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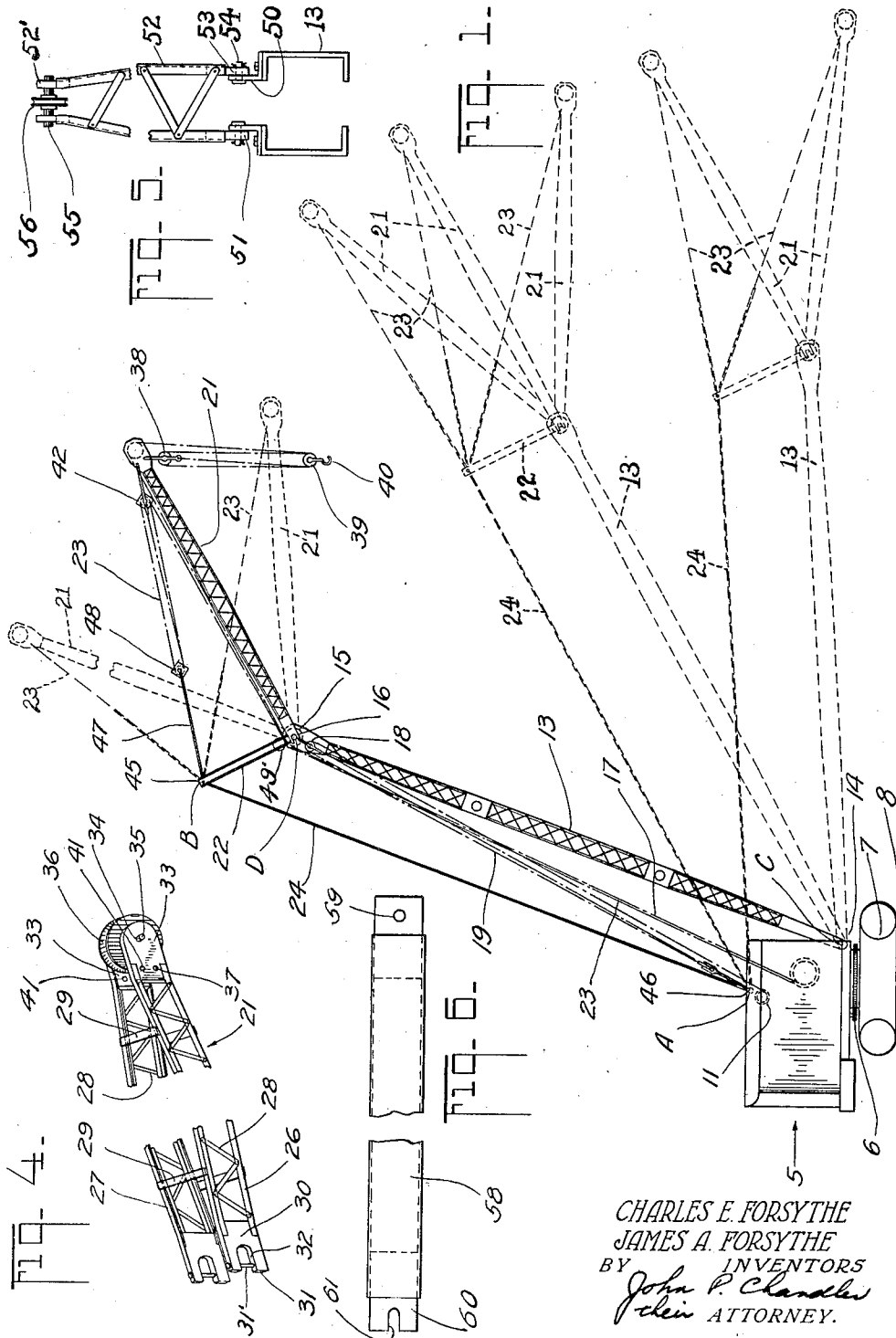
C. E. FORSYTHE ET AL

