

April 21, 1959

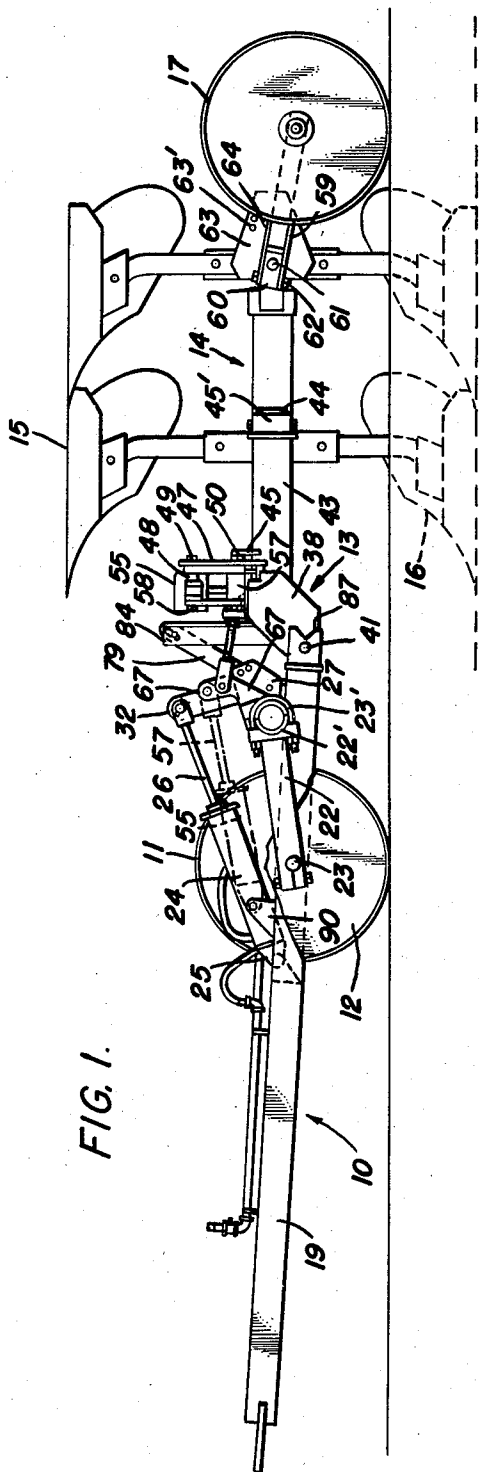
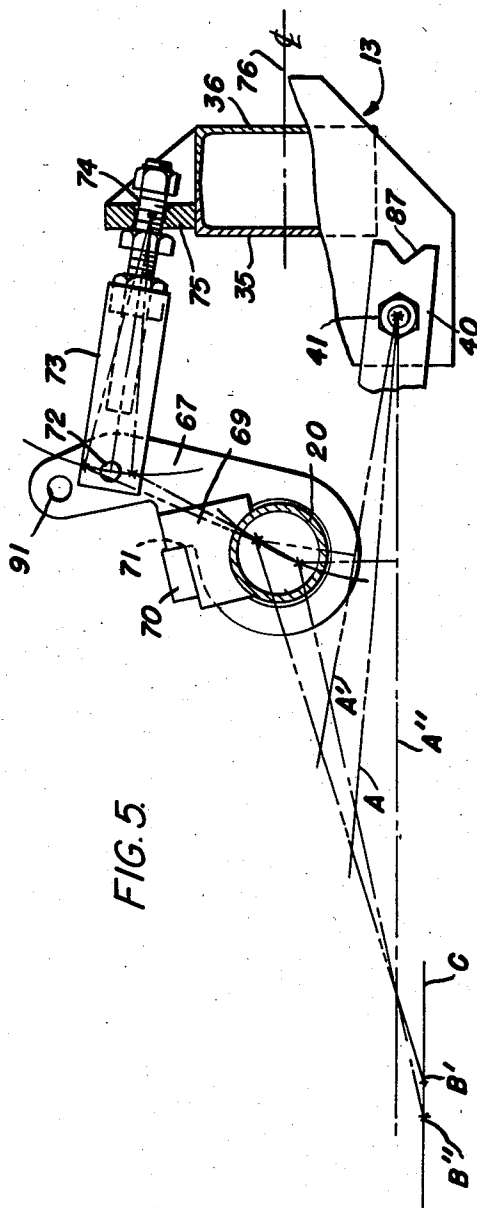
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2,882,979

COMBINATION TWO-WAY FLOW AND TOOL CARRIER

Filed July 22, 1954

3 Sheets-Sheet 1



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COMBINATION TWO-WAY PLOW AND TOOL CARRIER

