Jan. 2, 1934. E. B. NICKLES 1,941,952

BOOM CONSTRUCTION

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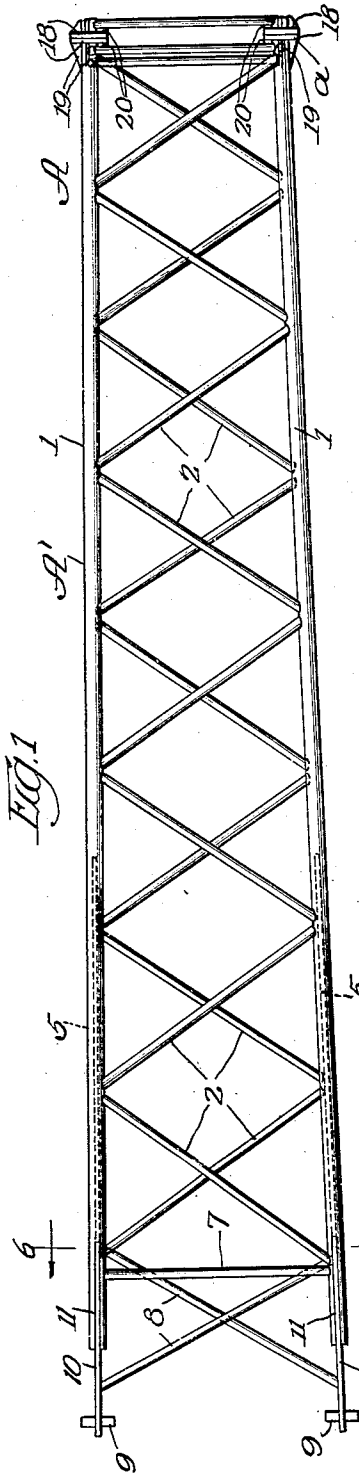