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EXTENSION BOOM FOR CRANES

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2 Sheets-Sheet 1



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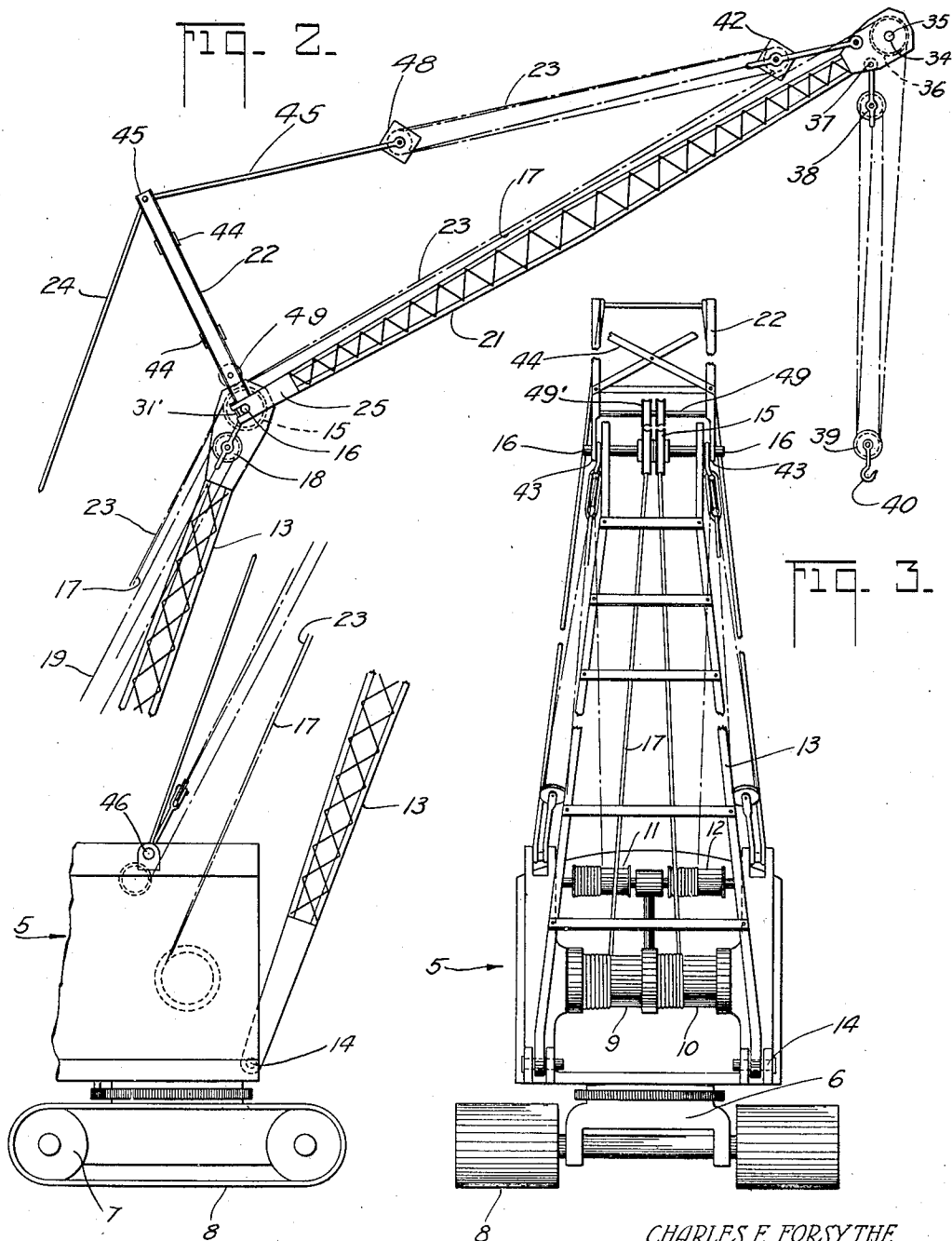
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## UNITED STATES PATENT OFFICE

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## EXTENSION BOOM FOR CRANES

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20 Claims. (Cl. 212—55)

This invention relates to cranes and derricks and relates more particularly to an auxiliary, detachable extension or jib boom therefor.

