Aug. 14, 1945. R. H. ZEILMAN 2,382,767

BOOM FOR LOAD HANDLING MACHINES

Filed Dec. 27, 1943 4 Sheets-Sheet 1

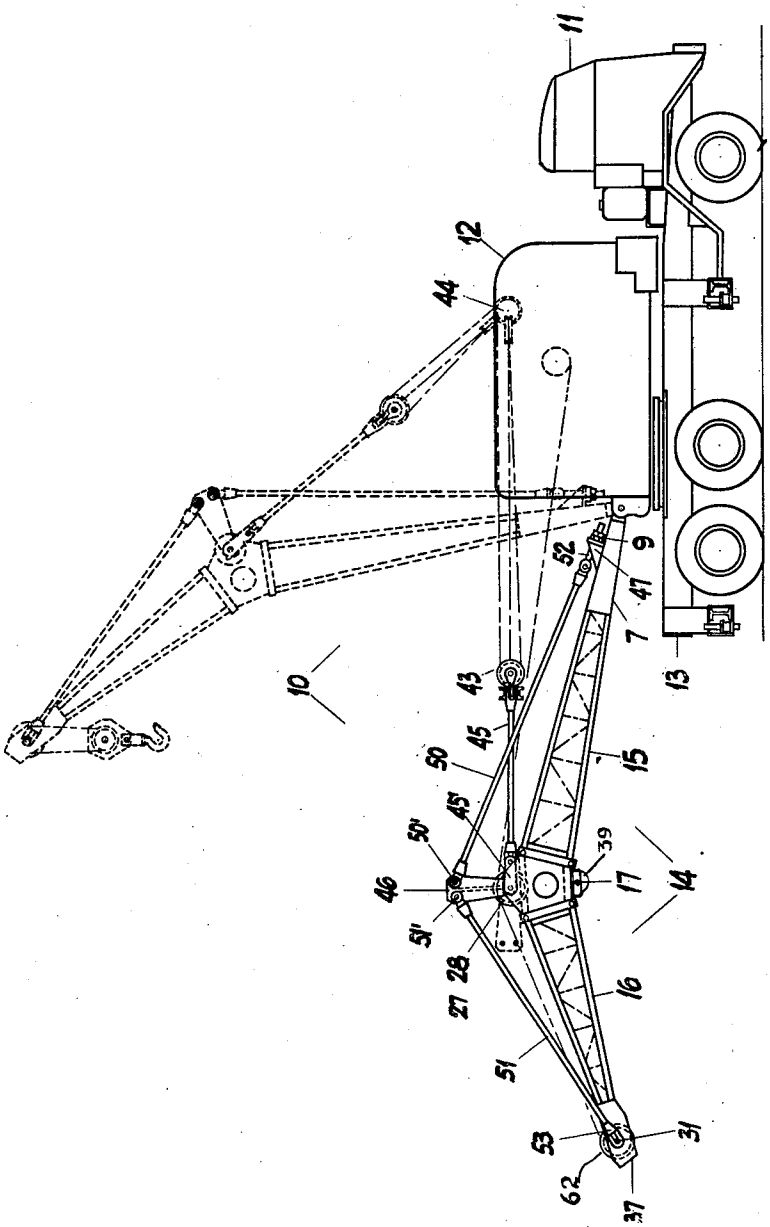

FIG. 1

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Filed Dec. 27, 1943 4 Sheets-Sheet 2

