March 12, 1957 D. M. BATSON ET AL 2,784,850

MACHINE FOR YARDING AND LOADING LOGS

Filed June 22, 1953 6 Sheets-Sheet 1

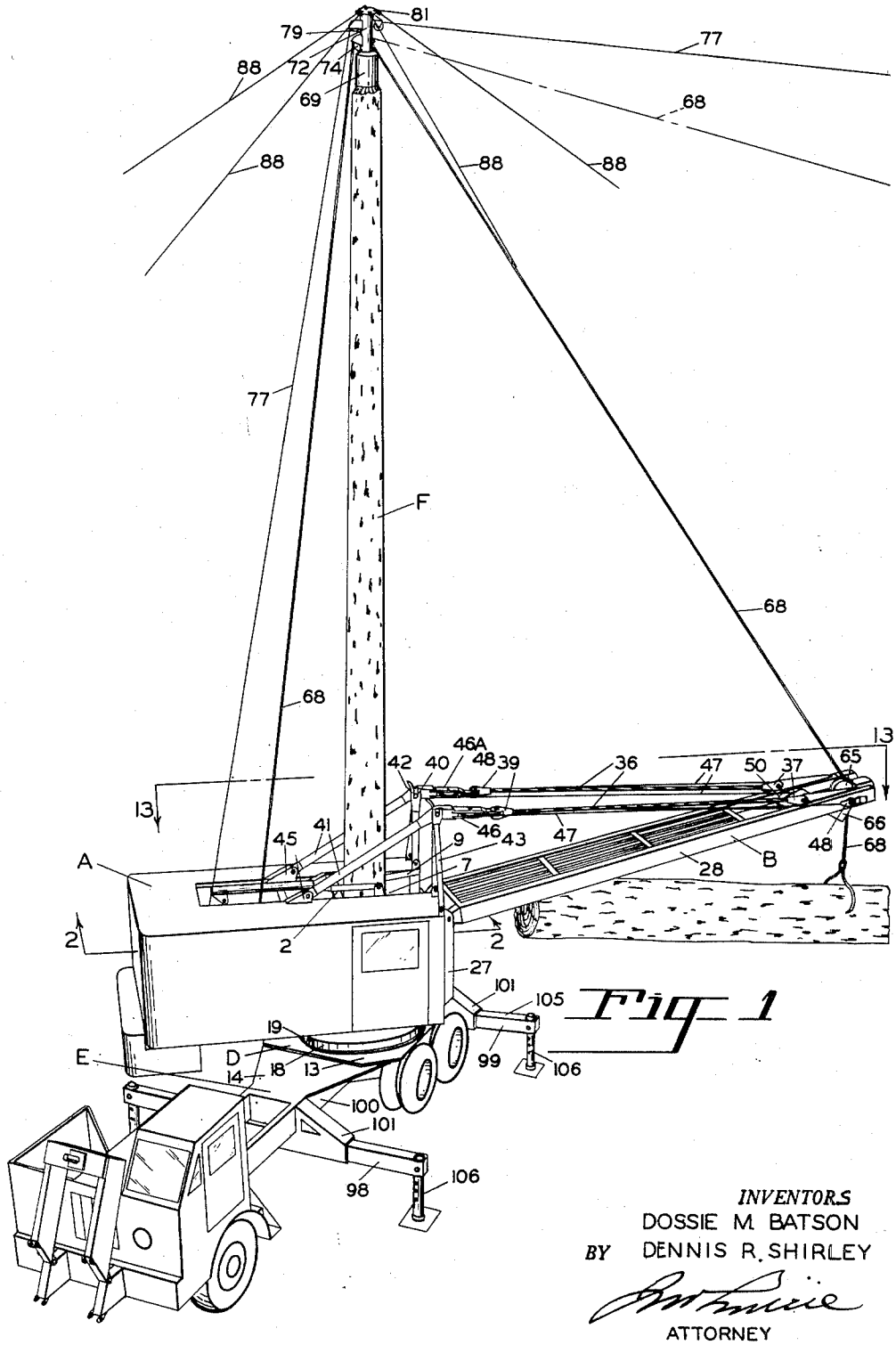


Fig 1

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MACHINE FOR YARDING AND LOADING LOGS

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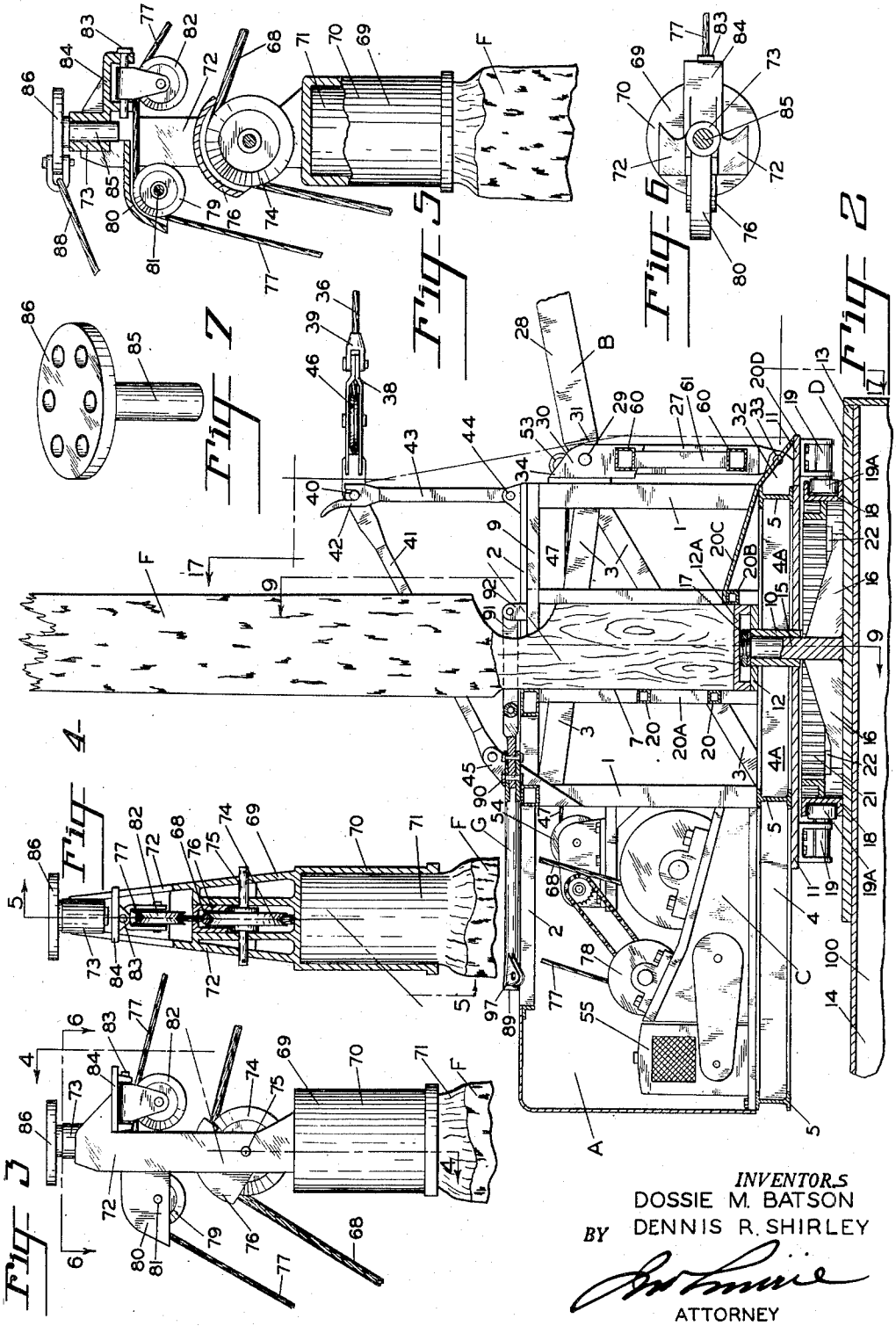


Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Fig. 7

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MACHINE FOR YARDING AND LOADING LOGS

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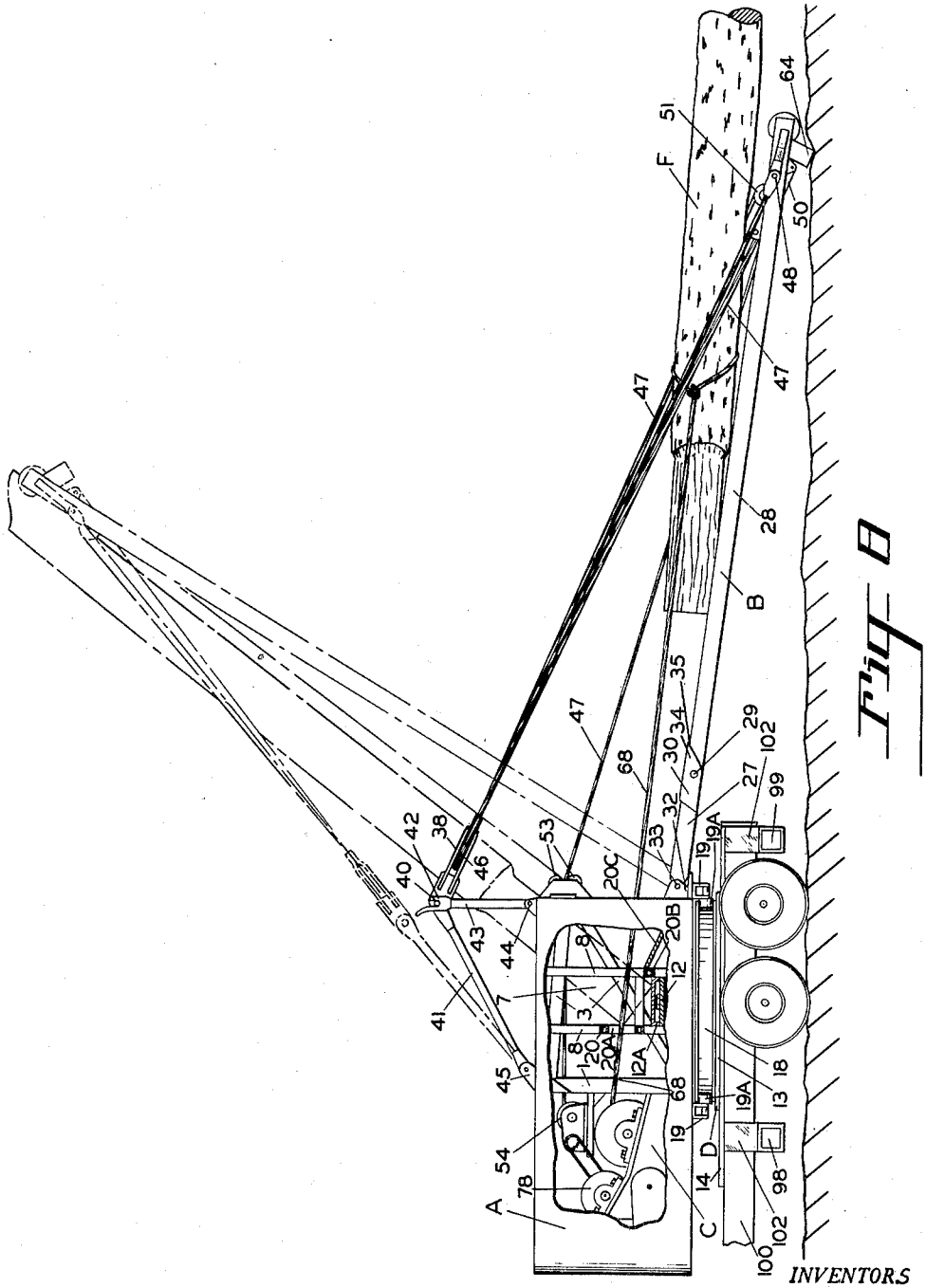


Fig. 8

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MACHINE FOR YARDING AND LOADING LOGS