Heretofore the conventional crane or derrick used generally for moving heavy machinery and materials, for electric magnet work, for dragline and clamshell operations, etc., has usually included a revolving superstructure mounted on a base having caterpillar treads or other moveable means, a boom or jib pivotally mounted at one end of the superstructure, boom falls for raising and lowering the boom, hoisting cables for raising the load, etc. This type of crane having the single boom has been found most convenient for the usual operations required of it. In many instances, however, it has been found exceedingly desirable, and in some cases imperative, to have an extension boom in order to get into difficult places, and in some cases merely a longer boom in the event that a larger radius is required.

It is one of the principal objects of the present invention to provide an auxiliary or extension boom which may be quickly and easily mounted on the sheave pin or other suitable place at the upper end of the boom on the conventional type of crane previously mentioned, said extension boom being supported by means of a novel strut also detachably mounted at the upper end of the boom, the strut carrying at its outer terminus a fixed guy, said guy being secured at its opposite end to the superstructure, the blocks and tackle for the falls adapted to raise the extension boom being preferably positioned between the strut and the outer end of the extension boom.

Another object of the invention is the provision of an exceedingly flexible extension boom for a crane which will considerably extend the length of the conventional boom and which will greatly multiply the usefulness of the crane, by increasing its radius without requiring greater head room. For instance, it can enable the crane to reach over the edge of a relatively high structure and deposit the load. It will enable the crane to rest its main boom on a structure and pick up materials from a far greater radius than the crane could otherwise. It will also enable the crane to draw materials in from a given radius without raising the main boom nor disturbing its center of gravity or balance. It will also provide many new angles for operation.

The invention also contemplates the provision of a device of the kind above referred to, which includes an extension boom, a strut, a fixed guy and extension boom falls, all in combination with

a conventional crane, wherein a new and novel parallelogram supporting arrangement will be achieved, thereby lessening the strain on the boom, the falls, and other parts of the structure.

A further object of the invention is to provide an auxiliary attachment for a crane having a single boom, said auxiliary attachment being adapted to convert said crane into a crane with either a rigid or a variable gooseneck extension.

Still another object of the invention is the provision of an extension boom for a conventional crane wherein a greater overhang will be achieved and wherein the crane will be rendered far more useful for such work as handling steel girders, stacking lumber, loading and unloading cars and all other transferring operations that must frequently be done within a relatively narrowly confined space.

Other objects and advantages of the invention will be hereinafter specifically pointed out, or will become apparent, as the specification proceeds.

With the above indicated objects in view, the invention resides in certain novel constructions and combinations and arrangements of parts, clearly described in the following specification and fully illustrated in the accompanying drawings, which latter show embodiments of the invention as at present preferred.

In said drawings:

Fig. 1 is a side elevation of the embodiment secured to a conventional crane and showing in broken lines a plurality of positions of the main boom and the extension boom.

Fig. 2 is a broken side elevation of the embodiment, showing certain of the parts thereof in greater detail.

Fig. 3 is broken front elevation of a crane and showing the means for detachably securing the embodiment thereto.

Fig. 4 is a broken detailed perspective view of the extension boom.

Fig. 5 is a broken front elevation of the supporting strut and shows a modified means for pivotally securing said strut to the main boom.

Fig. 6 is a broken side elevation of a modification in the construction of the extension boom.

Referring now more particularly to said drawings, the embodiment, as heretofore stated, is adapted to be detachably secured to a crane which conventionally includes a superstructure which is rotatably mounted on a base structure, the latter being carried on wheels having endless or caterpillar treads. The base structure may, of course, be mounted on any suitable move-

able element such as a truck for a railroad track. The superstructure 5, houses means (not shown) for providing suitable motive power for driving a plurality of large cable drums 9 and 10 and a plurality of smaller cable drums 11 and 12, said large and small cable drums being employed for raising the boom, for hoisting and for other operations.

