

July 10, 1951

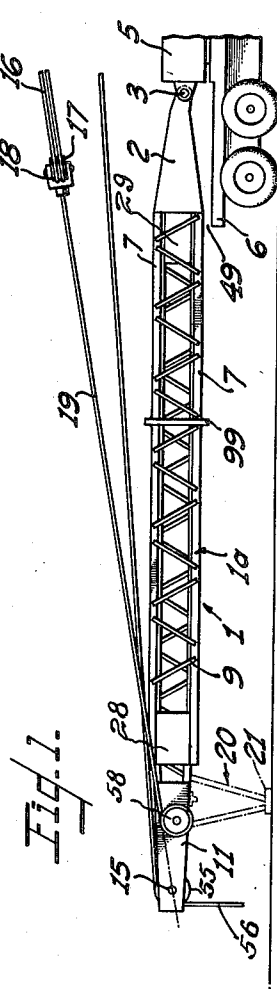
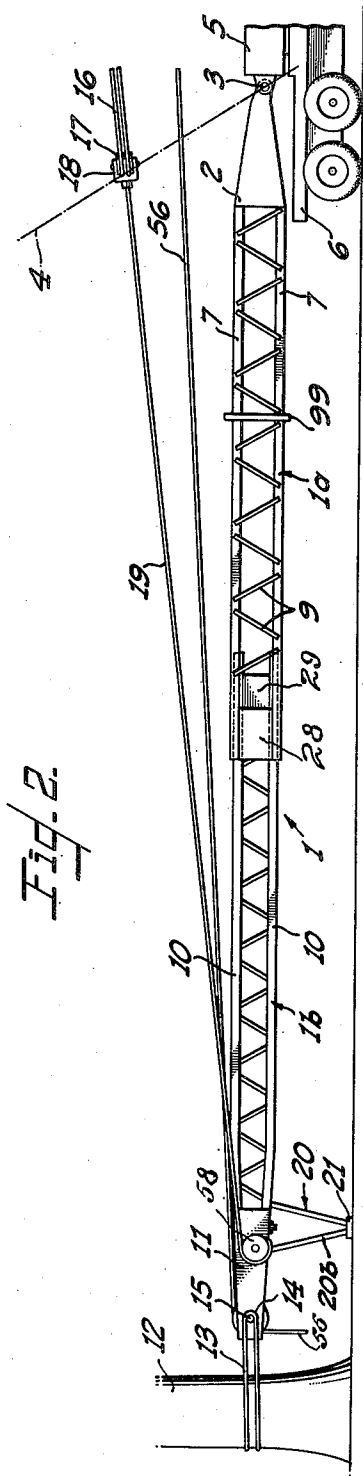
B. S. CALVERT

2,560,412

BOOM FOR EXCAVATORS OR THE LIKE

Filed Nov. 16, 1946

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

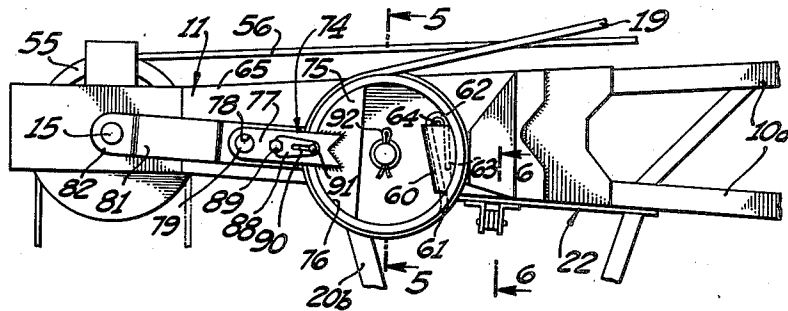


Fig. 3.

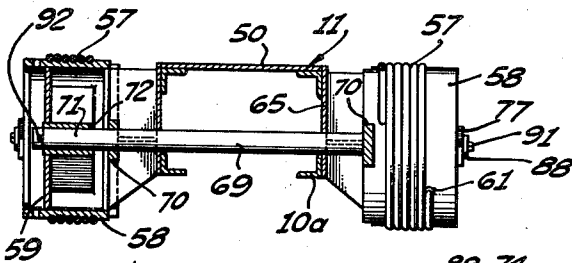


Fig. 5.

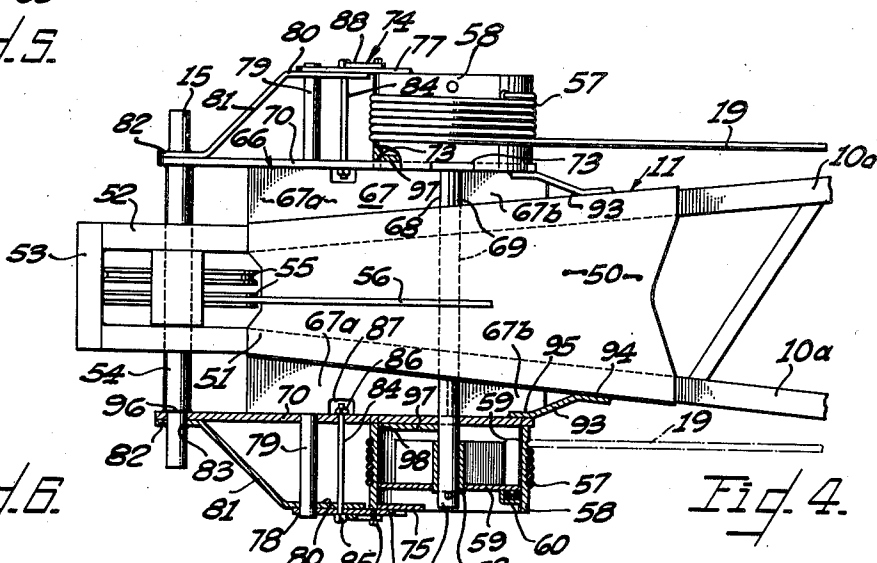


Fig. 4.

