March 20, 1951 M. ARMSTRONG 2,545,937

BOOM

Filed Nov. 8, 1947 2 Sheets-Sheet 1

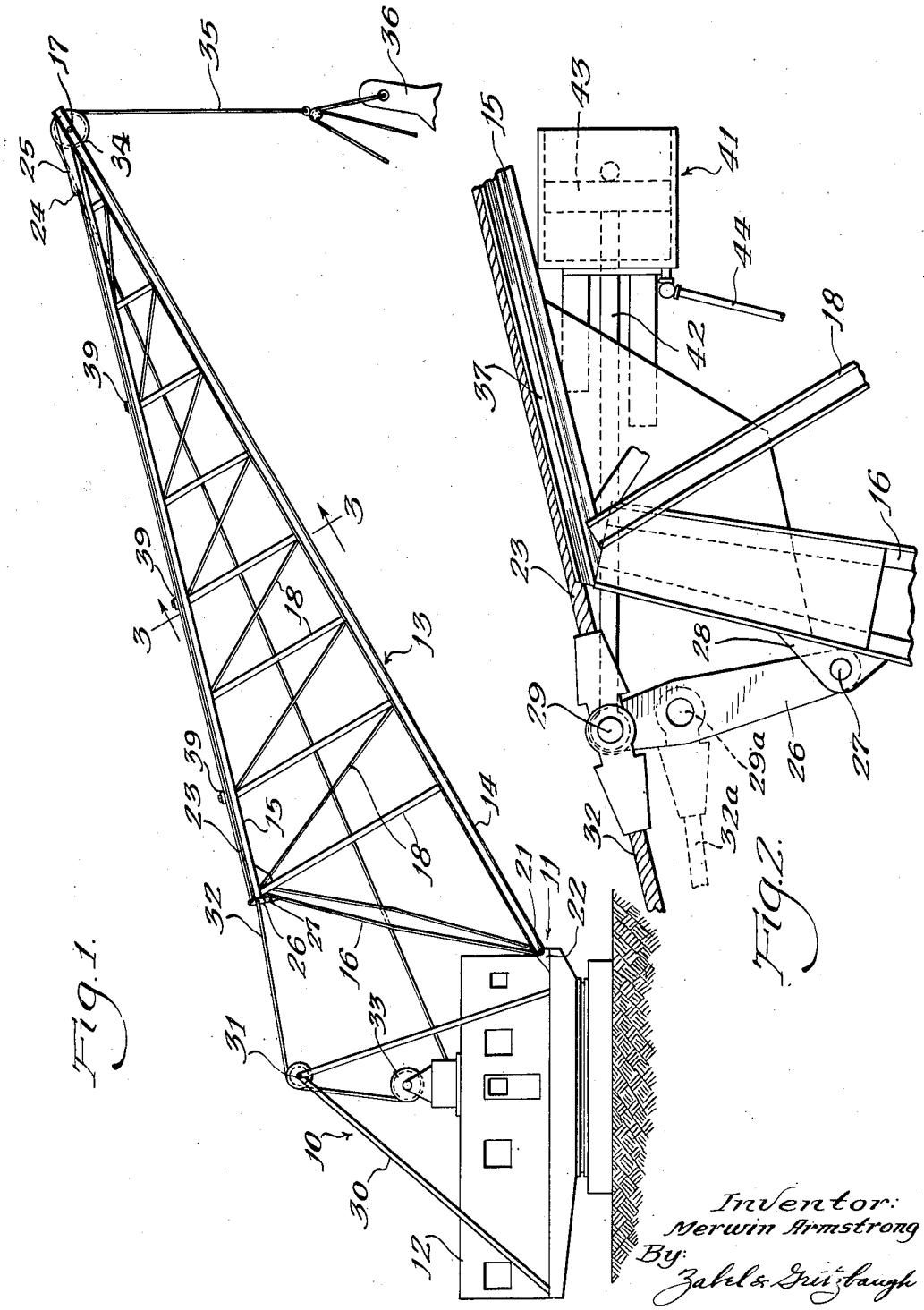


Fig. 1.

Fig. 2.

