Feb. 10, 1970 J. L. THIBODEAU 3,494,389

SLASHER-LOADER

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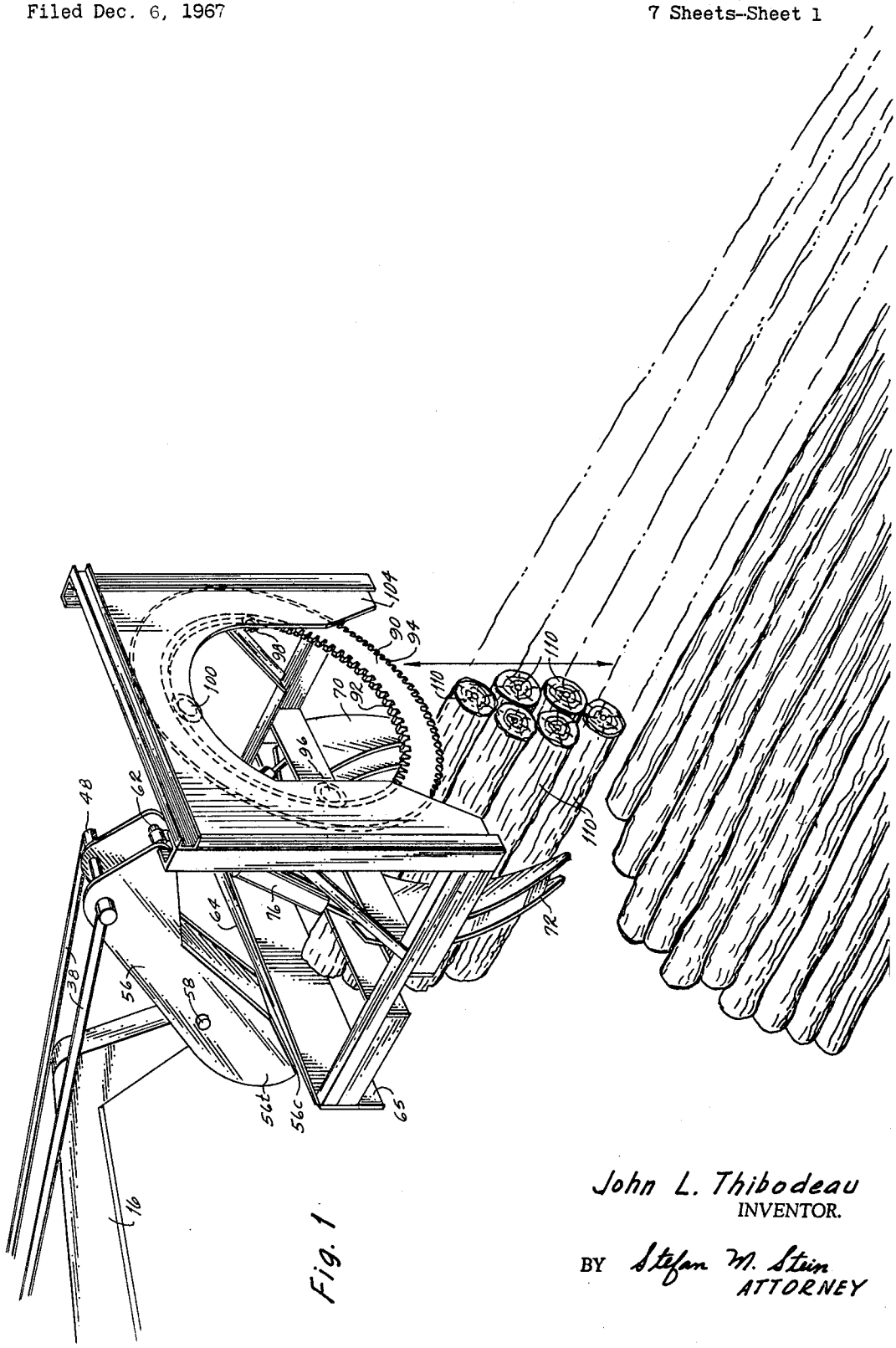


Fig. 1

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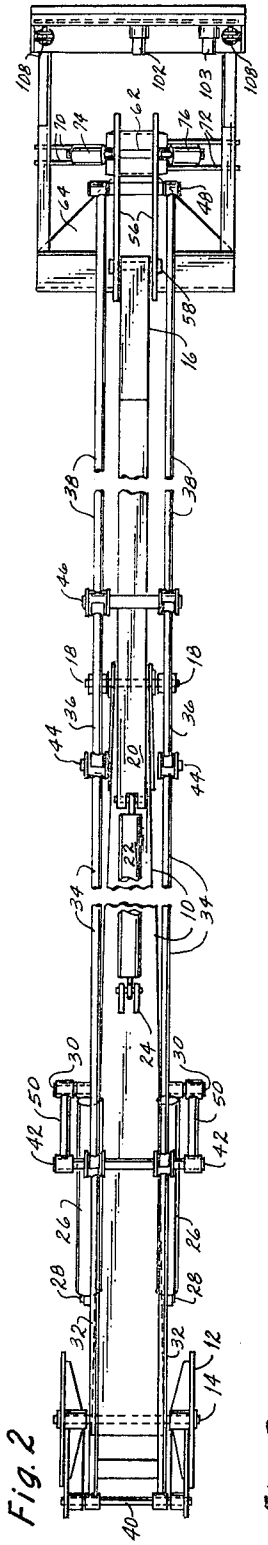