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Fig 10

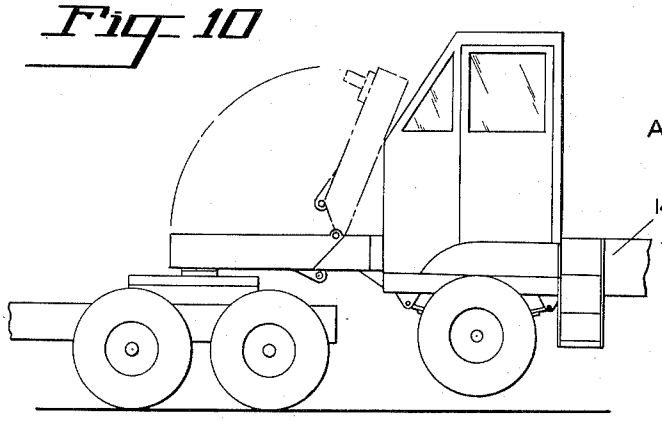


Fig 11

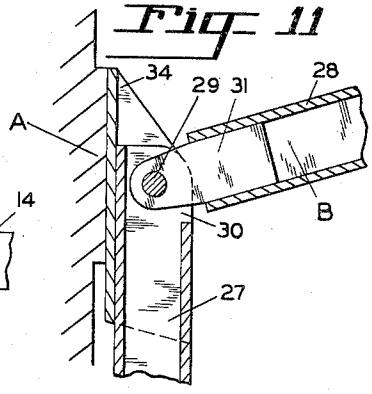


Fig 12

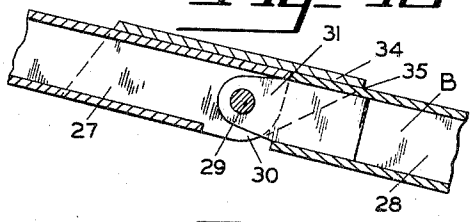


Fig 9

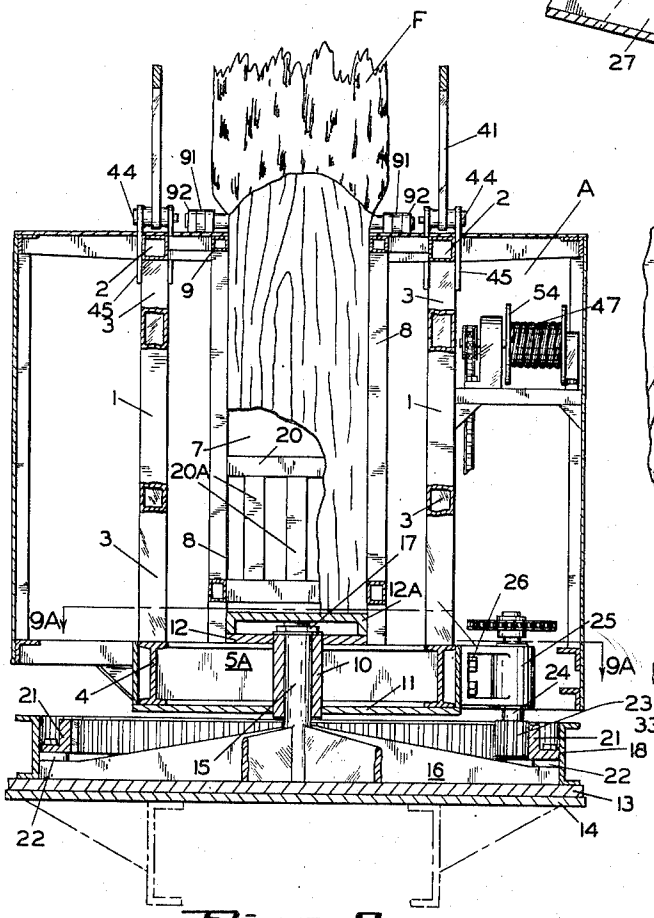
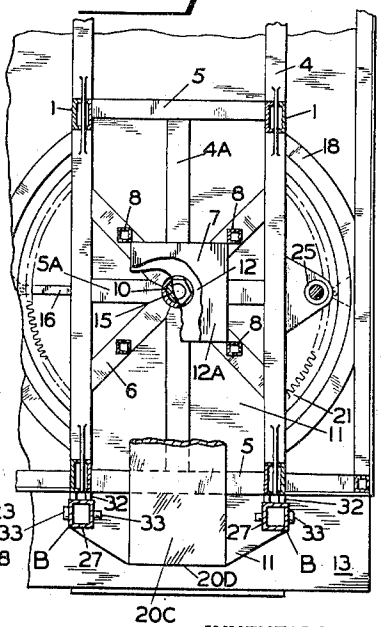


Fig 9A



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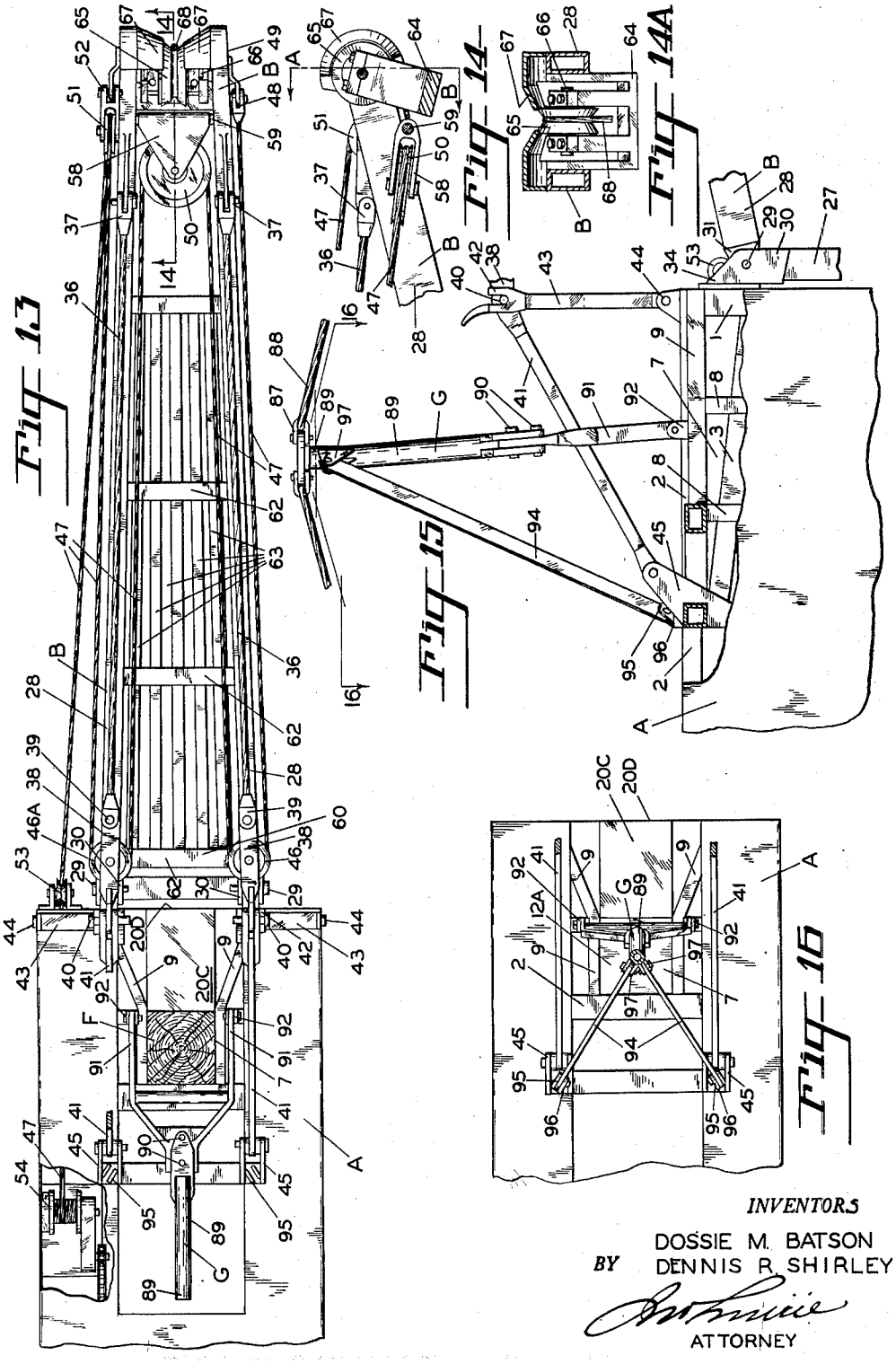


