicular to the length of the bridle for limiting upward movement of the boom and forming a rigid triangle with the mast.

5. The combination with a landing boat having a cargo deck, bulwarks at opposite sides of the cargo deck and a ramp hinged to close the end of the space between the bulwarks and to swing outward in continuation of the deck, of a mast having separated legs pivoted to the deck adjacent to the respective bulwarks and providing a space between them for the passage of persons and articles, a truss structure connected with the mast at its rear side, a boom coupled with the mast at its forward side, the mast being movable about its pivotal supports from an upright position to a reclining position in which the truss structure rests on the deck with the head of the mast below the upper limits of the bulwarks, and the boom also being movable about its pivot to a position wholly below the upper limits of the bulwarks.

6. The combination with a landing boat having a depressed cargo deck, bulwarks at each side of the deck bounding the cargo space thereon and a ramp hinged to the forward end of the boat at approximately deck level to close the space between the bulwarks and to swing outward into continuation of the deck, of a buoyant false bow secured to the ramp at the outer side thereof arranged to be partly submerged when the ramp is swung outward, a crane mast in pivotal connection with the deck to swing between an upright position and a recumbent position in which it extends aft from its pivotal connection, a brace between the mast and ramp for supporting the mast when erect and a boom pivoted to the mast arranged to extend over the ramp and to be raised and lowered.

7. The combination set forth in claim 6 in which the false bow extends to a width greater than the beam of the boat for giving lateral stability to the boat and mast when the mast is erect.

8. A crane comprising a mast having legs separated at their lower ends and near to one another at their upper ends, links between said legs connected thereto at the upper ends and at a lower point intermediate the ends of said legs, a boom pivoted to the mast near the last named point, a bridle pivoted to the outer end of the boom, sheave pulleys carried by the free end of said bridle, other pulleys located between said mast legs and links, a boom topping line passing around the pulleys of the bridle and the mast pulleys, and leading away from the mast, and a boom line extending along the boom for suspending a load from the boom end.

9. In a floating crane the combination with a hull having a deck, of base bars extending lengthwise of the deck and having guideways, a crane mast pivoted to said base bar to swing between upright and recumbent positions, braces connected to said mast and having slide members on their extremities arranged to travel in said guideways when the mast is raised and lowered, and means for securing said slides at prescribed points along the guideways.

10. The combination with a boat having an opening through its bow from its cargo space and a wall hinged to its hull to swing between a raised position in which it closes such opening and a substantially horizontal position, of a crane comprising a mast hinged at its foot to the boat hull so as to swing in a vertical fore and aft plane thereof, a boom pivoted to the mast at an elevated point thereof, and a brace coupled to the mast at a distance from its foot and to said wall at a distance from the hinge thereof; the brace and mast hinge being disposed so that the center of gravity of the crane is forward of the vertical line through said hinge when the wall is horizontal, and aft of such line when the wall is in its raised closing position.

11. The combination with a boat having an opening through its bow from its cargo space and a wall hinged to its hull to swing between a raised position in which it closes such opening and a substantially horizontal position, of a crane comprising a mast hinged at its foot to the boat hull so as to swing in a vertical fore and aft plane thereof, a boom pivoted to the mast at an elevated point thereof, a brace coupled to the mast at a distance from its foot and to said wall at a dis-

tance from the hinge thereof, a rigid bridle pivoted to the outer end of the boom, a boom topping line passing around pulleys on the mast head and bridle, respectively, for raising and lowering the boom, and a load line passing along the boom and downward from its outer end, the mast and bridle having abutting faces for limiting upward movement of the boom and causing the mast, boom and bridle to form a rigid triangle.

12. A crane comprising a mast, a boom pivoted to swing relatively to the mast in a substantially vertical plane whereby its free end is movable toward and away from the head of the mast, a rigid bridle connected pivotally at one end with the swinging part of the boom, and a boom topping line in operative engagement with the bridle and mast head for bringing the bridle toward the mast head, the mast and bridle having abutting faces for limiting such movement of the boom and causing the mast, boom and bridle to form a rigid triangle.

13. A crane comprising a mast pivotally mounted at its foot on a supporting structure to swing between an erect position and a recumbent position, a boom pivoted to said mast for relative swinging movement in a substantially vertical plane, a boom topping line in operative engagement with the mast and boom for raising the boom and controlling its elevation, stop means arranged to arrest the boom in an elevated position when the boom line is maintained under tension, a load line passing from the outer portion of the boom around a guide on the mast to hoisting means, and a snatch pulley mounted in front of the erected position of the mast and around which the load line passes between the before named guide and the hoisting means, said line being thereby adapted to ease the mast to recumbent position when paid out gradually and to erect the mast when taken up.

14. The combination with a supporting structure, of a crane comprising a mast in hinged connection with said supporting structure for movement between a recumbent position and other positions in which the mast is erect and substantially erect with a forward inclination, a brace pivoted to the mast at an elevated point thereon, provisions on the supporting structure for effecting connection of the lower end of said brace with the supporting structure at different distances from the foot of the mast, and load hoisting means associated with the mast.

15. The combination with a supporting structure, of a crane comprising a mast in hinged connection with said supporting structure for movement between a recumbent position and other positions in which the mast is erect and substantially erect with a forward inclination, a brace pivoted to the mast at an elevated point thereon, provisions on the supporting structure for effecting connection of the lower end of said brace with the supporting structure at different distances from the foot of the mast, a boom pivoted to the mast, a boom topping line interengaged with the mast and boom for raising and lowering the free end of the latter, and a load line leading from the outer part of the boom to the mast and hoisting means, said lines being operable to lay down and erect the mast when the brace is disconnected from the supporting structure.

16. The combination with a supporting structure, of a mast pivotally connected at its foot with the supporting structure to swing between a recumbent position and a substantially erect position, disconnectible bracing means for holding it in erect position, a boom pivoted to the mast to swing up and down, a boom topping line interengaged with the boom and mast for raising the boom, stop means for limiting positively the upward movement of the boom, whereby tension on said line tends to move the mast toward its recumbent position when the boom is so stopped, a load line passing from the outer part of the boom over guide means on the mast, and a snatch pulley connected with the supporting structure at the forward side of the mast in position for the load line to be passed around it in a course from said guide means to a point at the rear of the mast, whereby the load line is effective for restraining the movement of the mast to recumbent position and for erecting the mast.

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