FIG. 1

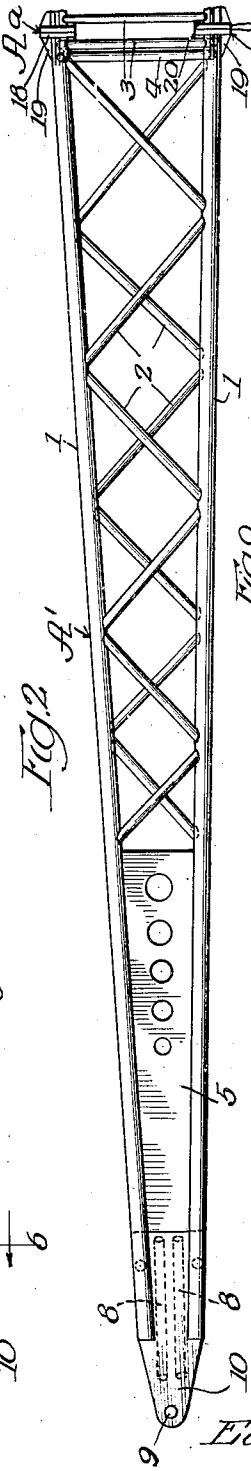


FIG. 2

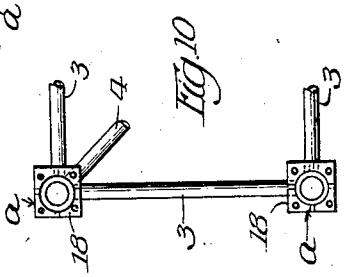


FIG. 10

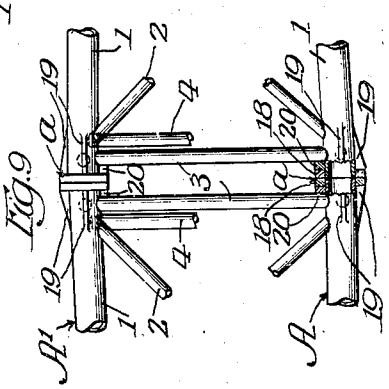


FIG. 9

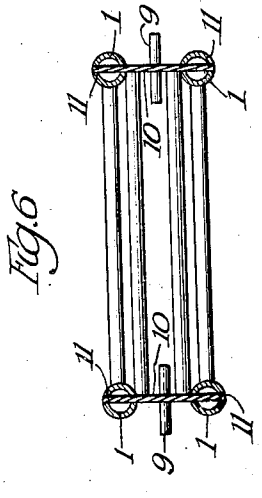


FIG. 6

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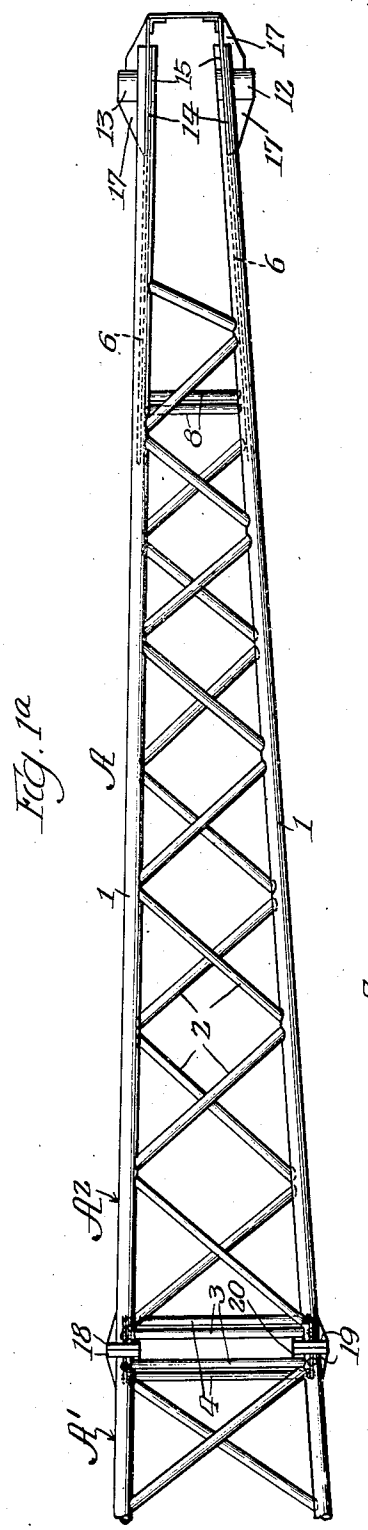