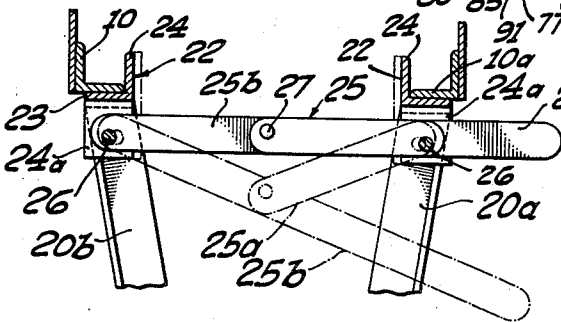


Fig. 6.

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3 Sheets-Sheet 3

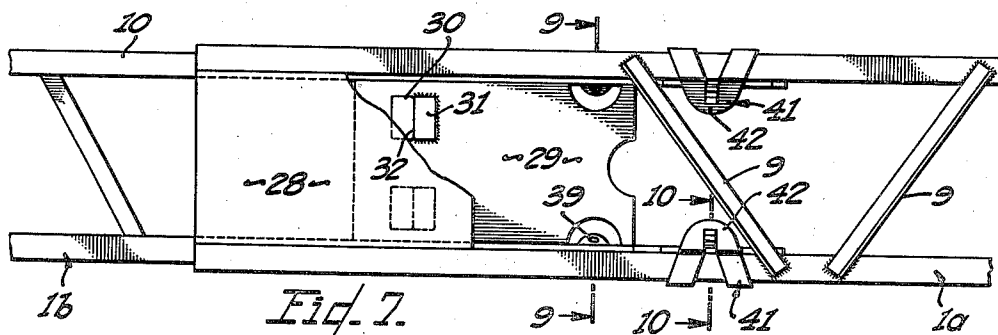


Fig. 7.

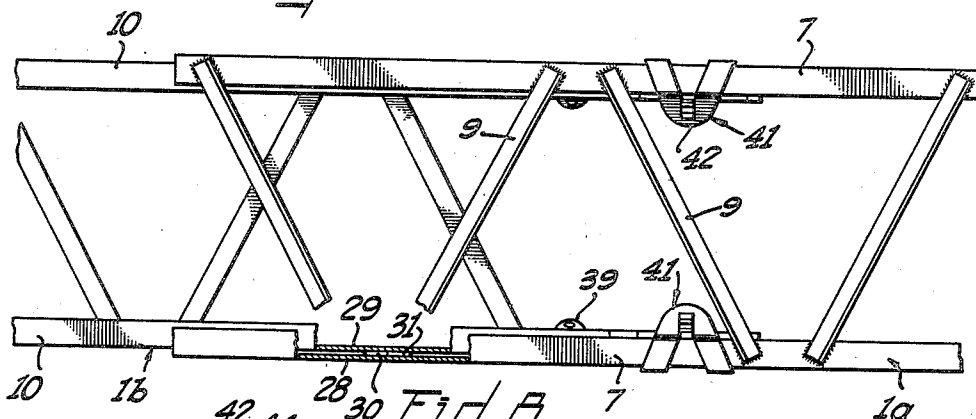


Fig. 8.

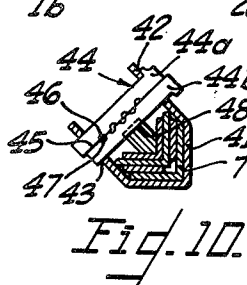


Fig. 10.

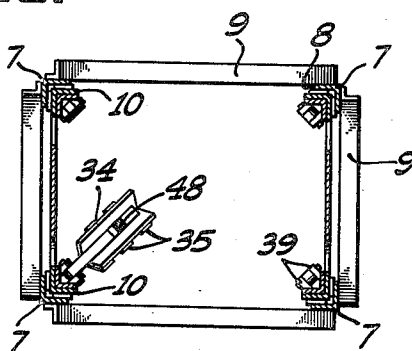


Fig. 9.

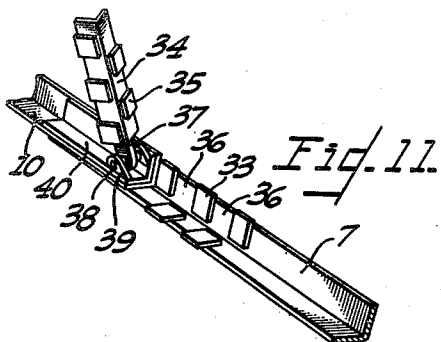


Fig. 11.

