March 5, 1957 C. O. KELLEY 2,783,699

RIPPER PLOWS

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Fig. 1

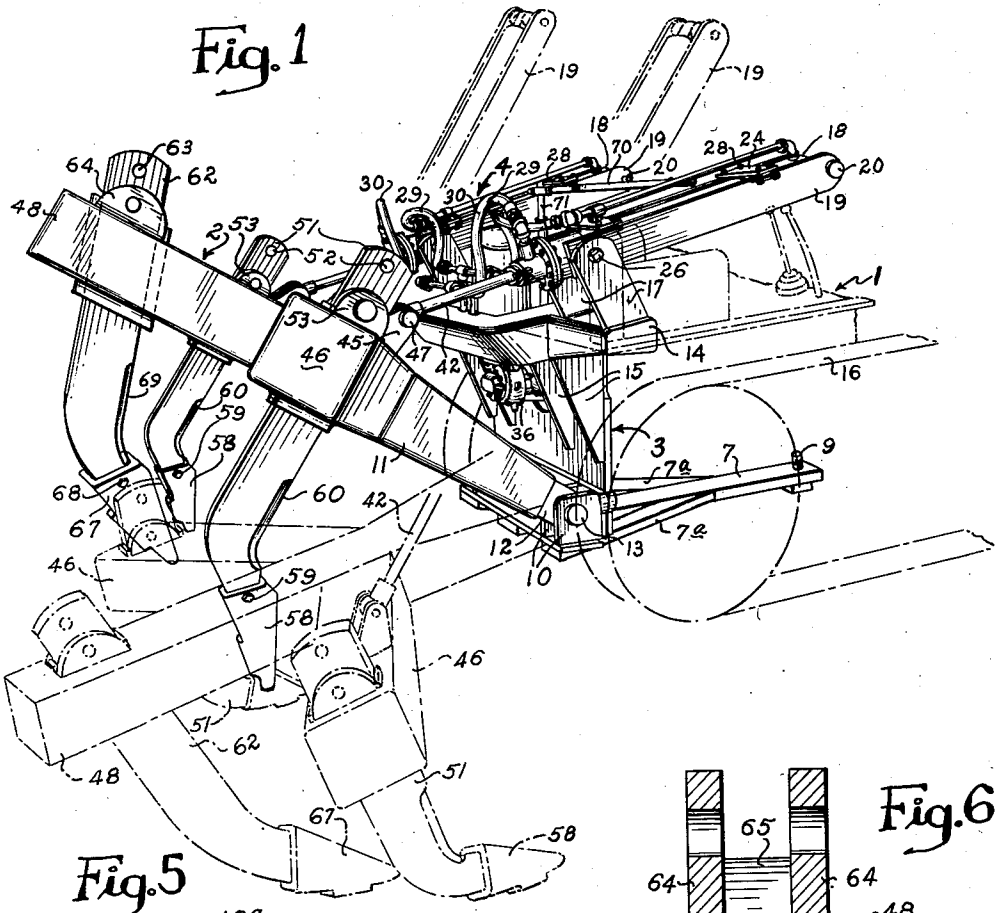


Fig. 5

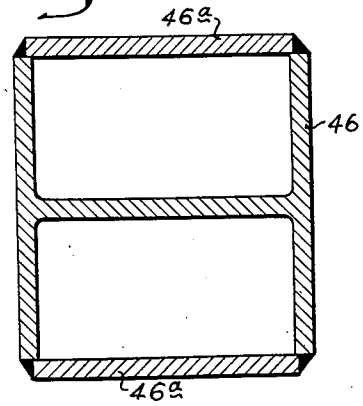
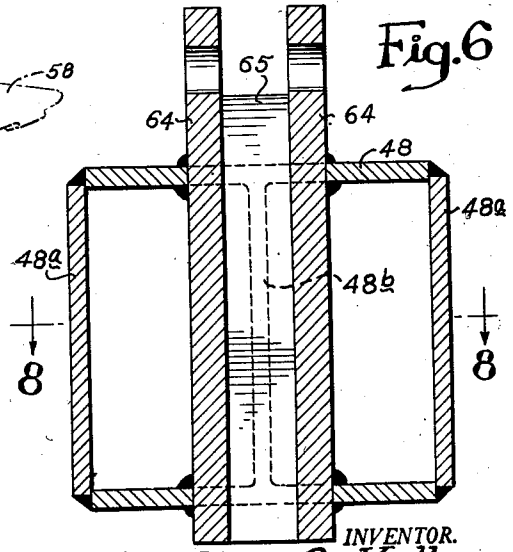