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3 Sheets-Sheet 2

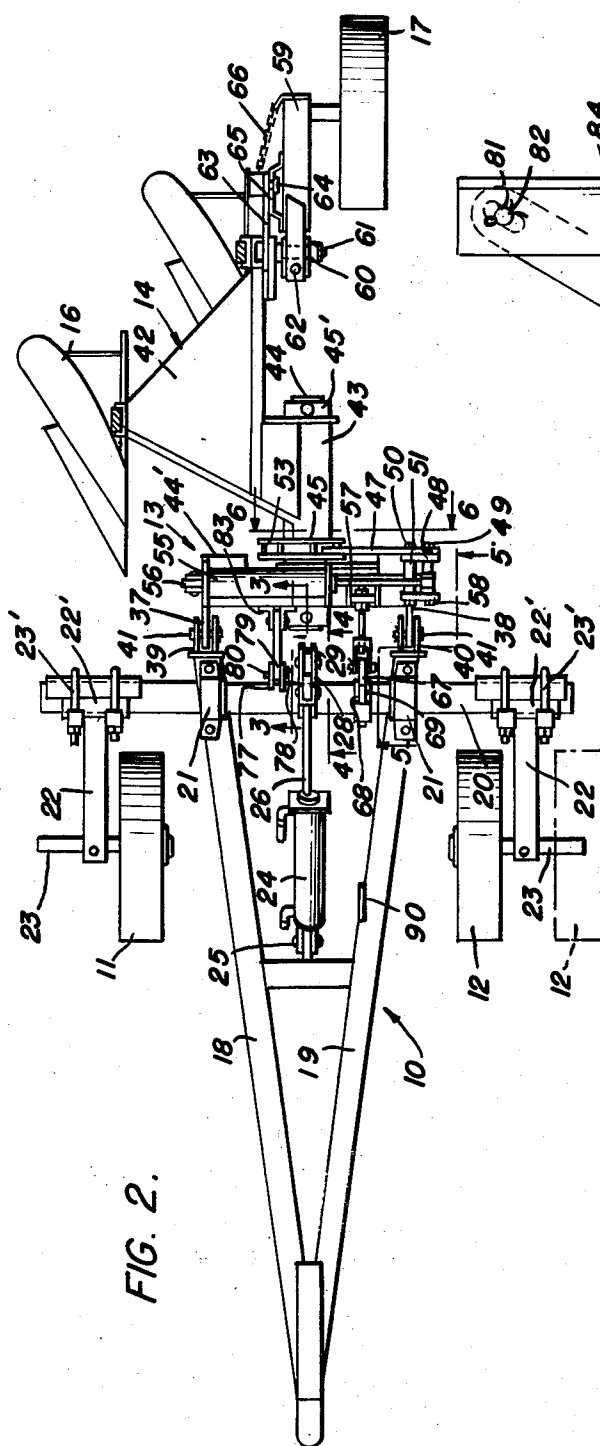


FIG. 2.

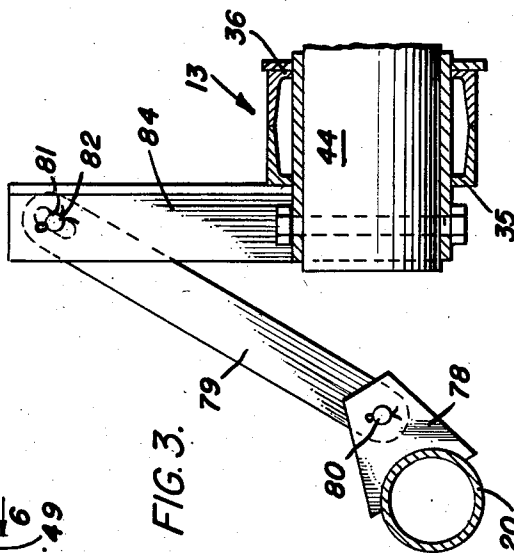


FIG. 3.

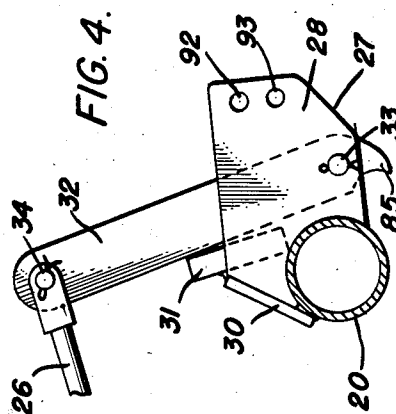


FIG. 4.

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3 Sheets-Sheet 3

FIG. 7.