Fig. 13

Fig. 14

Fig. 14A

Fig. 15

Fig. 16

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MACHINE FOR YARDING AND LOADING LOGS

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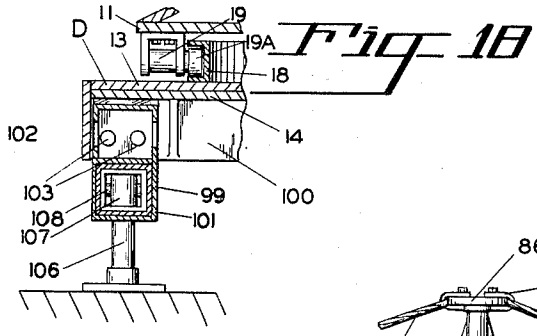


Fig 18

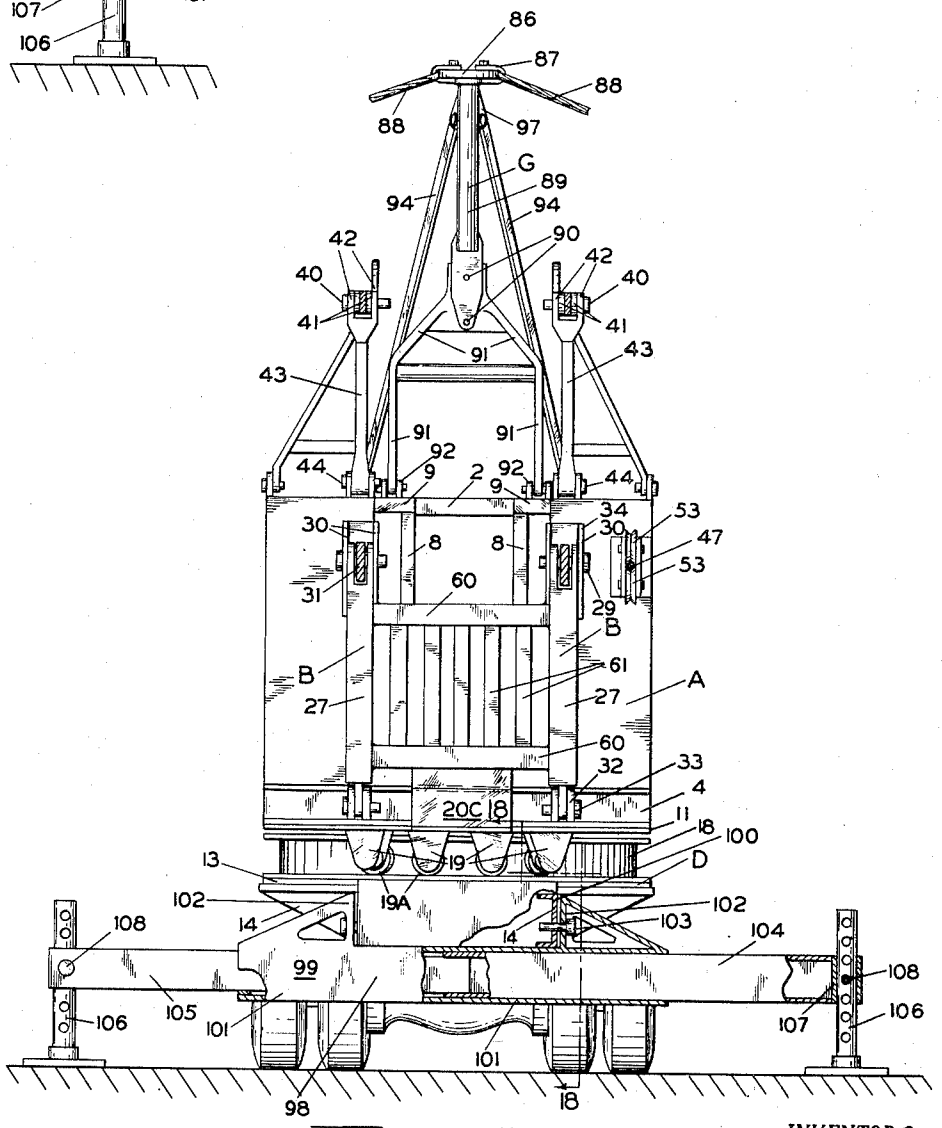


Fig 17

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United States Patent Office 2,784,850 Patented Mar. 12, 1957

2,784,850

MACHINE FOR YARDING AND LOADING LOGS

Dossie M. Batson and Dennis R. Shirley, Portland, Oreg.; said Batson assignor to said Shirley

Application June 22, 1953, Serial No. 363,126

18 Claims. (Cl. 212—58)

Our invention relates to a portable machine for yarding and loading logs, and the primary object of the same is to provide a combination of yarding and loading in one machine.

