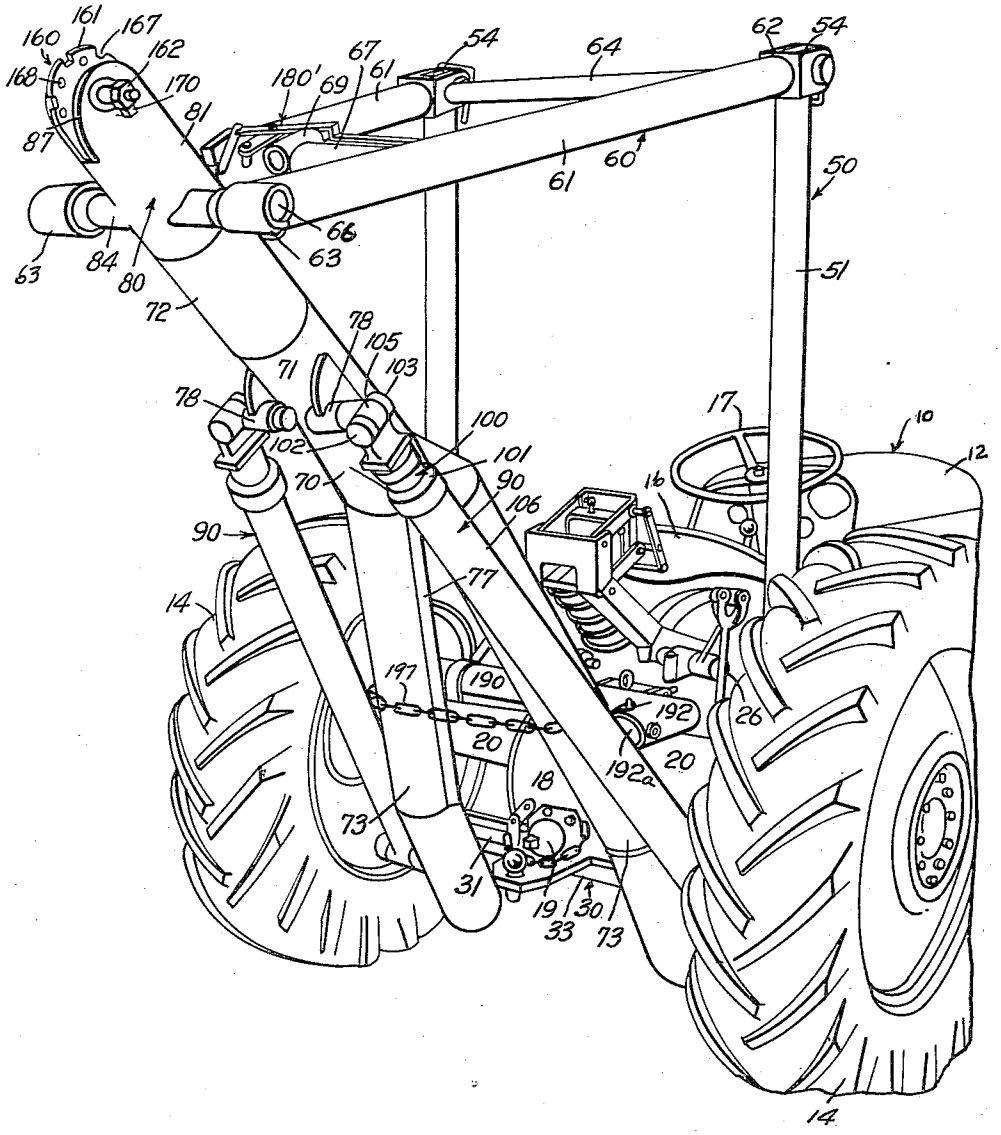
Sept. 30, 1958 E. M. HAWKINS 2,854,213

GRUBBER

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Fig. 1.



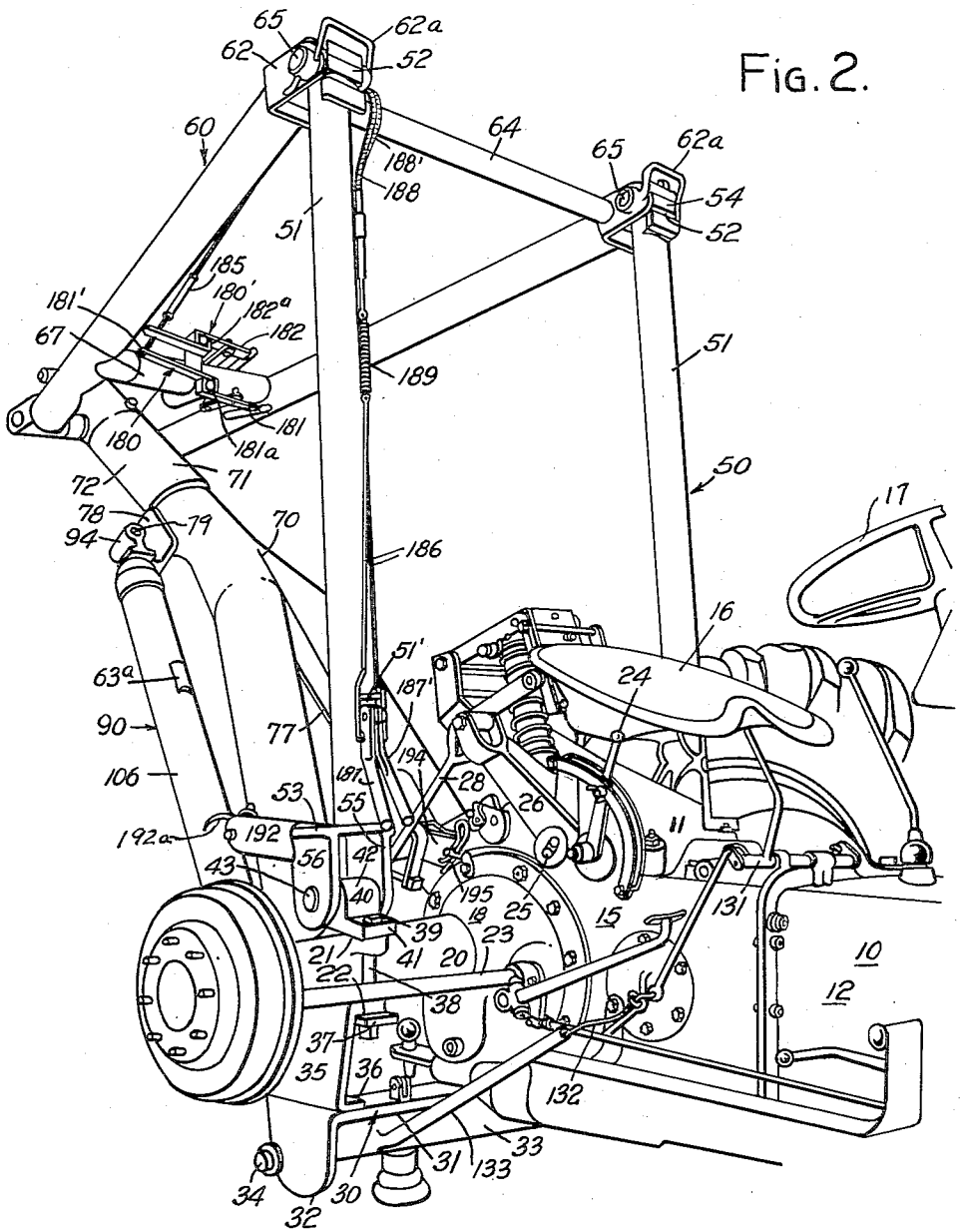
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GRUBBER

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Fig. 2.



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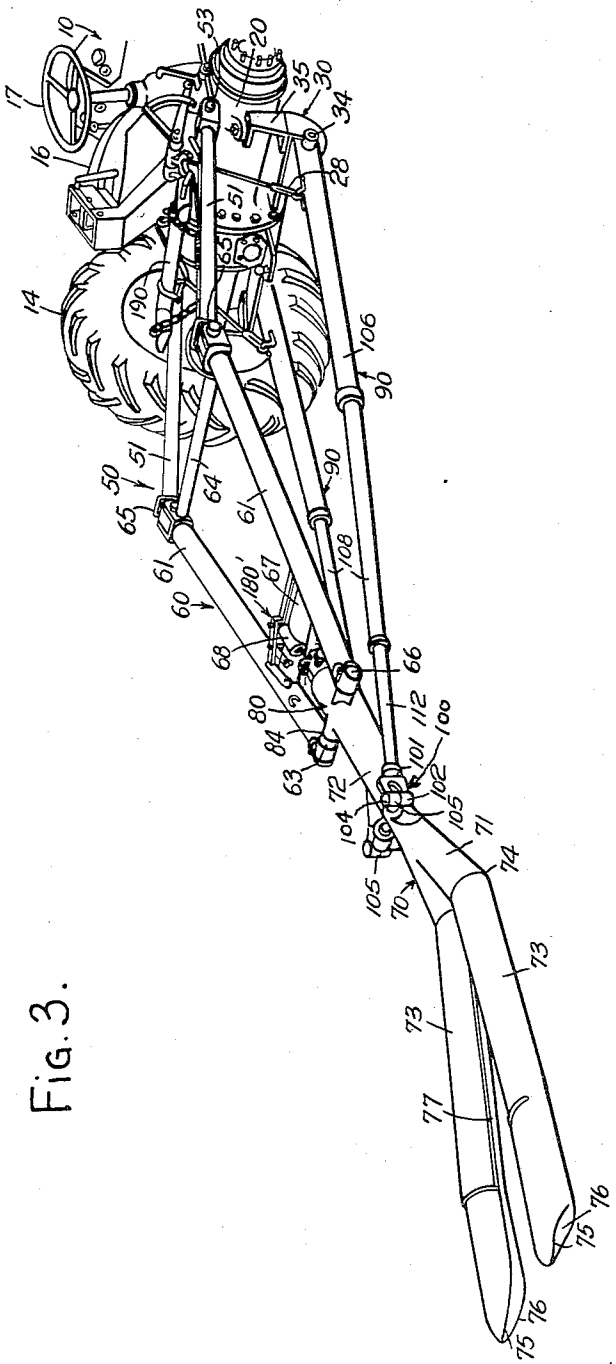


Fig. 3.