A boom or derrick 13 is pivotally mounted to the superstructure by means of a boom hinge 14, said boom being provided, at the upper end thereof, with a plurality of sheaves 15 mounted on a sheave pin 16, a hoisting cable 17 passing over one of said sheaves. The boom is also provided with a pulley block 18 which receives the boom falls 19 for raising and lowering the main boom.

The present embodiment includes an extension boom 21, a strut 22, extension boom falls 23 and a fixed guy 24.

The extension boom is preferably constructed in the same fashion as the main boom is conventionally constructed, with its trussed reinforcing members and tapered terminal portion, all as is well known in the art.

The extension boom 21, as shown in Fig. 4, is enlarged at the central portion and tapered at the terminals and comprises a pair of slightly curved angle bars 26 and 27 at each side thereof, said bars being reinforced by a plurality of truss members 28. A plurality of cross pieces 29 also provide additional reinforcement. These cross pieces may be at right angles to the angle bars, as shown, or they may be in the laced fashion. At the inner end of the boom are mounted flat end plates 30 having forked terminal portions 31, the opening 32 between the forked portions being generally U shaped to receive the sheave pin 16. Many of these sheave pins are not sufficiently long to receive both of these terminal portions and in such instances it is necessary to replace the pin with a longer one. The forked portions are also provided with removable pins 31' to prevent the extension boom from leaving the sheave pin as a result of a severe jar.

A pair of spaced end plates 33 are also secured to the outer end of the extension boom, said plates being provided with aligned apertures 34 to receive a sheave pin 35 carrying a sheave 36. The plates are further provided with a pair of aligned apertures 37 for mounting a pair of pulley blocks 38 and 39 carried on the hoist cable 17, the latter block 39 carrying a conventional hook 40. The end plates are also provided with a third set of aligned apertures 41 for mounting a block 42, the purpose of which is described hereafter.

The strut 22 comprises an A shaped frame constructed preferably from a pair of channeled or angle bars having forked terminal portions (not shown) at the lower terminals 43, the opening between said forked portions being elongated and generally U shaped and fit over the sheave pin 16 as shown in Fig. 3. Thus the strut is pivotally mounted at the end of the main boom and also in pivotal relation to the extension boom. The channeled bars are preferably braced by means of truss members 44 and are connected together at their upper terminals by means of a pin 45.

The fixed guy 24 may be any suitable cable or rod and is secured, at its lower end, to the upper portion of the superstructure at 46 and at its upper end to the pin 45. Another cable, bar or chain, commonly known as a bridle 47 extends from said pin to a block 48 which cooperates

with the block 42, both of which accommodate the extension boom falls 23.

The strut is preferably provided with a horizontal pin 49 between the channeled bars at the lower end thereof, said pin carrying a pair of deflecting sheaves 49' adjacent to the sheaves 15 in order that when the angle between the strut and the extension boom is acute the extension boom falls and the hoisting cable will not leave the sheave 15.

In Fig. 5 we have illustrated a front elevation of the strut in a slightly modified form and means for pivotally mounting same to the upper end of the main boom in a different fashion. The upper end of the main boom 13 is provided with a pair of opposed angle brackets 50, the lower end 51 of the strut 52 being provided with aligned apertures 53 which receive pins 54 held in the angle brackets. In this instance the lower end portions of the strut may be closer together than in the first illustrated embodiment where the strut is mounted on the sheave pin 16. The upper end 52' of the strut is provided with a sheave pin 55 carrying a sheave 56 which replaces the block 48 on the extension boom falls line 23. The guy or cable 24 may then be secured to the sheave pin by means of a bridle arrangement (not shown).