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UNITED STATES PATENT OFFICE

2,560,412

BOOM FOR EXCAVATORS OR THE LIKE

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Application November 16, 1946, Serial No. 710,383

19 Claims. (Cl. 212—55)

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This invention relates to booms for excavating apparatus, or the like. While some of the improvements about to be described can be used on booms of any construction, many of the improvements are useful when applied in the construction of extensible booms.

In operating excavators, or other apparatus having a boom which supports the hoisting cables, there are many situations and circumstances where a long boom, or a relatively short boom can be applied to advantage. One of the objects of this invention is to produce a boom that can be used as a long boom, and which can be transformed into a shorter boom when desired.

One of the principal objects of the invention is to provide a boom of this type, which is extensible, and which has special features of construction to enable it to be extended from its short form to the long boom form, quite expeditiously.

Another object of the invention is to provide an extensible boom characterized by the use of telescoping boom-members of girder type construction; also, to provide quickly operatable means for effectively locking the boom-members together in their extended relation.

Another object of the invention is to provide accessory apparatus to be used with the boom extension, or outer boom-member, for facilitating the use of power traction to effect the pulling out, or extension of, the outer boom-member to its extended position, so that it can be readily locked there to transform the short boom into a long boom.

As is usual with booms of excavating apparatus, the boom is supported in its normal operative position with its axis inclined, by means of a suspension cable, or cables, the forward or outer ends of which are anchored at the boom-point. When the outer boom-member is telescoped back into the main boom-member to transform the long boom into the short boom, it is necessary to take up slack in the suspension cables. One of the objects of my invention is to provide a construction for taking up this slack, and for dead-ending the suspension cables at the boom-point, in an adjustable way.

In the construction of booms handling relatively small loads, a single suspension cable could be employed, in which case it would be necessary merely to provide a single pick-up device for the slack. However, in the present specification and drawing, I have described and illustrated a type of boom adapted for use with heavy

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loads, in which case I employ two take-up devices, or reels, on which two suspension cables are dead-ended, said cables being located respectively on opposite sides of the boom. One of my objects in a construction of that type, is to provide a bracket construction extending out from the boom-point at each side, for providing a support for the take-up reels, which will enable the suspension cables running to them, to extend in a plane substantially parallel to the vertical plane passing through the longitudinal axis of the boom. In this way, the tension of these cables is reduced for a given load, and the tension in one of the cables is balanced by the tension in the other cable; that is to say, the load suspended by each cable, is half of the weight of the boom and its supported load, and as the point of attachment of each suspension cable to its take-up reel is at the same distance from the vertical plane of the longitudinal axis of the boom, the tension in these two cables results in a balanced bending moment at the boom-point, relieving the boom-point of any torsional strains with relation to a vertical axis passing down through it. These features of my improvement are adaptable to any type of boom, whether it is extensible or not, in which it is desired to provide take-up means for a dead-ended cable at, or near, the boom-point.

In accordance with my invention, I provide a supporting bearing for supporting each take-up reel for adjustable rotation on an axis on the boom-point, to enable them to be rotated to take up the slack in the suspension cables when this is necessary. One of the objects of my invention is to provide a construction for effecting an interlock of each reel with its seat on its supporting bracket, which will operate to relieve the supporting bearing of any strain upon the same, which would otherwise be occasioned by the tension in the suspension cable.

A further object of the invention is to improve the general construction of booms of this type referred to.

Further objects of the invention will appear hereinafter.

The invention consists in the novel parts and combinations of parts to be described hereinafter, all of which contribute to produce an efficient boom for excavators or the like.

A preferred embodiment of the invention is described in the following specification, while the broad scope of the invention is pointed out in the appended claims.

In the drawing:

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Fig. 1 is a side elevation illustrating a portion of a vehicle such as a tractor, broken away, and illustrating a boom embodying my invention, in its collapsed or non-extended condition. This view illustrates how the boom can be collapsed if desired, by exerting a tractive effort upon the vehicle that supports the base end of the boom, to effect the telescoping movement of the boom by forcing the outer end of the outer boom-member against a fixed object, such as a tree.

Fig. 2 is a view similar to Fig. 1, but illustrating the boom in an extended condition, and showing how accessory apparatus can be used to enable the tractive effort of the vehicle carrying the boom, to accomplish the extending movement of the boom-sections, or boom-members.

Fig. 3 is a side elevation showing the outer end of the outer boom-member broken away, and particularly illustrating the construction of the boom-point and the means for mounting, supporting, and bracing the take-up reels.

Fig. 4 is a plan of the boom end illustrated in Fig. 3, and showing the same parts, but in this view one of the bracket extensions and its corresponding take-up reel, are shown in horizontal section to further illustrate the bracing means for the take-up reels.

Fig. 5 is a vertical section taken about on the line 5—5 of Fig. 3, illustrating the box girder form of cross-section of the boom-point, and also showing one of the take-up reels in side elevation, and the other one in section. This view particularly illustrates the correlated locking means on the inboard ends of the reels, and on the seats for the same on their brackets, for interlocking the reels with the frame structure at the boom-point, to hold the reels against rotation on their axes, and to relieve them of strains upon their bearings.

Fig. 6 is a vertical section taken about on the line 6—6 of Fig. 3, showing the lower portion of the boom-point or peak broken away, and illustrating the upper end of a detachable stand or supporting frame that may be used for supporting the point of the boom when the outer member, or boom extension, is being pulled out or extended from the main boom-member.

