Sept. 21, 1954 K. F. POTTER ET AL 2,689,655

CRANE

Filed Nov. 1, 1951

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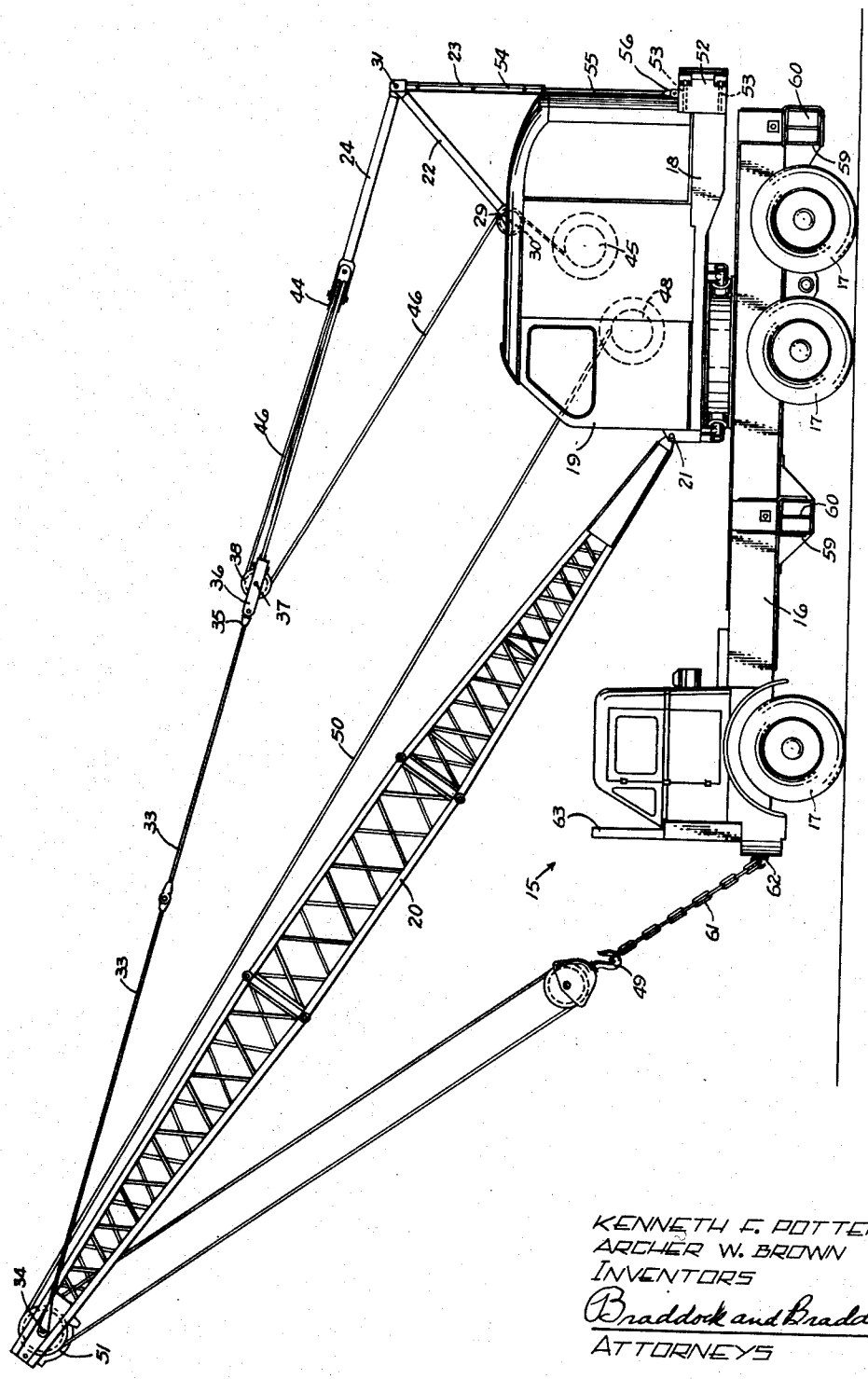