Inventor:
Merwin Armstrong
By: Zabel & Fritzbaugh
Attorneys

March 20, 1951 M. ARMSTRONG 2,545,937

BOOM

Filed Nov. 8, 1947 2 Sheets-Sheet 2

Fig. 3.

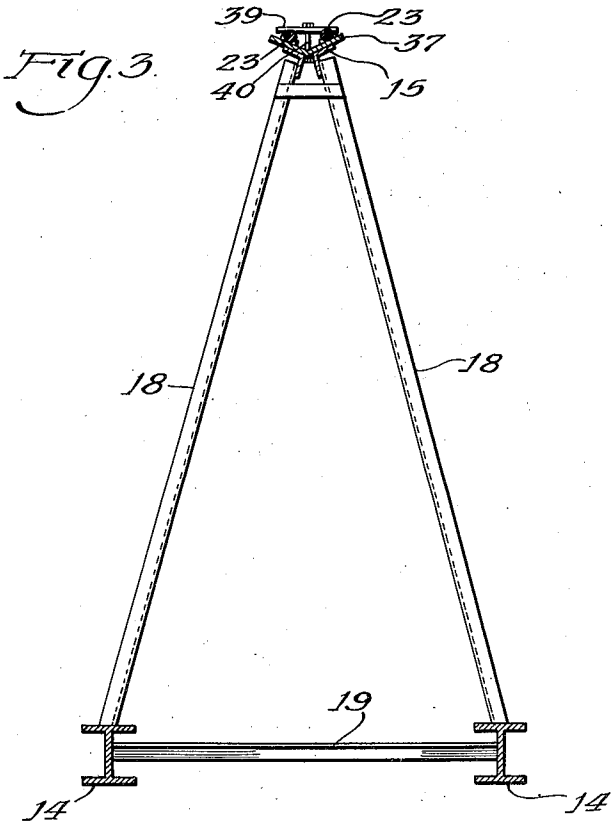
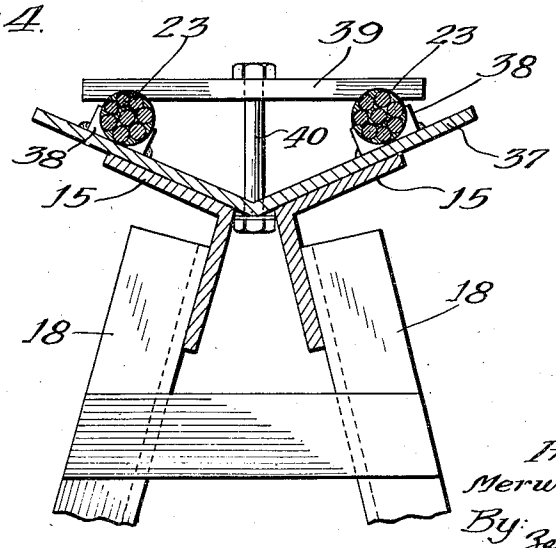


Fig. 4.



Inventor:
Merwin Armstrong
By: Zahl & Dritzbaugh
Attorneys

Patented Mar. 20, 1951 2,545,937

UNITED STATES PATENT OFFICE

2,545,937

BOOM

Merwin Armstrong, Hinsdale, Ill.

Application November 8, 1947, Serial No. 784,813

5 Claims. (Cl. 212—144)

1

The present invention relates to booms of the type required for large excavating machines and the like. Such booms are usually long and are required to handle heavy loads.

Normally in machines of this character a long boom serves as a stiff bottom member that is pivotally mounted at one end on a heavy machine base and is supported on its other end by flexible cables. The cables are normally swung free from the outer free end of the boom and are spaced upright some distance away from this first point of attachment. Across this relatively long span the cables normally sag considerably and during operation of the machine the cables are caused to whip due to the taking up of the slack upon application of the load. This whipping of the cable results in the bouncing around of the heavy boom, subjecting both the boom and the cable to excessive movement resulting in damage requiring frequent replacement of cables.

In the device forming the subject matter of the present invention the boom is designed to support the cable throughout substantially its entire length so as to eliminate sag in the cable, with the result that there is no bouncing of the boom with changing load conditions during operation of the machine. The life of the cables and the boom parts is thereby greatly increased and this is accomplished in a relatively simple and yet effective manner, and the weight of the boom structure is reduced substantially below that of the conventional type in present use.