Fig. 7 is a side elevation of the boom at the location of the joint between the main boom-member and the outer boom-member, and showing the boom-members in their extended relation. This view particularly illustrates the locking means for locking and clamping the boom-members together in their extended relation.

Fig. 8 is a plan view of the parts illustrated in Fig. 7, and showing the telescoping corner stringers of the two boom-members broken away to illustrate stop means employed on the two boom-members, to limit their extension movement, and to bring them into proper alignment for the application of the clamping splines that are applied to hold the boom-members securely in their extended relation.

Fig. 9 is a cross-section taken approximately at the location of the line 9—9 of Fig. 7, further illustrating the arrangement and mounting for the locking bars which I prefer to employ at the four corner stringers of the boom-members for locking them together. This view shows the locking members in place at three of the corners of the cross-section, while one of the locking bars is illustrated in an open position as though ready to be swung down into position to interlock with the stringers of the main boom-member.

Fig. 10 is a detail section taken on the line 10—

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10 of Fig. 7, located at one of the locking bars, showing the same in its locking position, and also illustrating a clamp with cotter pins for clamping up the locking bars in their locking position.

Fig. 11 is a perspective showing the nesting stringers of angle iron, employed at the corners of the box section of the boom-members, and illustrating one of the locking bars in a raised position. This view particularly illustrates the manner in which I employ splines, or pads, on the stringers of one of the boom-members and on the locking bar, that fit into each other so as to effectively lock the boom-members together in their extended relation.

Referring to the drawings, in Figs. 1 and 2 the boom is illustrated in its collapsed condition, and in its extended condition, respectively. Referring to these figures, and to Figures 7 to 8, inclusive, the boom 1 comprises two boom-members, including a main boom-member, and an extension member or outer boom-member 1b, which telescopes within the main boom-member.

At its inner end or base 2, the main boom-member is mounted on a horizontal shaft 3, which enables the boom to be held normally in an elevated position, with its axis inclined in some such position, as that indicated by the dotted line 4.

The shaft 3 may be mounted in any usual manner, for example, on the periphery of a turntable 5 that is mounted for rotation on a vertical axis on a vehicle such as a tractor 6, or "half track," enabling the boom and its accessory apparatus to be transported to and from places where work is to be done. The boom 1 is of girder type of construction, that is to say, the two boom-members have a "box" form, or rectangular form, in cross-section as illustrated in Fig. 9. The main boom-member 1a includes in its construction, four stringers or stringer bars 7, which are of a form popularly known as "angle irons" though of course they are made of steel. They present the usual flanges 8, and the outer faces of these flanges are on the outer sides of the boom-member, and are connected by diagonals, or cross bars 9. These diagonals 9 are preferably made of angle iron, or angle steel, as indicated in Figs. 8 and 9.

The outer boom-member 1b is also of the "box" girder type of construction, and includes corner stringers 10 also made of angle iron, or angle steel, and these stringers nest on their outer sides into the angle between the flanges of the stringers 7. However, the flanges of the stringers 10 are not in direct contact with the flanges of the stringers 7. This enables the interlocking means to be placed between these flanges. It should be understood, however, that when the two boom-members are not locked together, the outer boom-member 1b can slide freely in or out in the main boom-member 1a, with a telescoping movement.

When it is desired to extend the boom to its full length, this may be accomplished by attaching the boom-point 11 of the outer boom-member to any suitable fixed object such as a tree 12. In case a tree is used, the boom-point 11 can be anchored to the tree by using a sling 13 of rope or cable passed around the tree, and disposed in two bights 14 that are hooked over projecting ends 15 of a cross-head on the boom-point, that will be described later in more detail. The boom is lowered into this substantially horizontal position by means of cable runs 16 running freely over sheaves 17 carried in a "block" 18 in the form of a cross bar, and to this cross bar 2 suspension cables or ropes 19 are secured, which are dead-ended at the boom-

point as will be described hereinafter. The cable runs 16 of course pass over a drum on the turntable 5, which is controlled by the operator of the apparatus. It should be understood that if the boom is to be extended from its collapsed condition, indicated in Fig. 1, the boom is lowered down with its cable to a nearly horizontal position; I then attach a detachable frame 20 to the under side of the outer boom-member near the boom-point 11. This supporting frame or stand 20 may have any suitable form, but preferably includes two inverted A-frames 20a and 20b, the lower ends of which are attached to a base plate or foot 21. The legs of each A-frame are connected by two horizontal jaws 22, that are preferably made of angle iron (see Fig. 6) and present horizontal flanges 23 that fit under the horizontal flanges of the stringers 10, and present vertical flanges 24 to engage against the inner edges of the horizontal flanges of the stringers 10. To the under sides of the jaws 22, angle brackets 24a are provided, and these angle brackets are connected by a toggle lever 25, including a short link 25a and a long lever-link 25b. These links are mounted on pivot pins 26 on the brackets, and are connected by a toggle pin 27 at a point about midway between the jaws 22. When the toggle lever is in the position indicated by the dotted lines in Fig. 6, the jaws 22 can be pulled toward each other so as to occupy a position in which they are indicated in dotted lines, which will enable them to be passed up from below into position between the stringers 10.