Another object of our invention is to build a portable yarder and loader that can be operated in a 360° circle.

A still further object of our invention is to provide means of guying the machine through a spar tree mounted within the machine, thus permitting a 360° working circle.

Another object of our invention is the constructing of a boom that can be operated either as a straight boom or a heel or goose-neck boom.

Another object of our invention is to provide a main line and haul back block unit or cap to be applied to a revolving spar tree wherein the said cap will revolve with the tree without interferring with the guy lines.

The novel features that are considered characteristic of the invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and its method of operation, together with additional objects and advantages thereof, will best be understood from the following description of specific embodiments when read in connection with the accompanying drawings, wherein like reference characters indicate like parts through the several figures and in which:

Figure 1 is a perspective view of our new and improved yarding and loading machine, illustrating our new and improved spar tree erected within the machine.

Figure 2 is an enlarged fragmentary sectional view taken on line 2—2 of Figure 1 and illustrating the mounting of the spar tree on the machine.

Figure 3 is a side view of our new and improved cable block cap assembly, which is mounted to the top of the spar tree.

Figure 4 is a sectional view, taken on line 4—4 of Figure 3.

Figure 5 is a vertical sectional view taken on line 5—5 of Figure 4.

Figure 6 is a plan sectional view, taken on line 6—6 of Figure 3.

Figure 7 is a perspective view of the guy line anchor terminal assembly which is rotatably associated with the block or cap assembly of the spar tree.

Figure 8 is a side view of the machine showing the boom in position for pulling the spar tree into the house of the machine, parts of the house being broken away for convenience of illustration.

Figure 9 is a fragmentary sectional view taken on line 9—9 of Figure 2, the machine removed from the truck, broken lines indicating the position of the frame of the truck.

Figure 9A is a fragmentary sectional view of the base frame of the house, taken on line 9A—9A of Figure 9.

Figure 10 is a side diagrammatical view of a means of supporting the weight of the machine on the rear end of a 6-wheel truck while going over the highway.

Figure 11 is a fragmentary sectional view of the folding joint assembly of the boom in the position shown in Figures 1 and 2.

Figure 12 is a sectional detail of the folding joint of the boom while in the position shown in Figure 8.

Figure 13 is a plan sectional view, taken on line 13—13 of Figure 1, illustrating the position of the spar tree and the mechanism associated with the boom.

Figure 14 is a fragmentary sectional view, taken on line 14—14 of Figure 13.

Figure 14A is an end sectional view, taken on line A—B of Figure 14.

Figure 15 is a fragmentary side view of the house of the machine, illustrating a short spar tree in erected position, parts being broken away for convenience of illustration.

Figure 16 is a fragmentary plan view, taken on line 16—16 of Figure 15.

Figure 17 is an end sectional view, taken on line 17—17 of Figure 2 and showing the short spar tree in erected position, parts being broken away for convenience of illustration.

Figure 18 is an enlarged detail sectional view, taken on line 18—18 of Figure 17, illustrating the stabilizing units.

Referring now in detail to the drawings, specifically to Figures 1 and 2, a yarder and loader, in accordance with the present invention, comprises a specially constructed house A, to which is connected a special folding boom B, having the usual hoisting gear C installed therein. The house is mounted on a base D which may be mounted on a truck, or it may be mounted on skids. By mounting the same on a truck, the same is readily portable which is one of the objects of our invention.

The house A has specially rugged vertical framework 1, and horizontally disposed framework 2 with a cross bracing 3. This framework is mounted on the base frame 4. The base frame 4 is ruggedly constructed by having cross members 5 and diagonal frame members 6. The object of constructing the framework of the house in this manner is to provide sufficient strength to mount a spar tree F therein for stabilizing the machine, while performing heavy work, as for handling heavy logs. The position of the braces 3 is important, due to the fact that they absorb the back thrust of the boom while in the goose-neck position.

Erected upon the base frame 4 is a chamber 7 bordered by the vertical posts 8. These posts are mounted upon the diagonal framework 6 of the base 4 at their lower ends, having their upper ends secured to the underside of the horizontal framework 2 by way of the framework 9, which is secured to the framework 2 as best illustrated in Figures 2, 9 and 13. The frame member 4A and the cross frame 5A, including the diagonals 6, intersect and join to the vertical sleeve or bearing 10 by welding or any other suitable means, as best shown in Figures 9, 9A and 2.

The base frame 4 rests on a plate or platform 11 and is welded securely thereto. Mounted and welded to the top of the frame members 4A, 5A and 6 is a relatively heavy plate 12 through which the sleeve 10 passes, and is welded thereto. The sleeve is also welded to the plate 11. A base 13 is secured to the truck frame 14 by any suitable means, as for instance welding.

Projecting up from the base 13 is a king pin 15. This king pin is fixedly secured to the said base and is braced by the gusset members 16. The king pin passes up through the sleeve or bearing 10 and is secured to the cap or plate 12 by the nut 17.

Fixedly secured to the base 13 is a circular channel shaped track 18, also secured to the underside of the

base base plate 11 of the frame 4 are the trunnion wheel assemblies 19. The wheels 19A of the trunnion wheel assemblies travel within the track 18, as best illustrated in Figures 2, 9 and 17. These trunnion wheel assemblies are adapted to support the weight of the house, and the load on the boom B. The spar tree is supported directly on the base 13 by way of the sub-base 12A and the king pin 15.

Transverse members 20 are disposed between the vertical posts 8. These cross members carry the vertical bars 20A against which the butt of the spar tree engages while erecting the same. A cross member 20B connects the upright 8 and has an inclined platform 20C supported thereon and leading over the cross member 5 of the base frame 4 to the point 20D of the base plate 11. The platform 20C directs the base of the spar tree into the chamber 7 while erecting the spar tree.

Referring particularly to Figure 9, a ring gear 21 is mounted on the brackets 22 forming part of the track 18. This ring gear has a pinion 23 meshing therewith, the said pinion being keyed to the shaft 24 which is journalled within the bearing 25, which is fixedly secured to the base frame 4 by any suitable means, as bolts 26. This pinion is driven preferably by a hydraulic motor not here shown in the drawings, but it may be driven by any other suitable power means. As the shaft 24 is revolved it will revolve the pinion 23, which will crawl around within the ring gear 21, rotating the house A and its boom B, including the spar tree F.