Fig. 2

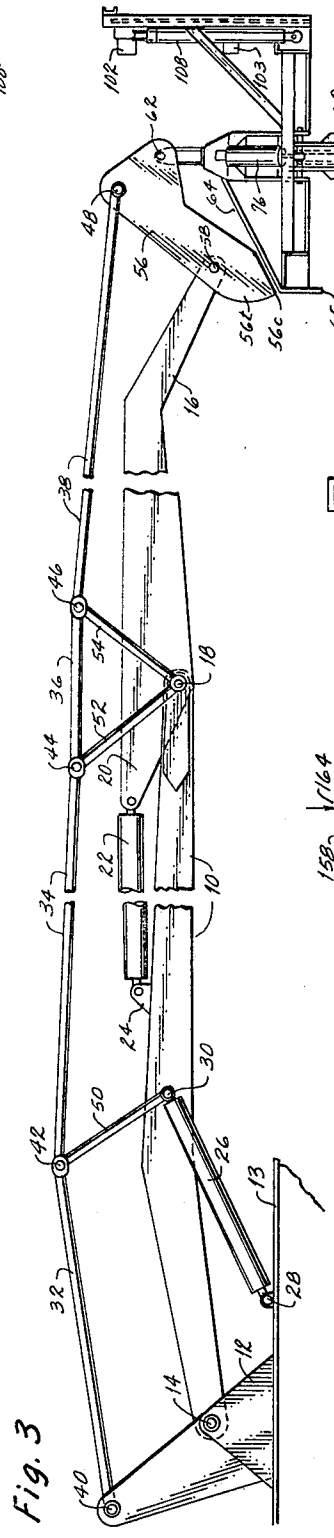


Fig. 3

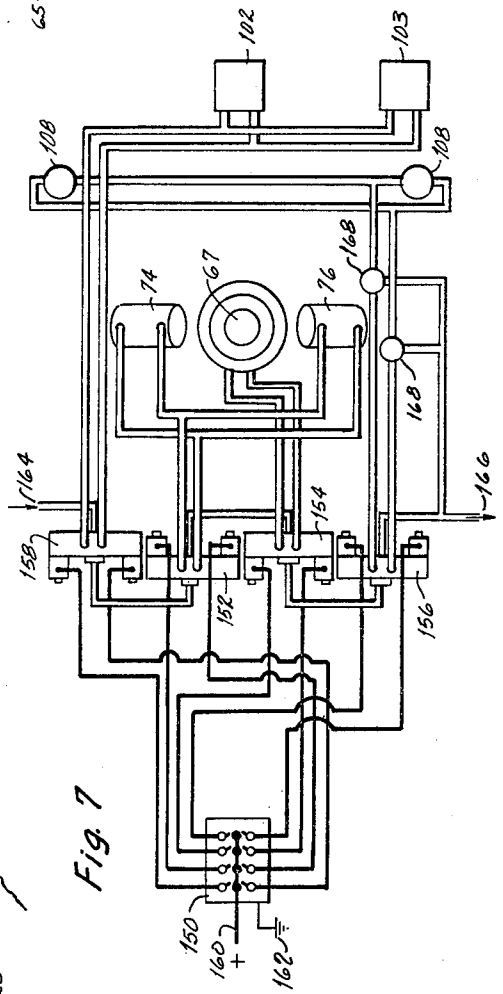


Fig. 7

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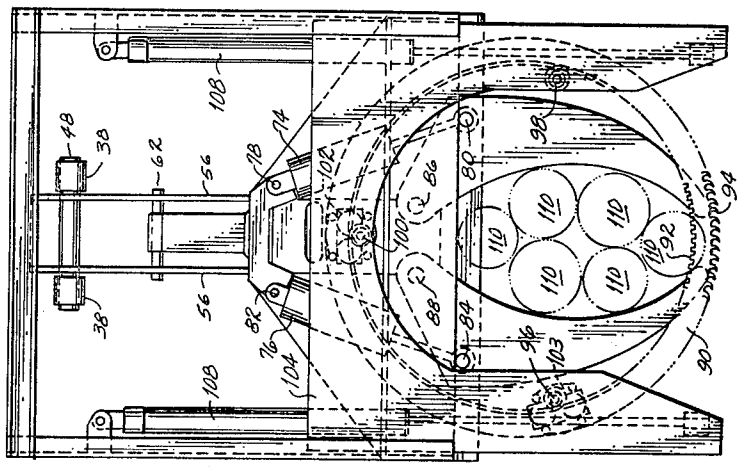