The toggle lever or link 25b is then pulled up to a substantial horizontal position to close the toggle connection. When this occurs, the toggle pin 27 will move up to a level above the line joining the pins 26. The sling 13 referred to above, is then applied to anchor the outer end of the boom, and the tractor is then backed away from the tree. At the same time, the operator pays out the run of the line at 16, or slacks up on the line before the backing off operation begins.

This supporting frame is placed in position just before the boom arrives at the position in which it is indicated in Fig. 1, after which the weight of the boom is let down onto the frame.

Referring now to Figs. 7 and 8, at the location of the overlap between the two boom-members which I secure rigidly together by my spline connections, the boom-members are provided on their vertical sides with two superposed cheek plates or side plates 28 on the main boom-member, and 29, on the outer boom-member, and on these cheek plates I secure stop means 30 and 31, respectively, which may be small rectangular metal pads welded to the plates. These pads 30 and 31, as illustrated in Fig. 8, have vertical meeting edges 32 that abut against each other to limit the extending movement. As indicated in Fig. 7, I prefer to provide these stop pads in two sets, one set at each side, so that there are four points of contact for the edges 32.

The locking means for forming a rigid joint between the corner stringers of the two boom-members, is clearly illustrated in Figs. 8 to 11, inclusive. On the inner sides of the flanges of the stringers 7 of the outer boom-member, I provide means including lateral projections for interlocking with a movable member, that, as illustrated, is preferably pivotally mounted on each stringer 10 of the outer boom-member. In the present instance, I provide a plurality of splines or spline pads 33. In the present instance I

have shown two sets of these pads equidistant from each other, one set being secured on one of the flanges of the stringer, and the other set on the other flange, in staggered relation. Using this staggered relation facilitates the operation of welding these spline pads to the flanges.

In order to form a closed, tight joint with the spline pads 33, I provide movable locking members with lateral projections to interlock with the first named projections. These are preferably in the form of spline bars 34 to cooperate with them. There are four of these spline bars 34, which are in the form of angle iron clips with the outer sides of their flanges provided with lateral projections in the form of spline pads 35 similar to the pads 33, but adapted to fit into the gaps 36 between the pads 33. While these locking bars 34 could be used as free unattached locking bars, I prefer to mount them on the ends of the stringers 10, so that they cannot be misplaced, and are always ready when needed to close the joint. For this purpose, one end of each angle bar 34 is provided with a tongue 37, which is pivoted on a pivot pin 38 between ears 39 that are formed on the flanges of an angle clip 40 that is welded to the flanges of the stringer 10. When the stops 30 and 31 come together to limit the extending movement of the boom-members, the pivot pins 38 will be in the proper position to enable the spline pads 35 to fit into the gaps 36 between the spline pads 33, after which the locking bars 34 are swung down, in order to accomplish this. Then they are securely clamped up into place by means of shackles 41, the bodies of which are of angle form to fit around the outer sides of the stringers 7, and these shackles have opposed ears 42 with aligned openings 43 in them, into which split wedges 44 are driven. The two sections of these split wedges 44 meet together on meeting faces, or edges 45, and have half round openings or grooves 46 in them. One of the wedge sections 44a, for example, may be seated at its head, and the other wedge section 44b will then be driven up tight until two of the grooves 46 come opposite to each other, and then a cotter pin 47 is driven into place to prevent any danger of the wedge sections working loose. The inner wedge section 44b on its inner side, rests up against a seat face 48 back of the locking bar.

In order to insure that there will be sufficient clearance at the point 49 (see Fig. 1) where the boom projects over the forward end of the vehicle 6, if necessary, the box form of the boom in cross-section, may be such as to give the boom a greater width than height. However, this of course is a matter of design, and the amount of clearance would depend somewhat upon the height of the shaft 3 above the vehicle frame.

Referring now to Figs. 3 to 5, inclusive, the boom-point 11 is preferably built on a taper as shown in Fig. 4; that is to say, the stringers 10 at each side are bent inwardly so as to present converging extensions 10a, and the point includes a tapered plate 50 that forms an apron overlying the stringers. Beyond the narrow end 51 of this apron, the stringers 10a are disposed in extensions 52 connected together by a cross bar 53 at their end, and these extensions 52 and the cross bar 53, form the peak of the outer boom-member, and through the extensions 52 a cross head 54 extends. This cross head is welded in place. Its middle part forms an axle or bearing for supporting one or more pendant-sheaves 55 over which the hoisting line or cable 56 runs. If the

load is heavy, the fall supporting it may run over more than one sheave at this point, and be dead-ended beyond the sheaves.

The live end of the line 56 of course, runs over to the hoisting drum on the turntable 5, and is under the control of the operator.

As indicated in Fig. 4, there are two of the suspension cables 19, and the anchored end of each of these cables is disposed in coils 57, each on its own take-up device or reel 58. These cables are dead-ended on the reels in any suitable manner, such as indicated in Fig. 3. As indicated in Fig. 3 and in the sectional part of Fig. 4, the outer head 59 of each reel is formed with a tapered socket 60. The shell of the reel is provided with an opening 61 leading into the small end of this tapered socket. The end of the cable is shoved in through this opening, and bent around into a bight 62 (see Fig. 3) and the tip 63 beyond this bight is laid against the side of a wedge 64 that is forced down into the tapered socket. With this arrangement, evidently the more that the line pulls on the bight 62, the more it will pull in the wedge 64 to give a tight dead-end anchorage.