Fig. 6



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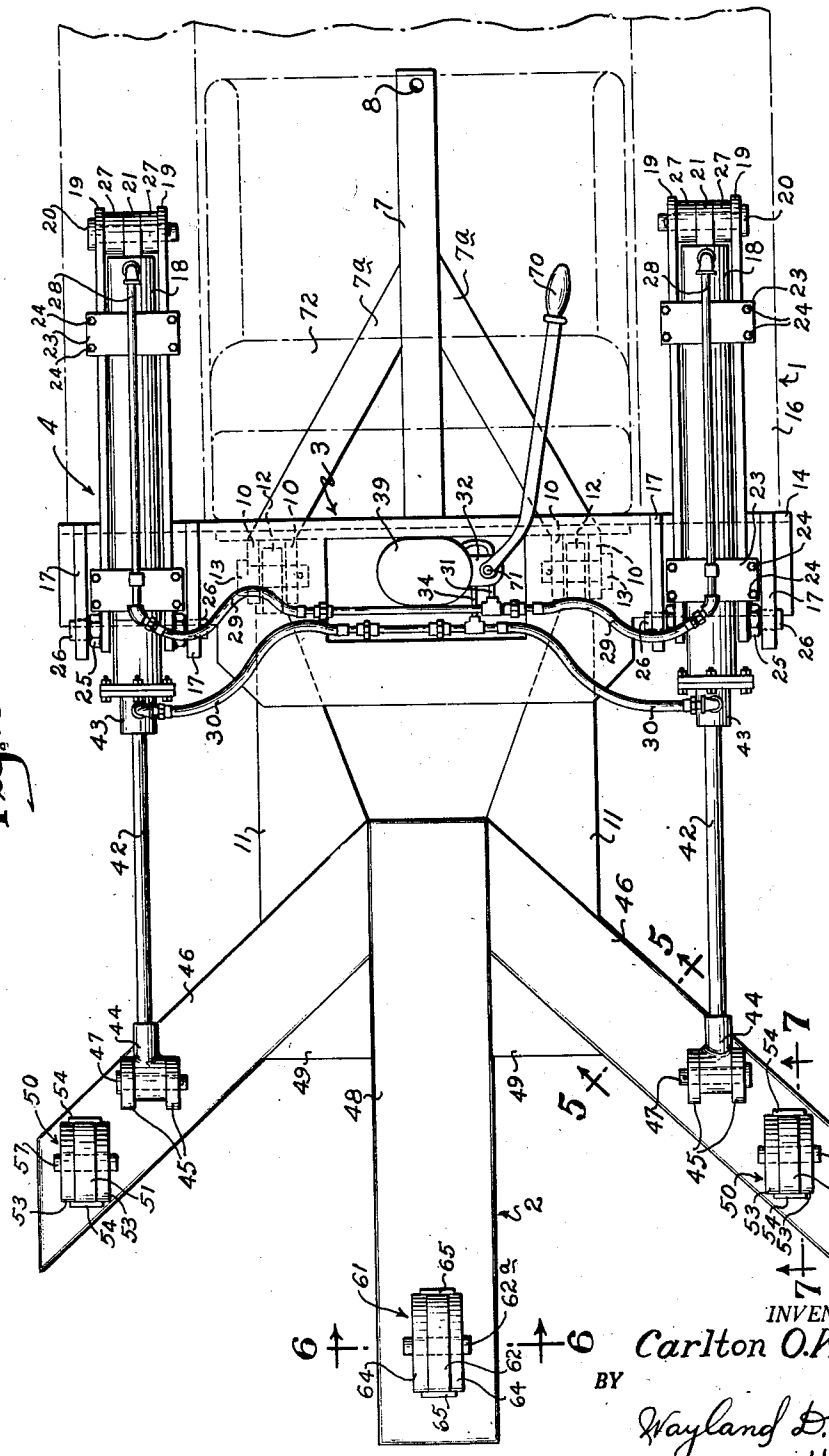
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RIPPER PLOWS

