

June 15, 1948.

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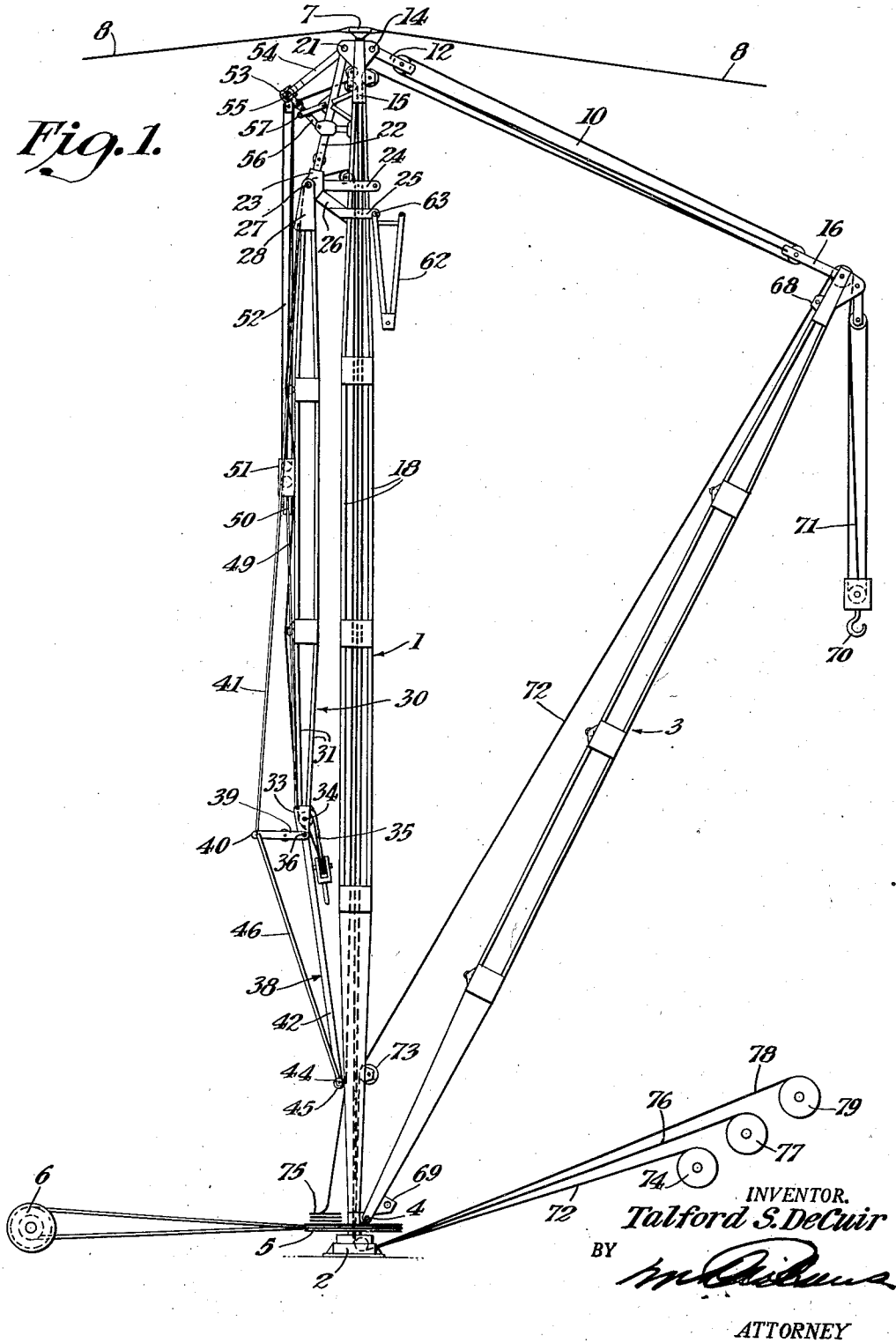
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Fig. 1.