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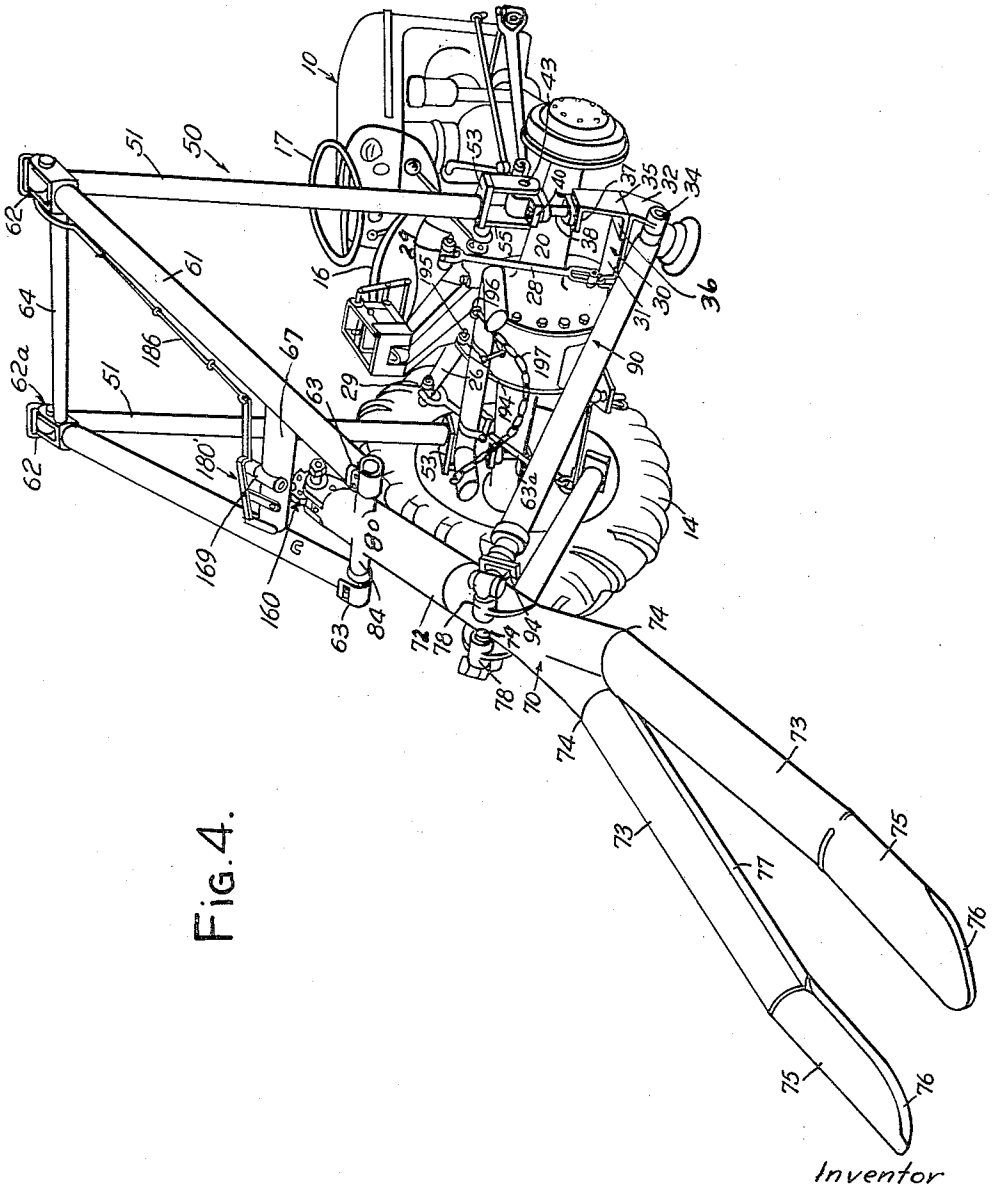


FIG. 4.

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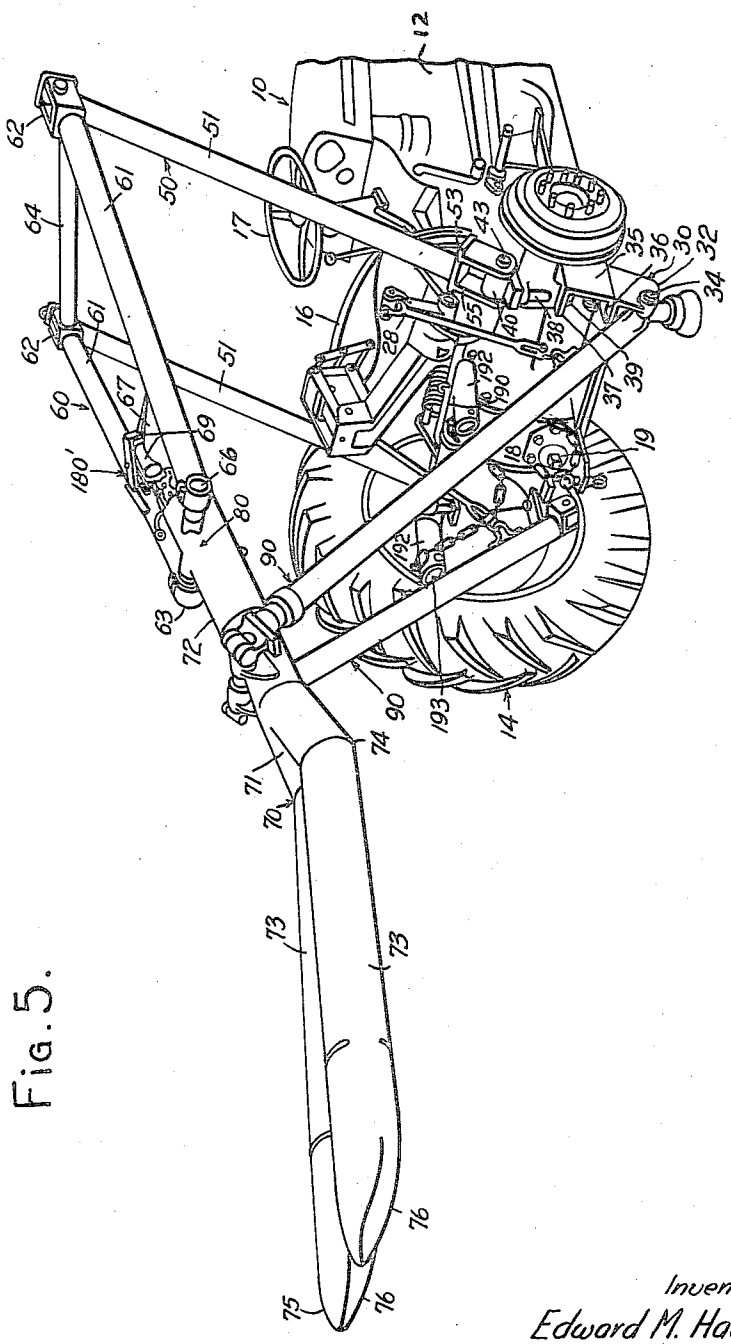


Fig. 5.

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FIG. 7.

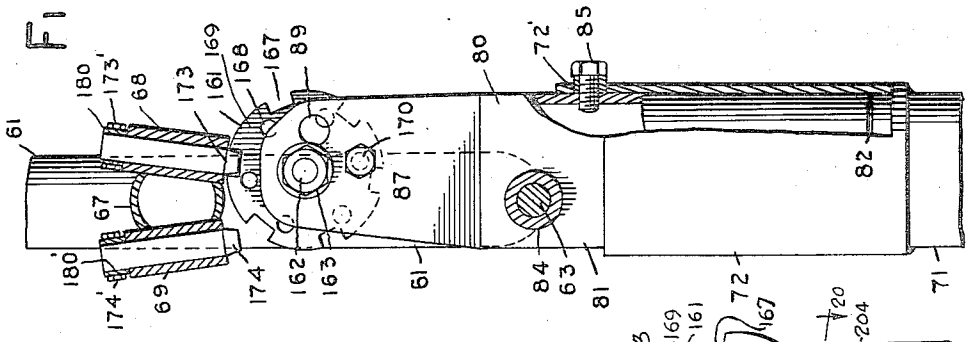


FIG. 6.