Fig. 1a

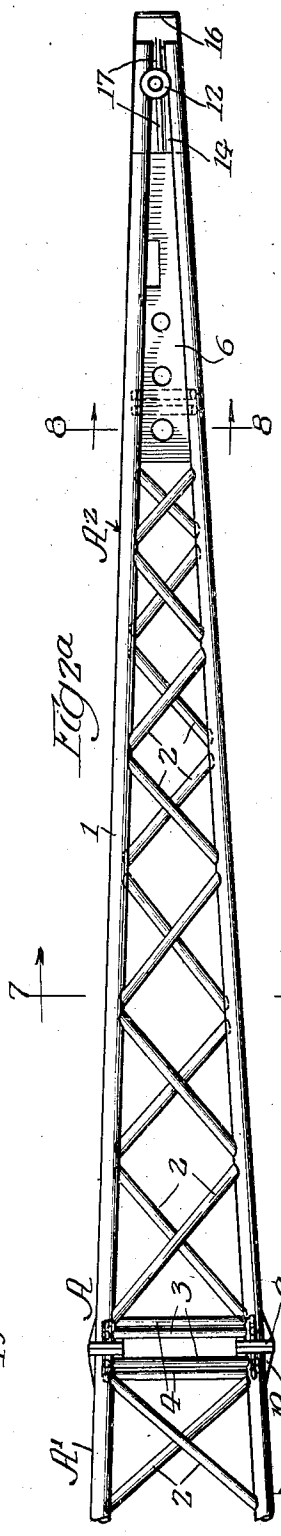


Fig. 2a

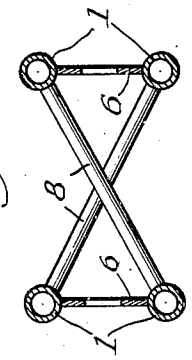


Fig. 8

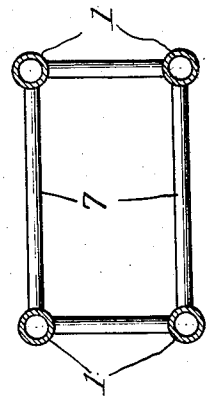


Fig. 7

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Fig. 3

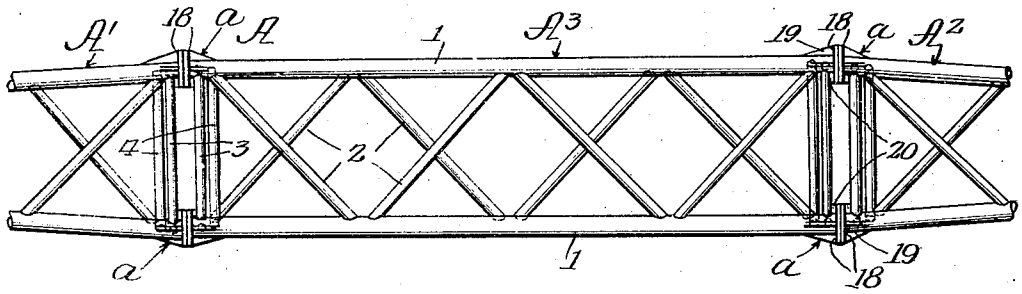


Fig. 4

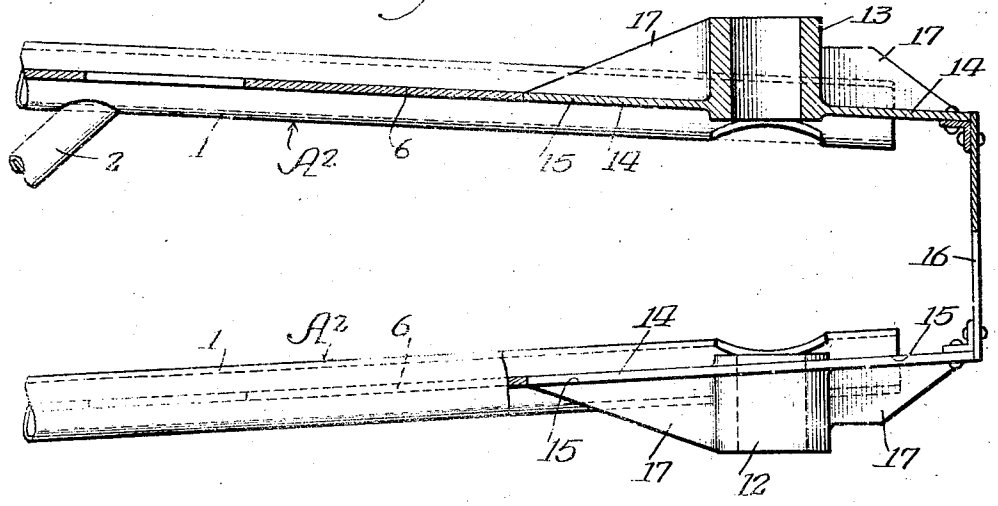
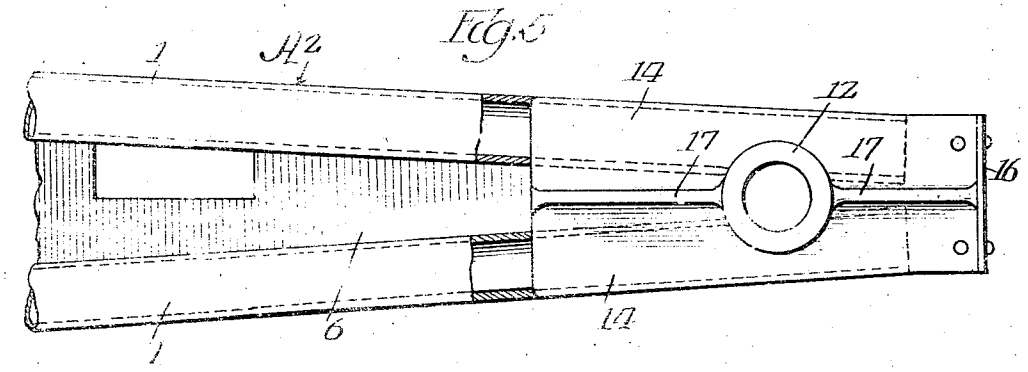


Fig. 5



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Patented Jan. 2, 1934 1,941,952

UNITED STATES PATENT OFFICE

1,941,952

BOOM CONSTRUCTION

Edward Belmer Nickles, Manitowoc, Wis., assignor to Manitowoc Shipbuilding Corporation, Manitowoc, Wis., a corporation of Wisconsin

Application December 26, 1931
Serial No. 583,338

18 Claims. (Cl. 212—144)

This invention relates to boom construction particularly designed and adapted for use on cranes, derricks, certain types of excavators, and similar machines.