At the side edges of the apron 50, the framing at this point includes side plates 65, the lower edges of which are riveted or welded to the lower stringers 10a.

It is necessary to have the suspension cables 19 extend substantially parallel with the vertical plane passing through the longitudinal axis of the boom, and in order to accomplish this, I provide a bracket structure 66 at each side, built on to the outer side of the side plates 65. In order to accomplish this, I prefer to employ a web plate 67 that is welded along its inner edge to the side plate 65. This web plate has a main section 67a and an auxiliary rear section 67b, the edges of which are welded at 68 to the sides of an axle or arbor 69 that passes through the side plates 65 and is welded to them. The outer portions of the bracket structure 66 include a bar 70 extending along the outer edge of the web plate 67a and welded thereto. This bar and the parts associated with it, operate as a seat for the inboard end of the take-up reel 58.

It should be understood that the construction for mounting each reel 58, and for operating the same to take up slack of the line 19 when desired, is the same at both sides of the boom. In accordance with my invention, I provide a bearing support for each reel to enable it to be rotated, that is to say, loosened up, and then oriented on its axis, for adjustment to take up slack in the cable 19, or to pay it out. After each adjustment, the reel is locked against rotation on its bearing support. In accordance with my invention, I provide means for locking each reel against rotation that is independent of the bearing support for the reel, and operates to center the reel so that the reel itself, and its seat on the bracket structure 66, resists all of the tension in the lines 19, and therefore avoids imparting any stresses to the bearing support for the reel. In order to accomplish this, I prefer to extend the axle bar at each side past the side bar 70 of the bracket structure, so as to form a shaft or journal 71 on which the hubs 72 of the reels are mounted as a bearing. In order to accomplish this, I use the bar 70 at each side as a seat for the inboard end of each reel 58, and I provide the adjacent edge, that is to say, the inboard end of each reel, with four notches 73, which are disposed 90° apart around

its edge. In Fig. 4, the reels are shown in their locked position, at which time two of these notches 73 engage over the bar 70. At this time, the notches 73 at the upper and lower sides of the reel, as shown in this view, do not perform any function, but I prefer to use four notches because that enables me to give each reel an adjustment that involves merely a movement through 90°.

Each reel is locked on its corresponding seat bar 70 by a keeper device, or a keeper unit 74, (see Fig. 3) that includes a segmental plate 75 with a circumferential edge 76 that fits neatly into the "bore" or inner diameter of the reel. This segmental plate 75 is rigidly secured to a plate-like arm 77 that extends toward the end of the boom, and has an eye 78 in its end, that fits over the projecting end of a brace 79 that is in the form of a post, the inner end of which is secured in the seat bar 70. The outer end of this post 79 passes through the foot 80 of a bracket 81, the body of which is inclined, and extends over to an integral foot 82 that has an opening or eye 83 to let the end of the cross head 54 through it, and this foot 82 is welded to this end of the cross head to secure this bracket 81.

In order to secure the locking plate 75 in position in the end of the reel, I provide a long clamping bolt 84, the head 85 of which seats against the outer side of the arm 77, and the inner end of which carries a nut 86 located in a clearance slot 87 in the web plate 67a. I prefer to provide locking means for locking this bolt head against working loose, and in the present instance, this may consist of a locking plate 88 having a socket 89 at its end to engage the side of the bolt head, and having a slot 90 toward its inner end, through which a small machine bolt or screw 91 passes. By loosening up this machine bolt or screw 91, the locking plate 88 can be disengaged from the bolt head 89, to permit its rotation while the nut 86 would be jammed, to enable the arm 77 and the segment plate 75 to be removed from the end of the reel. After this segment plate 75 has been removed, the reel 59 can be pulled outwardly after removing the split pin 92 that holds it in place, and the reel is then rotated by hand on the end of the arbor 69, either to pay out the line 19, or to take up the slack in it, if the boom is being shortened.

The lower or inner end of each web plate section 67b, is braced by a gasket 93 having a foot 94 that is welded to the adjacent side plate 65, and having a foot 95 at its other end, that is welded to the web section 67b, and also to the inner face of the adjacent seat bars 70.

Referring again to the cross head 54, the body of this bar is of relatively large diameter, and its ends 15 that project through the seat bars 70 are of reduced diameter, so that shoulders 96 are formed, that seat against the inner sides of the seat bars 70, and are welded to these seat bars. In addition to the segmental plate 75, I prefer to provide additional means for centering the reels on the seat bar 70 at their inboard ends. For this purpose, I provide two semi-circular segment plates 97 (see the sectional portion of Fig. 4), which are welded to the outer sides of the bar 70. These plates 97 have semi-circular edges 98 over which the inner ends of the reels seat, respectively.

With the bracket structure 66, and the mounting that it provides for the take-up reels 58, it will be evident that the tension in the lines 19 is resisted by the segmental plates 97 and 75,

and the forces acting upon these segment plates, are transmitted through the seat bars 70 and the web plates 67a, to the boom-point 11.