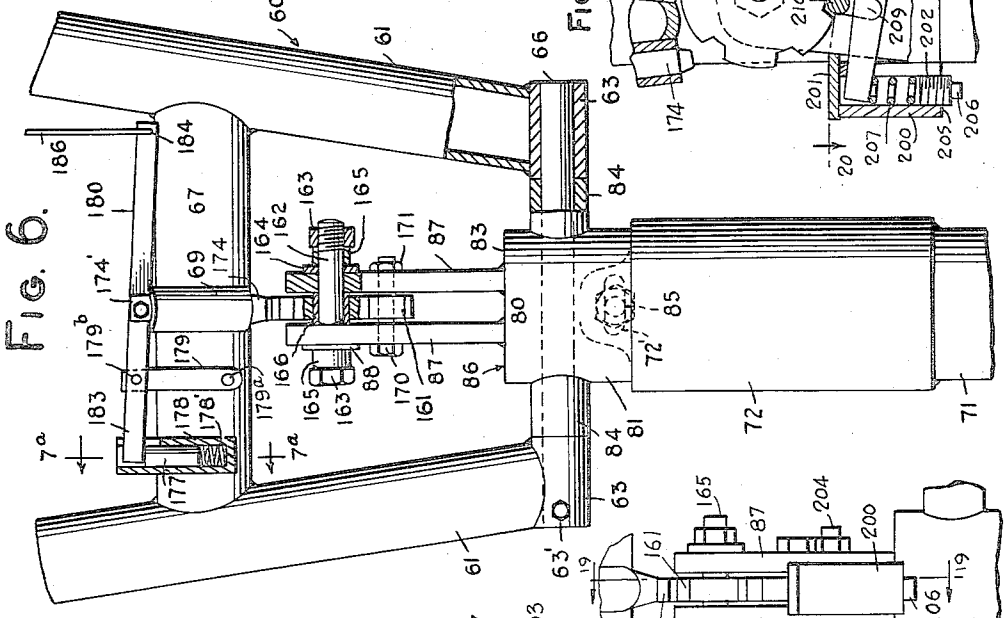


FIG. 19

FIG. 18

FIG. 7a

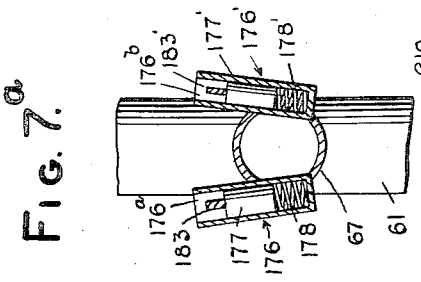
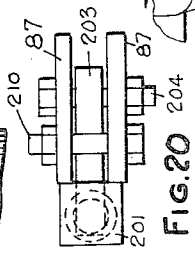


FIG. 20



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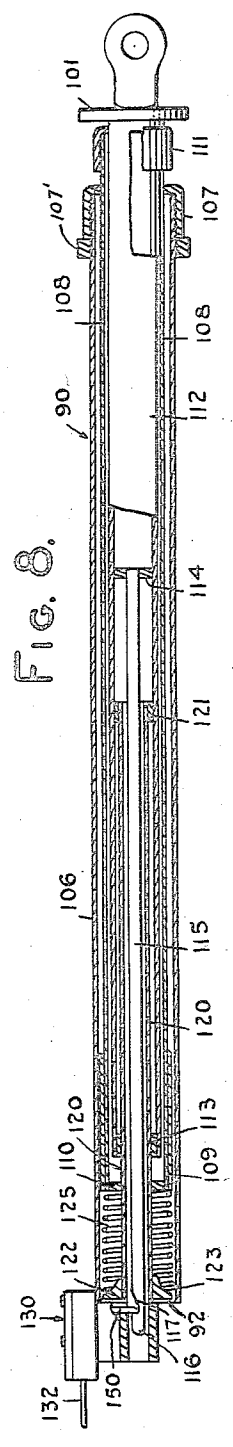


Fig. 8.

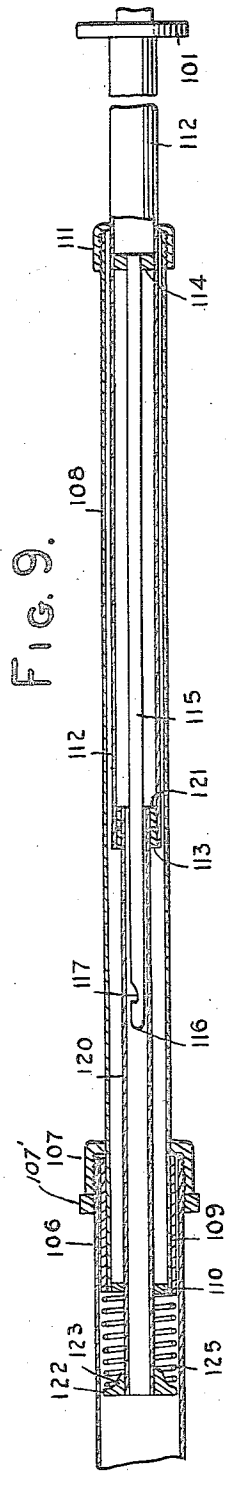


Fig. 9.

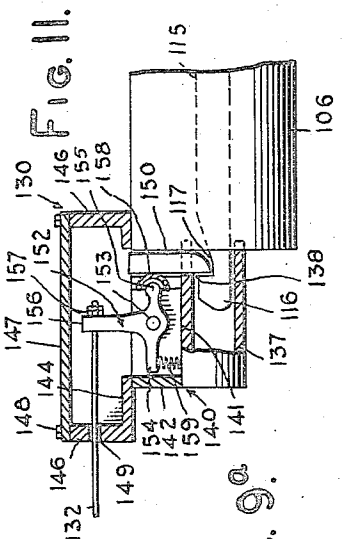


Fig. 11.

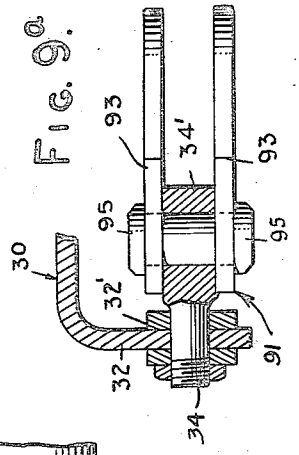


Fig. 9a.

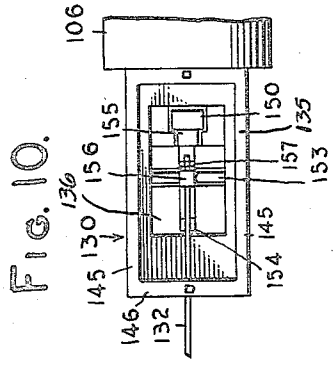


Fig. 10.

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FIG. 12.

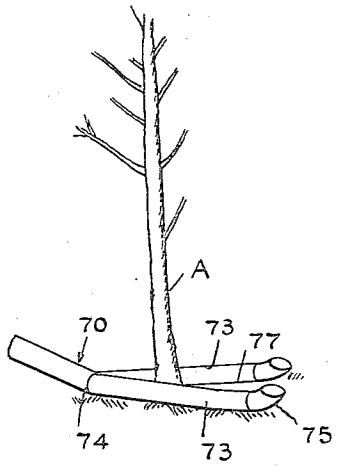


FIG. 13.

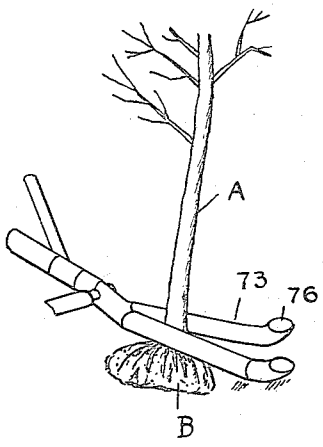


FIG. 14.

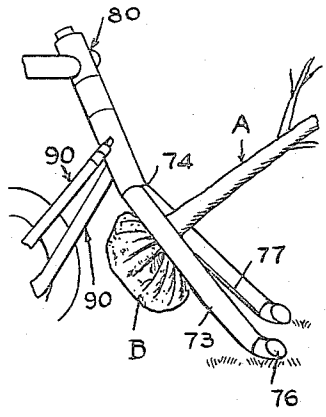


FIG. 15.

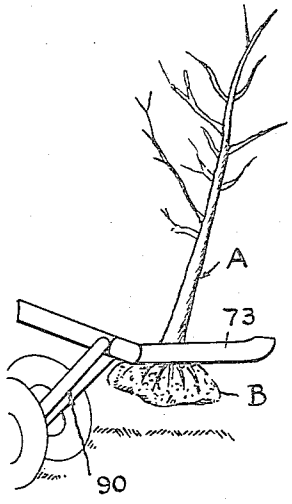


FIG. 16.

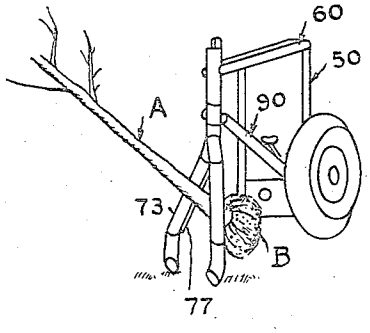
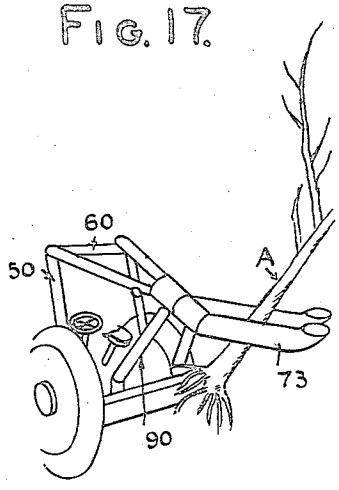


FIG. 17.



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United States Patent Office 2,854,213 Patented Sept. 30, 1958

2,854,213

GRUBBER

Edward Marion Hawkins, Goodes, Va.

Application December 3, 1954, Serial No. 472,948

17 Claims. (Cl. 254—132)

This invention relates to grubbers, and more particularly, to a novel jointed grubber adapted for mounting on a tractor, truck, or other vehicle, preferably embodying a hydraulic lift.

In my prior Patent No. 2,650,063, of August 25, 1953, I have disclosed and claimed a grubber, mounted on a truck chassis, and comprising a link arm pivoted to the truck; a lever arm coupled to the link arm by a knee joint; a bifurcated tree-engaging lifting fork having a swivel mount on the free end of the lever arm, and in alignment therewith; bilateral guide rods hinged to the rear of the truck chassis; and tubular pipe sections mounted on an axis in the shaft or handle section of the lifting fork, and inwardly of the crotch of the fork, the pipe sections serving to separately journal the guide rods for reciprocation therein.