It has been found that the particular construction of the extension boom shown in Fig. 4 affords the strongest structure. Yet for lighter loads, a much simpler and less expensive extension boom construction is illustrated in Fig. 6. In this instance we employ a pair of spaced channeled bars 58 having suitable cross reinforcing means (not shown). The bars are provided with aligned apertures 59 at their outer end portions and with forked portions 60 at their lower ends, the space 61 between said forked portions being adapted to receive the sheave pin 16.

The length of the fixed guy from the point 46, designated as A, where it is secured to the superstructure, to its upper terminus, where it is secured to the pin 45, designated as B, is desirably precisely the same as the length of the main boom 13, to wit, the distance between the boom hinge 14 designated as C, and the sheave pin 16, designated as D. Likewise the strut 22, from the sheave pin 16 to the connecting pin 45, to wit, from B to D, is desirably of precisely the same length as the distance between the boom hinge 14 and the point 46 on the superstructure, to wit, from A to C.

In this way a perfect parallelogram is always preserved within the points A, B, C and D, regardless of the angle of the main boom, this parallelogram arrangement giving the extension boom as well as the main boom a greatly increased strength and the strain on the boom falls are considerably less than in the conventional boom falls inasmuch as a considerable portion of the strain is placed upon the guy or rod 24.

It will be appreciated that the embodiment employed in conjunction with a conventional crane provides a far more flexible and useful apparatus than an ordinary crane or a crane with a rigid goose-neck extension. Furthermore the embodiment may be employed as a straight extension for the main boom, thereby increasing its height and radius of operation. It may also be employed as a goose-neck boom, obtaining a maximum reach at any given height, and furthermore as an inverted goose-neck, obtaining maximum height at any reach.

The embodiment may be employed with any

crane having a boom hoist drum and two conventional hoist drums, one of the latter being employed for hoisting the load and the other for raising the extension boom. Where it becomes necessary to employ both hoist drums for load lines as in grab-bucket work the extension boom falls line may be removed from the drum and attached to the main boom, fixing the angle of the extension boom as required for the work.

The extension boom and the strut are readily attached to the crane by inserting the sheave pin in the elongated opening in the lower terminus of the former, and the hoist cables and boom falls arranged in place.

The hereinbefore described construction admits of considerable modification without departing from the invention; therefore, it is the wish not to be limited to the precise arrangements shown and described, which are as aforesaid, by way of illustration merely. In other words the scope of protection contemplated is to be taken solely from the appended claims, interpreted as broadly as is consistent with the prior art.

What we claim is:

1. As an article of manufacture, an extension boom for use with the pivotally mounted boom of a crane, derrick and the like, said extension boom having a detachable pivotal mounting on said crane boom and means for arcuately swinging said extension boom in a vertical plane about said pivotal mounting, said swinging means including, in combination, a strut, a fixed guy for supporting said strut, and adjustable means between said strut and the outer end of said extension boom for raising and lowering the extension boom about its pivotal mounting independently of movement of the crane boom about the latter's pivotal mounting.

2. As an article of manufacture, an extension boom for attachment to the pivotally mounted boom of a crane, derrick and the like, said extension boom including a pivotal mounting on said pivotally mounted crane boom and having means for supporting hoisting mechanism, and said extension boom including means for arcuately swinging said extension boom in a vertical plane independently of the pivotal mounting of said crane boom, said swinging means including a strut pivotally mounted at the end of said crane boom, a guy for said strut and extension boom falls connected to said strut and operable between said strut and the outer end of said extension boom.

3. In a crane, derrick, and the like, a main boom having a pivotal mounting and an extension boom having a pivotal mounting on the main boom and arcuately movable to vary the normal reach of the main boom and to alter the effective height and length thereof in different working positions, a strut pivotally mounted on said main boom, a fixed guy for said extension boom, said fixed guy connected to said strut, and means to move said extension boom independently of movement of said fixed guy.

4. A detachable extension boom for a crane, derrick, and the like, including an elongated member having detachable pivotal mounting means for connection to the outer end of the working boom of said crane, derrick and the like, a fixed guy for said extension boom, and means to swing said extension boom in an arcuate path about said pivotal mounting means, independently of said fixed guy.