In order to carry out the objects of our invention, we have constructed a two-piece boom. This boom consists of legs 27 and 28. These legs are hinged together by the cross pin 29, which passes through the sides 30 of the legs 27 and through the tongue 31 forming part of the inner end of the boom legs 28, as best illustrated in Figures 11 and 12. The lower ends of the legs 27 are pivotally mounted to the frame 4 of the house by way of the outwardly extending ears 32 and by way of the pins 33.

The boom may be operated in the position shown in Figures 1, 2 or 11. While in this position the boom is being operated primarily as a loader, or the said boom may be operated in the position shown in Figure 8 as a straight boom and for erecting the spar tree F. When the boom is being operated as shown in Figures 1, 2 and 11, the legs 27 are forced towards the framework 1 of the machine by the action of the pressure towards the machine exerted on the boom. While operated in the position shown in Figure 8, the extension 34 forming part of the upper end of the legs 27 comes down against the point 35 of the legs 28, maintaining both the legs 27 and 28 in alignment, due to the weight of the boom.

When the boom is being operated as shown in Figures 1, 2 and 11, the same is supported by the cables 36 which are shackled to the boom at 37, and to the shackle blocks 38 at 39. The shackle blocks 38 are pivotally connected to the pins 40, referring particularly to Figures 1, 2 and 13. The pins 40 are fixedly anchored to the struts 41 and are adapted to drop into the bifurcated ends 42 of the vertical legs 43, which are pivotally connected to the framework 2 of the machine at 44. The opposite end of the struts 41 are connected to the brackets 45, which are fixedly secured to the framework of the house. Located within the shackle bars 38 are sheaves 46 and 46A.

Referring particularly to Figure 13, a boom operating cable 47 is dead ended at 48 to the outer end 49 of the boom. This cable is trained about the sheaves 46 and back down through the sheave 50, returned to the sheave 46A and back to the outer end of the boom to the sheave 51. The said sheave 51 is anchored to the end of the boom at 52, then back through the fair-lead assembly 53 and to the cable boom hoist 54. The hoist 54 is of a conventional design and is driven from the hoisting engine motor 55 by way of a power take-off assembly not here shown.

Referring back to the sheave 50, its frame 58 is pivoted between the legs of the boom by way of the cross shaft 59 in a horizontal plane. The sheave 50 is made relatively large so that the cable 47 is kept away from the center line of the boom. The object of positioning the cable 47 as above described is to provide a clear path over the center of the boom for pulling in the spar tree while erecting the same, the operation of which will be later described.

The boom B consists of legs 27 and 28, referring to Figure 17. The legs 27 are joined together by the cross members 60, the said cross members having vertical members 61 joining them together forming an abutment for the ends of the logs while handling the same in loading operations. Referring to Figure 13, the legs 28 of the boom are joined together by the cross members 62. Longitudinal bars 63 are also disposed between the legs 28 and supported by the cross members 62. The outer ends of the legs are spaced apart by the U-shaped member 64.

The main line cable sheave 65 is journalled to the outer end of the U-shaped member at 66. Inclined shields 67 bridge the space between the legs 28 and the sheave 65. These shields guide the main line 68 into the sheave at all times in the operation of the line.

For yarding and loading of logs, we have provided means of erecting a spar tree directly above the vertical axis of the house. This spar tree will permit the rotation of the boom a complete 360°. We have also provided a special cap for the tree for guying the same and for supporting the main line and the haul back line.

Referring to Figure 8, we illustrate how the spar tree is being pulled over the boom towards the house of the machine. The broken lines in this view illustrate how the spar tree is being raised by the boom. Before the spar tree is raised the main line and the haul back line are threaded through a cap or block unit, which is applied to the tree before the same is raised. This cap unit is indicated by numeral 69, Figures 3, 4, 5 and 6.

This unit consists of a cap 70 for fitting over the reduced portion 71 of the top of the spar tree F. Vertical legs 72 form part of the cap and extend upwardly, terminating in a sleeve or bearing 73. The main line sheave 74 is journalled to the cross shaft 75, which in turn is mounted within the framework 72, as best illustrated in Figures 3 and 4.

A cap or guide 76 is mounted within the framework for guiding the main line cable 68 over the sheave 74. The haul back line 77, leading from the haul back drum 78 of the hoisting unit C, runs to the top of the spar tree and trained about the haul back sheave 79. The haul back sheave 79 is journalled within the cap or guide 80 by way of the cross shaft 81. The said haul back line is then trained through the sheave block 82. The sheave block 82 is pivotally mounted to the horizontal shaft 83, which is supported by the bracket 84 of the vertical legs 72, as best illustrated in Figures 4 and 5.

The hanging of the block 82 in this manner is important, in that it will let the haul back line lead away from the spar tree at an angle from the main line. Rotatably mounted within the sleeve 73 is a stub shaft 85. A disk 86 forms part of the upper end of this stub shaft and is adapted to receive cable shackles 87 which connects the guy lines 88 to the spar tree.

For loading of logs, we have provided a short spar tree G, which forms part of the house. This spar tree consists of a metal tube 89 which is removably secured at 90 to the legs 91. The legs 91 are pivotally connected to the upwardly extending ears 92 forming part of the frame members 9 of the house. When this spar tree is not in use it lies in the position illustrated in Figures 2 and 13, but when the same is in use it assumes the position as shown in Figures 15, 16 and 17 and is held in this position by the braces 94. The lower end of the said braces being connected to the upwardly extending ears 95, which

are welded to the frame of the house at 96. Their upper ends being connected to the ears 97 forming part of the tube 89 of the spar tree G.

The guy line anchor terminal, referring to Figure 7, is adapted to fit on top of the spar tree G by having its stub shaft 85 inserted within the end of the tube 89, the center of the guy line terminal coming on the vertical axis of the house.

The machine is further stabilized by the outriggers 98 and 99. These units are removably secured to the frame 100 of the truck. They consist of a tubular member 101 having upwardly extending jaws 102 for embracing the said frame of the truck. Pins 103 pass through these jaws and through the frame of the truck, holding the said outrigger units to the truck.