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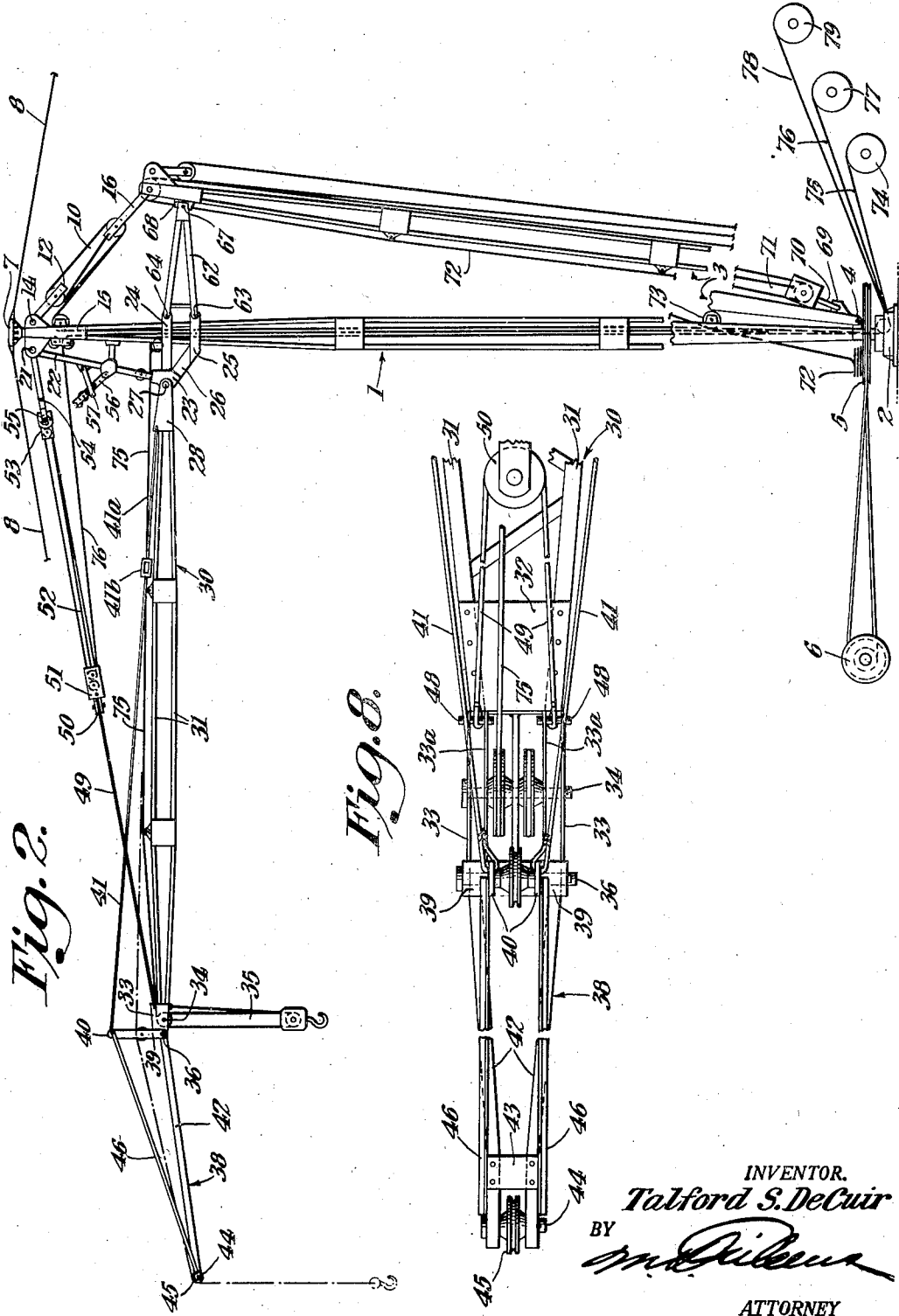
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