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Fig. 2



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RIPPER PLOWS

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Fig. 3

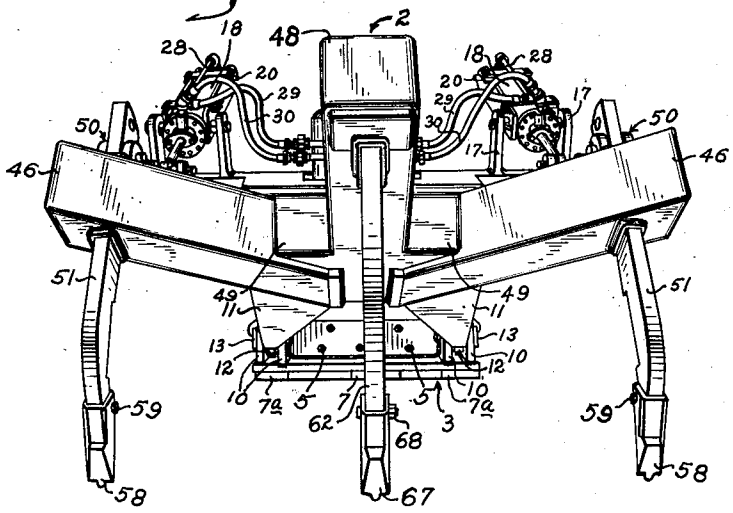
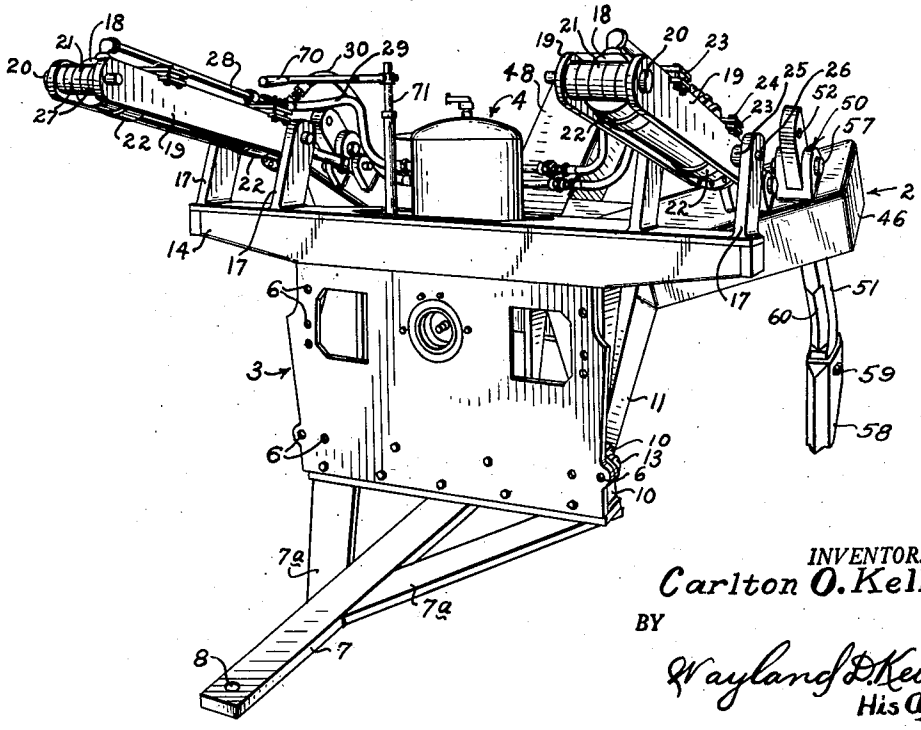