5. A detachable extension boom for a crane, derrick, and the like, including an elongated

member having detachable pivotal mounting means for connection to the outer end of the working boom of said crane, derrick and the like, and means to swing said extension boom in an arcuate path about said pivotal mounting means, said pivotal mounting means including a strut having means at one end for pivotal attachment to said detachable pivotal mounting means, whereby said strut is pivotally movable with relation to both said working boom and said extension boom, a fixed supporting guy connected to the opposite end of said strut, said extension boom and strut supporting boom falls for use in swinging said extension boom independently of said fixed supporting guy.

6. A detachable extension boom for a crane, derrick and the like, including a pair of side members, and plates at the inner terminals of said side members, said plates including means to receive a supporting member provided at the outer end of the working boom of said crane, derrick and the like, means to secure said extension boom in place upon said supporting member against unintentional dislodgement, said side members including means for attachment of load hoisting means, a fixed guy for said extension boom, and means to swing said extension boom in an arcuate path about said pivotal supporting member independently of said fixed guy.

7. A detachable extension boom for a crane, derrick and the like, including a pair of side members, end plates at the inner terminals of said side members, said plates including means to receive a supporting member provided at the outer end of the working boom of said crane, derrick and the like, means to secure said extension boom in place upon said member against unintentional dislodgement, said side members including means for attachment of load hoisting means, and means to swing said extension boom in an arcuate path about said pivotal supporting member, said swinging means including a strut having means at one end for pivotal and detachable connection to said supporting member, whereby said strut is pivotally movable with relation to both said working boom and said extension boom, the opposite end of said strut being adapted for attachment of a fixed guy leading from the base of said crane, derrick and the like, and boom falls for said extension boom between said fixed guy and the outer end of said extension boom.

8. A detachable extension boom for a crane, derrick and the like, including a pair of curved side members which converge toward their opposite ends, flat end plates at the inner terminals of said side members, said end plates having forked lower ends with U-shaped openings to receive a pivotal supporting member provided on the outer end of the working boom of said crane, derrick and the like, means to secure said extension boom in place upon said member against unintentional dislodgement, end plates at the outer ends of said side members, said end plates affording means for attachment of load hoisting means, a load-cable sheave positioned between said end plates, and means to swing said extension boom in an arcuate path about said pivotal supporting member.

9. A detachable extension boom for a crane, derrick and the like, including a pair of curved side members which converge toward their opposite ends, flat end plates at the inner terminals of said side members, said end plates having forked lower ends with U-shaped openings to

receive a pivotal supporting member provided on the outer end of the working boom of said crane, derrick and the like, means to secure said extension boom in place upon said member  
 5 against unintentional dislodgement, end plates at the outer ends of said side members, said end plates affording means for attachment of load hoisting means, a load-cable sheave positioned between said end plates, and means to swing  
 10 said extension boom in an arcuate path about said pivotal supporting member, said swinging means including a strut having means at one end for pivotal and detachable connection to said supporting member, the opposite end of said  
 15 strut being adapted for attachment of a guy leading from the base of said crane, derrick and the like, and said extension boom and strut being adapted to support boom falls for use in swinging said extension boom.

20 10. In combination, a crane, derrick and the like including a support and a main boom mounted thereon to swing in vertical and horizontal planes, falls for said main boom, an extension boom, detachably mounted on said main boom,  
 25 load hoisting means on said extension boom, a guy for said main boom, and falls between the outer end of said extension boom and said main boom guy, whereby said extension boom is arcuately  
 30 swingable independently of said main boom, by operation of said extension boom falls, in both stationary and movable conditions of the main boom, to vary the reach of said main boom and the effective height and length thereof in its working positions.