Telescopical arms 104 and 105 are slidably mounted within the member 101. This structure is best illustrated in Figures 17 and 18. When the supporting arms 104 and 105 are not in use they are telescoped within the member 101. Vertical legs 106 are slidably mounted within the bearings 107 within the outer ends of the arms 104 and 105 and held therein by the pins 108.

We will now describe the operation of our machine for yarding and loading of logs. The boom B is used as a straight line boom for the purpose of erecting the spar tree as shown in Figure 8. The guy cables 36 are removed from the shackle blocks 38 and from the boom at 37, referring to Figure 13. The boom B is then supported by the boom line 47 through the hoist 54, referring to Figure 8. The boom is raised and lowered by the line 47 and the hoist 54.

The lower end of the spar tree is squared off to a size that it will fit into the spar tree holding chamber 7 within the house. The upper end of the spar tree is reduced down as illustrated in Figures 3, 4 and 5. The cap 69 and the cable block assembly is then fitted to the reduced portion 71 of the spar tree F while the same is lying on the ground. The guy lines 88 and the shackles 87 are secured to the disk 86 of the guy line terminal assembly.

The outer end of the main line 68 is shackled to the spar tree in the usual manner. The hoisting gear C reels the said line in pulling the tree over the top of the boom on the longitudinal rails 63 and between the runs of the boom line 47. When the base of the tree approaches the house it slides up over the platform 20C into the chamber 7 and against the transverse members 20 and vertical bars 20A. This will hold the base of the tree in place while the boom B is raised as indicated by the broken lines in Figure 8.

When the base of the spar tree reaches this chamber the main line is disconnected therefrom and threaded through the sheave block 74 while the log is still lying on the ground. The end of the main line is then secured to a lower cross member of the boom so that it will be within reach of the operator. Before the spar tree has been erected the haul back line is also threaded through its sheave blocks 78 and 82.

The boom is raised by the boom line 47 being wound on the hoist 54 about the sheaves 46, 50, 46A, 51 and back through the fair-lead 53. The sheaves 46 and 46A are journalled within the shackle blocks 38, which in turn are anchored to the upright legs 43. When the boom reaches the position slightly before the broken line position the pins 40 will leave the bifurcated ends of the legs 43 so that the angle of pull of the cable 47 will continue to raise the boom to its vertical position, at which time the guy wires 88 will be secured to suitable anchor points beyond the machine.

In the rotating of the boom in yarding and loading operations, the spar tree will be revolved with the vertical axis of the house. The stem 85 of the guy line anchor unit will revolve within the sleeve 73, permitting the guy lines to remain stationary while the mast is revolved thereunder, thus permitting a 360 degree rotation of the cab and boom under the said guy lines.

For loading operations the short mast G is erected to the position shown in Figures 15, 16 and 17. This will permit the boom B to operate within a 360 degree circle thereunder.

When the spar tree F has been erected the boom B will be brought to the position shown in Figures 1, 2, 11, 13 and 17, which is termed as a goose-neck or healed position.

What is claimed is:

1. A portable yarder and loader comprising a mobile chassis, a cab rotatably mounted on said chassis, a boom pivotally connected to the fore end of said cab, a spar of substantially greater length than the boom mounted in said cab in vertical alignment with the axis of rotation of said cab, hoisting means mounted in said cab, a main line connected to said hoisting means and trained over the upper end of said spar for extension beyond the machine for the yarding in of logs from surrounding territory, said main line being further adapted to be trained over the outer end of the said boom for the loading of logs which have been yarded into the machine, said boom including sections that are pivotally connected to each other, and means provided at said pivotal connections for maintaining said sections in longitudinal alignment.

2. A portable yarder and loader comprising a mobile chassis, a cab mounted for rotation on said chassis, a boom pivotally connected to the lower fore end of said cab, supporting legs pivotally connected to the upper fore end of said cab, cables connected to the outer end of said boom and the upper end of said legs for supporting said boom, an operating cable connected to the outer end of said boom, hoisting means mounted in said cab and connected to said operating cable for raising and lowering of said boom, a spar mounted on said cab, guy line anchor means mounted on the upper end of said spar, and means for bracing said spar in relation to said cab.

3. In a portable yarder and loader including a mobile chassis, a base rotatably mounted on said chassis, a cab on said base, a boom swingably mounted on said base at the fore end of said cab, said base having a spar receiving socket projecting upwardly therefrom into said cab on an axis coextensive with the rotational axis of said base for increasing the lifting capacity of the boom, said cab having a longitudinal passage opening into the fore end thereof communicating said boom and socket whereby the boom may be utilized to place the spar in the socket and then raise the spar.

4. In a portable yarder and loader including a mobile chassis, a base rotatably mounted on said chassis, a cab on said base, a boom swingably mounted on said base at the fore end of said cab, said base having a spar receiving socket projecting upwardly therefrom into said cab on an axis coextensive with the rotational axis of said base for increasing the lifting capacity of the boom, said cab having a longitudinal passage opening into the fore end thereof communicating said boom and socket whereby the boom may be utilized to place the spar in the socket and then raise the spar, said cab having a pair of upstanding supporting legs projecting upwardly therefrom in flanking relation to said longitudinal passage adjacent said cab fore end, cables supporting the outer end of said boom and attached to the upper ends of said legs.

5. In a portable yarder and loader including a mobile chassis, a base rotatably mounted on said chassis, a cab on said base, a boom swingably mounted on said base at the fore end of said cab, said base having a spar receiving socket projecting upwardly therefrom into said cab on an axis coextensive with the rotational axis of said base for increasing the lifting capacity of the boom, said cab having a longitudinal passage opening into the fore end thereof communicating said boom and socket whereby the boom may be utilized to place the spar in the socket and then raise the spar, said base having an upwardly inclined ramp in said passage leading from the fore end of said cab to said socket for sliding a spar up the boom to the socket

whereby subsequent upward swinging movement of said boom will drop the spar into said socket.

6. In a portable yarder and loader including a mobile chassis, a base rotatably mounted on said chassis, a cab on said base, a boom swingably mounted on said base at the fore end of said cab, said base having a spar receiving socket projecting upwardly therefrom into said cab on an axis coextensive with the rotational axis of said base for increasing the lifting capacity of the boom, said cab having a longitudinal passage opening into the fore end thereof communicating said boom and socket whereby the boom may be utilized to place the spar in the socket and then raise the spar, a hoisting mechanism within said cab and operatively connected to said boom, said hoisting mechanism being disposed within said cab rearwardly of the rotational axis of said cab.