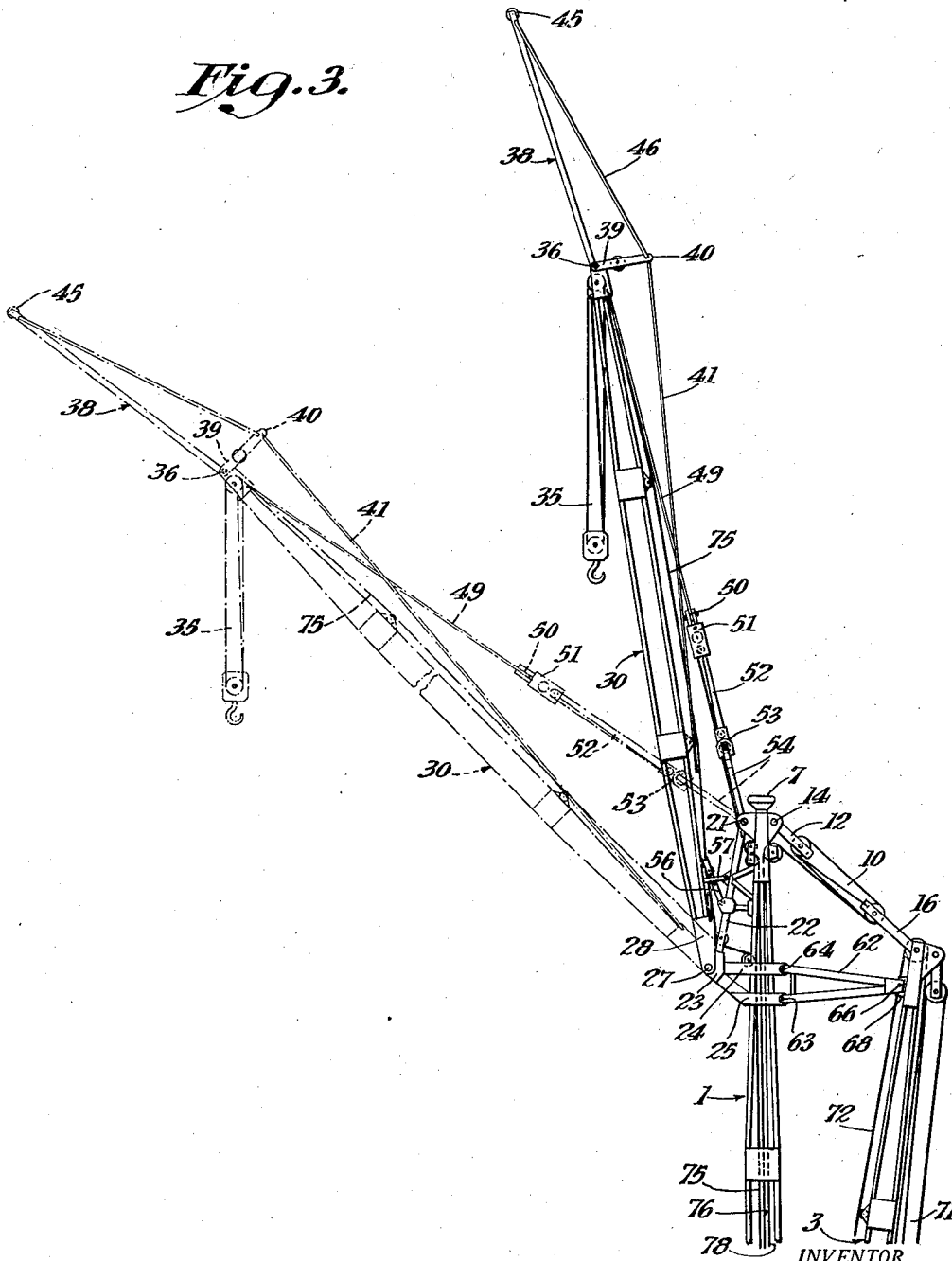
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Fig. 3.