Fig. 4



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RIPPER PLOWS

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Fig. 7

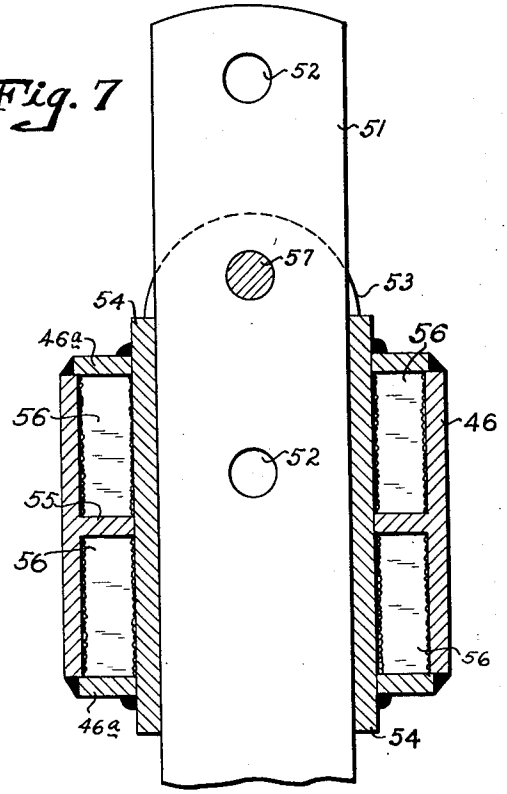


Fig. 8

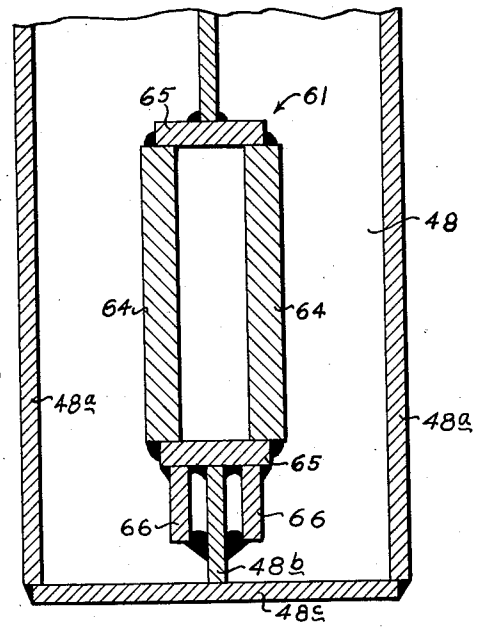


Fig. 9

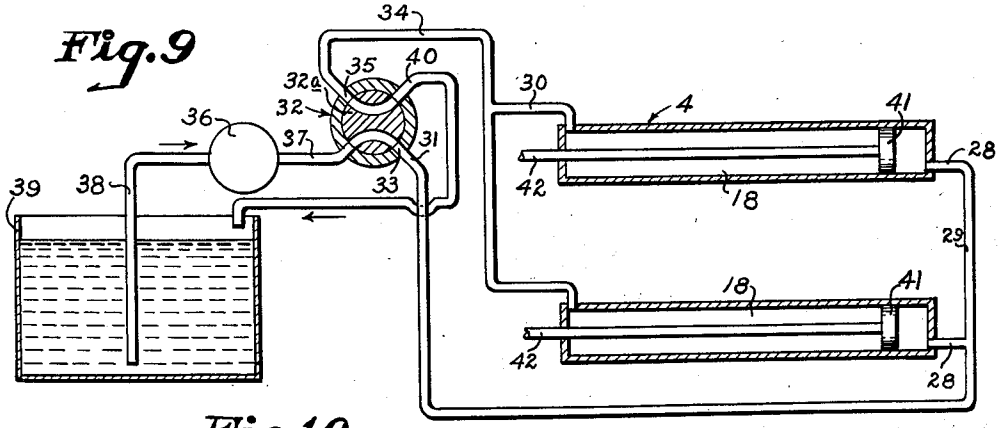
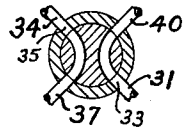


Fig. 10



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2,783,699

RIPPER PLOWS

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Application February 19, 1953, Serial No. 337,709

5 Claims. (Cl. 97—46.59)

This invention relates to improvements in ripper plows, and more particularly to a ripper plow which is hydraulically raised and lowered, which ripper plow is attached to a traction element such as a crawler type tractor.

Various types of ripper plows have been proposed, heretofore, but these for the most part, were difficult to handle, hard to attach to and detach from the traction element, and were usually of much greater weight than actually necessary to accomplish the desired results.

In the present device, the ripper plow unit is attached to the rear of the traction element in such manner that the attaching elements and beams of the ripper plow are substantially within the confines of the width of the traction element, which enables the traction element and the ripper plow unit attached thereto to pass through relatively narrow openings, and to perform operations not possible to perform with the type of ripper plow that attaches to the side of and extends outward from the traction element.

An object of this invention is to provide a ripper plow unit that may be readily attached to a traction element in such manner that a single operator may easily control both the traction element and the ripper plow unit.

Another object of this invention is to provide a ripper plow that is raised and lowered hydraulically, and that may be maintained at any desired position with respect to the horizontal, with the traction element either moving or standing still.

Still another object of the invention is to provide a medial main beam and laterally extending beams which attach to the main beam, each of which beams carry a ripper plow element.

Yet another object of the invention is to provide ripper plow beams that are internally braced so as to transfer the strain resulting from the pull on the ground engaging shanks to the medial beam and to the main frame of the traction element and the draw bar attached thereto.

An embodiment of this invention is illustrated in the accompanying drawings, in which like reference characters designate like parts in the several views thereof, in which:

Fig. 1 is a perspective view, taken from a side and the top of the device embodying the invention, showing the device in raised position in full outline, with the lowered position thereof being shown in dot-dash outline, and with a portion of the traction element being shown in dot-dash outline;

Fig. 2 is a top plan view of the device embodying the invention shown in full outline, and with the fragmentary portion of the traction element to which the device is attached being shown in dot-dash outline;

Fig. 3 is a perspective view of the device embodying the invention taken from the rear and below, to illustrate the details of construction;

Fig. 4 is a perspective view of the device detached from the traction element, which view is taken from an end and a side of the device;

Fig. 5 is a side view taken on the line 5—5 of Fig. 2, looking in the direction indicated by the arrows;

Fig. 6 is a sectional view taken on the line 6—6 of Fig. 2, looking in the direction indicated by the arrows;

Fig. 7 is a sectional view taken on the line 7—7 of Fig. 2, looking in the direction indicated by the arrows;

Fig. 8 is a sectional view taken on the line 8—8 of Fig. 6, looking in the direction indicated by the arrows;

Fig. 9 is a diagrammatic view of the hydraulic system used in connection with the ripper plow elements, showing a four-way valve in position to direct the hydraulic fluid to the ends of the cylinders to cause a lowering action of the ripper plows; and

Fig. 10 is a fragmentary view showing the four-way valve in an alternate position from that shown in Fig. 9, so as to direct hydraulic fluid into the opposite ends of the cylinders to cause the raising of the ripper plow beams.