Fig. 6

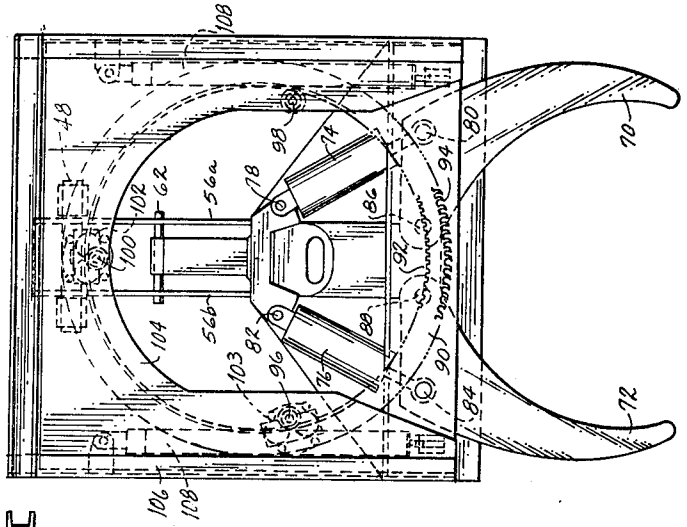


Fig. 5

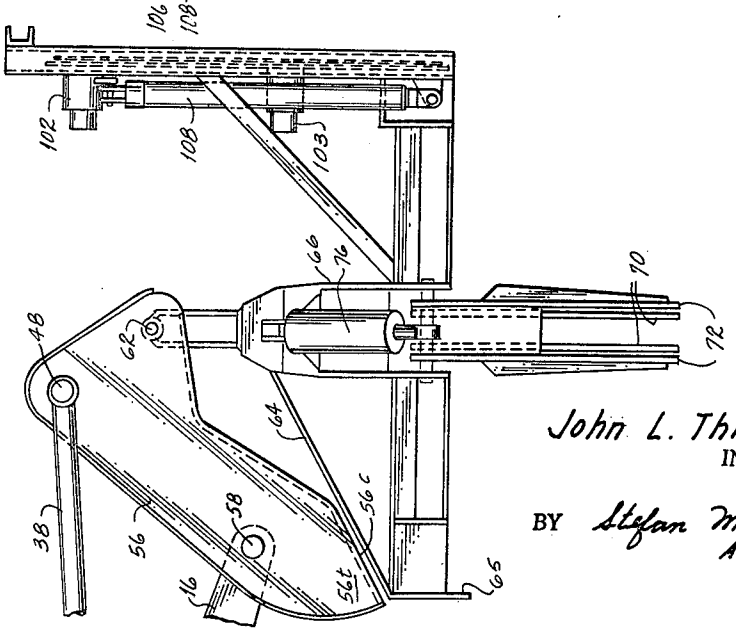


Fig. 4

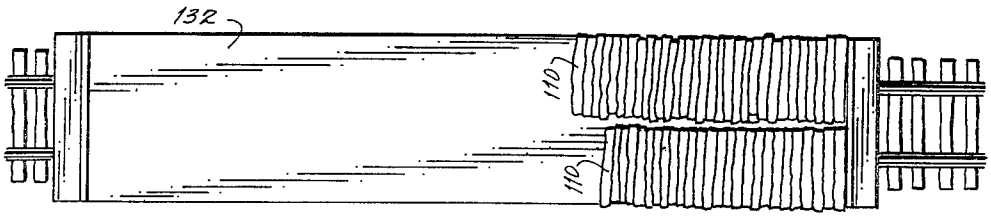
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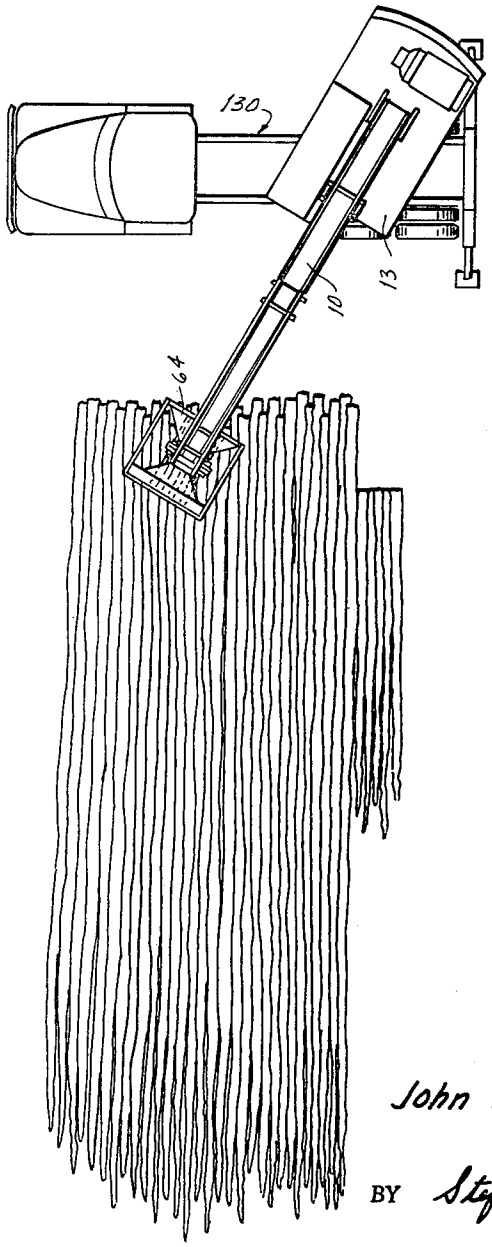