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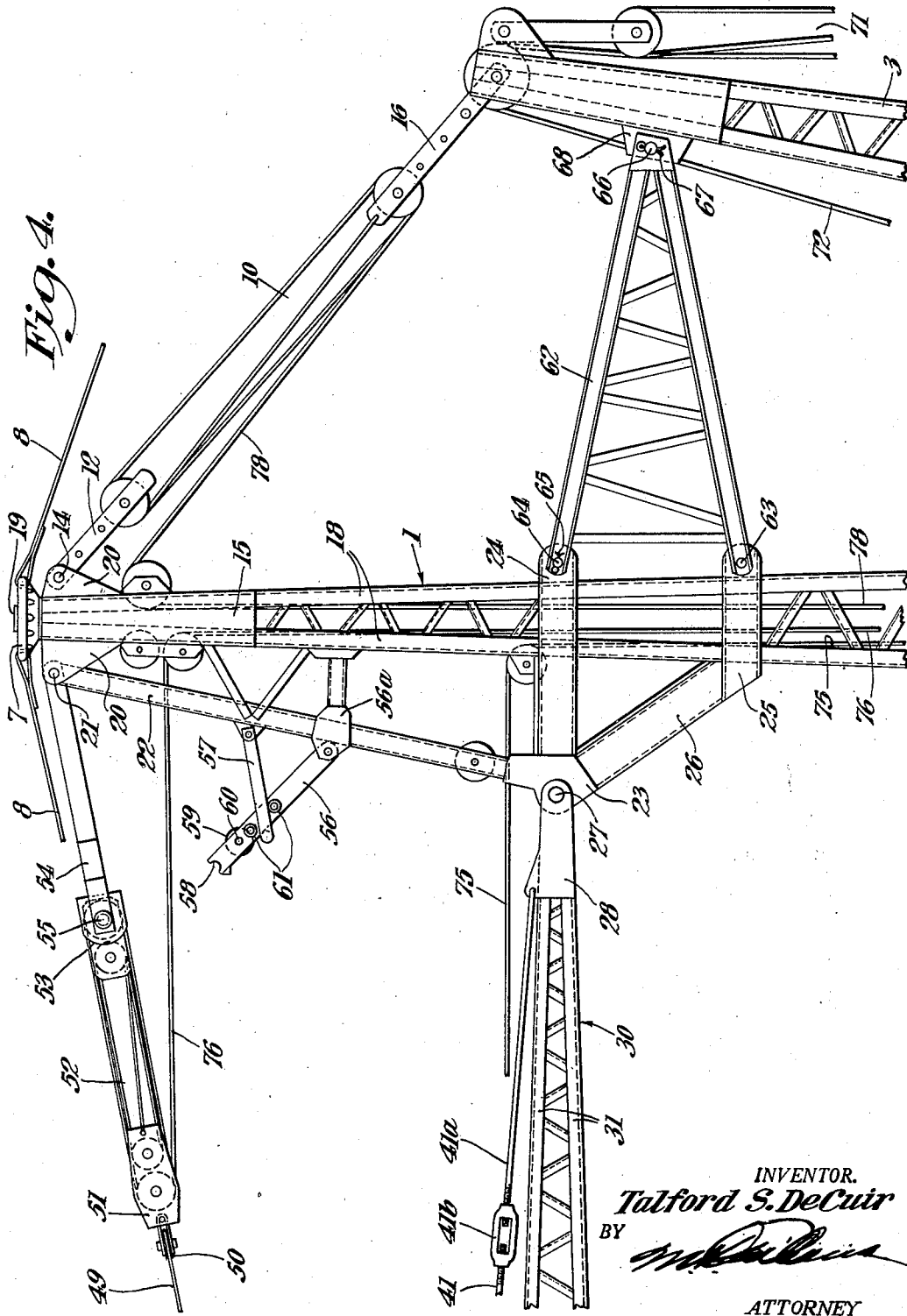
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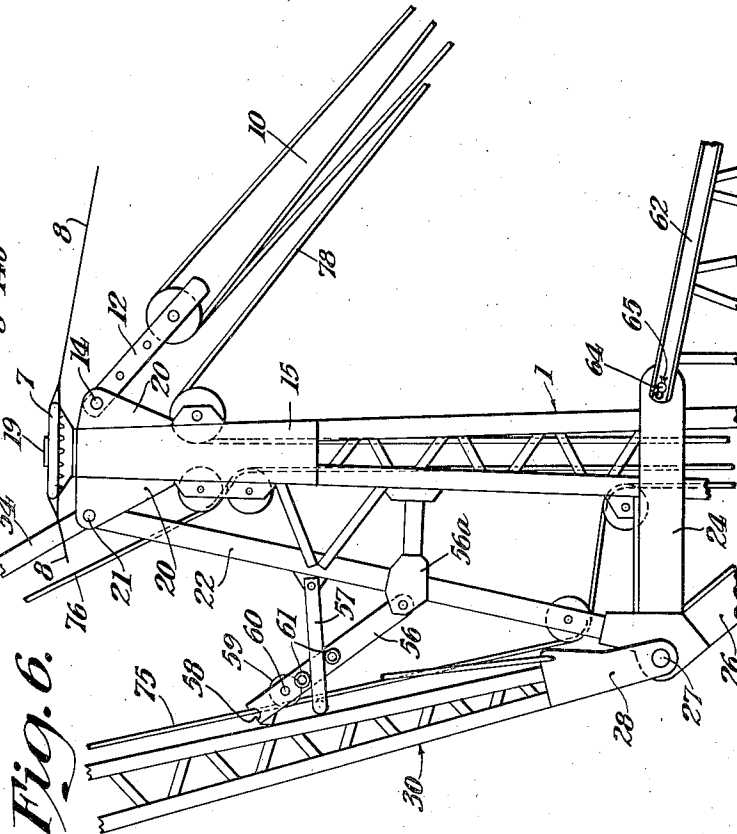
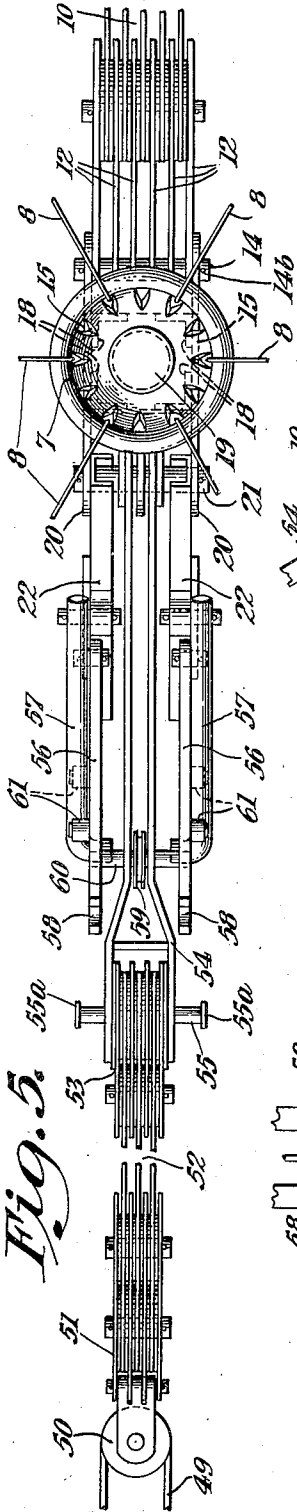