If desired to provide increased stiffness for the main boom-member, I may construct it with a collar 99 that projects outwardly on all sides of the box-girder cross-section of the main boom-member. This collar would of course be riveted or welded to the stringers 7 of the main boom-member. Furthermore, if desired, this collar could extend outwardly a considerable distance, and be provided with diagonal braces or links connecting its outer portions to the body of the main boom-member at a distance from the collar. This would impart a truss effect to the main boom-member, and give it considerable strength against any tendencies to bend under heavy loads.

The mode of operation of this apparatus will now be briefly re-stated. As is usual with apparatus of this kind, the boom 1 is normally held in a more or less upright position with its longitudinal axis located at some such angle as that indicated by the line 4 in Fig. 2. If the boom is in a collapsed completely telescoped condition as indicated in Fig. 1, and it is desired to extend the boom to transform it into a long boom, the sling 13, or other means, is applied to the boom-point 11 to anchor it to some fixed object, such as the tree 12. The vehicle 6 supporting and carrying the boom, is then operated to back it away from the tree. When this occurs, the main boom-member 1a will slide along the outer boom-member 1b, and this of course gives a relative extension of the outer boom-member 1b from the main boom-member 1a. This extending movement can be continued until the stop means 30 on the main boom-member 1a, impinges on the stop members 31 on the outer boom-member 1b. The locking bars 34 are then swung down on their pins 33 as axes, to enable their spline pads 35 (see Fig. 11) to engage in the gaps 36 between the spline pads 33 on the flanges of the stringers 7. As soon as this is accomplished, the clamps are applied over the inner sides of the bars 34, to lock them against the stringers 7. This is illustrated in Fig. 10, where the shackles 41 are illustrated wedged up tight in position by the use of a sectional wedge 44. The loose wedge section 44b on the inner side, is driven up tight, and the cotter pin or key 47, is put in place to keep the wedges from loosening up.

When it is desired to change the boom from a long boom to a short boom, these operations are performed in reverse; that is to say, the locking bars 34 are disengaged, and the outer extension or outer boom-member 1b can be pushed back into the main boom-member 1a either by man power, or if desired, the boom can be supported in a substantially horizontal position, and the tractor or vehicle 6 moved forward so as to push the peak of the outer boom-member against a fixed object, such as a large tree. This will telescope the boom-members as far as their construction will permit. In doing this, of course the lower end of the outer boom-member 1b, simply seats itself upon a rest of any kind (not illustrated), carried on the main boom-member.

In making the bracket structure, and determining the location for the axes of the take-up reels, it should be stated that it is necessary to have these axes located at a point such that the extended line from the suspension cable 19 when taut, will pass through the axis of the cross head 54, the axis of which is the axis of the pendant-

sheaves 55. This overcomes any disadvantage of having this line of pull eccentric to the axis of the boom.

When the boom has been shortened as described, the reels 58 are unlocked by loosening up the bolts 84 and removing the segmental plates 75, after which, by withdrawing the splint pins 92 of the reels, they can be pulled outwardly so as to disengage their notches 73 from the seat bar 70. They can then be rotated in a direction to take up the slack in the lines 19 if the boom is being transformed to a short boom, or to pay out the slack if the boom is being transformed from a short boom to a long boom.

Although I have described the boom as composed of only two sections, or boom-members, it will be evident that if desired, the boom could be composed of three or more sections, and the sections would be constructed so as to telescope with each other and be constructed so as to enable locking bars such as the locking bars 34, to be employed to lock the sections of the boom together at their overlapped zones.

Many other embodiments of the invention may be resorted to without departing from the spirit of the invention.

I claim as my invention:

1. In an extensible boom structure for excavator apparatus or the like, the combination of a main boom member with means for supporting the same to enable its outer end to be raised and lowered, an outer boom member with pendant-sheaves carried thereon at its outer end, and telescoping with the main boom member, said main boom member having a frame structure including longitudinally extending stringer bars, said outer boom member having a frame structure including longitudinally extending stringer bars juxtaposed to the first-named stringer bars, said first named stringer bars having projections thereon; and movable means having projections thereon carried on the second named stringer bars for effecting an interlocking engagement with the first named projections to lock the outer boom member in its extended position.

2. In an extensible boom structure for excavator apparatus or the like, the combination of a main boom member with means for supporting the same to enable its outer end to be raised and lowered, an outer boom member with a pendant-sheave carried thereon at its outer end; said outer boom member telescoping with the main boom member; said boom members each having a frame structure including longitudinally extending stringer bars; the longitudinally extending stringer bars of one of said boom members being juxtaposed to the stringer bars of the other boom member, the said juxtaposed stringer bars on one of said boom members having relatively fixed locking means including lateral projections thereon; and relatively movable locking means mounted on the other boom member having lateral projections thereon, and capable of being moved into interlocking engagement with the relatively fixed locking means of the other boom member to lock the outer boom member in its extended position.

3. In an extensible boom structure for excavator apparatus or the like, the combination of a main boom-member with means for supporting the same to enable its outer end to be raised and lowered, an outer boom-member with pendant-sheaves carried thereon at its outer

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end, and telescoping with the main boom-member, said boom-members being of box-girder form in cross-section with angle-bar stringers at the corners of the box-section, the angle-bars of the outer boom-member nested into the angle-bars of the main boom-member, the flanges of said nested angle-bars having locking means including lateral projections, and including a movable part on one of the boom-members capable of being moved into a position to interlock with the said projections to secure the outer boom-member in its extended position.