Fig. 8

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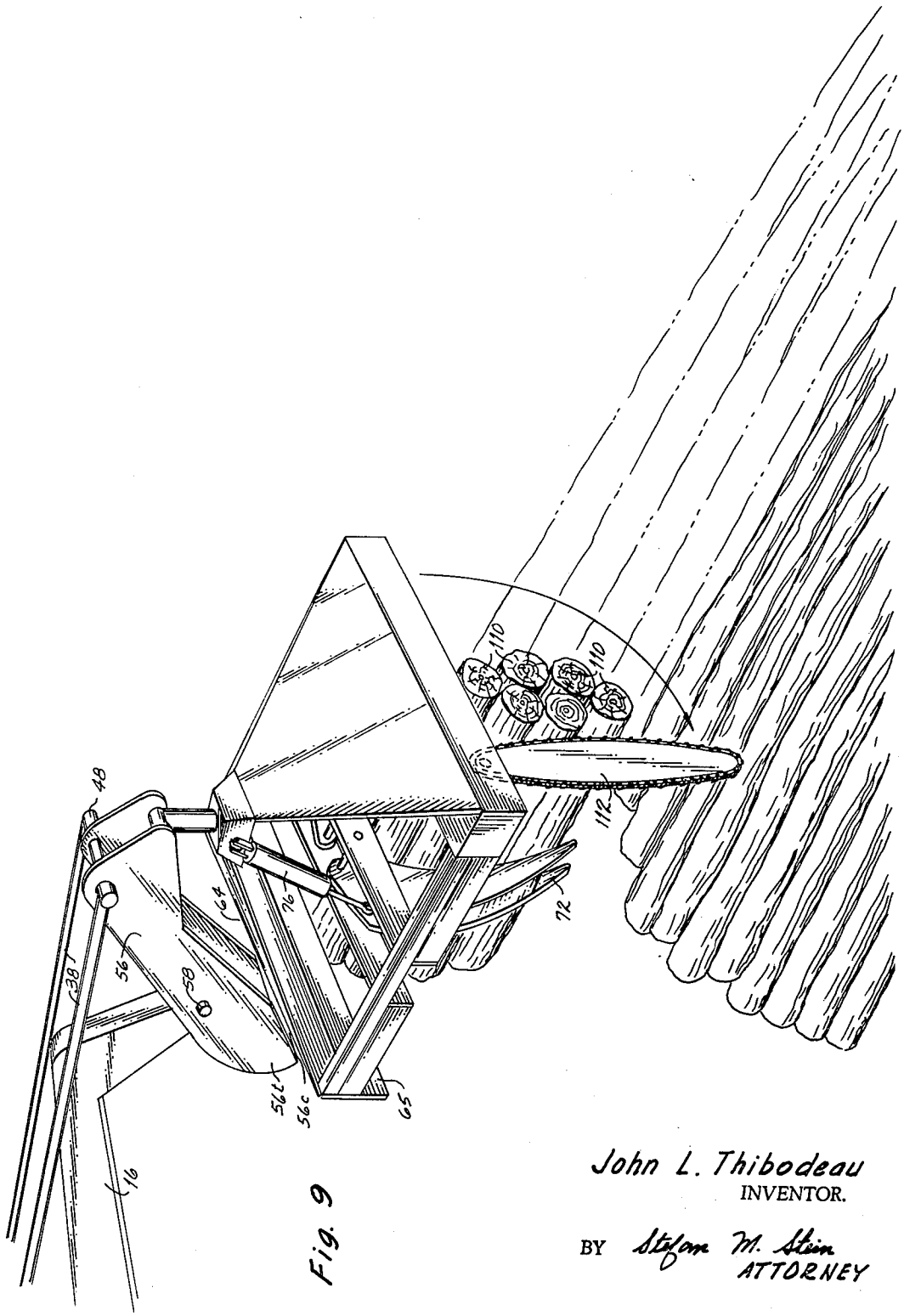