After considerable research and experimentation, I have found that the grubber should be capable of collapsing under overload, and that the link arm and lever arm, together with the connecting knee-joints should be comprised of duplex members, spacedly and rigidly interconnected. Additionally, I have found that the operation of the grubber of my prior patent is improved by replacing the guide rods and their bearings by telescoping guides incorporating shock-absorbing springs, whereby the guides can function as rams when the grubber is engaged with a tree or stump.

An object of my invention is to provide an improved grubber.

Another object of my invention is to provide an improved grubber having an automatic release arrangement constructed and arranged whereby the grubber is capable of collapsing under overload.

Yet another object of my invention is to provide a grubber having an improved break-joint in the lever arm, together with latching means therefor, the overload release or lever arm collapsing means normally serving to maintain the latching means in operative position.

Still another object of my invention is to provide a grubber constructed and arranged for connection with the hydraulic lift system of a tractor or other suitable vehicle, whereby the grubber can be rocked or pivoted, and the fork, with a stump or tree engaged therein, can be raised atrip of the ground and transported by the tractor to any desired location.

A further object of my invention is to provide an improved grubber adapted for mounting on various types of tractors or other mobile power units, and either forwardly or rearwardly thereof, depending upon the design of the tractor or power unit.

A still further object of my invention is to provide an improved grubber adapted for use under varying conditions of ground contour in the vicinity of the tree or stump to be raised, and capable of a plurality of modes of operation in connection with the uprooting and removing of trees and stumps.

With these and other objects in view, which may be incident to my improvements, the invention consists in

the parts and combinations to be hereinafter set forth and claimed, with the understanding that the several necessary elements, comprising my invention, may be varied in construction, proportions and arrangement, without departing from the spirit and scope of the appended claims.

In order to make my invention more clearly understood, I have shown in the accompanying drawings means for carrying the same into practical effect, without limiting the improvements in their useful applications to the particular constructions, which for the purpose of explanation, have been made the subject of illustration.

Figure 1 is a rear perspective view of a farm tractor mounting a grubber of the present invention, the grubber being fully retracted and raised, and secured for travel;

Fig. 2 is a side perspective view of the tractor and grubber of Fig. 1, with the right rear tractor wheel removed to show the mounting of the grubber and the controls therefor;

Fig. 3 is a side elevation of the novel grubber in fully extended position, in the first, ground fulcrumed lift position, with the safety break-joint latch of the duplex lever arm in locked position;

Fig. 4 is a right side perspective view of the rear of the tractor with the right rear wheel removed, and the grubber at the beginning of the second, ground-fulcrumed, lift position, the guides being telescoped, and the duplex link arms vertical;

Fig. 5 is a view similar to Fig. 4, showing the guides raised to maximum lift position by the hydraulic lift arms, the duplex lift arms being tilted forwardly over the tractor, and the fork in horizontal, load-carrying position;

Fig. 6 is an enlarged detail view showing of the duplex lever arm and associated grubber fork arm, with the interconnecting safety latch therefor;

Fig. 7 is a detail view of the latch means of Fig. 6;

Fig. 7*a* is a detail of the latch biasing means of Fig. 6;

Fig. 8 is a schematic longitudinal section through a fully telescoped guide;

Fig. 9 is a view similar to Fig. 8, with the guides fully extended;

Fig. 9*a* is a detail view of the mounting means at the inboard end of each guide rod;

Fig. 10 is a bottom plan view of the telescoping guide latch;

Fig. 11 is a vertical section through the latch mechanism of Fig. 10;

Figs. 12–15 are schematic showings of the steps in uprooting a tree;

Figs. 16–17 are schematic showings of two ways of transporting an uprooted tree;

Fig. 18 is a fragmentary view, similar to the parts shown in Fig. 6, of a modified form of overload release;

Fig. 19 is a vertical sectional view taken on line 19—19 of Fig. 18, and

Fig. 20 is a sectional view taken on line 20—20 of Fig. 18.

Turning now to the showings of Figs. 1, 2 and 4, the details of the tractor necessary for an understanding of the present invention will be considered, it being understood that no invention is predicated on the tractor, per se, except in the novel combination with the grubber herein, as will be set forth more in detail hereinafter. The tractor, designated generally by the numeral **10**, comprises the usual chassis **11**, power plant **12**, front wheels not shown, rear wheels **14**, transmission housing **15**, driver's seat **16**, steering wheel **17**, and conventional operative controls, gear housing **18** being provided with a capped power take-off, as shown at **19**. The bilateral axle housing **20** is integral with the gear housing, and each side of the axle housing is provided with integral,

parallel top and bottom bearing surfaces **21**, **22**, respectively bilaterally extended to form lugs, designated generally by the numeral **23**, and severally incorporating bolt holes, not shown, the top and bottom holes being in alignment.

A special feature of importance in connection with the present invention is the hydraulic lift system of the tractor. This system comprises a ram cylinder and piston and pressure oil supply, not shown, all encased in the transmission housing. The piston is operatively coupled to a lift shaft **25**, which extends through both sides of the transmission casing, the ends of the shaft being secured to identical lift arms **26**, by suitable securing means. The lift arms **26** are linked to a second set of lift arms **28** through suitable link means, designated generally by the numeral **29**. A finger tip control lever **24** is suitably mounted alongside the driver's seat, and serves to control the hydraulic lift mechanism, when the latter is to be used.

As noted, the foregoing tractor elements have been described in order to make clear their function in the method of mounting and operating the novel grubber mechanism forming the subject matter of the present invention. To simplify consideration of the invention, the mountings, structural elements, and mode of operation will be considered under the following headings: (1) Attachment to tractor; (2) Duplex link arm mechanism; (3) Duplex lever arm and pivoted connection to duplex link arm mechanism; (4) Grubber fork and knee-joint coupling to duplex lever arm; (5) Telescoping guide rods for grubber fork; (6) Break-joint mechanism for lever arm with latch and overload controls; and (7) Operation of grubber as tractor-mounted unit.

Attachment to tractor

Attachment of the grubber to the tractor is made by means of the following fitments: A bearing and transverse bracing member **30**, is comprised of an elongated steel plate section having a top surface **31**, bent downwardly, at both ends, to form lugs **32**. A stiffening strip **33** is secured to the under side of section **31**, as by welding. The lugs or ears **32** are apertured to receive aligned pivot pins **34**, whose function will be adverted to more in detail hereinafter. The member **30** is secured to and supported from the tractor in the following manner: A pair of channel sections **35**, each having a bottom side **36** and a top side **37**, are mounted across the ends of the upper surface **31**, the bottom sides **36** being bolted or otherwise fixedly secured thereto. The upper sides **37** are severally provided with bolt holes, adapted to register with bolt holes in the bearing surfaces **21**, **22**, of the axle housing, and to receive bolts **38**, secured by nuts **39**.

The upper bearing surfaces **21** of the axle housing are adapted to mount link arm pivots **40**. These members comprise a flat bottom section **41**, with upstanding central lugs **42**, apertured to receive pivot pins **43**. The sections **41** are bilaterally apertured to receive the bolts **38**, as described above, whereby the bottom bracing and mounting member **30** and the link arm pivots **40** are detachably secured to the axle housing of the tractor, and to the transmission by the bolts which normally hold a stationary draw bar, which bolts can be rapidly emplaced and removed, as occasion demands.

Duplex link arm mechanism

The link arm mechanism, designated generally by the numeral **50**, is comprised of a spaced pair of identical tubular members **51**, of suitable length, each member being provided with a top cap plate **52**, and a bottom plate **53**. The plates **52** and **53** are welded to the ends of the tubes **51**. Plate or disk **52** is substantially coextensive with the end of tube **51**, and serves as a mounting for an apertured lug or ear **54**, which is bolted thereto to form a journal for axle or pin **65** of the duplex lever arm **60**. The apertures in the lugs **54** of the spacedly mounted tubes **51** are in alignment, for a purpose to be described more in detail hereinafter. The bottom plates **53** are substantially rectangular, being roughly twice as long as they are wide, the width being slightly greater than the diameter of a tube **51**. The plates **53**, as noted, are welded to the bottoms of tubes **51**, and at one side of the plates, as shown. A pair of apertured lugs **55**, **56**, are welded to the undersides of members **53**, the apertures being in alignment with the apertures in lugs **42** of link arm pivots **40**, and are pivotally secured thereto by pins **43**. Thus, the link arms **51** are directly pivoted to and supported by the axle housing of the tractor. The link arms are hingedly joined to the inboard or upper end of a duplex lever arm, whose construction will now be described.

Duplex lever arm

The duplex lever arm is designated generally by the numeral **60**, and is shaped like a truncated letter **A**, being comprised of a pair of identical, outwardly converging tubular members **61**, transversely joined, along their length, by three cross-bars. Square caps **62** are fitted over and welded to the members **61**, at their inboard ends, and journals **63** are welded to the converging outboard ends. The first, or inboard, transverse bar **64** is welded to and spacedly secures the caps **62**. The caps are socketed to receive apertured lugs **54** of the link arms **51**, mounting pins or axle members **65**. The lugs **54** are thus pivotally secured, whereby an elbow or knee-joint is formed by and between the link arm assembly **50** and the duplex lever arm **60**. To prevent the rectilinear alignment of the arms **51** and **61**, loop members **62***a*, of steel rod, or the like, are welded to the caps **62** in such a manner as to serve as snubs or stops for engagement with link arms **51**, when a predetermined angularity between the lever arm and the link arms has been attained. The outboard end of the duplex lever arm mounts a cross-bar **66**, which is detachably secured in and between journals **63**, as noted above, and serves as a second cross-arm of the lever arm unit as well as an axis of rotation for a cruciform crosshead **80**, to be described hereinafter. A third cross-arm **67**, parallel to cross-arm **64** and cross-bar **66**, is welded to convergent side members **61**, at a relatively slight distance inboard from member **66**. Cross-arm **67** is routed out to seat a pair of axially aligned hollow sockets **68**, **69**, disposed on opposite sides of the cross-arm, and having a slight mutual outboard convergence. The members **68**, **69**, are welded in place, in their seated positions in the cross-arm, and are firmly embedded therein and retained thereby.