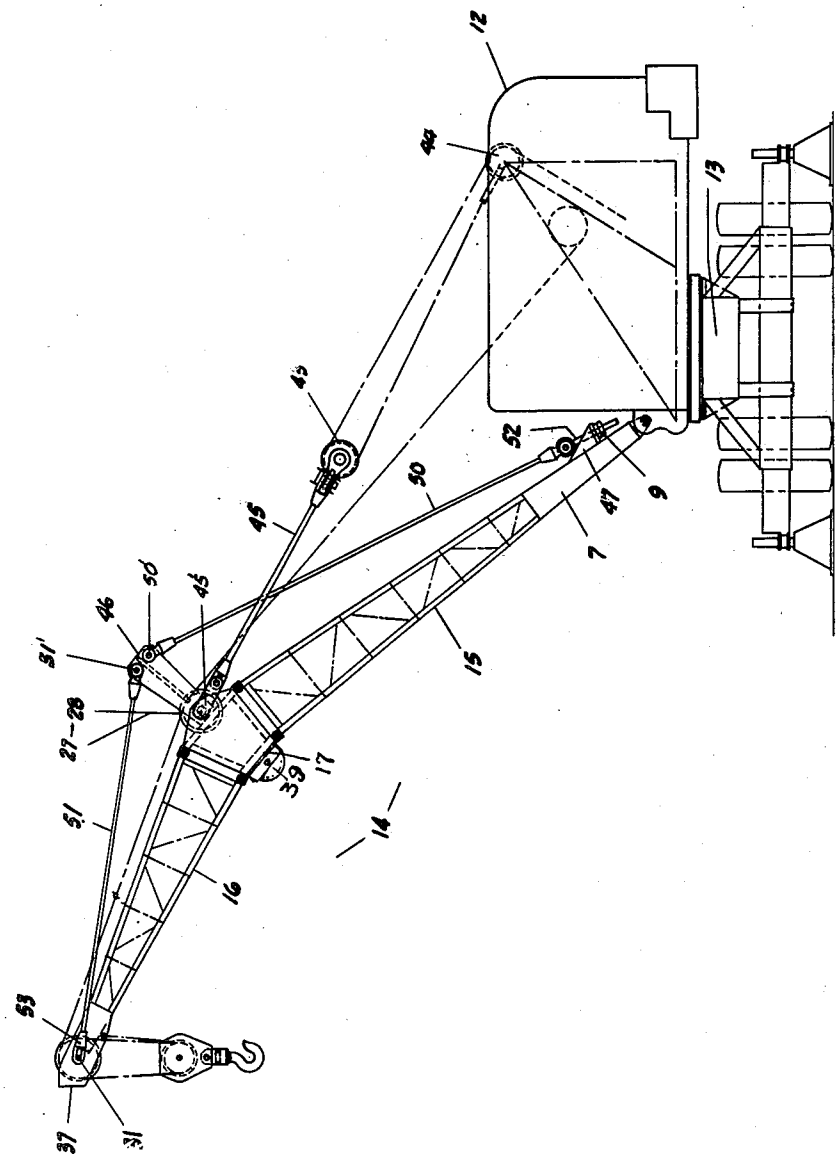

FIG. 2

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BOOM FOR LOAD HANDLING MACHINES

Filed Dec. 27, 1943 4 Sheets-Sheet 3

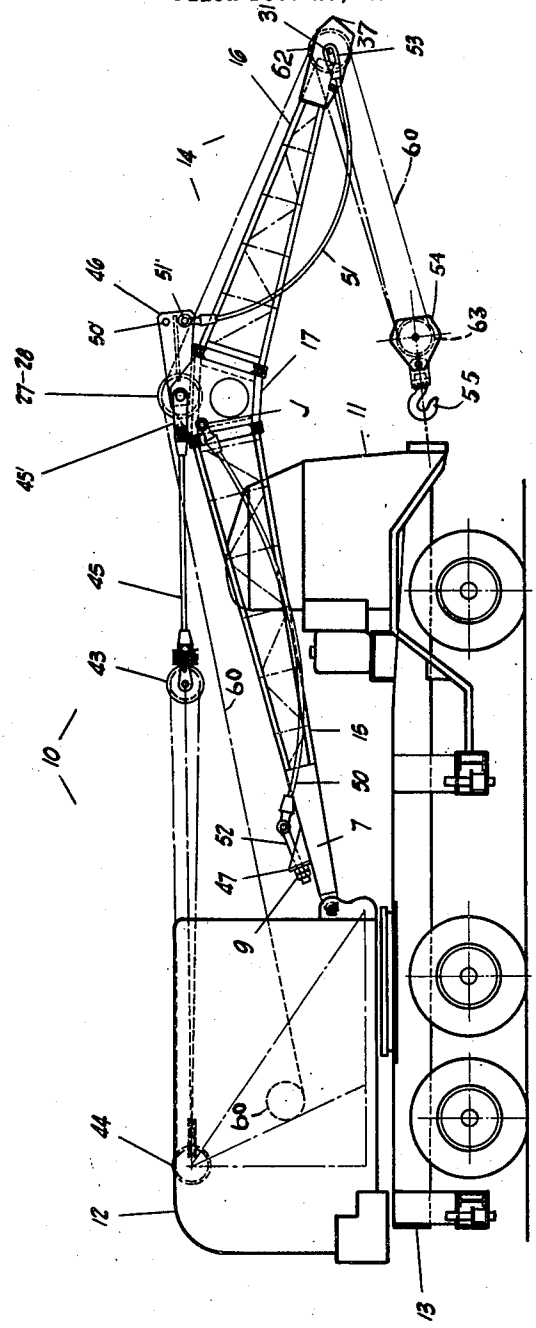

FIG. 3

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BOOM FOR LOAD HANDLING MACHINES