Fig. 9

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Fig. 12

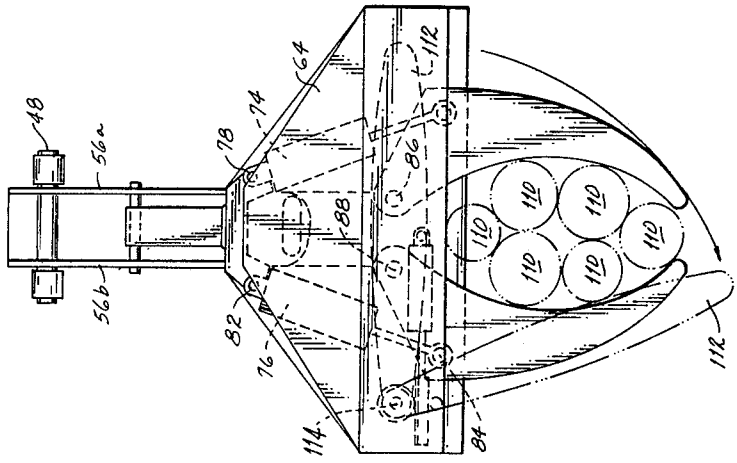


Fig. 11

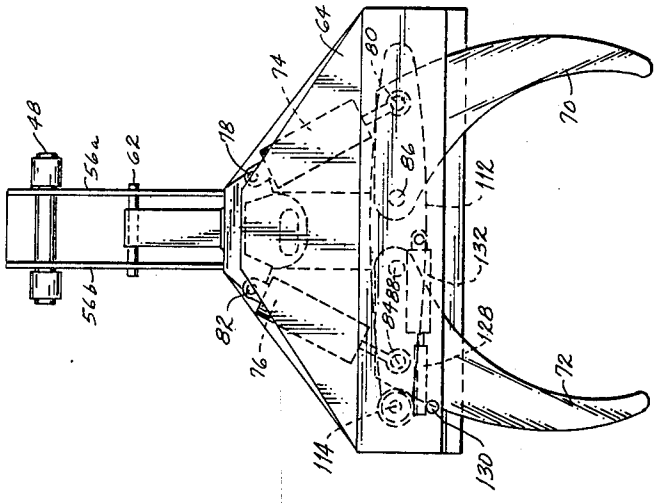
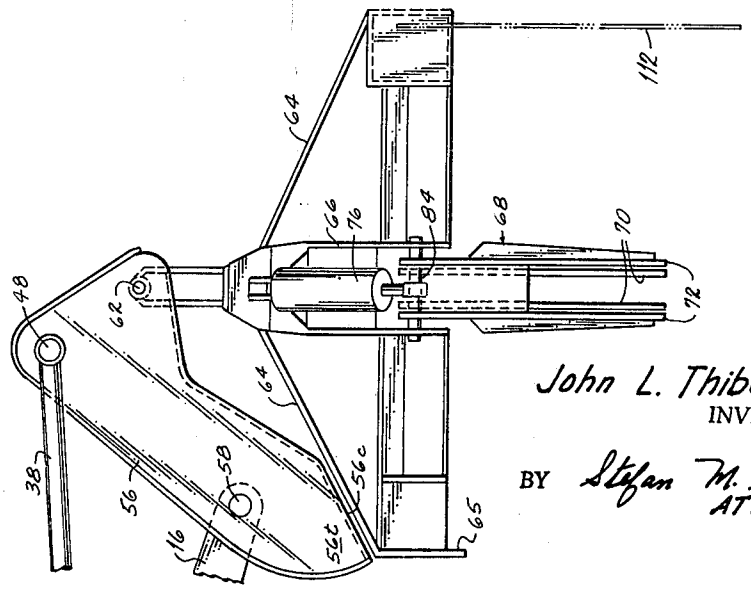


Fig. 10



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Fig. 13

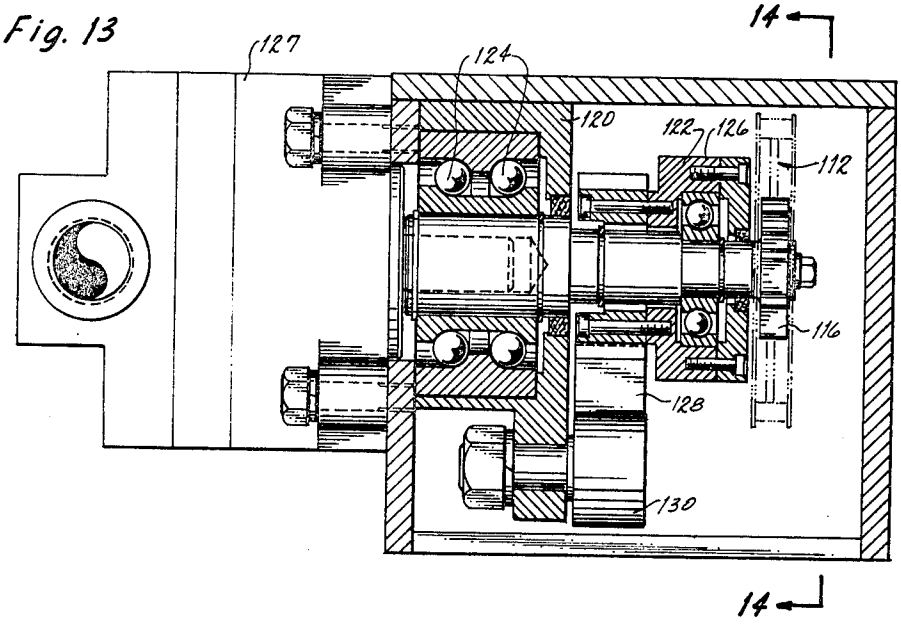
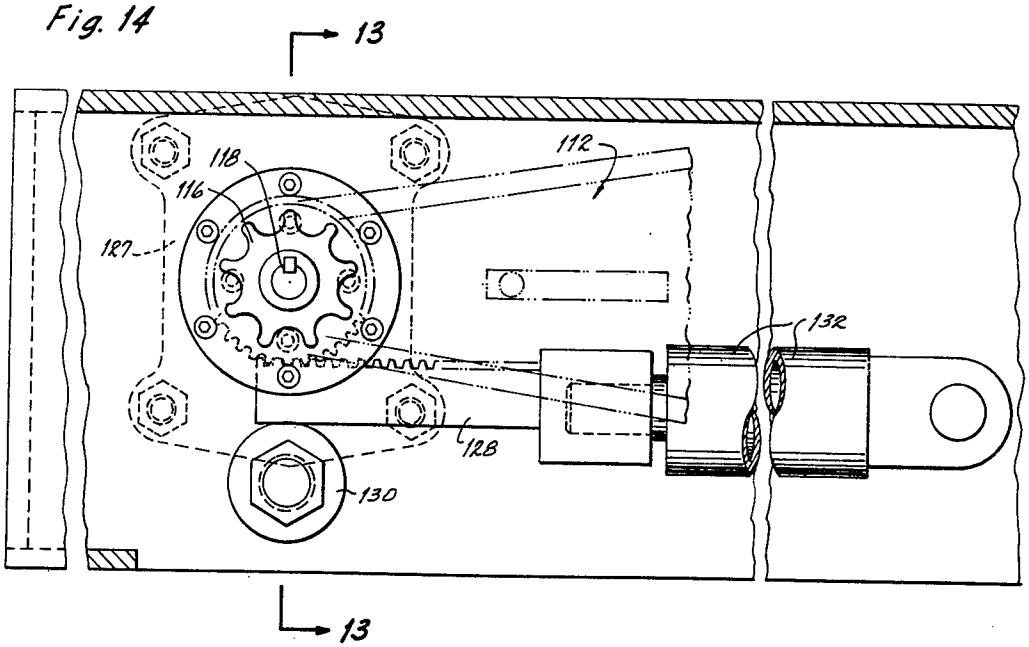