FIG 1

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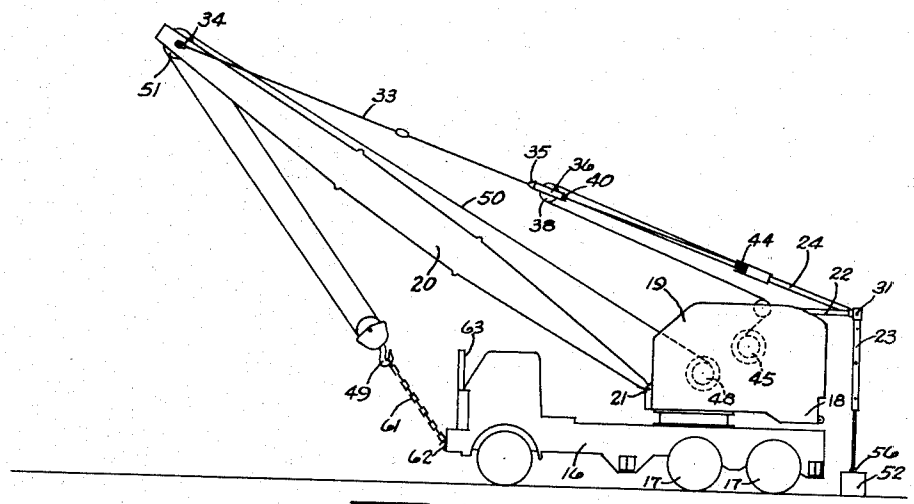


Fig 2

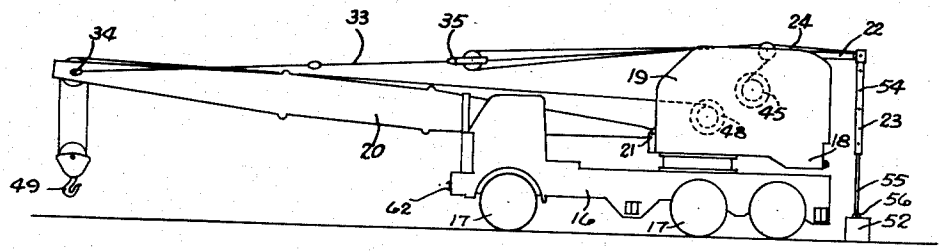


Fig 3

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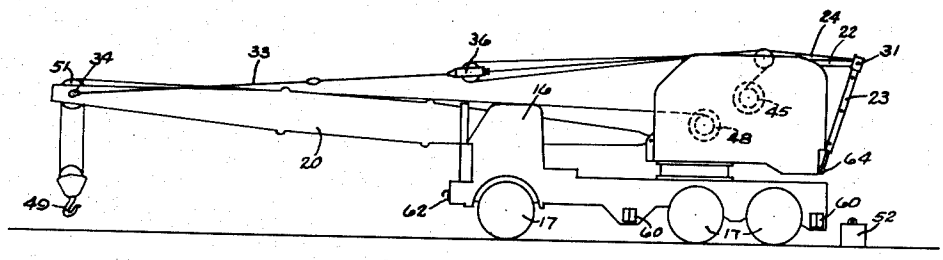


Fig 4

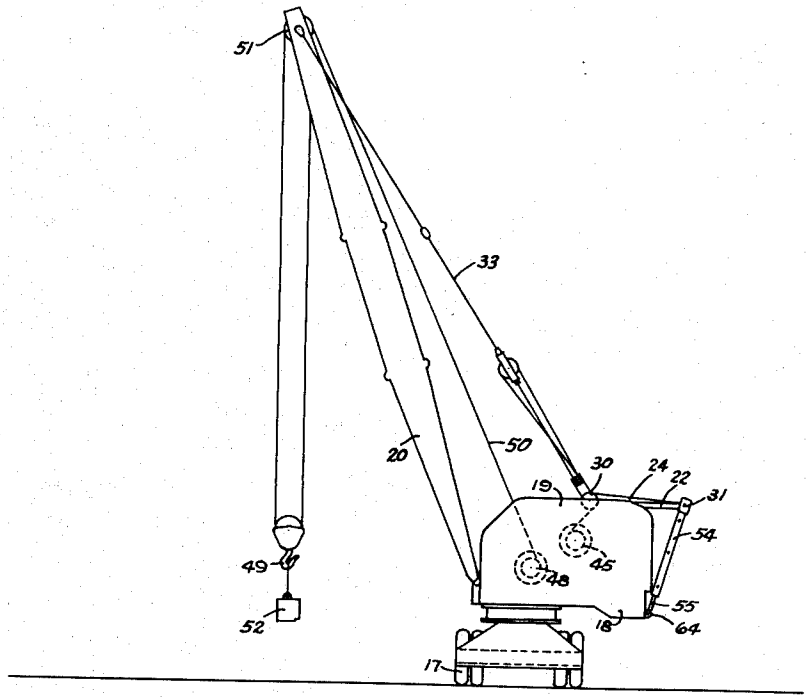


Fig 5

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Sept. 21, 1954 K. F. POTTER ET AL 2,689,655