Filed Dec. 27, 1943 4 Sheets-Sheet 4

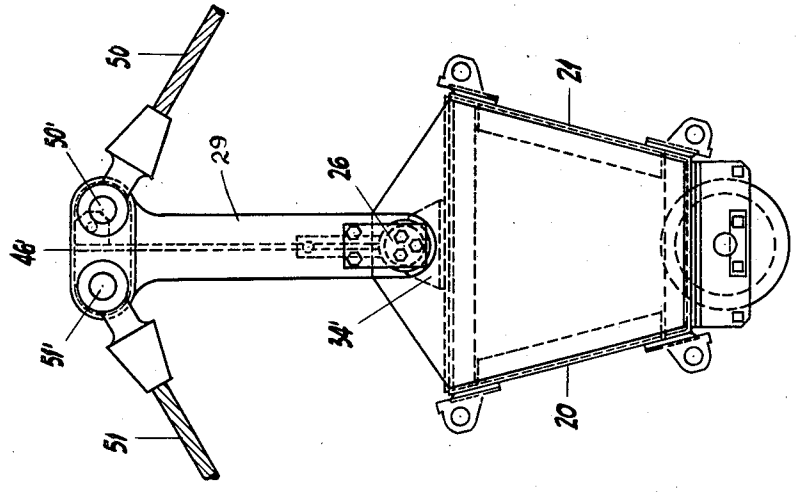

FIG. 4

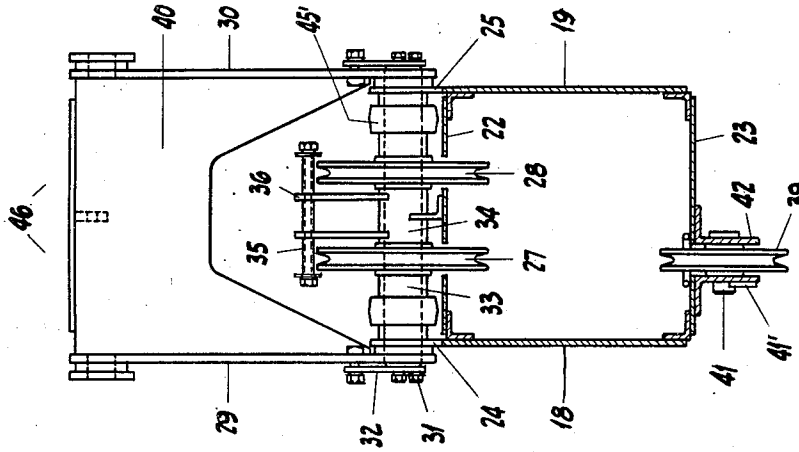

FIG. 5

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UNITED STATES PATENT OFFICE

2,382,767

BOOM FOR LOAD HANDLING MACHINES

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Application December 27, 1943, Serial No. 515,815

5 Claims. (Cl. 212—144)

The invention relates to improvements in booms for cranes and relates more particularly to booms for mobile cranes, adapted to travel under their own power.

Mobile cranes are now frequently so constructed as to provide a driver's station, near the normally forward end of the rotatable turntable, from which the crane controls are sometimes also operated, and the necessary structural parts of such station has seriously limited the extent to which downward movement of the crane boom load-handling end may be effected. Also, when subjected to vehicular travel from place to place, portions of the boom have extended to such undesirable height as to limit the passage of the crane below over-head bridges or other elevated obstacles to those of considerable clearance from the road or other terrain being traversed.

It is an object of the present invention to provide a mobile crane with a boom structure which is not only well adapted for all usual work purposes, and whose end may be lowered to a very desirable degree, but which may have all of its portions disposable at a desirable low level enabling the crane to readily pass below even the lower types of over-head bridges or other elevated structures, otherwise providing obstacles to travel of the crane.

Another object of my invention is to provide an improved boom possessing the foregoing advantages which while being sufficiently light, will also be quite satisfactorily strong.