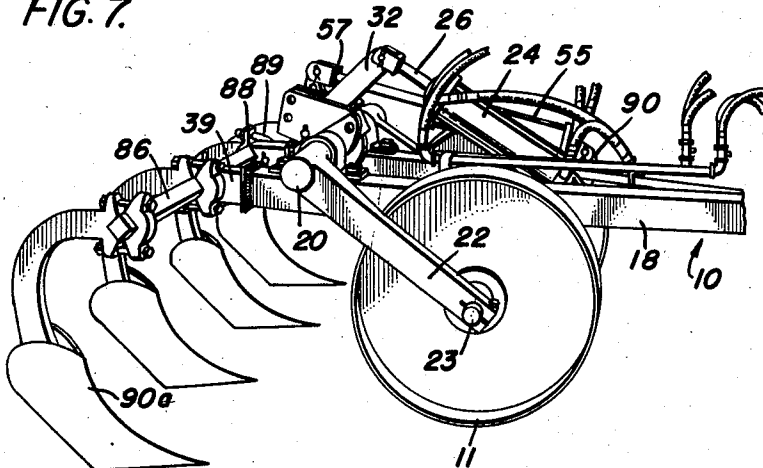


FIG. 9.

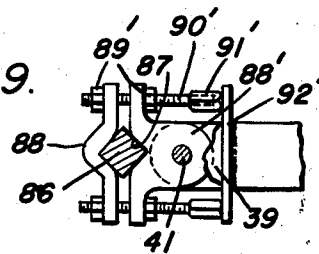


FIG. 6.

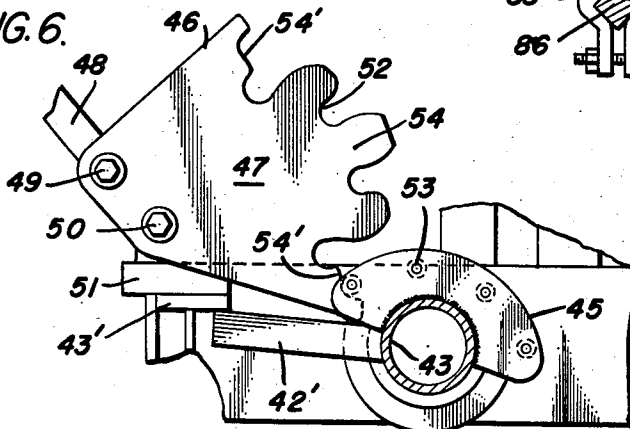
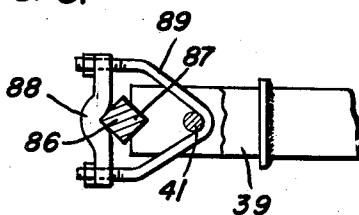


FIG. 8.



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## COMBINATION TWO-WAY PLOW AND TOOL CARRIER

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Application July 22, 1954, Serial No. 445,128

13 Claims. (Cl. 172-225)

The present invention relates generally to earth working equipment, and is more particularly concerned with a combination two-way plow and tool carrier.

It is one object of the herein described invention to provide an improved two-way plow in which a pulling tongue is pivoted on a wheeled structure arranged for adjusting raising and lowering movements by power means interconnected between the tongue and wheeled structure, a carrier frame being connected with the rear-end of the tongue through a floating link connection which is so proportioned that the carrier frame will be substantially free of vertical movements during normal vertical swinging movements of the tongue.

A further object of the invention is to provide in a two-way plow, a carrier frame assembly which is readily detachable from a tongue pulled wheel structure, when it is desired to utilize the wheeled structure as a carrier for other types of earth working tools.

A still further object is to provide an improved and simplified carrier adapted for selective use with a plurality of earth working tools, and in which a tool carrying bar is tiltably adjustable.

Another object of the invention is to provide a unique link arrangement for lifting the plow elements with a delayed cantilever action.

It is also an object to provide in a tool carrier for earth working, a wheeled structure in which the wheels may be selectively mounted inboard and outboard with reference to wheel supporting arms, and in which each arm and wheel is laterally adjustable as a unit.

Further objects of the invention will be brought out in the following part of the specification, wherein detailed description is for the purpose of fully disclosing the invention without placing limitations thereon.

Referring to the accompanying drawings, which are for illustrative purposes only:

Fig. 1 is a side elevational view of a two-way plow embodying the features of the present invention;

Fig. 2 is a plan view of the plow shown in Fig. 1;

Fig. 3 is a sectional view taken substantially on line 3-3 of Fig. 2;

Fig. 4 is a detailed sectional view illustrating the details of the lost motion connection for raising and lowering the rear-end of the pulling tongue;

Fig. 5 is a fragmentary sectional view taken substantially on line 5-5 of Fig. 2, and diagrammatically illustrating the floating articulate connection between the carrier frame and tongue for adjusting the operating depth of the earth working tool, and for minimizing the transmission of the vertical component of vertical movements of the tongue to the carrier frame;

Fig. 6 is a transverse enlarged fragmentary view showing the cam actuating mechanism for turning and locking the roll-over frame for selectively bringing plowing elements into operative position;

Fig. 7 is a more or less perspective view showing the utilization of the wheel supported tongue assembly as a carrier for different types of earth working tools, the

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carrier frame and associated two-way plow elements being detached;

Fig. 8 is a detail view showing the manner in which a tool supporting bar is secured to the rear end of the tongue structure; and

Fig. 9 is a view illustrating a further modification of the tool bar mounting to provide for tilting adjustments thereof.