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Filed Nov. 1, 1951

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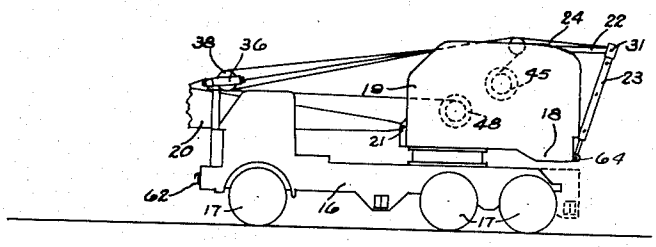


Fig 6

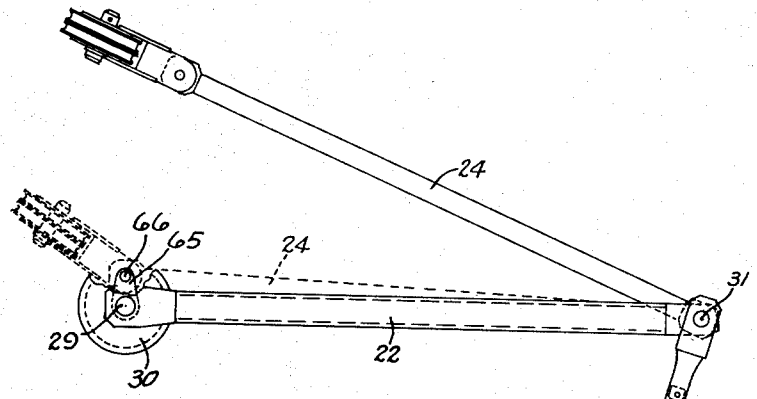


Fig 7

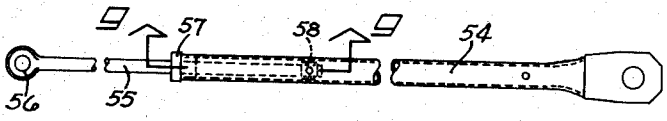


Fig 8

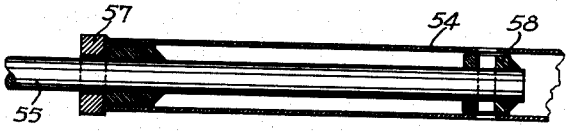
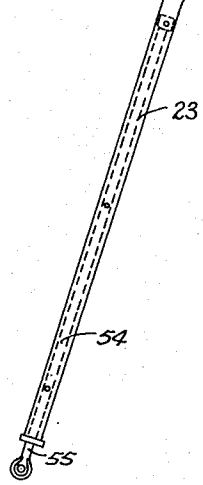