Another object of my invention is to provide a boom realizing the foregoing objectives, in a crane structure having operator's station structure disposed forwardly of the boom foot, which structure the boom must over-hang while in use, while laterally swinging, and while travelling under relatively low but elevated structures, such as an overhead bridge or the like.

Another object of my invention is to provide a boom for a mobile crane substantially realizing the foregoing objectives which will be quite strong so as to resist stresses of the various kinds to which such booms are commonly subjected.

Another object of my invention is to provide an improved inverted V-shaped boom, which in use realizes the foregoing objectives to a highly satisfactory degree.

Other objects of my invention and the invention itself will become more apparent from a perusal of the following description in which reference is made to the accompanying drawings, in which:

Fig. 1 is a side elevational view of the improved boom of my invention, applied to a mobile crane of the type described, dotted lines illustrating another operative position of the boom from that shown in solid lines in the figure, the crane being disposed in the same operative position throughout;

Fig. 2 is a rear elevational view of the mobile crane, to which my improved boom is secured, and the boom is shown in still another operative position from that shown in Fig. 1;

Fig. 3 is a side elevational view of the improved boom of my invention, showing said boom in travelling position on the mobile crane;

Fig. 4 is a side elevational view of the splice box, and mast, of the improved boom of my invention together with parts carried thereby;

Fig. 5 is a sectional view of the splice box per se, taken on a vertical medially located plane, with respect to Fig. 4, and shows the mast thereof in end elevation, and certain pulleys and shafts therefor carried by the splice box also, in end elevational view.

Referring now to the drawings, and particularly to Fig. 1, I have illustrated generally at 10 a mobile crane, comprising a driver's station 11, and a superstructure 12, mounted upon a truck 13, and rotatable thereon in the usual manner, said superstructure including a boom 14 pivotally secured to the mount of the superstructure.

Said boom, in accordance with my invention, comprises a foot section 15, a head supporting or load handling section 16, and these sections are of the usual fabricated construction comprising four spaced longitudinally extending angles interconnected by diagonal tie rods to provide a box-like boom structure. The foot section and the head section of the boom, as best illustrated in Figs. 1 to 3 inclusive, preferably vary in depth in said box like structures, proceeding from their ends towards the splice box 17 interconnecting these two sections.

The splice box 17, or connection section, is strongly constructed, preferably, of inter-welded plates and bars to form a box-like structure, and consists generally of two hexagonal side paltes 18 and 19 of substantially keystone shape, the major lower portions of said side plates being joined by a pair of rectangular end plates 20 and 21, and said box has a top and bottom 22 and 23, the sides 20 and 21 being downwardly converging, as best shown in Fig. 4.

Within the splice box and upon a support 34 welded by its base 34' to the upper wall 22 of the splice box, and upon the upright extensions 24

and 25 of the hexagonal side plates 18 and 19, a pulley shaft 26 is supported.

Upon said shaft, spaced pulley sheaves 27 and 28 are journalled, and, also, the downwardly extending end portions of the lateral arms 29 and 30 of the mast 46 is secured to the ends of the shaft by bolts 31. The mast arms are laterally braced by a web-plate 40 interconnecting the arms; keepers 32—32 are likewise clamped against the ends of said shaft 26 by the bolts 31, the upper end of each keeper 32 being bolted to the adjacent one of the mast arms 29 and 30. Suitable spacers including those at 33 and the eyes of the cable links 45' maintain the sheaves in proper laterally spaced positions upon the shaft to co-operate with cables reeved thereon as later described. The top box plate 22 is suitably perforated to permit the sheaves 27 and 28 to partially protrude downwardly therethrough and to provide space for a cable to be reeved over another sheave 39 and the sheave 27 downwardly through the box.

A transverse cable keeper rod 35 overlies the pulleys 27 and 28, and is supported by spaced upwardly extending arms 36 of the support 34. A third sheave 39 is journalled upon a bearing pin 41 which in turn is carried by a pair of angle iron supports 42 pendantly welded to the bottom box plate 23, at the two sides of an opening through said plate, to permit the sheave 39 to partially protrude within the box, the opening being sufficiently elongated to permit the reeving of a tag line or similar cable extending through the box 17 about said sheave and the relatively upwardly disposed sheave 27, aligned therewith, in accordance with established crane operating practice; a keeper 41' removably retaining the pin 41 in place.

The mast 46, being mounted by its lower arm extremities upon the shaft 26, terminates upwardly in the mast head 46' through which a pair of transversely extending parallel guy anchoring shafts 50' and 51' upon the opposite ends of which the terminal eyes of the pairs of guys 50 and 51 are anchored, and thus secured to the mast.