35 11. In combination, a crane, derrick and the like including a support and a main boom mounted thereon to swing in vertical and horizontal planes, falls for said main boom, an extension boom pivotally and detachably mounted on said  
 40 main boom, load hoisting means, including a cable, at the end of said extension boom, a strut pivotally mounted at the end of said main boom, a fixed guy between the outer end of said strut and said support, falls connecting said strut and extension  
 45 boom, said extension boom falls including a cable, sheaves for said extension boom-falls cable and load-cable at the upper end of said main boom, said fixed guy and said main boom being of substantially the same effective length and the opposite  
 50 ends of said fixed guy being substantially equally spaced from said main boom, and said fixed guy being substantially parallel with the latter, whereby to afford a parallelogrammatic support for said extension boom in all working positions of said  
 55 main and extension booms, and whereby said extension boom is arcuately swingable independently of said main boom, by operation of said extension boom falls, in both stationary and movable conditions of the main boom, to vary the  
 60 reach of said main boom and the effective height and length thereof in said working positions.

12. In combination, a crane, derrick and the like including a support and a main boom mounted thereon to swing in vertical and horizontal  
 65 planes, falls for said main boom, an extension boom pivotally and detachably mounted at the outer end of said main boom, load hoisting means, including a cable, and a load-cable sheave at the end of said extension boom, a strut pivotally  
 70 mounted adjacent to the end of said main boom, a fixed guy between the outer end of said strut and said support, falls connecting the outer portions of said strut and extension boom, said extension boom falls including a cable, sheaves for  
 75 said extension boom-falls cable and load-cable at

the upper end of said main boom, cable deflecting means adjacent to the lower end of said strut and in proximity to said extension boom-falls and load-cable sheaves, said fixed guy and said main boom being of substantially the same effective length and the opposite ends of said fixed  
 80 guy being substantially the same effective length and the opposite ends of said fixed guy being substantially equally spaced from said main boom, and said fixed guy being substantially parallel with the latter, whereby to afford a parallelogrammatic support for said extension boom in all working positions of said main and extension  
 85 booms, and whereby said extension boom is arcuately swingable independently of said main boom, by operation of said extension boom falls, in both stationary and movable conditions of the main boom, to vary the reach of said main boom and the effective height and length thereof in said working positions.

13. In combination, a crane, derrick, and the like including a support and a main boom mounted thereon to swing in vertical and horizontal planes, falls for said main boom, an extension boom including a pair of side members, means  
 100 including a pin to pivotally and detachably mount said extension boom at the outer end of said main boom, end plates at the inner terminals of said side members, said end plates having forked lower ends with U-shaped openings to receive said pin, locking means to hold said end plates in position on said pin, load hoisting means, including a cable, at the end of said extension boom, a guy for said main boom, and falls between the outer end of said extension boom and  
 105 said main boom, whereby said extension boom is arcuately swingable independently of said main boom, by operation of said extension boom falls, in both stationary and movable conditions of the main boom, to increase and decrease the reach  
 110 of said main boom and the effective height and length thereof in its working positions.

14. In combination, a crane, derrick and the like including a support and a main boom mounted thereon to swing in vertical and horizontal planes,  
 120 falls for said main boom, an extension boom including a pair of side members, means to pivotally and detachably mount said extension boom at the outer end of said main boom, said means including a pin the opposite ends of which extend  
 125 beyond the outer sides of said main boom, and plates at the inner terminals of said side members, said end plates having forked lower ends with U-shaped openings to receive said pin extensions, locking means to hold said end plates  
 130 in position on said pin extensions, load hoisting means, including a cable, and a load-cable sheave positioned at the end of said extension boom, a strut pivotally mounted adjacent to the end of said main boom, a fixed guy between the  
 135 outer end of said strut and said support, falls connecting the outer portions of said strut and extension boom, said extension boom falls including a cable, sheaves for said extension boom-falls cable and load-cable at the upper end of  
 140 said main boom, cable deflecting sheaves adjacent to the lower end of said strut and in proximity to said extension boom-falls and load-cable sheaves, said fixed guy and said main boom being of substantially the same effective length and  
 145 the opposite ends of said fixed guy being substantially equally spaced from said main boom, and said fixed guy being substantially parallel with the latter, whereby to afford a parallelogrammatic support for said extension boom in all  
 150

working positions of said main and extension booms, and whereby said extension boom is arcuately swingable independently of said main boom, by operation of said extension boom falls, in both stationary and movable conditions of the main boom, to increase and decrease the reach of said main boom and the effective height and length thereof in said working positions.