A primary object of the invention is to provide a boom consisting essentially of tubular frame members, comprising longitudinal members, diagonal lattice or lacing members, struts and tie rods, all welded together to form a unitary structure, which will be simple in construction, relatively inexpensive to manufacture, of relatively light weight and great strength as compared with most booms now used for the purpose, of which I have any knowledge.

A further object of the invention relates to a joint of new and novel construction for detachably connecting together, end to end, different sections of a boom of the general type specified consisting of separate sections, comprising end sections adapted to be connected directly to each other to form a boom of minimum length and which are equipped with usual devices and appliances for pivoting and manipulating said boom; and also an intermediate section or sections, by inserting or removing which, the boom may be lengthened and shortened, within predetermined limits.

To effect the objects thereof, a boom embodying my invention and improvements comprises the various features and details of construction hereinafter described and claimed.

In the accompanying drawings, in which the invention is fully illustrated,

Figs. 1, 1^a are, respectively, top plan views of the inner and outer ends of a boom embodying my invention and improvements.

Figs. 2, 2^a, are, respectively, side views of the inner and outer ends of the boom substantially as shown in Figs. 1, 1^a.

Figure 3 is a side view of a boom consisting of end sections, shown in part only, and an intermediate section removably secured between the same.

Figure 4 is an enlarged, fragmentary, detail top plan view of the outer end of the boom, partly in section.

Figure 5 is a side view thereof, also partly in section.

Figure 6 is an enlarged sectional view, substantially on the line 6—6 of Fig. 1.

Figures 7 and 8 are enlarged sectional views substantially on the lines 7—7 and 8—8 of Fig. 2^a, respectively.

Figure 9 is an enlarged fragmentary view, partly in section, showing the construction of the boom at the joints connecting the sections thereof, and the structure of the joints in detail; and

Figure 10 is an enlarged fragmentary face view of an end of a section of my improved boom and of the joints for connecting different sections thereof.

Describing the invention with reference to the drawings, a boom embodying my invention and improvements, designated as a whole A, consists of a plurality of sections, comprising sections designated as a whole A', A^2, respectively, which are present in all booms embodying the invention, and which may comprise intermediate sections, designated as a whole A^3, see Fig. 3, all of said sections being rigidly but detachably connected end to end, thus providing for varying the length of the boom from a minimum length represented by the sections A', A^2, to a maximum operating length by connecting in one or more intermediate sections A^3.

As regards their general construction and excepting as to features special to each—which will be separately described—all boom sections are substantially similar to each other and a description of one thereof will apply equally to all.

In accordance with my invention, each boom section comprises longitudinal members 1 consisting of standard steel pipes of proper diameter to provide adequate strength—say for usual purpose, three inches (3'') inside diameter—said longitudinal members being rigidly connected by top, bottom and side lattice or lacing members 2, the ends of which are shaped to fit the longitudinal boom members 1 and are electrically welded thereto. Adjacent the joints for connecting said boom sections, designated as a whole *a*, and presently fully described, the longitudinal members 1 are connected by tie members 3 on both sides and top and bottom, which will prevent spreading of said members 1 under compression, and by diagonal members 4, one at the connected end of each boom section, the diagonals at the ends of boom section designed to be connected, preferably crossing each other.

As shown, also, adjacent the remote ends of the boom sections A', A^2, as assembled for use, the longitudinal members 1 of said sections, respectively, on the same side of the boom are connected by plates 5 and 6, shaped to conform to the taper of said boom sections, the edges of which are electrically welded to the members 1.

Also, at the pivoted end of the boom A, the top and bottom members 1 thereof are connected in pairs by transverse tie members 7, and ad-

jacent the outer end of said boom, said longitudinal members are connected by cross-braces 8, all of said parts being electrically welded together.

The pivot of the boom is formed by pins 9 secured in relatively thick plates 10—say from one and one-half (1½) to two (2) inches thick—which are secured in slots 11 formed in the vertically spaced members 1 of the boom section A', by electric welding, adjacent ends of said plates and of the plates 5 abutting each other.