Grubber lift fork

The grubber lift fork **70** is a bifurcate, tubular member, having a shank adapted for cooperative interengagement with a tubular, cruciform cross-head **80**, transversely pivoted on cross-bar **66**.

The grubber fork proper is a unitary member having an inboard tubular shank **71**, provided with an extension sleeve **72**, welded thereto. Acutely angled, bifurcate legs **73** extend outwardly from the shank, and form a relatively flat angle or dog-leg joint **74** therewith. The legs **73** are mirror images of each other, and are welded to the shank to form an integral structure therewith. The legs terminate in rounded and tapered, parallel outboard toe sections **75**, having a rearwardly extending plantar or bearing surface **76**, whose inboard end curves inwardly and upwardly, merging with the under surface of the associated leg **73**. All surfaces of the fork elements are curviform to prevent catching in or on obstructions, and thereby assure that the fork will slide over any kind of terrain. Additionally, the curviform surfaces make for maximum strength in the members, and facilitate the easy cleaning of the device.

A pair of heavy, flat blade elements **77** are secured to the inner or V surfaces of the legs **73** to form a V-shaped tree trunk or stump-engaging member.

The sleeve **72** forms a socketed extension of the grubber fork, and receives the outboard section of longitudinal element **81** of cross-arm **80** in snug bearing fit. The sleeve is provided with a rear extension **72***a*, having a transverse arcuate slot **72'**, of limited angular extent, and is secured in place on and over the cross-arm element by a locking pin **85** tapped into the cross-arm, the pin riding in slot **72'**. By this construction, the grubber fork is mounted for limited transverse oscillation on the cross-head, and, as will appear more fully hereinafter, is made a functional extension of the duplex lever arm **60**.

The upper, or inboard end of shank **71** of grubber fork **70** is fitted with a pair of spaced, outwardly extending lugs **78**, welded to the sides of the shank, and formed with aligned apertures, not shown, pivotally mounting pintles **79**, serving as points of attachment for outboard swivel couplings **94**, of the guide rods **90**, to be described hereinafter.

Cruciform cross-head

The cruciform cross-head **80** is comprised of a continuous, longitudinal tubular member **81**, of the same diameter as shank **71** of the grubber fork, and having an open bottom **82**, and a closed top **83**, together with a tubular cross-piece **84**, which is welded, or otherwise secured, in and through the member **81**, immediately under the front surface thereof. The cross-piece **84** has a diameter less than half that of member **81**, and is located inboard, or above the horizontal center thereof. The upper portion of extension sleeve **72** of grubber fork **70**, as noted, serves as a socket or journal for the lower half of member **81**, and is locked therein, in limited rotative engagement by pin **85**, tapped into the rear of member **81**, and riding in slot **72'** in the sleeve **72** of fork **70**, in sliding, bearing engagement.

Desirably, the open bottom **82** of cross-head **80** has bearing engagement on the upper edge or lip of shank **71** of the grubber fork, while its upper, or inboard end is closed by a fitted steel plate **86**, which is welded thereto. A spaced pair of outwardly extending, hardened steel lugs **87**, are welded to the plate **86**, and are provided with two sets of aligned pivot holes **88**, and **89**, whose special orientation will be described more in detail in connection with the lever arm latch mechanism and its operation.

The tubular cross-piece **84** journals the member **66**, which is detachably held in place, as the outboard cross-arm of the duplex lever arm **60**, being clamped, by set screws **63'**, in apertured lugs **63**, integral with the outboard ends of legs **61** of the lever arm. The cross-piece **84** may be comprised of a single pipe section, or of a pair of aligned stub pipes, welded or tapped into section **81** of member **80**. Because of the offset mounting of cross-piece **84** in and on section **81**, the cruciform cross-head **80** will be underslung on the cross-arm **66**, and will rotate thereon, thereby assuring a maximum stability and flexibility of operation.

Guide rods and mounting

The guide rods are mirror images of each other, both in structural features, and in mounting on the grubber, and are designated generally by the numeral **90**. These rods are compound members, being extensible and retractable, and are severally comprised of specially interfitted, telescoping members. To facilitate the overall description of the novel grubber and the mutually cooperative interrelation of its component parts, the coupling of the extensible guide rods to and between the tractor and the grubber fork will be described before proceeding with the detailed description of the guide rods, per se. The couplings now to be described form universal joints, or doubly swiveled connections, and make possible the operation of the novel grubber herein over any and all kinds of irregularities in terrain.

The inboard, or rear couplings, are designated generally by the numeral **91**, and are comprised of the following elements: A cap piece **92** forms the inboard point of attachment for each of the guide rods. The cap pieces are secured to the guide rods in any suitable manner, and are integral with the outermost member of each telescoped assembly. Each cap piece mounts a pair of spaced lugs **93**, welded thereto, and incorporating aligned apertures, adapted to receive pivot pins or pintles **95**. The pivot pins **34**, previously described, are mounted for rotation in apertured bosses **32'** of supporting lugs **32** of the transverse supporting and bracing member **30** which forms the intermediate connection between the tractor and the grubber. The pins **34** incorporate loop or eye sections **34'**, adapted to be received in and between apertured lugs **93**, in a swivel fit, and are secured in place by the pivot pins **95**. By this arrangement the inboard ends of the guide rods have both lateral and vertical pivoted coupling to the tractor, and through any degree of arc. These self-adjusting or compensating couplings are of utmost practical importance in the operation of my improved grubber under all kinds of conditions, and make for smooth performance of even the most difficult jobs.

The outboard universal joint or double swivel connections to the shank **71** of the grubber fork **70**, are generally designated by the numeral **100**, and are severally comprised of the following elements: A mounting plate **101** is secured on the outboard end of the innermost element of the guide rod assembly, and in a manner to be described more fully hereinafter. The plate **101** mounts a yoke member **102** incorporating spaced lugs **103** having aligned apertures adapted to receive a pivot pin **104**. The yoke member receives apertured lug **105**, and is locked thereto by pin **104**. The lug **105** is formed integral with or secured to pintle **79**, which is mounted for rotation in a lug **78**, welded to shank **71** of the grubber fork, all as described hereinabove.

The guide rods herein are compound structures, and a proper description of their mode of operation is best served by a detailed study of their components, followed by a consideration of their assembled entity. Particular reference is had to the detailed showings of these devices in Figs. 8–11.

The outermost element of the guide rod assembly comprises a tubular member **106**, closed at the inboard end by cap piece **92**, and threaded at its open end to receive centrally apertured, threaded length adjusting cap **107**, and associated lock nut **107'**. A second tubular member **108**, adapted for sliding fit in the cap **107**, is fitted in tube **106**. This second tube is provided at its inboard end with a sheath **109**, and an internal hollow spacer or washer **110**, both of which are welded or otherwise fixedly secured to the tube **108**. At its outboard end tube **108** is threaded to receive centrally apertured, threaded cap **111**, which is slidingly engageable by, and adapted to reciprocate on and over a third tube **112**. Tube **112** fixedly mounts mounting plate **101** of outboard universal joint **100**, which is coupled to the shank **71** of the grubber fork **70**. At its inboard end, tube **112** receives a hollow washer **113**, which is welded to the inside of the tube. A second washer **114** is welded to the inside of the tube **112**, at a point somewhat less than half way along its length. The washer **114** fixedly mounts the outboard end of a latch rod **115**, whose free end **116** is rounded, and extends inwardly beyond and through washer **113** for about one-third of its total length. The end **116** of the latch rod is notched, as shown at **117**, and this notch is adapted to be engaged by a detent **150**, of a latch locking and release mechanism **130**, to be described more fully hereinafter. The free end of inboard section of latch rod **115** is slidingly ensheathed in a fourth tube **120**, which is wholly encased in and by the three telescoping outer tubes of the guide rod assembly. The tube **120** has a flange **121** secured on its outboard end, and this flange is slidingly engageable in the inboard section of tube **112**, its inboard travel being

limited by abutment against internal flange 113 of that tube. A heavy duty washer 122 is fixedly secured over the inboard end of tube 120. The outboard surface 123 of washer 122 is curved to receive and act as inboard bearing and stop surface for a spiral compression spring 125, which is loosely fitted over tube 120 and contained within tube 106, its outboard travel being limited by inboard sheath 109 of tube 108 as a stop member.

The guide rods, when unlatched, can be extended by lowering the grubber fork until it is laying on the ground. To attain this extended position, the tractor is driven forward, carrying the inboard segments or outer telescoping tubes with it, while the weight of the grubber fork and its drag on the ground serves as an anchor for the outboard segments of the telescoping tubes. When the full stretch or elongation of the guide rod assembly is attained, compression spring 125 is compressed by and between sheath stop 109 of tube 108, and heavy flange 122 of tube 120, preventing undue jerking or pulling of the interfitted, telescoping guide rod elements, as they stop the link arm and lever arm's travel toward rectilinear alignment and hold them at the desired angularity. When the tractor is backed up to effect complete telescoping of the guide rods, the spring 125 is again compressed by and between elements 109 and 120, and serves as an effective shock absorber in both instances.