Fig. 14



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United States Patent Office 3,494,389 Patented Feb. 10, 1970

3,494,389

SLASHER-LOADER

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Int. Cl. B27b 5/14
U.S. Cl. 143—32 9 Claims

ABSTRACT OF THE DISCLOSURE

Apparatus for slashing and loading timber consisting of an inner main boom and an outer knuckle boom and support linkage for both, said booms and linkage being secured at the base end to a bell crank mount and at the working end to a hoist bar which remains in a fixed position. A clamp frame having a timber clamp and a power saw affixed to it is hung from said hoist bar. The frame has a cam surface which bears against said hoist bar to maintain a fixed horizontal position during use.

This invention relates to apparatus for the slashing and loading of timber. More particularly the invention relates to apparatus which grasps felled timber, slashes it to a desired size and loads it onto a vehicle for transport.

In the past such apparatus has generally comprised a powered crane mounted on a truck or other mobile vehicle. The crane was equipped with a clamping means to grasp and to pick up felled timber. A power saw affixed to the clamping means would then slash the timber and it would be loaded onto a vehicle for transport or stacked or whatever else was desired with respect to the slashed timber.

While such apparatus offered a great savings in time and cost, there have been certain inherent difficulties in the use of such apparatus. These difficulties have primarily been in the lack of positive control over the timber along its longitudinal axis, especially after the timber is slashed to the desired size. To combat such, two spaced clamping supports had to be provided or else the operator was forced to operate several control mechanisms simultaneously to maintain the timber in the preferred horizontal position, or else the timber had to be picked up near its balance center. If shifting occurred, a dangerous situation was created.

The net result has been twofold. First, the degree of skill necessary to operate such apparatus has required longer training periods for operators and consequently higher labor costs. Second, the extra time needed to properly position the apparatus to maintain longitudinal control over the timber necessitated a slower operation.

An object of this invention is to provide novel apparatus for grasping felled timber and slashing it to length.

Another object is to provide apparatus of the above character which provides positive control along the longitudinal axis of the timber during the complete grasping and slashing cycle.

Still another object is to provide apparatus of the above character which will automatically maintain the timber at the proper angular relation with respect to the ground.

A further object is to provide apparatus of the above character which will increase the production rate of loading slashed timber.

A still further object is to provide apparatus of the above character which will allow simple operation.

Another object is to provide apparatus of the above character which will substantially reduce the amount of shifting subsequent to slashing of the timber.

Other objects of this invention will in part be obvious and will in part appear hereinafter.

In its most elemental form, the invention comprises a novel crane structure which may be mounted on a wheeled or tracked vehicle to provide mobility. The crane is in the form of a bell crank with parallel linkage. The free end of the crane is connected to a double pinned pivotable hoist bar. The bar supports and guides a clamping mechanism and a power saw.

The invention accordingly comprises the features of construction, combinations of elements and arrangement of parts which will be exemplified in the constructions hereinafter set forth, and the scope of the invention will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawings in which:

FIG. 1 is a perspective view of the forward part of the hoist bar and the clamping mechanism and power saw affixed thereto showing the power saw in the form of a circular embodiment with interior rim drive.

FIG. 2 is a top view of the entire hoist, hoist bar, clamping mechanism and power saw.

FIG. 3 is a side view.

FIG. 4 is a side view of the hoist bar, clamping mechanism and power saw.

FIG. 5 is a front view of the apparatus of FIG. 4 showing the clamping mechanism in the open position.

FIG. 6 is a front view of the apparatus of FIG. 4 showing the clamping mechanism in the closed position holding several logs.

FIG. 7 is a circuit diagram of the electro-hydraulic control system.

FIG. 8 shows the hoist, hoist bar, clamping mechanism and saw mounted on a truck body in a typical timber slasher-loader operation.

FIG. 9 shows another embodiment of a power saw, more particularly a chain saw, in use in the apparatus of this invention.

FIGS. 10, 11 and 12 are similar to FIGS. 4, 5 and 6 but with the chain saw embodiment of FIG. 9 shown therein.

FIG. 13 is a cross sectional view of the drive mechanism for the chain saw taken along line 13—13 of FIG. 11.

FIG. 14 is a cross sectional view of the drive mechanism taken along line 14—14 of FIG. 13.

Similar reference characters refer to similar parts throughout the several views of the drawings.

As best seen in FIGS. 2 and 3, the invention comprises a main boom **10** pivoted via main boom pivot pin **14**, to bell crank type boom mount **12** affixed to a support **13**, such as a truck body, railroad car and the like. A knuckle boom **16** pivotally supported on the free end of main boom **10** by knuckle boom pin **18** extends the overall length of the boom and provides a knuckle action to the entire boom as will be described hereinafter.