Also, at the outer end of the boom A, as assembled for use—which is the end of the boom section A^2 remote from the boom pivot—said boom section A^2 is provided with bearings to receive a pivot pin for mounting hoisting sheaves and other operating devices, neither said pin or sheaves being shown. As best shown in Figs. 4 and 5, said bearings consist of bosses 12 and 13 formed on plates 14 which are electrically welded into slots 15 formed in the outer ends of the longitudinal boom members 1 in substantially the same manner as the butt plates 10 are secured in the slots 11 formed in the pivoted end of the boom section A'. The plates 14 and bosses 12 and 13 preferably are steel castings. As shown, also, the plates 14 project beyond the ends of the boom members 1 and are connected by a plate 16 riveted or otherwise secured thereto, and which will operate, in an obvious manner, to strengthen and stiffen the outer end of said boom member. The structures consisting of the plates 14 and bosses 12 and 13, are further strengthened and stiffened by webs 17.

In accordance with my invention, different boom sections—which always include the sections A', A^2 and, if desired, an intermediate section or sections A^3, depending on the contemplated operating length of the boom—are adapted to be connected together, end to end, to form a boom proper A of desired length, by the joints *a*.

What I now consider a preferable joint for the purpose, consists of flange plates 18 provided with holes proportioned to receive the ends of the longitudinal boom members 1 and adapted to be electrically welded thereto in abutting relation, as shown, the relation preferably being such that the ends of the boom members 1 will terminate short of the abutting faces of said plates, the welds preferably forming fillets in the angles between the ends of the members 1 and the bores of the plates 18. Preferably, also, the abutting faces of the plates 18 are ground to provide continuous compression contact between abutting flange plates, and such, also, that the faces of all flange plates on the same end of a boom section will be in the same plane. Abutting flange plates 18 on different boom sections are provided with aligned bolt holes and are adapted to be rigidly, but detachably, bolted together.

The joints *a* are further reinforced and strengthened by webs 19 and 20, of which the webs 19 fit into the angles between the backs of the flange plates and the surface of the boom members 1, while the webs 20 are proportioned to fit into the spaces defined by the flange plates 18, the tie members 3 and the boom members 1, all of which they, also, are electrically welded.

All booms of my invention comprise the end boom sections A', A^2, which, alone, would of course form a boom of minimum contemplated length, say, forty feet (40'), while booms of greater length, say up to ninety feet (90') may be formed by the insertion of intermediate boom sections A^3 of suitable lengths, as two twenty foot (20') and one ten foot (10') sections—any of which may be inserted or removed as occasion may require.

While I have herein described the different parts and members of the boom as being electrically welded together, it is not my desire or intention to limit the inventon to electric welding or any particular form or process of welding, as the invention contemplates the use of any usual or desired means or method of welding said boom members together, as, for example, acetylene welding.

Also, while, in the preferable embodiment of the invention, the longitudinal boom members 1 are always tubular and the members, which connect said longitudinal members, are preferably so, my invention contemplates the use of connecting members made of solid bars, if desired, but welded to said longitudinal members as in the case of tubular connecting members.

I claim:

1. A boom construction for the purpose specified, comprising tubular longitudinal members, lacing members and transverse tie or strut members, the ends of all of which are permanently secured to and rigidly connect the longitudinal boom members to which they are secured, respectively, said tie or strut members being positioned in planes substantially square with the axis of the boom and arranged to reinforce and strengthen the boom to resist buckling stresses.

2. A boom construction for the purpose specified, comprising tubular longitudinal members, tubular lacing members the ends of which are welded to said longitudinal members, and transverse tubular tie or strut members the ends of which are welded to different longitudinal boom members, being positioned substantially in planes at right angles to the axis of the boom and arranged to reinforce and strengthen said boom to resist buckling stresses.

3. A boom construction as specified in claim 1, in which the remote ends of opposite side pairs of longitudinal boom members are connected by plates the edges of which are welded to the boom members which they connect, respectively.

4. A boom construction as specified in claim 1, in which the means for pivotally mounting the boom comprises butt plates welded into slots formed in the inner ends of opposite side pairs of longitudinal boom members and which project beyond the same, and pivot pins secured in the projecting ends of said plates.

5. A boom construction as specified in claim 1, in which the means for pivotally mounting the boom comprises butt plates welded into slots formed in the inner ends of opposite side pairs of longitudinal boom members and which project beyond the same, and pivot pins secured in the projecting ends of said plates, the slotted ends of the top and bottom pairs of boom members being reinforced and strengthened by transverse tie or strut members the ends of which are welded to the boom members which they connect, respectively.

6. A boom construction as specified in claim 1, in which the means for pivotally mounting the boom comprises butt plates welded into slots formed in the inner ends of opposite side pairs of longitudinal boom members and which project beyond the same, pivot pins secured in said butt plates, and diagonal tubular members which connect said butt plates adjacent their opposite ends and are welded thereto.