With more detailed reference to the drawings, the numeral 1 designates generally a traction element, such as a crawler type tractor, such as used in earth moving operations and the like. The numeral 2 designates generally the ripper plow beam assembly including the ripper plow elements. The numeral 3 generally designates the mounting plate assembly on which the hydraulic unit, which is designated generally at 4, is mounted.

The mounting plate assembly 3 is attached to the rear end of the traction element 1 by means of bolts 5, as will best be seen in Fig. 5. Various holes, indicated at 6 in Fig. 4, will register with holes provided in the rear portion of the traction element frame so that bolts or studs may be screw threaded thereinto and into the frame of the traction element 1, so as to hold the mounting plate assembly 3 securely in place.

A draw bar 7, having angular brace members 7*a* secured thereto, which draw bar and brace members is secured to the lower edge of the mounting plate 3, at the center and each side, respectively, as by welding or the like, and which draw bar extends forward and has a hole 8 therein which enables a bolt 9 to be passed therethrough to secure the draw bar 7 to the lower side of the frame of the traction element. By having the draw bar 7 and angular brace members 7*a* secured to the mounting plate in this manner, the pull of the beam assembly 2 is transferred through the angular braces 7*a* to the draw bar 7 without undue strain being exerted on the mounting plate 3. The mounting plate 3 has a pair of apertured lugs 10 on each side and near the lower edge theref. The beam assembly 2 has a pair of forwardly extending arms 11, each of which arms 11 has an apertured lug 12 at the forward terminal end thereof. Each apertured lug 12 is received between a pair of lugs 10 so that the respective apertures are in register.

A pin 13 passes through the apertures of each pair of lugs 10 and of the lug 12 that is in register therewith so as to hingeably connect the beam assembly 2 with the plate assembly 3.

The upper side of the mounting plate 3 has a transverse brace 14 thereacross, which transverse brace is secured to the mounting plate 3 by means of angle braces 15. The transverse brace 14 extends outward over the tracks 16 of the traction element 1. Each end of the transverse brace 14 has a pair of upstanding apertured lugs 17 formed thereon, which pairs of lugs are each adapted to receive a hydraulic cylinder 18 therebetween. Each of the cylinders is mounted within a cradle comprising a pair of side members 19 which have a pin 20 extending through the forward ends thereof and through an end of lug 21 formed on the respective ends of the hydraulic cylinders 18. The side plates 19 on each side of each cylinder 18 have a cradle 22 on the lower side thereof near each end thereof to support the lower portion of the respective cylinders. A transverse

bar 23 is secured to the upper edge of the respective pairs of side plates 19 by means of bolts 24 so as to enable the cylinder 18 to be readily removed. Nuts 25 are welded to the rear end and exterior of each of the side plates to threadably receive the respective studs 26 that pass through the apertured lugs 17, so as to hingeably support the rear end of the side plates 19 that support the respective hydraulic cylinders 18 therebetween. Spacers 27 are provided intermediate the side plates 19 and the lugs 21 on each side of the cylinders to hold the respective cylinders 18 in aligned relation with respect to the side plates 19.

Each of the cylinders 18 is of the double acting type and has a pipe 28 leading from the forward end thereof to connect with a hose 29 to enable pivotal movement of the respective cylinders about the axis of the respective studs 26. The hose elements 29 of the respective cylinders are connected with a pipe 31 that leads to a port 33 in a side of the four-way valve 32. The hose 30 leads to pipe 34 that connects to the port 35 on the opposite side of the four-way valve from the port 33, as will best be seen in Figs. 9 and 10. A hydraulic pump 36, as best seen in Figs. 1 and 9, is mounted beneath transverse brace 14 and connects with a power shaft on the traction element 1, so as to provide hydraulic pressure for the hydraulic cylinders 18. The discharge of the pump 36 is connected to the four-way valve 32 by means of a conduit 37. The inlet side of the pump 36 has an inlet conduit 38 that connects with a hydraulic fluid reservoir 39. The side of the four-way valve 32 opposite the inlet 37 has a conduit 40 leading therefrom for discharge of fluid from the four-way valve back into the hydraulic fluid reservoir 39. It may be appreciated, by inspection of Figs. 9 and 10, that the valve 32 may be moved so as to selectively direct hydraulic fluid into selected respective ends of the hydraulic cylinders 18, which fluid is discharged from the opposite ends of the respective cylinders back into the hydraulic fluid reservoir 39.