When the guide rods are thus compressed and latched to prevent their extension, the duplex lever arm 60 and grubber fork are made movable with respect to each other about member 66, by retracting detents 173 and 174 of the break joint mechanism to unlatch it, thus providing a much shorter grubber. It will be noted that lever arm members come to rest on guide rod member 106 as the dog-leg joint of the grubber fork rests on the ground, and with the assistance of the hydraulic lift, which is connected to the top side of guide rod member 106, a short levered ground fulcrumed lift is obtained. As the blades engage a tree the inboard portion of the fork rocks upwardly on pintles 79 as they pivot in lugs 78. In this shortened condition the guide rods perform the lifting and pushing action normally done by the link arms, while the link arms 50 and lever arms 60 serve only to keep the fork in alignment, as it readily assumes the positions indicated by Figs. 12–16. For uprooting smaller trees in limited space or uphill work the shorter grubber has been found to be most practicable and efficient.

Guide rod latches

For many uses of the novel grubber of the present invention, it is desirable to maintain the guide rods locked in their telescoped condition, and a latch locking and release mechanism, under the control of the tractor operator is provided. This mechanism, designated generally by the numeral 130, comprises a control handle 131 mounted alongside the driver's seat, and connected by cable 132, protected by suitable pipe or conduit means 133, to latch mechanism casing 135, fixedly mounted on inboard end 92 of guide rod tube 106, and in and between the spaced lugs 93 of the inboard couplings, or universal joints 91.

The latch casing 135 is comprised of a composite, box-like structure 136, secured to inboard end or cap-piece 92 of guide rod segment 106, and in and between spaced lugs 93 of inboard universal joint 91. Member 136 serves as a housing for the notched end 116 of latch rod 115, as well as for detent 150, detent-actuating lever 152, lever-biasing spring 159, and actuating cable 132. The outboard portion of casing 135 incorporates a tubular sheath section 137, fitted in member 92 of the guide rod, and having a closed end. A slot 138, is formed in sheath 137 immediately adjacent to member 92 of the guide rod, and receives detent 150. Sheath 137 serves as a guideway for the notched end of latch rod 115, and the cooperating slot 138, as noted, serves as a guideway for the detent 150.

The sheath 137 is mounted on a narrow box section 140, having a closure 141, end 142, and sides 143. A longitudinally slotted plate section 144 is joined to the inboard edge of section 140, and overlies a portion of member 106. Side-wall members 145 and end wall members 146, of a cable housing chamber are secured to plate 144, and the chamber is closed by an inboard plate 147, detachably secured in place in any suitable manner, as by machine screws 148. The inboard end wall member 146 is apertured, as shown at 149, to receive cable 132.

The detent and its actuating mechanism will now be described. The detent 150 is comprised of a steel bar, set on an edge, and is provided with a rounded tapering end 151, adapted to engage in notch 117 of latch rod 115. The detent is normally biased into its locking position by a compression spring 159, acting through the following mechanism: A T-shaped lever 152 is pivoted at its center by pivot pin 153, mounted in and between side walls 145 of the casing. The lateral arms of lever 152 terminate in a flat end 154, and a rounded end 155. A centrally offset arm 156 mounts the end of control cable 132, which is secured thereon by any suitable means, such as nut 157. A curviform socket member 158 is welded on to the outer edge of detent 150, as shown, and receives the rounded end 155 of the lever. The flat end 154 of the lever is biased by compression spring 159, which has fixed bearing engagement against sheath 137, and the lever is normally depressed at that end, whereby the detent is moved into latch locking position, and is retracted therefrom when cable 132 moves offset arm 156, and overcomes the bias of spring 159.

It will be seen that the guide rod latching mechanism is simple in construction, installation and operation, and is at all times under the positive control of the operator. The specific mode of operation of the guide rods forms an integral part of the grubber actuating and control mechanism, and discussion of such operation will be considered in the general presentation to follow after the description of the lever arm break-joint mechanism.

Lever arm break-joint mechanism and overload release

A special feature of the invention herein is the provision of a novel overload release, which serves as a break-joint mechanism when fitted with operator-controlled latch means, all as will now be described.

Turning to the detailed showings of Figs. 6 and 7, the overload release 160 is comprised of a hardened steel ratchet wheel 161, mounted for rotation on an axle or pin 162, journaled in aligned apertures 88 in hardened steel lugs 87 of cross-head 80. The wheel 161 is secured in place on axis 162, which is threaded at both ends, by nuts 163, spaced from the lugs by washers 164 and bushings 165. The member 161 is provided with an axial bushing 166, which is adapted for free rotation on the axle 162. The wheel is formed with a plurality of peripheral sockets 167, and an equal number of shear-pin holes 168, equidistant from the center, and lying on the radii severally intersecting the teeth 169 formed by and between the sockets 167. A shear pin, or threaded bolt 170, having a nut 171, is fitted in and through a third pair of aligned holes 172, in lugs 87, the pin passing through one of the radial shear-pin holes 168, all of which are adapted to register with holes 172, when the wheel is rotated. The shear pin is of relatively soft steel, and the wheel and lugs through which it passes are of hardened steel, so that any overload will cause shearing of the pin. The wheel is so constituted and arranged, that in its normal mounting on axle 162, when the axle is fitted in holes 87, and shear-pin 170 is engaged in and by one of the shear-pin holes 172, a plane drawn through the axial centers of members 66 and 162 will bisect a peripheral socket 167, and this socket will receive a detent 173 in locking engagement, as will now be described.

The detents 173, 174, are severally mounted, in sliding fit, in the apertured sockets or journals 68, 69 of cross-

bar 67, as described hereinabove. The detents are made of hardened steel and are apertured to receive pivot members 173', 174', respectively, which members, as shown, are comprised of a headed bolt, threadedly receiving a securing nut. The pivot members 173', 174', are mounted in actuating levers 180, 180', to be described later, and are reciprocated thereby. A pair of outwardly converging, open-topped socket members 176, 176', are severally fitted in and welded to opposite sides of cross-bar 67, and adjacent one of the side members 61 of the duplex lever arm 60. The members 176, 176', severally receive plungers 177, 177', which are spring biased by helical coiled compression springs 178, 178', into bearing engagement with the ends 183, 183', of the levers 180, 180', which are adapted to reciprocate in longitudinal slots 176*a*, 176*b*, in the open ends of members 176, 176'. Opposed vertical rocker arms 179, 179', are pivotally secured to the opposite sides of cross-arm 67, by pivots, 179*a*, and to the lever arms 180, 180', by a second set of pivots 179*b*. As shown, the rocker arms 179, 179', are mounted substantially midway between the journals 68, 69, and the socket members 176, 176', all three sets of elements being arranged at one end of the cross-arm 67.

The cross-arm mounts actuating levers 180, 180', which control the release of detents 173, 174, from their respective engagement in sockets 167 of locking wheel 160. The levers are compound members of special construction, as shown in Figs. 2, 3, 4, 6, 7, and 8. Each lever is comprised of equal longitudinal segments 181, 181', and 182, 182', severally formed with offset end sections which are reversely and spacedly juxtaposed and welded to their companion elements to form detent-receiving box sections 181*a*, and 182*a*. The box sections are transversely apertured to receive the pivot members 173', 174', to which the detents are secured for reciprocation. The ends 183, 183' of segments 181, 181', of the levers, are square, and have spring-biased engagement with plungers 177, 177', while the opposite segments 182, 182', of the levers, have rounded ends incorporating apertures 184, 184'. These apertures receive links 185 of control cables 186. The control cables extend along one leg 61 of the duplex lever arm 60, over cross-arm 64, and inboard along link arm 51 toward the driver's seat, where they are severally coupled to control handles 187, 187', pivotally mounted on a plate 51', welded to the link member. Armored cable housings 188, 188', serve to protect the cables as they are looped over cross-arm 64. Lost motion, or take-up springs 189, 189', are incorporated in the cables to insure the necessary tension at all times. It will be noted that with the control handles 187, 187', in the down position shown in Figs. 2 and 3, the control cables will be fully retracted, thereby rocking the lever arms 180, 180', against the bias of springs 178, and retracting the detents into their sockets, out of engagement with locking wheel 160 of the cross-head 80. When one of the control handles is raised to its up position, the control cable actuated thereby is fully extended, and no opposing bias is applied to the lever arm coupled thereto, whereby the lever is biased on its pivot by its spring-biased plunger, and the detent pivoted thereto is forced into locking engagement with a socket 167 in member 160.

It will be appreciated that the mechanism described above gives the driver direct control of the break-joint mechanism coupling the duplex lever arm 60 and the grubber fork 70 as a compound, rigid, and substantially rectilinear entity, allowance being had for the dog-leg joint in the fork, and the angular displacement at the latch mechanism, depending upon which detent is engaged.

The overload mechanism adds a most important safety factor to the operation of the novel grubber herein, in that any overload imposed on the rigidly intercoupled grubber-lever arm will result in the shearing of shear-pin 170, and the rotation of the grubber to a collapsed condition on the ground, while the duplex lever arm automatically adjusts or adapts itself to the new, load-free condition.

When the grubber is completely retracted to the traveling position shown in Fig. 1, means are provided for both locking the legs of the grubber fork against the tractor, and snubbing the legs. As shown in Figs. 1, 3, 4, and 5, this means comprises a fitment 190 adapted to be detachably secured to the tractor in place of the usual plow or harrow connection. The fitment consists of a tubular body member 191, having rearwardly extending stub arms 192, at the ends thereof, and severally mounting snubber pads 193, of rubber, or the like. A mounting lug 194 is welded to the forward side of the member, and is detachably secured to the tractor by pin 195. Loops or eyes 196, welded to the tops of stub arms 192, serve as points of attachment for the ends of a chain 197, which is adapted to serve as a keeper for the retracted grubber fork. A pair of bosses 192*a* are welded on the upper surfaces of inboard tubular segments 106 of the guide rods 90, and serve as abutments for the snubber pads 193. In similar manner, snubber pads 63*a* serve to protect journals 63 when they are apposed to guide rod segments 112, upon full extension of the guide rods.