15. In combination, a crane, derrick and the like including a support and a main boom mounted thereon to swing in vertical and horizontal planes, falls for said main boom, an extension boom including a pair of curved side members which converge toward their opposite terminal ends, means to pivotally and detachably mount said extension boom at the outer end of said main boom, said means including a sheave pin the opposite ends of which extend beyond the outer sides of said main boom, flat end plates at the inner terminals of said side members, said end plates having forked lower ends with U-shaped openings to receive said pin extensions, locking means to hold said end plates in position on said pin extensions, end plates at the outer ends of said side members, load hoisting means, including a cable, supported on said outer end plates, a load-cable sheave positioned between said end plates, a strut pivotally mounted at the end of said main boom, a fixed guy between the outer end of said strut and said support, falls connecting the outer portions of said strut and extension boom, said extension boom falls including a cable, sheaves for said extension boom-falls cable and load-cable at the upper end of said main boom, cable deflecting means adjacent to the lower end of said strut and in proximity to said extension boom-falls and load-cable sheaves, said fixed guy and said main boom being of substantially the same effective length and the opposite ends of said fixed guy being substantially equally spaced from said main boom, and said fixed guy being substantially parallel with the latter, whereby to afford a parallelogrammatic support for said extension boom in all working positions of said main and extension booms, and whereby said extension boom is arcuately swingable independently of said main boom, by operation of said extension boom falls, in both stationary and movable conditions of the main boom, to increase and decrease the reach of said main boom and the effective height and length thereof in said working positions.

16. In a crane, derrick, and the like, in combination, a base, a main boom, a pivotal mounting for said main boom, an extension boom having

a pivotal mounting at the outer end of said main boom, a strut having a pivotal mounting on said main boom, a guy connecting the upper part of said strut and said base, and cable means connecting said strut and extension boom and adapted to swing said extension boom about its pivotal mounting end toward and away from said strut independently of said guy.

17. In a crane, derrick, and the like, in combination, a base, a main boom pivotally mounted on said base, an extension boom pivotally mounted at the outer end of said main boom, an elongated strut having a pivotal mounting on and adjacent to the end of said main boom, a guy connecting said strut and base, and cable means connecting said strut and extension boom to swing the latter toward and away from said strut.

18. In a crane, derrick, and the like, in combination, a main boom having a pivotal mounting at its inner end, an elongated extension the inner end of which has a pivotal mounting at the outer end of said main boom, an elongated strut having a pivotal mounting on said main boom adjacent to the pivotal mounting of said extension, a guy for said strut, and cable means independent of said guy connecting said strut and the outer portion of said extension.

19. In a crane, derrick, and the like, in combination, a pivotally mounted main boom, an elongated extension pivotally mounted at the outer end of said main boom, a pivotally mounted strut uprising between the meeting portions of said main boom and extension, a guy for said strut, and falls connecting said strut and the outer end of said extension and adapted to swing said extension in an arcuate path independent of said strut guy.

20. In a crane, derrick, and the like, in combination, a base, a main boom pivotally mounted on said base, an extension boom the inner end of which has a pivotal mounting at the outer end of said main boom, a strut uprising from the pivotal mounting of said extension boom, a guy connecting said strut and said base, and means independent of said guy connecting said strut and the outer end of said extension boom, whereby said extension boom is movable on its pivotal mounting to alter the effective length of said main boom during pivotal movement of the main boom, said means comprising falls operable to move the extension boom in an arcuate path toward and away from said strut.

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