In the event that it is desired to add a tag line to the boom of these figures, the tag line may be secured to a winding drum mounted upon the superstructure and the line reeved, first, over the pulley 27, and then over the pulley 39.

The boom 14 is raised and lowered by means of block and tackle means 43 operated by a power operated winding drum 44 which is mounted on the superstructure and a pair of cables 45—45 secured thereto and to the shaft 26 by links 45'. In crane operating position, as shown in Figs. 1 and 2 herein, the mast is disposed in vertically disposed or upstanding relation to the boom, and, in crane travelling position, as shown in Fig. 3 herein, the mast is disposed in recumbent position relative to the adjacent portion of the boom, the foot and head portions 15 and 16 respectively of the boom being disposed generally in inverted obtuse V-form and said mast disposed, in crane operating position, at the apex of the inverted V.

The boom is strongly reinforced by the provision of pairs of guy cables 50 and 51, rigidly secured, in tension, by eye and bolt securing means, as shown at 52 and 53, to the opposite foot and head end portions respectively of the boom sections 15 and 16, and said cables are preferably detachably secured by their eye terminals, to the upper portions of the mast. The guy cables 50 and 51, disposed in pairs above each side of the boom sections 15 and 16, before being put in tension with the terminals of the two pairs of guys 50 and 51 are secured in operative attachment with the two ends of the shafts 50' and 51' which are positioned in relatively aft and fore positions, and relatively parallel in the mast head 46', and the remote terminal ends of the guys 50 and 51 are secured to the foot and head ends of the boom.

The connection of the pair of guys 51 with the two sides of the boom head is made by hooking the eyes of the terminals 53 of the guys 51 over the laterally protruding ends of the sheave shaft 31, which extends transversely through the boom head 37, and locking said eyes in place, in any well known manner, as by the use of cotter pins; this operation may best be accomplished with the mast in the traveling position, as shown in Fig. 3. Then the guys 50 are secured to the foot bracket 47 carried on the upper side of the boom foot 7, by rearwardly rotating the mast to nearly erect position and then projecting the eye bolts 52 through a pair of openings through the bracket, and by tensioning the guys 50 and 51 by turning up the nuts 9 on the ends of said bolts tightly, wherefore the mast attitude is normal to the longitudinal axis of the boom.

As shown in Figs. 1 and 2, when the boom is in crane-operating position, each of the pairs of guy cables 50 and 51 are maintained taut to complete for the boom a strong truss structure, the mast 46 being maintained in compression in an upright attitude extending normal to the longitudinal boom axis.

When the boom is in traveling position, as shown in Fig. 3, the guy cables are slackened, preferably by first slackening off the nuts 9 on the eye bolt 52 anchored at the boom foot and then detaching the guy cable terminal 50 from the mast and resting the same by a suitable hook J on the splice box 17, whereby the mast 46 rotates to a recumbent position upon the adjacent portion of the boom, and the guy cable 51 is resultantly slackened, as shown.

In this latter position, the boom may be lowered to such an extent that it will not protrude above the heighth of the superstructure or crane operator's cab. Hence, the crane in its traveling position, may travel under overhead bridges providing sufficient clearance for the truck, without the boom. The boom is well adapted for association with a driver's cab of the general type shown in my Design Patent No. 134,464, dated December 1, 1942, and, as shown in Fig. 3, the boom, when in traveling position, is supported by the tackle mechanism 43 and the pair of cables 45—45 and links 45' joining said tackle and cables to the shaft 26, which, in turn, is secured between the side plates of the splice box.

As best illustrated in Figs. 2 and 3, a hook line 60 has one of its ends secured to a drum 61 mounted on the superstructure and this line 60 is guided by the sheave 28 positioned in the mast and the sheave 62 in the boom head 37 about a sheave 63 disposed in the block 54 adjacent to the hook 55 and returned about the sheave 62 and sheave 63 and anchored to the boom head 37.

When the boom is in traveling position, as described, the hook 55 is secured by a loop to the front of the driver's cab 11, as shown in Fig. 3.

As described, the boom of my invention, besides being, per se, of very strong construction so as to resist the various strains, including torsional stress, resulting from its goose neck form, is

greatly strengthened by the provision of the guys 50 and 51, which, being in tension, put the mast in compression against the splice box and the boom, per se, is thus relieved of the otherwise component of tensile stresses imposed by boom loads, which otherwise would be exerted in the boom portions disposed medially of its top and bottom.