Operation of grubber as a tractor-mounted unit

Turning now to Figs. 12–17, there is shown the sequence of steps involved in the uprooting and removal of a tree A having a root system B. These figures were made from actual photographs of the steps involved, and illustrate, most clearly, the simplicity of the device herein and a preferred method of using the same.

As shown in Fig. 12, the grubber fork 70 has been slid along the ground, with the under surfaces of its fork legs 73 in contact therewith, until the trunk of tree A, at substantially ground level, is firmly gripped in the crotch of the fork. To insure a maximum gripping effect, as described hereinabove, the convergent blades 77, on the inner surfaces of fork legs 73, are adapted to bite into the trunk or bole of a tree. Where lodged or wedged trees are involved, the invention comprehends the provision of hooks or loops, not shown, on the tops of the legs, at the outboard ends of the blades 77, which hooks serve for the attachment of the ends of a suitable chain adapted to be looped around a tree trunk. The maximum gripping effect is attained by backing the tractor, so that the tree is engaged in and by the crotch of the fork. The guide rods 106 are unlatched by operating control member 131, and grubber fork latch control member 187, or 187', as may be required, to withdraw the detent 173, or 174, which is engaged in and by the locking wheel or keeper 160. It is to be noted that all latch controls are positioned within easy reach of the driver's hand.

With a break-joint latch engaged, and the guide latches disengaged, on driving the tractor forward, the weight of the grubber fork serves as an anchor, and the telescoped elements of the guide rods 90 are fully extended. The compression spring 125 in the guide rod assembly serves to take up the shock of the tractor pull. When the guide rods are fully extended, the tractor is backed up, and the crotch-mounted blades 77 of the fork are driven firmly into the tree trunk. It is to be noted that, at the moment of the completion of the telescoping of the guide rod elements, they are positively locked together by the locking of notched end 116 of lock rod 115, by detent 150 of the latch mechanism 130, when control lever 131 is in automatic locking position.

It will be appreciated that with the guide rods fully telescoped, as noted above, they will act as reinforced thrust rods or rammers, and will serve to apply the tractor thrust to the shank of the lever arm. With the continuing rearward thrust of the tractor, the fork legs are tilted forwardly, about the crotch as a fulcrum, until the plantar surfaces 76 of the toes 75 of legs 73 are embedded in the ground to serve as ground fulcrums. As the fork is tilted up on its toes, the break-joint latch

is released, and the resistance of the tree trunk causes a buckling of the unlatched linkage between the crosshead **80** and the duplex lever arm **60**. As a result of the continuing thrust progressively imposed and applied to the shank **71** of the grubber fork **70**, and as illustrated in Figs. 12, 13, and 14, the shank is approximated to the vertical position of Fig. 14, carrying the uprooted tree or stump, with its roots, firmly retained in and by the bladed crotch of the grubber fork. With the uprooted tree in the position illustrated in Fig. 14, and the guide rods **90** latched in telescoped position, the tractor can now be driven forward, permitting the break-joint latch to be re-engaged. Reversing the tractor, with the toes **75** of the grubber fork sliding along the ground, the uprooted tree can be carried away. To free the tree from the fork, the guide rod latches or the break-joint latch is released, and the dragging of the tree releases it from the fork.

Where the uprooted trees or stumps are to be transported and carried away for any appreciable distance, the hydraulic lift mechanism of the tractor can be availed of to impose an upward pull on the guide rods **90**, whereby their outer segments **106**, pivoted by the universal joints **91**, are pulled inward toward the tractor by the hydraulic lift arms **28** engaging loops **106***a* welded on the top surfaces of guide rod tubes **106**. When the guide rods are fully uplifted, or retracted, as shown in Fig. 17, the link arms **51** and the duplex lever arm **60** are carried forwardly, overhanging the body of the tractor, and the tree or stump is carried clear of the ground. Under the conditions illustrated in Figs. 15 and 17, the dead weight of the tree and the grubber is applied, at all times, as a positive, downward thrust on the axle and transmission housing of the tractor, the weight of the tree being applied, through the guide rods, beneath the housing, to the underslung bracing member **30**. As noted, the underslung bracing member **30** is bolted to both the transmission casing and to the axle housing. With the major load underslung on the axle and transmission housing, the subjoined load pulls the axle and wheels down, so that there can be no overturning of the tractor, as no load is applied to any part of its superstructure. Additionally, the weight of the duplex lever arm-link arm assembly is superposed, as a downward thrust, on the axle housing, and in substantially the same vertical plane as the effective downward thrust of the underslung load.

While the operation of the grubber, as above described, is concerned essentially with the uprooting and removal of trees and stumps of relatively light weight, and characterized by relatively shallow root systems, it will be understood that my improved grubber is equally well adapted for use where large trees and stumps are involved, and particularly, where the trees and stumps have deep-seated top roots and extended root systems.

In the case where a massive root system is only partially uprooted or tilted, the grubber fork shank may be tilted at a suitable angle, and the legs or prongs driven underneath the roots, at as flat an angle as possible. Upon lifting up the grubber shank as the tractor is driven backwards against the resistance of the tree or stump root system, the grubber fork is fulcrumed on the plantar surfaces of its toes, and the weight of the root system and bole is distributed on and between the legs of the fork. Repeated driving of the grubber fork under such a root mass, followed, in each instance, by tilting the fork up after each drive, will result in the unseating and uprooting of the bole or stump, which can then be carried away by the tractor, in the manner set forth above.

It will also be appreciated that the novel design of the grubber of the present invention is such that it permits of a plurality of different methods of operational procedure in connection with the uprooting and removal of trees and stumps, depending on the location or position of the trees or stumps, the nature of the terrain, the size of the trees, and the character of their root systems. Among other operative techniques, use may be made of the hydraulic lift, in conjunction with the fork and its associated linkages, for example, while the tractor is moving in reverse, with the fork raised as shown in Fig. 5, and approaching a tree which is to be removed, the fork blades embed in the trunk of the three upon contact just before the fork pivots toward the front of the tractor, thus carrying the tree upwardly. In other words, as the grubber fork embeds in the tree, the horizontal travel of the grubber is momentarily arrested, while the vehicle on which it is mounted continues toward the tree, causing the grubber to pivot on the vehicle connections, forcing the fork upwardly and raising the tree to the extent of this lift; a tree can be effectively uprooted by pushing it over, that is to say, by approaching the tree with the fork raised to a suitable position, substantially parallel to the ground; and by suitable manipulation of the break-joint and guide rod mechanisms to release or to engage the same, various combinations of angularity of the fork and its associated link arms can be obtained.

The hydraulic lift system, in accordance with accepted safety practices, will have an overload by-pass in its hydraulic pump circuit. Additionally, and in accordance with the teachings of the present invention, any overload will cause the shearing of the shear-pin and the unlocking of the latch-keeper, whereby the grubber fork is released and its legs collapse on the ground. While in this position, the keeper wheel **160** is removed and reversed, and its axle is shifted into its second, offset position, in aligned openings **89**, spaced from, and in the same horizontal plane as openings **88**. Another shear pin **170** is passed through aligned holes **172** and **168**, to lock the keeper, which is now engaged by the second detent **174** of the latch mechanism.

It will thus be seen that with the shifting of the axis and reversal of the keeper, the angle between the crosshead and the lever arm will be changed, while the keeper will be locked in the usual manner by either of the detents **173**, **174**. Changing the angle between the crosshead and the lever arm, as noted above, has been found particularly desirable when the ground slope exceeds normal or usual inclination, since the noted change of angularity enables the fork to tilt forward to accommodate it to the terrain and provide firm engagement of the toes.

It will be appreciated that means other than a shear-pin may be used to secure the ratchet wheel **161** against rotation. For example, a modified form of overload release, as shown in Figs. 18–20, may be used in lieu of the shear pin **170**, described in connection with the overload release arrangement of Figs. 6–7. In the modification, a cylindrical shaped housing **200** is mounted on the lugs **87**, the housing being capped at its upper end by a plate **201**, and slotted as at **202**, to receive a lever **203** pivotally mounted between the lugs by means of a pin **204**. The lower open end of the housing is threaded as at **205** to receive a plug **206** for adjusting the tension of a spring **207**, positioned within the housing between the plug and the end portion **208** of the lever **203**. The lugs **87** are formed with registering slots or elongated openings **209**, adapted to receive a bolt or pin **210** located above the lever **203**, the pin being normally retained in seated position in one of the peripheral sockets **167** of the ratchet wheel **161**, by the spring biased lever **203**. As shown in Fig. 19, the pin **210** is seated in one of the sockets **167** of the ratchet wheel, and the wheel is thus restrained against rotation. When sufficient rotative force is applied to the wheel to overcome the tension exerted by the lever **203** against the pin **210**, the pin moves out of the socket **167** and slides downwardly in the slots **209**, thereby permitting the ratchet wheel **161** to rotate. In connection with the above described movement of the pin, it will be noted that the configuration

of the sockets 167, in conjunction with the cylindrical shaped surface of the pin, permits the pin to be forced out of the socket and ride in the slots 209. By means of this modified form of overload release, the rotative resistance which is to be overcome before the ratchet wheel is released for rotation may be predetermined by adjustment of the tension of spring 207, through the medium of plug 206, and by reason of the mounting arrangement of the pin for free movement into and out of the peripheral sockets of the ratchet wheel, overcomes the delay incident to the installation of a new shear pin.

While I have shown and described the preferred embodiment of my invention, I wish it to be understood that I do not confine myself to the precise details of construction herein set forth by way of illustration, as it is apparent that many changes and variations may be made therein, by those skilled in the art, without departing from the spirit of the invention or exceeding the scope of the appended claims.