Fig. 6.

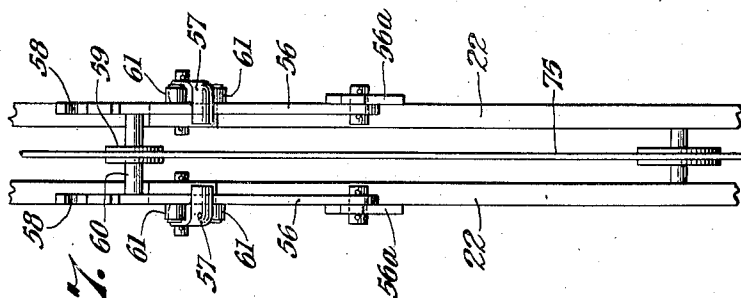


Fig. 7.

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UNITED STATES PATENT OFFICE

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Application July 17, 1945, Serial No. 605,559

9 Claims. (Cl. 212-47)

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This invention relates to derricks and, in particular, to the provision of a new and improved derrick possessed of great versatility and efficiency, and capable of handling large, heavy, bulky objects and equipment, requiring elevation of the point from which the load line is supported a substantial distance above the end of the derrick mast.

It is a further object of this invention to provide such a derrick structure embodying, in addition to a conventional mast and main boom, an auxiliary boom or "high boom," (preferably provided with an extension boom or jib boom projecting therefrom) which may be elevated to high angle positions whereby the load line is supported from points substantially above the upper end of the derrick mast.

It is a further object of this invention to provide such a derrick structure embodying means for detachably connecting the upper end portion of the conventional main boom rigidly to the mast in such manner that the mast is substantially stiffened or strengthened, making possible operation of the high boom or auxiliary boom to handle objects which are too heavy to be handled by such a high boom when the mast is not so reinforced and which objects are of such length or height as to require that the load line be supported from points beyond the upper end of the mast.

It is a further object of this invention to provide such a structure wherein the jib boom or extension boom may be adjusted to extend downwardly at an acute angle from the outer end of the high boom in such manner as to engage the lower end portion of the mast when the high boom is lowered thus offsetting the outer end of the high boom from the mast in the lowered position of the high boom wherein it does not obstruct or interfere with operation of the main boom and by means of which offsetting of the outer end of the high boom, at rest is off "dead center."

It is a further object of this invention to provide such a derrick structure wherein means is also provided for predeterminedly maintaining the upper block of the high boom topping lift spaced from the axis of the mast at such distance and in such manner as to provide sufficient leverage for operation of the topping lift to elevate the high boom from its lowermost, "at rest," or inoperative position without placing undue or unusual strain on the high boom topping lift or the high boom lift line.

It is a further object of this invention to provide such a derrick structure embodying means

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for predeterminedly limiting the uppermost position of the high boom whereby to prevent it from "going over backward" or swinging past "dead center" toward the derrick mast, i. e., beyond a vertical plane passing through the hinge or axis thereof.

It is a further object of this invention to provide such structure wherein the jib boom is hingedly attached to the outer end of the high boom in such manner that it may be adjusted angularly with respect thereto.

These and other objects and advantages will appear from the following description taken with the drawing.

In the drawing:

Fig. 1 is a view in elevation, and partly diagrammatic, of an illustrative derrick embodying the principles of this invention with the main boom in operation and the high boom or auxiliary boom in its lowermost, inoperative, position;

Fig. 2 is a similar view of the derrick of Fig. 1, partially broken away, but showing the high boom or auxiliary boom in operation, and with the main boom connected to the derrick mast to provide for strengthening thereof, the high boom or auxiliary boom being shown in substantially horizontal position;

Fig. 3 is a view similar to Figs. 1 and 2, of the upper end of the derrick, but showing the extreme uppermost or high angle position of the high boom or auxiliary boom, with a position intermediate the positions of Figs. 2 and 3 indicated therein in dash lines;

Fig. 4 is an enlarged detail view of the upper end of the derrick, with the parts substantially in the position shown in Fig. 2;

Fig. 5 is a fragmentary top plan view of the structure shown in Fig. 4;

Fig. 6 is a view similar to Fig. 4, but showing the parts substantially in the position shown in full lines in Fig. 3, and with the boom stop in its operative position wherein it limits the uppermost or highest position of the high boom;

Fig. 7 is a fragmentary view of the boom block stop, and boom stop, in the position shown in Fig. 6 with the high boom omitted in the interest of clear disclosure; and

Fig. 8 is an enlarged fragmentary detail plan view of the outer end of the high boom and the connected jib boom, with the latter partly broken away.

As shown in Figs. 1, 2, and 3, the mast 1 is of conventional form, being pivoted to or swingably mounted in conventional manner on the base 2 and the conventional main boom 3 being hinged to the mast 1 adjacent its lower end in conven-

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tional manner at the point 4. Conventional means such as the bull wheel 5, operatively connected with a reversable swing engine 6, is provided for swinging the upright mast 1 about its vertical axis. At its upper end, the mast 1 is provided with a pivotally attached spider 7 to which are secured a plurality of guys 8 for maintaining the upper end of the mast 1 in position.

While the above described structure is conventional, and the outer end of the main boom 3 is connected through the main boom topping lift (generally designated 10) in conventional manner to the upper end of the mast 1, the pivot for the links 12 of the upper block of the topping lift 10 is provided by a pin 14 secured in the head block 15 as shown in Figs. 5 and 6, and as hereinafter more fully explained. The links 16 of the lower block of the topping lift 10 are secured in conventional manner to the outer end of the main boom 3.