Knuckle boom **16** has a rearwardly extending lever arm **20**. A knuckle boom hydraulic cylinder **22** is pivotally pinned between cylinder bracket **24** on the main boom and lever arm **20** to enable movement of the knuckle boom **16** in a knuckle-like movement with respect to the main boom **10**.

Main boom **10** is raised and lowered by a main boom hydraulic cylinder **26** on each side of the boom (see FIG. 2), each cylinder being pivoted to support **13** at pin **28** and to the main boom **10** at pin **30**. It should be evident that as cylinders **26** are extended or retracted, main boom **10** will pivot on main boom pivot pin **14** to cause a raising or a lowering respectively of the entire boom. And with extension or retraction of knuckle boom cylinder **22**, such action can be simultaneously or subse-

quently supplemented by a knuckle action of the knuckle boom. Thus far, intermediate or near accomplishment of the slasher-loader operation by the apparatus of this invention is possible.

Mounted vertically above, and on each side of the main boom **10** and knuckle boom **16** are pairs of parallel boom support links **32**, **34**, **36** and **38**. Links **32** are pivotally pinned to link pin **40** on boom mount **12**, and pin **42** at each junction of links **32** and links **34**. Links **34** are similarly pivotably pinned but between pins **42** and pins **44** at the junction of linkages **34** and links **36**. The same structure exists as to links **36** and **38** via pins **46** and **48**.

The boom support links are connected to the main and knuckle booms by appropriately positioned pivotable pairs of connector links. Thus, a pair of connector links **50** one on each side of the main boom **10** connects the boom support links **32** and **34** by a pivot connection of their ends to pivot pins **30** and **42**. Two other pairs of connector links **52** and **54** connect boom support links **34** and **36**, and **36** and **38** respectively to the front or working end of the main boom **10** and the rear end of the knuckle boom **16** by connection to pivot pins **18** and **44**; and **18** and **46** respectively. It will be noted that connector links **52** and **54** are joined at their lower end to the common knuckle boom pin **18**. It will be seen from the description as it proceeds that such common connection enables a better knuckle action.

The working end of boom support link **38** is pivotally affixed to a hoist bar **56**.

With reference to FIGS. 10, 11 and 12, it can be seen that hoist bar **56** is doubly pinned to the far or working ends of knuckle boom **16** and boom support linkage **38** by hoist bar pins **58** and **48** respectively. As seen in FIGS. 11 and 12, the hoist bar **56** is, in actuality, two similarly shaped plates **56***a* and **56***b* joined or held together by pins **58** and **48** and clamp frame support pin **62** described hereinafter.

A clamp frame **64** with an inner clamp support **66** is suspended from the hoist bar **56** by support pin **62**. The entire frame and support may be pivoted partially about a vertical axis by a clamp and saw rotation hydraulic motor **67**.

The clamp **68** comprises two jaws **70** and **72** (FIG. 11) and two hydraulic cylinders **74** and **76**. The cylinders **74** and **76** are pivotally pinned between the base of inner support **66** and the jaws **70** and **72** by jaw moving pins **78**, **80** and jaw moving pins **82** and **84** respectively. The jaws **70** and **72** are pivoted on jaw pivot pins **86** and **88**. These pins are secured to the lower end of clamp mechanism support **66**.

In the embodiment shown in FIGS. 1 to 6, a ring saw **90** is utilized. Saw **90** has an inner geared drive rim **92** and a concentric outer cutting rim **94**. The saw is supported on saw idler gear **98** and driven by saw drive gears **96** and **100**. The drive gears are connected to hydraulic saw motors **102** and **103**. Idler gear **98**, and drive gears **96** and **100** and motor **102** are mounted on inverted U-shaped saw support **104** which can move vertically in track **106** by the action of saw moving cylinders **108**. In this manner, logs **110** can be cut while clamped between jaws **70** and **72** (see FIG. 6). In the embodiment shown in FIGS. 9 to 14, a chain saw **112** is employed to cut logs **110**. Saw **112** is pivoted about chain saw pin **114** and driven by a hydraulic drive mechanism illustrated in detail in FIGS. 13 and 14. The drive mechanism comprises a chain saw drive sprocket **116** driven by spline **118**. The spline **118** is mounted in saw drive housings **120** and **122** via bearings **124** and **126** and is driven by hydraulic saw motor **127**. And as best seen in FIG. 14, a rack **128** supported by rack idler **130** translates the horizontal motion of the piston of hydraulic saw pivot cylinder **132** to rotate housing **126** which, in turn, causes pivoting of chain saw **112** about spline **118** to cut the timber **110** (see FIG. 9).

During the slashing operation of the timber, various unbalancing forces act upon the clamp frame **64**. However, the unique design employed in the support mechanism therefor resists such unbalancing forces and, if anything, the cutting action of the saw is aided to speed up the slasher-loader operation. Specifically referring to FIGS. 1, 3, 4, 9 and 10, it will be noted that the clamp frame **64** hangs freely via clamp frame pin **62** from the hoist bar **56**. There is actually a clearance between frame **64** and the tail end **56***t* of hoist bar **56**.

The hoist bar is stabilized in the position shown in the various figures by the action of the main and knuckle boom and the boom support links.

When jaws **70** and **72** grasp uneven length timber from a pile, such as illustrated in FIG. 8, there is a natural unbalancing force exerted on the clamp frame **64**, in a tilting away direction from vehicle **130**. The weight of the vehicle acting through cam surface **56***c* on the clamp frame **64** offsets such and the timber is kept in a horizontal position. And when the timber is cut, as in FIGS. 1 and 9, the cam surface **56***c* continues to stabilize the clamp frame **64** and hence the slashed timber in that horizontal position whereby easy stacking on railroad flat car **132** is enabled (see FIG. 8).