Fig 9



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CRANE

Filed Nov. 1, 1951 5 Sheets-Sheet 5

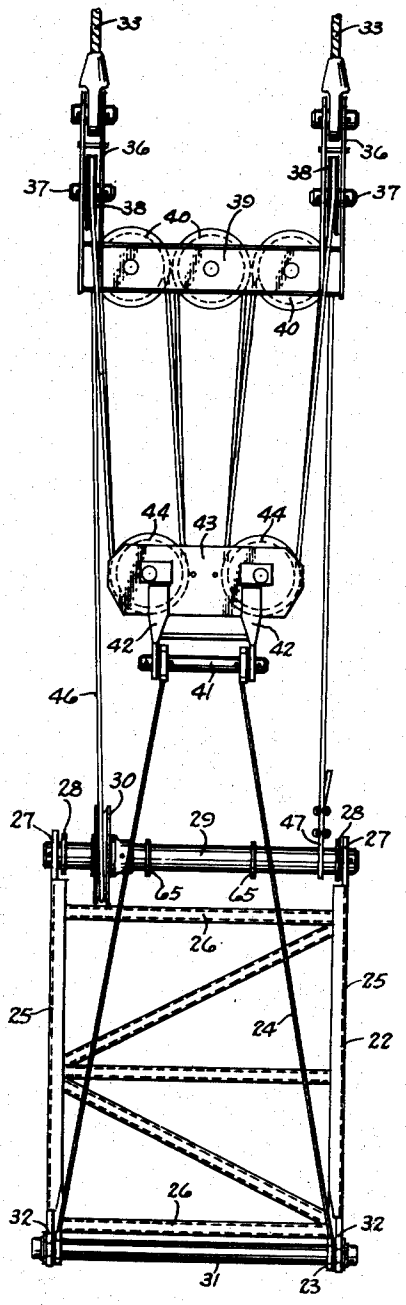


Fig 10

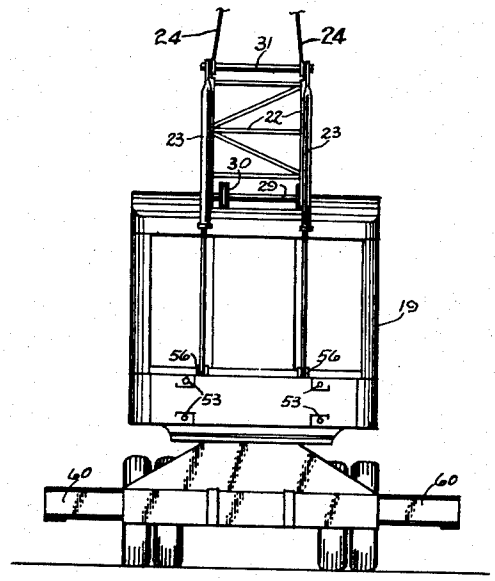


Fig 12

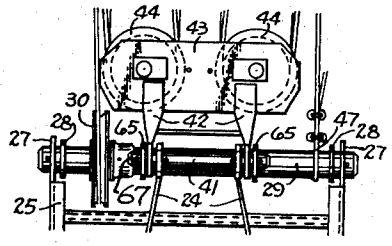


Fig 11

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UNITED STATES PATENT OFFICE

2,689,655

CRANE

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Application November 1, 1951, Serial No. 254,356

2 Claims. (Cl. 212—59)

1

The invention herein has relation to a crane or like machine of the character adapted to travel over the ground, and equipped with mechanism for hoisting, swinging and/or excavating, etc.

The purpose of the invention is to provide a crane, or like machine, wherein will be incorporated a new and improved construction and arrangement including a collapsible mast adapted to be lowered when lowering of the collapsible mast is necessary or desirable, and also including novel and improved mechanism for removing and replacing a counterweight of the crane.

In the accompanying drawings forming a part of this specification,

Fig. 1 is a side elevational view of a crane made according to the invention;

Fig. 2 is a side elevational view, on a reduced scale, disclosing a mast of the crane of Fig. 1 in collapsed position, and a counterweight of said crane as when rested upon the ground;

Fig. 3 is a view corresponding generally with the disclosure of Fig. 2, showing a boom of the crane lowered into a cradle thereof;

Fig. 4 is a view corresponding generally with the disclosure of Fig. 3, showing struts of said crane detached from the counterweight and secured to a rotatable platform of the crane;

Fig. 5 is a view corresponding generally with the disclosure of Figs. 2 to 4, showing parts of the crane situated as when the counterweight is being conveyed, as to a truck for transporting said counterweight;

Fig. 6 is a view corresponding generally with the disclosure of Figs. 4 and 5, showing the crane as when parts thereof are moved or adjusted from positions as in said Fig. 5 to positions about as in said Fig. 4;

Fig. 7 is an enlarged side elevational view detailing a unit of the crane including its mast and struts as parts thereof, and also including spaced bars of an inner bail assembly of the crane;

Fig. 8 is an enlarged side elevational view of a strut of the unit disclosed in Fig. 7;

Fig. 9 is a detail sectional view, taken on line 9—9 in Fig. 8;

Fig. 10 is an enlarged plan view of the unit disclosed in Fig. 7, additionally showing elements of the crane assembled with said unit, as said unit and elements would appear from position above the disclosure in Fig. 1;

Fig. 11 is a fragmentary plan view showing parts of the unit and elements disclosed in Fig. 10 in different positions; and

Fig. 12 is an end elevational view, partially broken away, of the crane as it would appear from the right in Fig. 1.