While the mast 1 and main boom 3, as well as the high boom or auxiliary boom (hereinafter described) are shown diagrammatically in Figs. 1, 2, and 3, the details thereof are shown in Figs. 4, 5, and 6. As herein shown, the mast 1 comprises four similar angles 18 connected by conventional trusswork to form a hollow column terminating at its upper end in a headed pin 19 upon which the above described spider 7 is rotatably supported. The head block 15 comprises a pair of similar obverse plate 20 welded or otherwise rigidly secured each to a pair of angles 18 at opposite sides of the mast 1. Each plate 20 is provided adjacent each upper corner with an aperture or bore, one pair of such apertures being aligned and having the above described pin 14 extending therethrough and secured therein against axial movement by suitable known means such as the cotter pins 14b (Fig. 5) or the like. The other pair of apertures or bores are aligned and provide support for the pin 21 for a purpose which will hereinafter appear. Provided at its upper end with a bore or aperture aligned with the last described bore in each plate 20, and cooperating therewith to support the pin 21, is an angle 22 having its upper end adjacent the aforesaid aperture welded or otherwise rigidly secured to the adjacent portions of each plate 20.

These angles 22 extend downwardly at an acute angle and in spaced relation to the adjacent upper portion of the mast, and have their lower ends welded or otherwise rigidly secured each to a high boom bearing plate 23 which is supported rigidly in outwardly spaced relation to the mast by pairs of substantially horizontal angle members 24 and 25 connected together and to the bearing plate 23 by a pair of upwardly and outwardly inclined angle members 26.

The bearing plates 23 are suitably apertured to support the pivot pin or hinge pin 27 which extends also through suitable apertures provided in the hinge block 28 at the inner end of the high boom or auxiliary boom which is generally designated 30. The high boom or auxiliary boom 30 is shown diagrammatically in Figs. 1, 2, and 3, but the details thereof are shown in Figs. 4, 6, and 8. As therein shown, it is formed conventionally by four similar angles 31 connected by trusswork to form a hollow column, the column terminating at its inner end in the above described hinge block 28, and at its outer end in a plate 32 connected between the outer ends of the upper pair of angles 31 and a pair of side plates 33 and suitable bracing.

The sheave pin 34 of the upper block of the

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fall 35 extends through suitable bearing blocks provided between the angles 31 at their outer ends. A hinge pin 36 also extends through the side plates 33 and suitable bearings pivotally to connect the jib boom or extension boom 38 to the outer end of the high boom 30. Also pivoted about the pin 36 is a pair of carrier brackets 39 terminating at their upper ends in ears or extensions 40 provided with apertures receiving the outer ends or loops of the stays 41 which are connected at their inner ends to the hinge block 28 and which may comprise either cables, as shown in Fig. 8, or a plurality of rods 41a connected by turn buckles 41b by means of which the angle of brackets 39 may be varied with respect to the high boom 30 for a purpose which will hereinafter appear.

The jib boom or extension boom 38 (Fig. 8) comprises a pair of channels 42 bent inwardly at their outer ends and secured together by plates 43 and being apertured at their outer ends to support the pin or pintle 44 which supports the pulley 45. Each of the channels 42 is rigidly connected to an ear 40 of a bracket 39 by means of one of a pair of similar angles or stays 46, each having its outer end welded or otherwise rigidly secured to one of the channels 42, and its inner end welded or otherwise rigidly secured to an ear 40, as shown in Fig. 8. Thus, the angle between the brackets 39 (and ears 40 thereof) and the jib boom or auxiliary boom 38, is always maintained constant by the rigid connecting stays 46.

Since the length of the stays 41 may be adjusted, if desired, as pointed out above, by means of the turn buckles 41b and the use of rods 41a of varying length (Fig. 4), the angle between the brackets 39 and the high boom 30 may be adjusted, if desired, to vary the angularity of the jib boom or auxiliary boom 38 with respect to the high boom 30.

Each side plate 33 cooperates with a similar parallel plate 33a secured to the inner sides of one pair of the angles 31 to form, by means of aligned apertures extending through them, a seat for a pair of similar pins 48, each of which supports an end of an equalizer cable 49 which passes about a sheave or pulley 50 supported by the outer block 51 of the high boom topping lift 52. The inner block 53 of the aforesaid topping lift 52 is pivotally secured to a bifurcated bracket 54 hingedly supported at its inner end by the above described pin 21 extending through the supporting apertures provided in the members 22 and plates 20.

The means for pivotally securing the inner block 53 to the bifurcated bracket 54 comprises the extension pin 55 which in addition to forming a support for the sheaves of the upper block 53 of the topping lift 52, extends outwardly on both sides a substantial distance and terminates in enlarged heads 55a to form extensions cooperating with the hereinafter described boom block stop to limit downward movement of the block 53 and bracket 54 for a purpose which will hereinafter appear.

The boom block stop mechanism (Figs. 4, 5, 6 and 8) which cooperates with the above described extension pin 55 comprises a pair of laterally spaced arms or links 56 pivoted at their inner or lower ends to the plates or brackets 56a and having their outward or downward movement limited each by the end hook on an auxiliary boom stop or boom stop member 57, as hereinafter described. The outer end of each of the

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members 56 is provided with a recess 58 which, in the outward position of the members 56 (shown in Fig. 4), are adapted to engage the ends of the extension pin 55 to limit downward movement of the bracket 54, as shown in Fig. 1. An idler pulley 59, supported on the pintle or axle 60 adjacent the outer end of the boom block stop formed by the members 56, is adapted to engage the boom line or lift line 76 which extends to the six sheave hinged tandem block of the topping lift 52 in the position shown in Fig. 1. Extending outwardly from each of the members 56 is a pair of rollers 61 which have anti-friction engagement with the members 57 forming the auxiliary boom stop.