Each of the hydraulic cylinders 18 has a piston 41 therein, and to each piston is connected a piston rod 42 that extends rearward and out through a stuffing gland 43 and has an eye 44 on the rear end thereof. Each of the eyes 44 is adapted to be received between apertured lug members 45 secured to the upper face of laterally extending beams 46. A pin 47 passes through the apertured lugs 45 and the eye 44 positioned therebetween so as to operatively connect the beam assembly 2 with the hydraulic cylinders 18.

The lateral beams 46 radiate outward from a medial beam 48. Angle braces 49 secure the lateral beams in fixed relation with respect to the medial beam 48 and the arms 11 are secured to the forward ends of the lateral beams 46 so as to form a rigid beam unit with open, spaced apart radiating beams.

Each of the laterally extending beams 46 has a socket, generally designated at 50, formed near the outer end thereof, to receive a shank 51. The shanks 51 are preferably vertically disposed and have apertures 52 formed along the upper portions thereof.

The sockets 50 are each constructed of a pair of side plates 53 and a pair of end plates 54, which pairs of plates are secured together as by welding, and are secured to the respective lateral beams 46 as by welding. The pairs of plates 53 and 54 pass perpendicularly through a medial web member 55, as will best be seen in Fig. 7. Vertical internal braces 56 are welded to the pairs of plates so as to secure these plates in rigid relation with respect to the beams 46.

The beams 46 have plates 46*a* on the top and bottom thereof respectively so as to form a box section, as will best be seen in Figs. 5 and 7. The plates 46*a* are welded to the flanges of the respective beams 46.

The upper ends of the side plates 53 are apertured,

as will best be seen in Figs. 1 and 7, and a pin 57 is adapted to pass through the respective apertures and through one of the apertures 52 of the respective shanks 51. This will enable the ground engaging ripper points or teeth 58 to be adjusted a spaced distance below the laterally extending beams 46. The ground engaging points or teeth 58 are preferably hard surfaced with tungsten, cobalt or other hard surfacing material or alloy, so as to resist the abrasive action of the soil. These ground engaging points or teeth 58 are held in place by means of bolts 59.

The forward edge of each of the shanks 51 is preferably sharpened to a knife edge, as indicated at 60, so as to part the ground when the shanks are engaged therein, as will be more fully described hereinafter.

The ground engaging points or teeth 58 preferably extend forward in somewhat of a horizontal position when in their lower most position, so as to form the proper pitch to keep the ripper plows engaged in the soil when the device is moved along behind a traction element.

The medial main beam 48 has a socket 61, which socket is similar to the sockets 50 except the socket 61 is preferably disposed at an acute angle with respect to the medial main beam in such manner that the shank 62 projects downwardly and forwardly as it passes therethrough. The shank 62 has apertures 63 formed therein. A pair of side plates 64 are positioned on each side of the socket 61 and a pair of end plates 65 are positioned on each end thereof, which plates are securely welded together and to the medial main beam 48, as will best be seen in Figs. 6 and 8. Plates 48*a* are secured to each side of the medial main beam 48 as by welding, after the side plates 64 and end plates 65 are secured in place. The side plates are welded together so as to form a box beam with the web thereof aligned in vertical relation so as to present a pull on the forward end of the socket 61, and which vertical web also serves as a brace to the rear portion of the socket 61. A pair of braces 66 are disposed at the rear of the plate 65 and are welded thereto and to the vertical web 48*b* of the medial main beam 48. An end plate 48*c* closes the rear end of the medial main beam 48 and is welded at all four edges to the beam 48 and to the side plates 48*a* so as to further reinforce the beam and the vertical web 48*b*.

The shank 62 is substantially of the same construction as the shanks 51, except it is preferable to have this shank 62 heavier both in thickness and width, as when a single shank is used, the entire pull is transmitted through the beam to this shank. The shank 62 has a point or tooth 67 which is also hard surfaced on the lower end thereof, the point 67 being attached to the shank 62 by means of bolts 68.

The forward edge of the shank 62 is sharpened, as indicated at 69, so as to part the soil when the shank is engaged in the ground.

Due to the depth at which these ripper plows are designed to operate, the construction must necessarily be strong and rugged for the amount of material used. The machines must, however, be portable, and not too heavy to be easily and readily raised and lowered, without taxing the mechanism of the traction element 1.

The raising and lowering of the beam assembly 2 is accomplished by the hydraulic assembly 4, wherein the hydraulic supply reservoir 39 supplies the hydraulic fluid through pump 36 to and through four-way hydraulic valve 32 to the respective hydraulic cylinders 18. A control lever 70 is connected through a shaft 71 with the rotatable element 32*a* of the valve 32 so that the valve may be moved into the position shown in Fig. 9, or to the position as shown in Fig. 10, by manipulation of lever 70 through the desired arc. In this manner an operator seated on seat 72 on the fraction element, is able to steer the traction element and to operate the ripper plows to the desired depth without undue strain, and

without the necessity of having another operator to raise and lower the ripper plows.