2

With respect to the drawings and the numerals of reference thereon, the crane, or like machine, as disclosed, includes a truck 15 of ordinary or preferred construction having a body 16 and wheels 17. The truck 15 is adapted to be propelled in ordinary or preferred manner forming no part of the invention. Insofar as the novel and improved crane here presented is concerned, the truck 15 could as well be a car body or tractor.

Said truck or equivalent 15 supports a platform 18 which is rotatable upon the truck in a customary or preferred way also forming no part of the invention. The rotatable platform 18 constitutes the floor or a cab 19 of the crane.

A boom 20, of ordinary construction as disclosed, is pivotally supported, as at 21, upon the rotatable platform 18 for rotative movement in a vertical plane.

The cab 19 supports a unit consisting of a collapsible mast 22, a pair of spaced struts 23 and a pair of spaced bars 24 constituted as a part of an inner bail assembly of the crane.

Spaced apart, longitudinally extending frame members of the collapsible mast 22 are represented 25, and spaced apart, transversely extending frame members of said mast are indicated 26. The longitudinal frame members 25 and the transverse frame members 26 are interconnected to provide a rectilinear structure or frame which is reinforced by oblique and transverse strengthening members. The longitudinal and transverse frame members and the oblique and transverse strengthening members are welded, or otherwise secured, into an integral construction.

The inner or lower end of the collapsible mast 22 includes spaced apart, integral arms 27 extending away from said inner or lower end of the frame of said mast and alined with the longitudinal frame members 25 thereof. The cab 19 includes spaced apart, upstanding arms 28 integral with upper portions of the side walls of said cab. The arms 27 and 28 include overlapping parts thereof in a vertical plane passed transversely through the cab 19 parallel to the axis 21 for the boom, and said arms 27 and 28 are situated at the side of the boom axis opposite the boom, rearwardly of said boom, in considerably spaced relation to the boom axis as disclosed.

A transverse shaft 29 having its opposite end portions mounted in openings through said overlapping portions of the arms 27 and 28 constitutes means pivotally supporting the collapsible mast 22 upon the cab 19 of the crane. Said mast extends rearwardly of the cab from the axis 29

and is disposed obliquely upwardly, as in Fig. 1, when in use and horizontally, as in Figs. 2 to 6, when collapsed. The transverse shaft **29** supports a sheave **30** for a purpose to be set forth.

A transverse shaft **31**, situated in spaced relation to the transverse shaft **29**, has its opposite end portions mounted in outer or upper extremities **32** of the longitudinal frame members **25**, at the rear of the rear transverse frame member **26**, and the transverse shaft **31** rotatably supports the spaced struts **23**, which extend downwardly from said transverse shaft, and the spaced bars **24**, which extend forwardly from the transverse shaft.

Short cables **33**, at each side of the boom **20**, have their outer ends secured, as at **34**, to the boom point. The inner ends of the short cables **33** are suitably and conveniently secured, as at **35**, to spaced apart, longitudinal plate members **36** adjacent each side of the crane. A transverse shaft **37** in each set of spaced apart, longitudinal plate members **36** rotatably supports a sheave **38**.

Spaced apart, transverse plate members **39**, extending between and secured to the spaced apart, longitudinal plate members **36**, rotatably support transversely spaced sheaves **40**.

The ends of the spaced bars **24** of the inner bail assembly opposite or spaced from the transverse shaft **31** are pivotally connected, by a cross pin **41**, with spaced ears **42** rigid with spaced transverse plate members **43** and extending longitudinally of the crane, and the spaced transverse plate members **43** rotatably support transversely spaced sheaves **44**.

The rotatable platform **18** suitably and conveniently supports a power plant (not shown) for operating a rotatable drum **45** for manipulating the boom **20**. A cable **46** for the purpose of accomplishing raising and lowering operations of said boom has one of its ends secured to the drum **45**. From said drum the cable **46** passes over the sheave **30** on the transverse shaft **29** and is reaved suitably and properly over all of the sheaves **38**, **40** and **44**. The end of said cable **46** opposite or spaced from the drum **45** is secured, as at **47**, to a part of the transverse shaft **29** spaced from the sheave **30**.

The power plant also operates a rotatable drum **48** for manipulating a hoisting hook **49**, or other member substituted for said hoisting hook to the accomplishment of the like or a different purpose. A cable **50** for the hoisting hook has its inner end attached to the drum **48** and leads from said drum over a sheave **51** upon the outer end of the boom to said hoisting hook.