4. An extensible boom structure according to claim 3, in which the locking means on one of the boom-members presents a plurality of fixed shoulders disposed transversely to the longitudinal axis of the boom; and in which the movable member for effecting the interlocking connection is pivotally supported on the other boom-member, and presents a plurality of shoulders to engage the first-named shoulders; and including means for holding said movable member in position to interlock with the first-named shoulders to lock the outer boom-member in its extended position.

5. In an extensible boom structure, the combination of a pair of telescoping boom-members, each of said boom-members being of box-girder form in cross-section, and having corner stringers in the form of angle-bars, the corner stringer bars of the outer boom-member nesting into the corner angle-bars of the corresponding stringers of the inner boom-member, the said angle-bars of the inner boom-member having a series of means on the inner face thereof presenting shoulders past which the flanges of the stringer bars of the outer boom-member slide when the outer boom-members is being extended, spline bars mounted on the outer boom-member corresponding to the corner stringers respectively, and having means with shoulders adapted to fit the first-named shoulders to lock the boom-members against relative longitudinal movement.

6. An extensible boom structure according to claim 5, including clamps secured fitting around the spline bars and the nested corner stringers to maintain the engaging shoulders in alignment with each other.

7. In an extensible boom structure, the combination of a boom including a main boom-member, and an outer boom-member telescoped within the main boom-member, means for pivotally supporting the inner end of the boom, means for securing the outer boom-member to the main boom-member in an extended position, a suspension cable for supporting the boom in operating position, and a reel mounted on the outer boom-member adjacent its peak on which the suspension cable is dead-ended while the outer boom-member is in its extended position, with means for holding the reel fixed against rotation, said reel having an axial support so that it is capable of rotation when not held, to take up the slack in the suspension cable when the outer boom-member is telescoped back into the main boom-member to shorten the boom.

8. An extensible boom structure according to claim 7, in which the said take-up means includes a take-up reel to take coils of the suspension cable when taking up the said slack.

9. An extensible boom structure according to claim 7, in which the take-up means includes a said take-up reel and the outer boom-member having correlated interlocking means for enab-

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ing the take-up reel to be held fixed against rotation on the outer boom member with or without coils of the suspension cable wrapped upon it.

10. An extensible boom structure according to claim 7, in which the said take-up means includes a take-up reel, said outer boom having supporting means for rotatably supporting the said reel for adjusting orientation on its own axis; and means independent of said supporting means for effecting the support of the take-up reel on the outer boom-member.

11. In an extensible boom structure, the combination of a main boom-member, an outer boom-member telescoped within the main boom-member, a reel axle on the outer boom-member near the boom-point thereof, a take-up reel rotatably mounted on said axle, a suspension cable for the boom dead-ended on the take-up reel and having coils on the reel, said outer boom-member and said reel having means for locking the reel to the outer boom-member, operating to prevent rotation of the reel and center the same on its axis of rotation; thereby relieving the axle of tension forces in the said cable.

12. An extensible boom structure according to claim 11, including means on the outer boom-member for interlocking with one end of the reel, and including means for engaging the outboard end of the reel for centering the same, and for resisting the forces acting upon the reel through the said cable.

13. In a boom structure, the combination of a boom having a boom-point with pendant-sheaves supported thereon, a pair of take-up reels located respectively at opposite sides of the boom-point for receiving coils of suspension cable dead-ended thereon, said reels having a support on their axes, so that they are capable of being oriented adjustably for taking up the slack of the cables, the inboard ends of said reels and said boom-point having interlocking means for enabling the take-up reels to be locked against rotation on their axes.

14. In a boom structure, the combination of a boom having a tapered boom-point as viewed in plan, said boom-point having a peak with pendant-sheaves carried therein for supporting the fall of a hoisting cable, bracket structures respectively secured to the tapered boom-point at each side thereof, and presenting seats for take-up reels, take-up reels seating at their inboard ends on said seats, for carrying coils of suspension cables dead-ended thereon and leading off of the reel on lines substantially parallel to the vertical plane passing through the axis of the boom.

15. A boom structure according to claim 14, including cooperating interlocking means between the inboard ends of the take-up reels and their seats, for holding the reels against rotation on their axes.

16. A boom structure according to claim 14, including cooperating interlocking means between the inboard ends of the take-up reels and their seats, for holding the reels against rotation on their axes, and braces connecting with the outer ends of the reels and attached to the bracket structures and the said peak, for bracing the outboard ends of the reels.

17. A boom structure according to claim 14, including cooperating interlocking means between the inboard ends of the take-up reels and their seats, for holding the reels against rotation on their axes, and including a cross-

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head carried by the peak, projecting outwardly at each side of the same, and connected with said bracket structures; and outboard braces connected with said cross-head and connected with the outer ends of said reels, for bracing 5 their outer ends.

18. An extensible boom structure according to claim 11, in which the means for locking the reel to the outer boom-member, includes a centering plate fixed to the outboard side of the outer boom-member, and having an edge engaging the inner side of the reel shell. 10

19. A boom structure, according to claim 13, including braces supported on the side of the boom-point, and means for holding the braces pressed against the ends of the reels to hold their inner ends interlocked with the boom-point. 15

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