Operation

With the device as described above attached to the rear end of a traction element, as shown in Figs. 1 and 2, and with the pump **36** connected in suitable driving relation to the power take-off shaft of the traction element, the device is ready to operate. With the device in raised position, as shown in Fig. 1, and with the valve **32** positioned as shown in Fig. 9, the valve having been moved to this position by the manipulation of valve control lever **70**, hydraulic fluid will be withdrawn from the reservoir **39** through inlet conduit or suction pipe **38** by pump **36** and directed outward through pipe **37** into and through valve **32** and out through pipe **31** into hose **29** and thence into pipe **28** into the forward end of the respective cylinders **18**, Whereupon the respective pistons **41** will move toward the opposite ends of the respective cylinders to expel the fluid that is on the opposite side of the piston into hose **30**, into pipe **34** and through port **35** into and through valve **32** to discharge it out through pipe **40** back into the reservoir **39**. The pistons **41** will be moved the desired distance, which will move the respective piston rods **42** until the beam assembly, to which each of the connecting rods **42** is pivotally attached, is moved into the ground, substantially as shown in dot-dash outline in Fig. 1.

The pump **36** is of the variable pressure control type so as to enable the maintaining of a given pressure on the pistons **41** at all times, thereby the beam assembly unit may be held in ground engaging position to the desired depth at all times. The cylinders **18** are mounted between side plates **19** and are held against lateral movement by a cradle **22** therebelow, and a bar **23** thereabove. The side plates **19** have nuts **25** secured thereto as by welding to each rear end thereof so as to enable the cylinders **18** and side plates **19** to pivot about each pivot point **26** within upstanding lugs **17**. This arrangement enables each of the connecting rods **42** to automatically align with the respective cylinders **18**, as the beam assembly **2** moves about the pivot point **13**.

The pull exerted by the engagement of the shanks **51** and **62** with the earth, will be transmitted through beams **46** and **48** to arms **11** and through pivot pins **13** to the mounting plate assembly **3**, and with the mounting plate assembly **3** securely bolted to the rear of the frame portion of the traction element, as hereinbefore set out, and with the draw bar **7** and brace **7a** of the mounting plate assembly **3** extending forward to be securely bolted to the under portion of the frame of the traction element by means of bolt **9**, it will be readily appreciated that, upon the traction element **1** exerting a pull on the draw bar **7** and arms **11** of the beam assembly **2**, the pull is transmitted to the lower portion of the traction element which gives a greater stabilizing effect than if the pull was above the center of the traction wheels. Therefore, it is possible for the shanks **51** and **62** to be engaged within the ground to a greater depth than has usually been possible heretofore.

While the device is shown to have a medial main beam **48** and two lateral beams **46**, each with a ground engaging shaft mounted on the respective outer ends thereof, certain of these shanks may be dispensed with to obtain the desired ripping results. For example, in the case of laying pipe lines and the like, it may be desirable to use a single shank **62** and dispense with the shanks **51**. This will permit the opening of a single ditch to the desired depth, through such terrain as rocks, roots and the like, which ditch may be cleaned out for laying the pipe. But, in removing pipe from the ground, shanks **51** may be used and the shank **62** dispensed with, so that the shanks **51** will "straddle" the pipe and loosen the earth on either side thereof, cut roots, loosen rocks and the like without damaging the pipe, and thus making it possible for the pipe to be readily removed, in the conventional manner.

Since it is often desirable to use the traction element apart from the ripping device, but for which jobs it is not feasible to disassemble the entire mounting plate assembly **3** from the traction element **1**, the beam assembly **2** can be readily removed by the removal of pins **13** and **47**, thereby enabling the traction element to be used for jobs on which the beam assembly is not needed.

The beam assembly may be readily put back in operating condition in a few minutes time, by registering the holes within lugs **12** with the holes in lugs **10** and interconnecting same by means of pins **13** and connecting the eyes **44** with the lugs **45** by means of pins **47**.

It can be readily appreciated that the present device is mobile and can be maintained substantially within the width of the traction element, but at the same time, it is capable of performing the type of work that formerly required much heavier machinery.

While the device has been illustrated and described in one embodiment thereof, it is to be understood that changes may be made in the minor details of construction without departing from the spirit of the invention of the scope of the appended claims.