The rotatable drums **45** and **48** of course will be under the control of brakes, etc., usually employed in machines of the present general character.

A counterweight **52** of or for the crane is detachably secured, as by bolts **53**, to a rearward part of the revolvable platform **18**, or part of said revolvable platform directly opposite the pivotal support **21** for the boom **20**.

Each of the spaced struts **23** is constituted as an upper and a lower telescopic rod, denoted **54** and **55**, respectively. The upper end of each upper telescopic rod **54** is the part of the corresponding strut which is rotatably supported upon the transverse shaft **31**, and the lower end of each lower telescopic rod **55** is detachably secured, as at **56**, to the counterweight **52**. Means for limiting the extent to which the lower telescopic rods **55** can be moved longitudinally in direction away from the upper telescopic rods **54** of the struts **23** are constituted as cap members **57** rigid with the lower ends of the upper telescopic rods **54** to be engaged by collar members **58** rigid with intermediate portions of the lower telescopic rods **55**.

When the lower ends of the lower telescopic rods **55** of the struts **23** are secured to the counterweight **52**, the collapsible mast **22** will be at fixed oblique position or elevation, as in Figs. 1 and 12 of the drawings. It will be evident that rotation of the drum **45** in one direction, while the mast is situated as in said Figs. 1 and 12, will cause the boom to be raised by shortening of the cable **46**, and that rotation of said drum in opposite direction will permit said boom to be lowered by gravity by reason of lengthening of said cable.

Numeral **59** represents ordinary outriggers with outrigger beams **60**. In Fig. 12 outrigger beams are disclosed as when partially withdrawn from rear outriggers by which contained.

In some instances when cranes having high masts, as in Figs. 1 and 12 of the drawings, are employed to the accomplishment of their intended purposes, overhead clearances beneath which the cranes are required to travel are too low to allow passage of their high masts. On erection work, for instance, long booms are ordinarily preferable and sometimes necessary, and when a long boom is employed it is quite desirable that a high mast be utilized, both to the purpose that the mast will be at more advantageous lifting relation with respect to the boom and that the tension of the boom suspension will be reduced. At the same time, cranes useful for erection work usually have overall height too great to be shipped or transported with their masts applied. When overhead clearances are to be passed, the masts of the cranes must either be detached or collapsed. In the disclosure as made, the mast **22** is collapsible.

The counterweight **52** is for the advantageous purpose of balancing the boom **20** and its load, and said counterweight is removable to the end that the overall weight of the crane can be reduced when it is transported, either under its own power, or the power of a conveying vehicle for the crane.

In Fig. 1 of the drawings, the weight of the boom **20** is suspended from the collapsible mast **22** by the cables **33**, the spaced a part bars **24**, the connection between said cables **33** and spaced bars **24**, and the struts **23** in such manner that there is tendency toward swinging said collapsible mast upwardly, the weight of the boom thus causing the cables **33** to be taut. The struts **23** maintain the collapsible mast **22** at its intended oblique elevation against tendency of the weight of the boom to swing said collapsible mast upwardly and forwardly. In said Fig. 1, the upper and lower telescopic rods **54** and **55** of the struts **23** have their greatest length, the collar members **58** on the lower rods **55** being engaged against the cap members **57** on the upper rods **54**.

When it is desired to collapse the mast **22** and remove the counterweight **52**, operations as hereinafter set forth will be accomplished. The boom cable **46** will be tightened sufficiently, in response to operation of the rotatable drum **45** while the hoist hook **49** is attached, as by a chain **61**, to a tow lug **62** upon the front of the truck body **16** and the hoisting hook cable **50** is fixedly held by the rotatable drum **48**, to cause the counterweight **52** to be supported or suspended. Or, the hoisting hook cable **50** may be shortened while