By means of this high boom stop, when the auxiliary boom 30 is raised to the position shown in Fig. 3, the members 57 which have their movement confined each by one pair of rollers 61, define the uppermost position of the auxiliary boom 30 and prevent it from "falling over backwards" or traveling beyond dead center toward the mast 1 in the high lift positions thereof.

When the auxiliary boom 30 is lowered toward, or to, the position shown in Fig. 1, the boom block stop formed by the members 56 and axle 60, by engagement of the recesses 58 with the ends of the extension pin 55, limit downward movement of the bracket 54 effectively to maintain the upper block of the top lift 52 spaced from the mast 1, as shown in Fig. 1.

In order to strengthen the mast 1 for operation of the auxiliary boom 30 in high angle positions as shown in Fig. 3 wherein the auxiliary or high boom portion of the derrick operates as a stiff leg derrick, a strongback or strut 62 is provided which comprises a braced structure somewhat similar in construction to the booms 3 and 30, but which strongback or strut is of triangular shape in elevation, being permanently pivoted on a pin 63 to the above described horizontal angle member 25, and being adapted to have the adjacent inner apex secured rigidly to the above described horizontal angle 24 by means of a removable pin 64 provided with a cotter or key 65. At its outer apex, the strut or strong back 62 is provided with apertures receiving removable pin 66 provided with a cotter or key 67, which pin 66 is adapted to be removably secured in an aperture provided in a bracket 68 on the main boom 3, as shown in Fig. 4.

When the main boom 3 is in operation, as shown in Fig. 1, the pin 64 is removed from the apertures in the plates 24, and the strongback or strut 62 swings downwardly about the pivot or pin 63 to the position shown in Fig. 1, wherein it does not obstruct free movement of the main boom 3. During such operation, the auxiliary boom 30 is in its lowermost position, and the boom block stop 56, 60 is operative to offset the upper block of the topping lift 52 from the mast 1. However, when it is desired to operate the high boom or auxiliary boom 30, especially for high angle lifting, the strongback or strut 62 is placed in the position shown in Figs. 2, 3, 4 and 6, the pin 64 being inserted and secured by the cotter or key 65, whereupon by means of the topping lift 10, the main boom 3 is pulled up into position for the insertion of pin 66 to lock the main boom 3, the strongback or strut 62, and the mast 1, into a rigid substantially triangular structure. Alternatively, when a single quick high angle lifting operation is performed, the pin 66 may be left out, and the main boom raised to the position shown in Fig. 4 by the topping lift 10, whereupon

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a substantial amount of strengthening of the mast 1 is secured.

As shown in Figs. 1 and 2, the main boom 3 is provided adjacent its inner or lower end with an apertured bracket 69 which is adapted to receive the hook 70 on the lower block of the fall 71, to which fall the main boom load line 72 extends, the aforesaid load line 72 passing over the pulley 73 on the mast 1 to the drum or nigger-head 74 on the hoist engine. Thus, in order to keep the lower block of the fall 71 from becoming an obstruction in operation of the high boom 30 of the derrick, the hook 70 may be inserted in the aperture of the bracket 69 to maintain the lower block close to the lower end of the main boom 3, as shown in Fig. 2.

Extending from the high boom fall 35 is the high boom load line 75 which extends over a pulley on the mast, and down through the mast 1 to the nigger-head or drum 74 to which it is connected when the main boom 3 is inoperative, as shown in Fig. 2, whereupon the main boom load line 72 is coiled upon the bull wheel 5, as shown in Fig. 2. When the main boom 3 is to be operated, as shown in Fig. 1, the high boom load line 75 is coiled upon the bull wheel, as shown in Fig. 1.

The high boom lift line is designated 76 and extends from the high boom topping lift 52 over suitable pulleys down through the mast 1, and thence to a nigger-head or drum 77 on the hoist engine which is diagrammatically shown in Fig. 2. The main boom lift line is designated 78 and extends over suitable pulleys and thence down through the mast 1 to the nigger-head or drum 79 of the hoist engine. While various suitably located pulleys are shown for avoiding friction between the load lines 72 and 75 and the boom lines or lift lines 76 and 78, and the mechanical parts of the derrick, these are not described since they do not constitute, per se, a part of this invention.