7. A boom construction as specified in claim 1, in which the outer ends of opposite side pairs of longitudinal boom members are connected by plates opposite edges of which are welded to the boom members which they connect, respectively, and said boom members are connected between the ends of said plates by tubular cross braces the ends of which are welded to said boom members.

8. A boom construction as specified in claim 1, in which plates are welded into slots formed in the outer ends of opposite side pairs of longitudinal boom members formed on which are hubs or bosses provided with aligned bearings for mounting a pivot pin, the adjacent sides of said side pairs of longitudinal boom members being recessed to receive said bearing bosses and being welded thereto.

9. A boom construction as specified in claim 1, in which plates are welded into slots formed in the outer ends of opposite side pairs of longitudinal boom members formed on which are hubs or bosses provided with aligned bearings for mounting a pivot pin, the adjacent sides of said side pairs of longitudinal boom members being recessed to receive said bearing bosses and being welded thereto, said bearing plates projecting beyond the ends of the longitudinal boom members, and a plate connected to and which rigidly connects the ends of said bearing plates.

10. A boom construction for the purpose specified, consisting of a plurality of sections, joints for detachably connecting said sections together, end to end, means at the inner end of the inner boom section for pivotally mounting said boom, and bearings at the outer end of the outer boom section for mounting a pivot pin, each boom section comprising tubular longitudinal members, lacing members permanently secured to and which rigidly connect said longitudinal members, and members which connect said longitudinal boom members adjacent the connected ends of the boom sections, arranged to reinforce said boom to resist buckling stresses under compression, each boom section forming a separate unit all parts of which are rigidly and permanently connected together.

11. A boom construction for the purpose specified, consisting of a plurality of sections, joints for detachably connecting said sections together, end to end, means at the inner end of the inner boom section for pivotally mounting said boom, and bearings at the outer end of the outer boom section for mounting a pivot pin, each boom section comprising tubular longitudinal members, tubular lacing members the ends of which are welded to said longitudinal boom members, and members which connect said longitudinal boom members adjacent their connected ends, arranged to reinforce said boom to resist buckling stresses when under compression.

12. A boom construction as specified in claim 11, in which the members for resisting buckling stresses in the boom comprise tubular tie or strut members which extend substantially at right angles to the boom members which they connect, respectively, and the ends of which are welded thereto.

13. A boom construction as specified in claim 11, in which the members for resisting buckling stresses in the boom comprise tubular tie or strut members which connect the longitudinal boom members and the ends of which are welded to the longitudinal boom members which they connect, respectively, and which are disposed in planes substantially at right angles to the axis of the boom.

14. A boom construction as specified in claim 11, in which the members for resisting buckling stresses in the boom comprise diagonal tie or strut members adjacent the connected ends of connected boom sections, the ends of which are welded to the longitudinal boom members which they connect, respectively, and which are disposed substantially in planes extending at right angles to the axis of the boom, and which comprise diagonal tie or strut members on different boom sections which cross each other.

15. A boom construction as specified in claim 10, the joints for detachably connecting the different boom sections of which, comprise flange plates having holes adjusted over the ends of the longitudinal boom members and welded thereto, the relation being such that the abutting faces of said flange plates will be positioned in planes square with the center line of the boom, said flange plates also being provided with aligned bolt holes.

16. A boom construction as specified in claim 10, the joints for detachably connecting the different boom sections of which comprise flange plates having holes adjusted over the ends of the longitudinal boom members and welded thereto, the relation being such that the ends of the longitudinal boom members will be inside of the abutting faces of the flange plates secured thereto, respectively, and such also that the welds will form fillets in the angles between the ends of said longitudinal boom members and the sides of the holes in the flange plates.

17. A boom construction as specified in claim 10, the joints for detachably connecting the different boom sections of which comprise flange plates having holes adjusted over the ends of the longitudinal boom members and welded thereto, and webs which connect said flange plates to adjacent boom members and are welded thereto.

18. A boom construction for the purpose specified, comprising tubular longitudinal members, tubular lacing members the ends of which are welded to said longitudinal members, and transverse tie or strut members the ends of which are welded to different longitudinal boom members, being positioned substantially in planes at right angles to the axis of the boom and arranged to reinforce and strengthen said boom to resist buckling stresses.

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