Having thus described the invention, what is claimed is:

1. In a ripper plow for attachment to a tractor, an upstanding mounting plate, means for securing said mounting plate to the rear of said tractor between the traction elements thereof, a transverse member secured to the top of said mounting plate and extending outwardly over said traction elements, a pair of apertured lugs secured to said mounting plate on each side near the bottom thereof, a rearwardly extending, apertured arm mounted between each pair of said lugs and a pin fitted within said apertures so as to pivotally connect said arms with said lugs, a laterally extending beam connected with each of said arms, a medial beam interposed between said lateral beams and secured therebetween so an open throat will be formed between the rear end of each of said lateral beams and said medial beam, an upright socket formed in each of said beams near the outer ends thereof, a shank positioned within each of said sockets and means detachably holding said shanks in fixed position with respect to said sockets, each of said shanks being pointed at its lower end for engagement with the soil, a pair of spaced, apertured lugs mounted on the upper side of each of said lateral beams near the outer end thereof, a pair of spaced, apertured lugs mounted on said transverse member near each outer end thereof, a hydraulic cylinder pivotally mounted between each of said last mentioned pairs of lugs, each of said cylinders having a connecting rod extending rearward therefrom, means for pivotally connecting the rear end of each of said connecting rods with a pair of said lugs on the respective lateral beams, and hydraulic means connected to said hydraulic cylinders for actuating said connecting rods to raise and lower said beams.

2. In a ripper plow for attachment to a tractor, an upstanding mounting plate, means for securing said mounting plate to the rear of said tractor between the traction elements thereof, a transverse member secured to the top of said mounting plate and extending outwardly over said traction elements, a pair of apertured lugs secured to said mounting plate on each side near the bottom thereof, a rearwardly extending, apertured arm mounted between each pair of said lugs and a pin fitted within said apertures so as to pivotally connect said arms with said lugs, a laterally extending beam connected with each of said arms, a medial beam interposed between said lateral beams and secured therebetween so an open throat will be formed between the rear end of each of said lateral beams and said medial beam, an upright socket formed in each of said beams near the respective outer ends thereof, a shank positioned within each of said sockets and means detachably holding said shanks in fixed position with respect to said sockets, each of said shanks being pointed at

its lower end for engagement with the soil, a pair of spaced, apertured lugs mounted on the upper side of each of said lateral beams near the outer end thereof, a pair of spaced, upstanding, apertured lugs mounted on said transverse member near each outer end thereof, a pair of side plates mounted between said upstanding, apertured lugs of each pair, aligned bosses on each outer side of each of said side plates near the rear end thereof, each of which bosses has a threaded opening formed therein and aligned with the apertures in said upstanding lugs, trunnion pins positioned through said apertured lugs and threadedly engaging said bosses to pivotally mount said side plates, bars secured across the lower portion of said side plates and forming a cradle for a hydraulic cylinder, an abutment formed between said side plates at the forward end thereof for the abutment of the forward end of a hydraulic cylinder thereagainst, a hydraulic cylinder fitted between the side plates of each pair and resting on said cradle, with the forward end of each of said cylinders abutting with the respective abutment, bars attachably secured about the upper portion of said side plates so as to secure said hydraulic cylinders therein, each of said hydraulic cylinders having a connecting rod extending rearward therefrom, means for pivotally connecting the rear end of each of said connecting rods with a pair of said lugs on the respective lateral beams, and hydraulic means connected to said hydraulic cylinders for actuating said connecting rods to raise and lower said beams.

3. In a ripper plow mounting assembly, a substantially vertical mounting plate, a draw bar attached to the lower portion of said mounting plate and extending forwardly beneath a traction element and detachably secured thereto, a pair of apertured, upstanding lugs mounted on an overhanging portion extending laterally from the upper portion of said mounting plate near each outer end thereof in order to dispose the cylinders over the treads of said traction element, a pair of bars pivotally connected to each pair of said apertured lugs and extending forwardly thereof and having apertures formed near the outer end thereof, a hydraulic cylinder cradled between each pair of said forwardly extending bars and secured thereto, each of said hydraulic cylinders having a plunger extending rearwardly therefrom to detachably connect to the respective ripper plow beams, said pair of bars and said hydraulic cylinder adapted to move between a substantially horizontal position and an upright position to move said plow beam and means for directing hydraulic fluid to said hydraulic cylinders.

4. In an attachment for a tractor, an upstanding mounting plate, means for securing said mounting plate to the rear of said tractor between the traction elements thereof, a transverse member secured to the top of said mounting plate and extending outwardly therefrom, at least one apertured lug secured to each side of said mounting plate at the rear thereof and near the bottom, rearwardly extending, apertured arms pivotally connected with said lugs, a beam connected with said arms, at least one upright socket formed in said beam, a pointed shank positioned within said socket and means detachably holding said shank in a fixed position with respect to said socket, a hydraulic cylinder pivotally interconnecting said transverse member and said beam, hydraulic means connected to said hydraulic cylinder for raising and lowering said beam, and a draw bar secured to the lower side of said upstanding mounting plate, which draw bar extends forwardly of said mounting plate and is secured to said tractor.

5. The device substantially as defined in claim 4, wherein said draw bar is secured to said upstanding mounting plate medially of the lower side thereof, and angular brace members secured to the lower side of said mounting plate near the outer edge thereof and to said draw bar intermediate the ends thereof.

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