It is, of course, to be understood that the above description is merely illustrative and in no wise limiting, and that I desire to comprehend within my invention such modifications as are comprehended within the scope of the appended claims.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In combination with a derrick including an upright mast, a main boom pivotally connected thereto adjacent its lower end, and means for elevating and lowering said boom; an auxiliary boom pivotally connected to said mast at a high point relatively to the pivotal connection between the main boom and the mast and at the opposite side of the mast from the main boom, means for raising and lowering said auxiliary boom independently of the raising and lowering of said main boom, and means detachably connectible between said mast and said main boom and constructed to form together with the main boom a structure for bracing said mast for high angle operation of said auxiliary boom.
2. In combination with a derrick including an upright pivotally supported mast, a main boom hinged thereto adjacent its lower end, and means for raising and lowering said boom; an auxiliary boom hinged on said mast adjacent the upper end of said mast at the side thereof opposite said main boom, means for raising and lowering said auxiliary boom independently of said main boom and means cooperating with said main boom for bracing said mast for high angle operation of said auxiliary boom comprising a linkage de-

tachably connectible between said mast and the upper end of said main boom for forming together with the mast and the main boom a rigid triangular upright structure supporting said auxiliary boom.

3. In a derrick, an upright mast, a main boom hinged to said mast adjacent its lower end, means for elevating and lowering said boom, an auxiliary boom pivotally connected to said mast adjacent the upper end of said mast at the side thereof opposite said main boom, means for raising and lowering said auxiliary boom independently of said main boom and means cooperating with said main boom for bracing said mast for high angle operation of said auxiliary boom comprising a linkage detachably connectible between said mast and the upper end of said main boom at a high angle elevation of the latter for forming together with the main boom and the mast a rigid triangular upright structure supporting said auxiliary boom.

4. In a derrick, a mast constantly supported upright, a main boom pivotally secured thereto at one side adjacent the lower end thereof, means for raising and lowering said main boom, means for detachably connecting the upper end portion of said main boom in an elevated position of the latter to said mast and constructed to form together with the mast and the main boom a rigid inverted triangular structure, an auxiliary boom pivotally attached to said mast at its opposite side adjacent its upper end, means for raising and lowering said auxiliary boom independently of said main boom, and means for limiting the upward angular movement of said auxiliary boom with respect to said mast for preventing it from passing dead center.

5. In a derrick including an upright mast, a main boom hinged thereto adjacent its lower end and means for elevating and lowering said main boom; an auxiliary boom pivotally connected to said mast adjacent the upper end of said mast at the side thereof opposite said main boom, means for raising and lowering said auxiliary boom independently of said main boom comprising a topping lift including a pair of blocks one of which is connected swingably in spaced relation to said mast, means cooperating with said last named block in the inoperative position of the auxiliary boom to maintain said block spaced from the plane of said auxiliary boom to provide purchase for further operation of said auxiliary boom, and means detachably connectible between and cooperable with said mast and said main boom for bracing said mast for high angle operation of said auxiliary boom.

6. In a derrick including a mast constantly supported upright, a main boom hinged thereto adjacent its lower end and means for elevating and lowering said boom; an auxiliary boom pivotally connected to said mast adjacent the upper end of said mast at the side thereof opposite said main boom, means for raising and lowering said auxiliary boom independently of said main boom comprising a topping lift including a pair of blocks one of which is connected swingably in spaced relation to said mast, means cooperating with said last named block in the inoperative position of the auxiliary boom to maintain said block spaced from the plane of said auxiliary boom to provide purchase for further operation of said auxiliary boom, means comprising a boom stop for limiting the high angle position of said auxiliary boom and preventing it from travelling

beyond "dead center", and means connectible between and cooperable with said mast and said main boom when inoperative for bracing said mast for high angle operation of said auxiliary boom.

7. In a derrick, an upright mast, a main boom hingedly connected to said mast adjacent the lower end of the mast, means for raising and lowering said main boom, an auxiliary boom pivotally connected to said mast at a high point of the mast at the side thereof opposite the main boom, means for raising and lowering said auxiliary boom independently of the main boom, and a strut pivotally secured to the mast to swing between a pendent inoperative position and an outwardly extending operative position and detachably connectible at its outer end with the main boom in an elevated position of the latter to form, together with the main boom and the mast, a rigid triangular upright structure supporting the auxiliary boom.

8. In a derrick, a mast constantly supported upright, a high boom pivotally connected to said mast at a high point of the latter, means for raising and lowering said boom comprising a topping lift including a pair of blocks one of which is connected swingably in spaced relation to the mast, a strut pivotally connected to the mast and engageable with the last-named block in the inoperative position of said boom to maintain said block spaced from the plane of said boom to provide a purchase for further operation of the boom, a strut pivotally connected to the mast at a point above the pivotal connection of the first-mentioned strut and engageable with said boom to limit the high angle position thereof and prevent it from passing dead center, and means borne by one of said struts and engaging the other strut to support both struts in operative position and permit limited relative movement therebetween.

9. In a derrick, an upright mast supported for turning on an upright axis, a main boom pivotally secured to said mast at one side of the mast at a relatively low point of the latter, means for raising and lowering said boom, means for detachably connecting the outer end portion of said main boom to the mast, said connecting means being constructed to form, together with said mast and main boom, a rigid triangular structure, an auxiliary boom pivotally attached to said mast at a high point relatively to the pivotal connection between the main boom and the mast and at the opposite side of the mast from the main boom and means for raising and lowering said auxiliary boom independently of the raising and lowering of said main boom.

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