What is claimed is:

1. In a grubber adapted for mounting on a mobile power unit, a link arm mechanism, a forked tree-engaging lever arm mechanism pivotally connected to the link arm mechanism, said link arm mechanism comprising mutually spaced arms adapted to be pivotally secured to a mobile power unit and to the lever arm mechanism, the lever arm mechanism incorporating a cruciform cross-head and a pair of outwardly convergent lever arms pivotally connected to the sides of the cross-head and to the link arms.

2. In a grubber of the character described, a link arm mechanism, a lever arm assembly including a swiveled, forked tree-engaging element incorporating a shank having a terminal sleeve attached thereto; a cross-head received in said sleeve and rotatably mounting a transverse cross-arm; duplex lever arms detachably fixed at their outboard ends to the ends of the transverse cross-arm; said lever arms being pivoted at their inboard ends to the link arm mechanism; guide rod means coupled to the forked tree-engaging element; a mobile power unit pivotally mounting the link arms and the guide rods; a break-joint between the cross-head shaft and the duplex lever arms; and means associated with the break-joint adapted to break said joint when the tree-engaging element is subjected to a resistive force great enough to cause an overload on the system.

3. In a grubber of the character described, a link arm mechanism, a lever arm assembly including a swiveled, forked tree-engaging element incorporating a shank having a terminal sleeve secured thereto; a cruciform cross-head received in said sleeve and rotatably mounting a transverse cross arm; duplex lever arms detachably fixed at their outboard ends to the ends of the transverse cross-arm; said lever arms being pivoted at their inboard ends to the link arm mechanism; guide rod means coupled to the forked tree-engaging element; a mobile power unit pivotally mounting the link arms and the guide rods; a break-joint between the cross-head shaft and the duplex lever arms; and shear pin means in the break-joint adapted to be sheared when the tree-engaging element is subjected to a resistive force great enough to cause an overload on the system.

4. A grubber, according to claim 3, characterized by the fact that the break-joint incorporates latch means, whereby the joint can be broken independently of the shearing of the shear pin means.

5. A grubber of the character described, including, in combination, a unitary cruciform cross-head member having tubular arms at right angles to each other forming a longitudinal shaft and a transverse journal; lugs extending inwardly from said shaft, an outer forked lever arm mounted for limited oscillation on the outer end of the longitudinal shaft; latch keeper means on said lugs; latch means operatively associated with said latch keeper means, a cross-bar mounted for rotation in the transverse journal and extending therebeyond at both ends; a pair of uniplanar inner lever arms detachably secured to the ends of said cross-bar; a second cross-bar fixedly secured in and between the inner lever arms, said second cross-bar mounting detents and their controls for the latch means; elbow joints at the other ends of the inner lever arms, and fixedly mounting a third cross-bar; spaced link arms rotatably secured at one end in the said elbow joints; a mounting frame adapted for mounting on a mobile power unit; pivots at the ends of the mounting frame coupling the link arms thereto; and a pair of telescoping guide rods pivotally secured to the ends of the mounting frame and to the forked lever arm.

6. A grubber according to claim 5, characterized by the fact that when the latch means are released, the inner and outer lever arms are mutually rotatable in the cross-head to form a break-joint.

7. A grubber according to claim 6, including hydraulic lift means coupled to the telescoping guide rods and to the mobile power units, whereby when the guide rods are rocked upwardly on their pivots by said hydraulic lift means the forked lever arm is raised.

8. A grubber according to claim 5, characterized by the fact that the latch keeper incorporates a shear-pin, whereby when an overload is imposed on the lever arm mechanism, the pin is sheared, and the lever arm mechanism collapses about the cross-head as a pivot.

9. A grubber according to claim 5, characterized by the fact that the latch keeper includes a peripherally slotted wheel rotatably mounted on an axle; and the wheel incorporates a plurality of circumferentially spaced openings and a shear pin seated in one of said openings and engaging the lugs, whereby when an overload is imposed on the lever arm mechanism, the pin is sheared.

10. A mounting frame for a grubber of the character described and adapted for detachable securing on the axle and transmission housings of motor vehicles, comprising, in combination, a transverse mounting plate bolted to the transmission casing; depending lugs at the ends of the plate; inturned channel-shaped brackets secured to the top of the plate, and at the ends thereof, the tops of the brackets being bilaterally apertured to receive mounting bolts; bilaterally apertured link arm-mounting lugs having apertures adapted for alignment with the apertures in the tops of the brackets; bilaterally extended, parallel bearing surfaces at the top and bottom of the axle housing, adjacent the ends thereof, said extended bearing surfaces incorporating apertures severally in alignment with the apertures in the brackets and the link arm-mounting lugs; and mounting bolts fitted in said several sets of aligned apertures, whereby the link arm-mounting lugs and the transverse mounting plate are fixedly secured to the axle housing and the transmission casing as functional elements thereof.

11. A mounting device for the attachment of a grubber of the character described to the axle and transmission housings of tractors and like mobile power vehicles, said axle housings embodying pairs of bilaterally extending, parallel top and bottom bearing surfaces, comprising, in comibnation, a transverse mounting plate attached to the transmission casing, said plate having depending lugs at its ends, and inturned brackets secured to the ends and top thereof; link arm-mounting lugs having bilaterally extended, flat bearing surfaces; said mounting lugs and brackets being severally apposable to the top and bottom bearing surfaces of the axle housing, said apposed elements being provided with registering apertures adapted to receive mounting bolts; and mounting bolts in said registering apertures, whereby the mounting device is detachably, yet fixedly secured to the said axle and transmission housings to form a functional element of said tractor.

12. A grubber of the character described and particularly adapted for detachable mounting on the rear axle and transmission housing of a tractor, comprising, in

combination, a mounting member adapted to be detachably secured to a vehicle, said member incorporating pivot means at the top ends thereof, and swivel joint means at the bottom ends thereof; a pair of parallel link arms pivotally secured at their inboard ends to said pivot means on the mounting member; an outwardly convergent, duplex lever arm having side members and interposed cross-arms fixedly secured thereto, the inboard ends of said side members being pivotally secured to the outboard ends of said link arms; a cruciform cross-head pivotally mounted on the outboard end of said duplex lever arm and in and between its side members; a grubber fork having a socketed extension shank mounted for limited oscillation on and over the outboard leg of said cross-head; a pair of extensible telescoping guide rods having inboard swivels coupled to said mounting member-swivels to form universal joint connections, and universal joint connections between their outboard ends and the shank of the grubber fork, said link arms and guide rods being in substantial parallelism when the grubber is fully extended, whereby the thrust of the mounting vehicle is applied to the grubber fork in substantial parallelism with the ground over which the grubber is traversed.

13. A grubber according to claim 12, characterized by the fact that three cross-arms spacedly secure the sides of the duplex lever arm together, the inboard cross-arm joining and securing the inboard ends of the sides, and the intermediate cross-arm being juxtaposed to the outboard cross-arm, said intermediate cross-arm mounting latch means and controls therefor, and said outboard cross-arm pivotally mounting a cruciform cross-head having an inboard latch keeper adapted to be apposed to and lockingly engaged with said latch means.

14. A grubber according to claim 13, characterized by the fact that the latch means comprises outwardly converging detents, and the latch keeper comprises a peripherally notched, toothed wheel mounted for rotation at the inboard end of the cruciform cross-head, a shear pin passing through said wheel and engaging a portion of the cross-head, whereby said wheel is fixed against rotation.

15. A grubber according to claim 14, characterized by spaced lugs integral with and extending from the inboard end of the cruciform cross-head, the wheel being mounted for rotation between the lugs, said lugs incorporating two pairs of mutually spaced and aligned pivot holes lying in a plane at right angles to the length of the lugs, said lugs incorporating a third set of aligned holes, not in the plane of the first two said sets, said third set of holes receiving a shear pin, and said wheel incorporating an annular array of concentric shear pin-receiving holes, said holes lying on radii bisecting the teeth of the wheel.

16. A grubber according to claim 15, characterized by the fact that a common plane bisects the outboard cross-arm of the duplex lever arm on which the cross-head is pivoted, the normal axis of the latch-keeper wheel, a notch of the latch-keeper, and a detent of the latch means.

17. A grubber of the character described, comprising in combination, mounting means adapted for attachment to the transmission and axle housing of a tractor, and like mobile vehicles; parallel spaced link arms pivoted to the mounted means on the top of the axle housing and at the ends thereof; a duplex lever arm pivotally secured to the other ends of the link arms, said duplex lever arm comprised of convergent side members having a pair of interposed cross-arms secured thereto; a cross-bar detachably secured in the outboard, converging ends of the duplex lever arm; a cruciform cross-head mounted for rotation on the cross-bar and between the side members; a grubber fork having a socketed inboard shank and elongated bifurcate legs set at a dog-leg angle to the shank and terminating in outboard toe sections serving as ground-engaging fulcrums; said bifurcate legs defining a V-shaped member, the socketed shank receiving the outboard leg of the cruciform cross-head, whereby the fork is rotatable with the cross-head about its cross-bar; telescoping guide rods pivotally subjoined at their inboard ends to the mounting means, and pivotally joined at their outboard ends to the shank of the grubber fork; said grubber being apposable to a tree or stump to grippingly receive the same in the crotch of the grubber fork, and upon continued apposition of the grubber, the fork will be tilted to bring its toes into ground-fulcrumed bearing engagement, and the fork and lever arm will be fulcrumed about the toes of the fork, thereby uprooting the tree or stump, and the duplex lever arm and the link arms pivotally coupled thereto will be progressively approximated to define a decreasing apical angle therebetween, whereby the resistive force of the tree or stump is continuously applied downwardly onto the axle and transmission housing, through the link arms of the grubber, and tipping of the tractor or other vehicle about its rear axle is prevented.

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