7. In a portable yarder and loader including a mobile chassis, a base rotatably mounted on said chassis, a cab on said base, a boom swingably mounted on said base at the fore end of said cab, said base having a spar receiving socket projecting upwardly therefrom into said cab on an axis coextensive with the rotational axis of said base for increasing the lifting capacity of the boom, said cab having a longitudinal passage opening into the fore end thereof communicating said boom and socket whereby the boom may be utilized to place the spar in the socket and then raise the spar, said base having an upwardly inclined ramp in said passage leading from the fore end of said cab to said socket for sliding a spar up the boom to the socket whereby subsequent upward swinging movement of said boom will drop the spar into said socket, said boom comprising an elongated member with a generally planar upper surface from its swinging connection to the base whereby a spar may be slid therealong into communication with said spar receiving socket.

8. In a portable yarder and loader having a mobile chassis, a base on said chassis and a cab on said base, a boom pivotally mounted on said base at the fore end of said cab, said boom comprising inner and outer sections pivotally connected to one another, means on one section overlying the other whereby the sections can not swing beyond alignment with one another in one direction, a gantry structure carried by said cab, boom supporting cables interconnecting said gantry structure and the outer end of said boom, means for lengthening and shortening said supporting cables to lengthen and shorten said boom by selectively maintaining said boom sections in alignment with one another as a long boom and in angularly movable relation relative to one another as a short boom, and means on the fore end of said cab for abutment by the inner boom section when the boom sections are relatively angularly movable with the outer boom section functioning as a short boom.

9. In a portable yarder and loader including a mobile chassis, a base rotatably mounted on said chassis, a cab on said base, a boom swingably mounted on said base at the fore end of said cab, said base maving a spar receiving socket projecting upwardly therefrom into said cab on an axis coextensive with the rotational axis of said base for increasing the lifting capacity of the boom, said cab having a longitudinal passage opening into the fore end thereof communicating said boom and socket whereby the boom may be utilized to place the spar in the socket and then raise the spar, said base having an upwardly inclined ramp in said passage leading from the fore end of said cab to said socket for sliding a spar up the boom to the socket whereby subsequent upward swinging movement of said boom will drop the spar into said socket, said boom comprising an elongated member with a generally planar upper surface from its swinging connection to the base whereby a spar may be slid therealong into communication with said spar receiving socket, supporting legs extending upwardly from said cab in flanking relation to said passage, generally parallel boom supporting cables attached at their inner ends to said legs and at their outer ends to the outer end of said boom whereby a spar may be slid unobstructedly along said boom.

10. In a portable yarder and loader having a mobile chassis, a base on said chassis, and a cab on said base, a boom pivotally attached to said base at the forward end of said cab and having a section thereof normally lying against the forward end of said cab, bracing means within said cab for transmitting horizontal thrusts against said forward end to said base, said bracing comprising transversely spaced, vertical posts fixed to said base within and adjacent opposite sides of said cab rearwardly of said forward ends, longitudinally extending beams cantilevered from the upper portions of said posts into bracing relation with the forward end of said cab, and diagonal braces connecting the outer ends of said beams and the lower portions of said posts.

11. A portable yarder and loader comprising a mobile chassis, a cab mounted for rotation on said chassis, a boom pivotally connected to the fore end of said cab, gantry means pivotally connected to the upper portion of said cab, cables connected to the outer end of said boom and the free end portion of said gantry means for supporting said boom, an operating cable connected to the outer end of said boom, hoisting means mounted in said cab and connected to said operating cable for raising and lowering of said boom, a spar mounted on said cab, guy line anchor means mounted on the upper end of said spar, and means for bracing said spar in relation to said cab.

12. A portable yarder and loader as defined in claim 11 wherein said gantry means includes strut means pivotally mounted at one end on said cab, said cables being connected to the free end of said strut means, and brace means pivotally mounted at one end on said cab and having strut engaging means on the free end thereof for releasably supporting the free end portion of said strut means.

13. A portable yarder and loader as defined in claim 12 wherein said brace means is mounted on the fore end of said cab and said strut means is mounted rearwardly of said brace means, said strut engaging means comprising yoke means for freely receiving said strut means and permitting elevation thereof when said boom is raised.

14. A portable yarder and loader as defined in claim 11 wherein said spar is pivotally mounted on said cab.

15. A portable yarder and loader as defined in claim 11 wherein said guy line anchor means is pivotally mounted on said spar.

16. A crane structure comprising a cab, a boom mounted on the lower fore end of said cab, an operating cable connected to the outer end of said boom, hoisting means mounted in said cab and connected to said operating cable for raising and lowering said boom, supporting cables connected to the outer end of said boom, strut means connected at one end to said supporting cables and pivotally mounted at the other end to the upper portion of said cab to swing up and down according to the elevation of said boom, brace means pivotally mounted on the upper fore end of said cab in front of said strut means, and yoke means on the free end portion of said brace means for straddling and supporting the free end portion of said strut means when the boom is lowered but permitting elevation of said strut means when the boom is raised.

17. A crane structure as defined in claim 16 wherein said strut means includes a pair of laterally spaced rigid struts, shackles attached to said supporting cables, elongated pivot pins connecting the free ends of said struts to said shackles and extending beyond said shackles and struts on both sides thereof, said brace means comprises a pair of laterally spaced bars, and said yoke means comprising a U-shaped portion on the free end of each of said bars for respectively straddling said struts and shackles, the arms of said U-shaped portions being bifurcated to straddle the extending ends of said pivot pins.

18. A crane structure as defined in claim 16 wherein said strut means includes a pair of laterally spaced struts, shackles pivotally connected to said struts and attached to said supporting cables, a sheave journaled in each of said shackles, a sheave journaled on the free end of said boom centrally thereof, a sheave journaled on the free end of said boom on one side thereof, and anchor means on the free end of said boom on the opposite side thereof, said operating cable being anchored at one end to said anchor means and passing through the shackle sheave on the corresponding side of said boom and through said central sheave and through the other shackle sheave and then through said side sheave and back to said hoisting means.

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