In addition to main and knuckle boom cylinders **26** and **22** respectively, it is preferred to operate the clamp and saw apparatus hydraulically. A typical hydraulic circuit for such is illustrated in FIG. 7. It comprises a control panel **150**, located at a convenient spot to the operator. The panel contains a plurality of electrical control levers, each of which has a different function. One lever controls the two-way valve **152** which actuates jaw cylinders **74** and **76**. Another lever controls two-way valve **154** which actuates clamp and saw rotation motor **67**. A third lever controls two-way valve **156** which actuates saw moving cylinder **108**. A fourth lever on the control panel **150** controls two-way valve **158** which actuates saw motors **102** and **103** in the case of the ring saw embodiment of FIG. 6, or, with some modification, of the circuit hydraulic saw motor **127** and saw pivot cylinder **132**. Electrical power for the control levers is supplied from source **160** and grounded to the vehicle frame at ground **162**. Hydraulic fluid is supplied via inlet **164** and released to sump outlet **166**. Pressure controller **168** regulates the pressure of ring saw moving cylinder **108**.

The automatic positive control over the timber by the apparatus just described can best be explained by reference to FIG. 3. As main boom cylinders **26**, on each side of main boom **10**, are extended, main boom **10** will rotate counterclockwise about pin **14**. As this occurs, boom support links **32** also rotate counterclockwise. Such movement causes connector link **50** to rotate clockwise about pin **30** and boom support links **34**, **36** and **38** will shift axially toward hoist bar **56** to maintain it in the position shown in FIG. 3. If cylinders **26** are contracted, the reverse process will occur. It can thus be seen that regardless of the action of cylinders **26**, jaws **70** and **72** will remain perpendicular to the ground.

If knuckle boom cylinder **22** is extended, lever arm **20** will cause knuckle boom **16** to rotate clockwise about pin **18**. As this occurs, boom support links **38** will also rotate clockwise, the net result being that hoisting bar **56** remains in its same position as seen in FIG. 3. Thus, again jaws **70** and **72** will maintain their perpendicular relationship with respect to the ground.

Now, when timber **110** is lifted via clamp **68**, it is lifted so that the cut end of the timber bears against timber butt plate **65** of the clamp frame **64**. Being lifted in such fashion a moment is created about clamp frame support pin **62**. However, this moment is directly transmitted by frame **64** to hoist bar **56** by the action of plate **65** camming against tail **56***t* of the hoist bar. Thus, bar **56** is positively maintained at its customary angular relationship (as shown) at all times and jaws **70** and **72** will remain perpendicular. Hence, positive control is automatically provided along the longitudinal axis of the

timber. Even after saw **90** or **112** cuts timber **100**, upsetting does not occur because of this positive longitudinal control.

The interaction of the main boom **10** and the knuckle boom **16** with the above described positive control provides further versatility. Now, near, intermediate, and far work positions can be assumed by the apparatus of this invention with auxiliary equipment, such as illustrated in FIG. 8.

It might be noted that, in practice, the ring saw **90** is preferred mainly because the mass and weight of the saw is less, and the drive gear is located near the circumferential edge which allows reduced torque and higher rotational speed of the drive motor. Rapid acceleration of saw **90** is therefore possible without the necessity of a reduction gear arrangement. It therefore can compete economically with chain saws heretofore more often used due to cost considerations. Furthermore, since chain saws are prone to stretching with use, are more difficult to sharpen, and are always subject to jumping off the sprocket or breaking, thereby creating a safety hazard, the ring saw is preferred.

It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained and, since certain changes may be made in the above construction without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A slasher loader comprising a bell crank mount, a main boom pivoted to said mount and extending outwardly therefrom, boom support linkage also pivoted to said mount but above said main boom pivot and extending outwardly from said mount parallel to said main boom, connector links connecting said main boom and said boom support linkage, a hoist bar, said bar pivoted to the outer ends of said main boom and said boom support linkage in such manner as to continuously maintain a fixed position, and a clamp mechanism and a power saw affixed to said hoist bar, said clamp mechanism and said power saw are freely suspended from said hoist bar but are cammed by said hoist bar to maintain a fixed position during use.

2. The slasher loader of claim **1** wherein said bell crank mount is affixed to a vehicle.

3. The slasher loader of claim **1** having, in addition, a knuckle boom interposed between said main boom and said hoist bar and said support linkage is affixed to both the main boom and the knuckle boom.

4. The slasher loader of claim **1** wherein said clamp mechanism and said power saw are affixed to a clamp frame and said clamp frame contains a cam surface which bears against said hoist bar to maintain said frame in a fixed position.

5. The slasher loader of claim **1** wherein said power saw is a pivotally mounted chain saw.

6. The slasher loader of claim **5** wherein said chain saw is controlled pivotally by a rack and pinion gear arrangement.

7. The slasher loader of claim **1** wherein said power saw is a ring saw with an interior rim drive.

8. The slasher loader of claim **7** wherein said ring saw is mounted within a vertically movable slide.

9. The slasher loader of claim **8** wherein said slide is vertically movable by hydraulic pressure cylinders which act on said slide.

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