The foregoing constitute some of the principal objects and advantages of the present invention, others of which will become apparent from the following description and the drawings, in which

Fig. 1 is a more or less diagrammatic side elevational view of a machine employing a boom embodying the present invention;

Fig. 2 is an enlarged more or less detail view showing the inner connection for the cables and an equalizer therefor;

Fig. 3 is an enlarged, vertical, sectional view through the boom, the view being taken on the line 3—3 of Fig. 1; and

Fig. 4 is an enlarged, fragmentary, vertical sectional view taken through the upper chord of the boom and showing the supports for the cables.

For purposes of illustration a single embodiment of the present invention will be described herein, it being recognized, of course, that many modifications may be made without departing from the intended scope of the invention.

2

Referring now to the drawings a heavy machine, such as an excavating machine, is illustrated generally at 10 and includes a machine base generally indicated at 11. Mounted on this base is a house or machine cab 12.

The boom forming the subject matter of the present invention is illustrated generally at 13 and as shown is provided with a pair of horizontally spaced lower chord members 14 (see Figs. 1 and 3), a pair of horizontally spaced upper chord members 15 and a pair of upwardly extending end truss members, one of which is shown at 16 in Fig. 1. The lower and upper chord members 14 and 15 are connected together at their outermost end indicated at 17 and throughout their lengths there are provided intermediate truss members 18. As best shown in Fig. 3 a plurality of cross ties 19 are provided throughout the length of the lower chords 14.

The boom 13 is pivotally mounted at its lower inner end as at 21 to brackets 22 that are mounted on the machine base 11 so that the boom 13 as a unit is adapted to pivot about these pivot connections 21.

A pair of cables 23 extend throughout the full length of the upper chords 15 and are attached at one end as at 24 to anchor members 25 that are fixed to the outermost end of the boom 13. The other end of each of the cables 23 is fastened to an arm 26, which arm as shown in Fig. 2 is pivotally mounted at one end as at 27 to a bracket 28 on each of the end truss members 16. As shown in solid lines in Fig. 2 the cables 23 may be secured as at 29 to the free end of the arms 26.

Referring now to Fig. 1 a framework generally indicated at 30 may be mounted on the machine base 11 and extend upwardly to a position above the house or machine cab 12. A pair of pulleys, one of which is shown at 31 in Fig. 1 may be rotatably mounted at the upper end of the framework 30, and a pair of cables 32 may be adapted to operate over the pulleys 31. Each of the cables 32 is secured at one end at 29 (Fig. 2) to the free end of the arm 26, while the other end of each cable may pass over a drum or windlass generally indicated at 33 in Fig. 1. This drum or windlass is supported on the machine cab 12 and is powered in any suitable manner from an engine or the like (not shown) that is housed in the cab 12.

A pulley 34 is mounted at the outer free end of the boom 13 over which pulley passes a cable 35. An excavating shovel partially shown at 36 in Fig. 1 is mounted at one end of the cable 35 and the other end of the cable passes into the

machine cab 12 to a powered windlass mounted therein. Thus the excavating shovel 36 may be lowered and raised by means of cable 35 passing over the pulley 34. The boom 13 is raised and lowered about its pivot connections 21 by means of cables 32 operating about the powered windlass 33.

Referring now to Figs. 3 and 4 the top chord members 15 are angle members that are adapted to support a substantially V-shaped plate 37 that extends throughout the length of the boom. Spaced throughout the length of this V-shaped plate 37 are a plurality of saddles 38 disposed beneath each of the cables 23 and as best shown in Fig. 4 the cables 23 rest on these spaced saddles 38. Hold-down plates 39 are disposed at spaced intervals on top of the cables 23 and these hold-down plates 39 are clamped downwardly by means of bolt and nut assemblies 40 so as to loosely engage the cables 23. The cables 23 are adapted to move backward and forward in a lengthwise direction along the plate 37 riding on the saddles 38 beneath the hold-down plate 39, but vertical whipping of the cables 23 is prevented by the fact that the cables are supported throughout their length and are thus prevented from sagging and also by the fact that they are held down by the hold-down plates 39 and are thus prevented from jumping out of the saddles 38.