the hoisting hook is attached to the tow lug and the boom cable **46** is fixedly held by the rotatable drum **45** to cause the weight of said counterweight to be supported or suspended. See Fig. 1. While said counterweight is thus supported or suspended, the bolts **53** can be removed thus to release the counterweight from the rotatable platform. Then said counterweight will be lowered by gravity to the ground, as in Fig. 2, by paying out one of the cables, **46** or **50**, of course in response to operation of the corresponding rotatable drum, and, while the counterweight is rested upon the ground and the struts **23** are yet secured to said counterweight, the boom **20** will be lowered into a cradle **63** of the crane, by paying out the boom cable **46**, as in Fig. 3. After the counterweight is released from the struts **23**, while the boom **20** is situated in the cradle **63**, the lower ends of the lower telescopic rods **55** will be secured, as at **64**, to the rear of the rotatable platform **18**, or part of said rotatable platform opposite the boom **20** and its pivotal support **21**. The upper and lower telescopic rods **54** and **55** of the struts **23** are capable of sufficient relative movement to permit the collapsible mast **22** to be horizontally disposed, as in Fig. 4, when said lower telescopic rods are secured to the rotatable platform, and when said collapsible mast **22** is horizontal, by reason of sufficient payout of the boom cable **46**, the cross pin **41** and the transverse shaft **29** will be in adjacent relation and substantially vertical alinement, with said cross pin situated above said transverse shaft in position to be detachably secured thereto. In Fig. 11, the cross pin **41** which pivotally connects the spaced ears **42**, rigid with the transverse members **43** to the adjacent ends of the spaced bars **24**, has been assembled with annular links **65** slidably disposed upon the transverse shaft **29** thus to pivotally connect said spaced ears and transverse shaft to each other. As shown, the annular links **65** have openings **66** which receive opposite end portions of the cross pin **41**. Cotter pins **67** retain said cross pin in its intended position.

In Figs. 4 and 11 of the drawings, where the spaced ears **42**, rigid with the transverse plate members **43**, are pivotally connected to the transverse shaft **29**, the unit consisting of the collapsible mast **22**, the struts **23** and the bars **24** is inoperative. Instead, suspension of the boom through the instrumentality of the cable **46** is directly from the transverse shaft **29** and the cross pin **41** upon which the transverse plate members **43** and the spaced ears **42** are pivotally supported. With the boom suspended as in said Fig. 4, the counterweight **52** can be lifted from the ground and placed upon a conveying vehicle therefor, as suggested in Fig. 5 of the drawings. The crane is set up in said Fig. 5 to be operative independently of the collapsible mast **22**.

In Fig. 6 of the drawings, the crane is disclosed as when its operative parts have been moved or adjusted back to their positions about as in Fig. 4 from operative positions as in Fig. 5. In Figs. 4 and 6 the crane is set up as when ready for transportation under its own power, or for shipment under the power of a different vehicle,

with the mast **22** collapsed and the counterweight **52** removed.

To again situate the mast **22** at its oblique position and suspend the counterweight **52** upon the revolvable platform **18**, as in Figs. 1 and 12 of the drawings, it is only necessary to perform operations which are the reverse of those employed to collapse said mast and remove said counterweight.

What is claimed is:

1. In a machine of the character described, a supporting structure, a boom pivotally mounted upon said supporting structure, a pair of upright spaced struts at the rear of said supporting structure each constituted as an upper and a lower telescopic rod, means securing a lower end of the lower rod of each of said spaced struts upon said supporting structure, a first transverse shaft mounted upon an upper end of the upper rod of each of said spaced struts, spaced apart, upstanding arms upon said supporting structure at a location forwardly of said spaced struts and rearwardly of said boom, a second transverse shaft mounted upon an upper end of each of said upstanding arms, a mast having a lower, forward end thereof pivotally mounted upon said second transverse shaft and an upper, rearward end thereof pivotally mounted upon said first transverse shaft, said mast normally slanting upwardly obliquely away from its pivotal support upon said second transverse shaft and away from said boom, a boom suspension constituted as an elongated member having a rearward end thereof pivotally mounted upon said first transverse shaft, a cross pin mounted in spaced elements at the forward end of said elongated member and a cable extending between sheaves supported upon said cross pin and an outer portion of said boom for supporting the boom from the mast when in normal upwardly slanting position, means for limiting the extent to which the upper rods of said spaced struts can be moved outwardly of the lower rods thereof thus to maintain the mast at fixed oblique elevation against tendency of the weight of the boom when suspended from the mast toward causing said mast to be swung upwardly toward said boom, the boom being releasable from supported relation to the mast by lengthening of said cable and said mast and said elongated member with said cross pin being movable to lowered position upon release of said boom, and means for detachably securing said cross pin to an intermediate portion of said second transverse shaft at a side thereof.

2. The combination as specified in claim 1 wherein the lower ends of the lower rods of said spaced struts are detachably secured to a counterweight itself detachably secured to said supporting structure.

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