At the same time, the boom achieves the advantages previously herein set forth, resulting from angular or so-called goose neck form, which are at once obvious to workers in this art.

Fig. 2 illustrates the boom operating laterally of the vehicle chassis and the use of outriggers to lengthen the vehicle base in the transverse direction in which the boom is presented to the work and in such position the goose neck form achieves the additional advantage of permitting lowering of the end of the boom over an embankment or the like to a greater degree than is possible with a straight boom.

Having thus described my invention in a preferred embodiment, I am aware that numerous and extensive departures may be made therefrom, without, however, departing from the spirit of my invention and the scope of the appended claims.

I claim:

1. In combination with a mobile crane vehicle comprising a rotatable table, a prime mover, boom cable winding drums selectively operable from said prime mover, and frame means disposed on the table for supporting said drums, of a boom therefor comprising a pair of boom sections, one a head and one a foot section, and a splice section rigidly so uniting the head and foot sections substantially medially of the boom as to cause them to substantially define an obtuse angle disposed in a vertical plane, an upstanding mast normally extending upwardly from and hingedly secured to the splice section, said head section terminating at its end disposed remotely of said splice section in a boom head adapted to support a work load, said foot section terminating at its remote end in a foot element, said foot element transversely hinged to the crane, guy cables under tensile stress joining the remote ends of said head and foot sections to an upper portion of said mast to provide a truss boom structure with said guys defining a smaller obtuse angle than that defined by said sections, sheaves carried by said boom splice section, a plurality of crane operating cables, each having an end windable upon and unwindable from one of said drums, operable over said sheaves, for variously adjusting the boom load to angularly raise and lower the boom.

2. A truss-type boom for mobile cranes comprising three longitudinally disposed sections comprising a head supporting section, a foot section and a splice section rigidly interconnecting said head and foot sections, an upstanding mast carried by the boom in the region of the said splice section, a pair of guys under tension respectively interconnecting an upper portion of said mast with the head and foot portions of the boom, transversely disposed hinge means for securing said mast to the boom, releasable securing means for joining at least one of said guys to said mast, whereby when such guy is released from its connection with the mast, said mast may swing in the opposite direction to slack the other guy and dispose the mast in substantially closer parallel relation to the adjacent upper surface of the boom.

3. A boom for mobile cranes comprising a first section adapted to be pivotally secured to the crane and a second section having load handling means associated therewith, cable means reeved on drums mounted on the crane adapted to raise and lower the load handling means, an upstanding mast carried by the boom substantially in a mid-region thereof, a pair of guy cable means interconnecting an upper portion of said mast with the remote ends of each said section, a substantially block and tackle mechanism comprising pulleys and cables threaded thereover, said mechanism interconnecting the lower end of said mast and the crane, a power operated winding drum mounted on said crane for operating said block and tackle mechanism whereby the said boom may be raised and lowered.

4. A boom substantially as set forth in claim 3 wherein one of said guy cable means is detachably secured to said upper portion of the mast whereby said guy cable means may be released from its connection with the mast, said mast being pivotally secured to the boom, and said mast being swung in an opposite direction to slack the other guy, securing means carried at the forward end of the mobile crane to which said load handling means may be secured whereby said crane is adapted for travelling.

5. In combination with a mobile crane vehicle comprising a rotatable table, a prime mover, boom cable winding drums selectively operable from said prime mover, and frame means disposed on the table for supporting said drums, of a boom therefor comprising a pair of boom sections, one a head and one a foot section, and a splice section, said splice section having a connecting portion rigidly so uniting the head and foot sections substantially medially of the boom as to cause them to substantially define an obtuse angle disposed in a vertical plane and having an upstanding mast portion normally extending upwardly from and hingedly secured to the said connecting portion, said head section terminating at its end disposed remotely of said splice section in a boom head adapted to support a work load, said foot section terminating at its remote end in a foot element, said foot element transversely hinged to the crane, guy cables under tensile stress joining the remote ends of said head and foot sections to an upper portion of said mast to provide a truss boom structure with said guys defining a smaller obtuse angle than that defined by said sections, sheaves carried by said boom splice section, a plurality of crane operating cables, each having an end windable upon and unwindable from one of said drums, operable over said sheaves, for variously adjusting the boom load to angularly raise and lower the boom.

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