In the structure just described the straight lower chord members 14 are adapted to take the direct thrust load to be carried by the boom 13. The cables 23 serve as suspension members for the boom and these cables are at all times held in tension during lowering and raising of the boom by the relatively short cables 32 that operate about the windlass 33. Each of the arms 26 to which the corresponding short cable 32 is attached serves as an equalizer for maintaining the corresponding cable 23 at all times in tension. By moving the lowering and raising cables 32 to the position shown in broken lines 32a and attaching them at an intermediate point 29a on the arm 26, a proportionate part of the load may be carried by the upper chord members 15, the load being transmitted by the arm 26 at its connection point 27.

As shown in Fig. 2 it may be desirable to provide a hydraulic or air cylinder generally indicated at 41 which is equipped with a plunger 42 that is fastened at its free end to the pivot connection 29 on the upper end of arm 26. The inner end of the plunger 42 is provided with the usual piston 43 operating in the cylinder 41 and the air or hydraulic fluid is introduced into cylinder 41 through suitable pipe connections 44 to a tank or accumulator (not shown) having a fixed pressure. Thus as the boom 13 is lowered by letting out or lengthening the cables 32 the equalizer cylinder 41 tends to maintain the cables 23 in taut condition with a limited and known load being carried by the relatively light members 15, and the balance of the suspension load being carried by the cables 23.

I claim:

1. A device of the class described comprising a base member, a boom pivotally mounted at one end to the base member and projecting upwardly and outwardly therefrom, the boom comprising a lower stiff frame member, a continuous top chord connected at its outer end to the lower member and spaced above the lower member at its other end, and truss members connecting the lower member and the top chord, a cable attached at one end to the outer portion of the boom and extending backward throughout the length of the boom and terminating at its other end adjacent to the inner end of the top chord, the cable being supported throughout its entire length by the top chord, a second cable fixed at one end to the last mentioned terminating end of the first cable and secured at its other end to the base member.

2. A device of the class described comprising a base member, a boom pivotally mounted at one end to the base member and projecting upwardly and outwardly therefrom, the boom comprising a lower stiff frame member, a continuous top chord connected at its outer end to the lower member and spaced above the lower member at its other end, and truss members connecting the lower member and the top chord, a cable attached at one end to the outer portion of the boom and extending backward throughout the length of the boom and terminating at its other end adjacent to the inner end of the top chord, a longitudinally disposed plate substantially coextensive with the length of the top chord and mounted on the top chord, the cable being supported throughout its entire length by said plate, a second cable fixed at one end to the last mentioned terminating end of the first cable and secured at its other end to the base member.

3. The combination of a base member, a relatively rigid boom pivoted at one end to the base member and having a free end spaced from the base member, and including a stiff lower thrust member extending from the free end of the boom throughout the length of the boom, and an upper member secured at one end to the free end of the lower thrust member and disposed above the thrust member, a supporting cable including a long cable secured to the boom adjacent the free end thereof and extending along the upper member to a position at the opposite end of the boom, and a shorter cable secured at one end to the last mentioned end of the long cable and at the other end to the base member, and supporting means on the upper member engaging the long cable and supporting the long cable substantially throughout its length.

4. The combination of a base member, a relatively rigid boom pivoted at one end to the base member and having a free end spaced from the base member, and including a stiff lower thrust member extending from the free end of the boom throughout the length of the boom, and an upper member secured at one end to the free end of the lower thrust member and disposed above the thrust member, a supporting cable including a long cable secured to the boom adjacent the free end thereof and extending along the upper member to a position at the opposite end of the boom, an equalizer on the boom disposed adjacent to the upper member and adjacent to the pivot end of the boom, cable fastening means on the equalizer, the long cable being attached to the cable fastening means, a shorter cable secured at one end to the cable fastening means and to the base member at the other end, and supporting means on the upper member engaging and supporting the long cable substantially throughout its length.

5. The combination of a base member, a relatively rigid boom pivoted at one end to the base member and having a free end spaced from the base member, and including a stiff lower thrust member extending from the free end of the boom throughout the length of the boom, and an upper member secured at one end to the free