Referring now more specifically to the drawings, the combination two-way plow and tool carrier of the present invention is arranged to be towed behind a powered vehicle, such as a tractor. As shown primarily in Figs. 1 and 2, the equipment of the present invention includes a mobile tongue structure 10 supported upon ground-engaging wheels 11 and 12. The rear-end of the tongue structure carries a carrier frame, as generally indicated at 13 which serves as a forward support for a roll-over frame which carries a left-hand plow gang 15 and a right-hand plow gang 16. The rearmost end of the roll-over frame is supported by a depth gauging wheel 17 which cooperates with the wheels 11 and 12 to form a three point support for the plows, and further cooperates to determine the desired plowing depth.

More specifically, the tongue structure 10 is shown as including rearwardly diverging side rails 18 and 19 at the rear-ends of which there is rotatably supported a shaft 20, the shaft being retained in position by U-shaped strap members 21-21 which are respectively bolted to the side rails of the tongue structure.

The shaft 20 at its opposite ends is provided with a projecting arm 22, in each case, which is arranged to support at its outer end a wheel supporting axle 23 which may be longitudinally adjusted in the associated arm 22 in order to adjust the spacing of the associated wheel with reference to its supporting arm 22. Moreover, the wheel may be positioned inboard of the supporting arm 22 or may be supported outboard, as shown in dotted lines in Fig. 2 merely by reversing the axle 23.

The arms 22 may be welded or otherwise fixedly secured to the ends of shaft 20, as shown in Fig. 7. More flexible adjustment of the wheels 11 and 12 will be possible, however, if the arms 22 are secured in the manner shown in Figs. 1 and 2, where the inner end of each arm 22 is provided with a clamping plate structure 22' adapted to be adjustably movable along the associated end of shaft 20, and secured thereto by U-bolts 23'.

The structure as thus far described provides an arrangement by means of which the rear-end of the tongue structure 10 may be relatively raised and lowered with respect to the wheels 11 and 12 simply by imparting rotative movements to the shaft 20. This is accomplished by the provision of power means which are interconnected between the shaft 20 and the tongue structure 10. More specifically, the power means in this case is shown as comprising a power lifting device, which may be a single cable operable by the tractor, or as disclosed may comprise a fluid cylinder 24 having a pivoted anchor connection 25 at one end with the tongue structure. A power delivery element 26 is operatively associated with the fluid cylinder and connected with the shaft 20 through a lost motion connection.

As best seen in Fig. 4, the lost motion connection comprises a coupler 27 fabricated from plate members which are welded or otherwise secured together to form a projecting arm structure rotatable with the shaft. As shown, the coupler includes a pair of spaced side plates 28 and 29 which are interconnected at their forward end by an end plate 30. A bumper plate 31 is secured between the side plates and forms an abutment against which a floating link 32 is adapted to strike. The link 32 is pivoted at its lowermost end on a pivot pin 33 for swinging movements between the plates 28 and 29 and is connected by

pivot pin 34 at its outer end with the power delivery element 26. Under ordinary operating conditions, it will be apparent that limited movements of the tongue will not be transmitted to the shaft 20, due to this lost motion connection. However, by swinging the floating link 32 in a counterclockwise direction, as seen in Fig. 4, the shaft 20 will be rotated when the floating link strikes the bumper plate 31, and upon further movement of the floating link will cause the rear-end of the tongue structure to be raised. Movement of the floating link in the opposite direction will permit lowering movement of the rear-end of the tongue.

The carrier frame 13 is in the form of a transversely extending box-like structure composed of a forward channel 35 and a rear channel 36, as shown in Figs. 3 and 5, these channels being mounted in confronting relation and secured at their respective ends to end plates 37 and 38. These end plates project to one side of the forward channel 35 and are adapted to be pivotally connected to end brackets 39 and 40 secured to the rear-ends of the tongue side rails 18 and 19, respectively to form a two point suspension for the carrier frame 13. The connecting pivot bolts 41 provide for attachment and detachment of the carrier frame 13 and associated elements, when desired.

The carrier frame 13 provides a connecting support for the two-way plow assembly. As shown, the roll-over frame 14 embodies a generally triangular shaped box-like platform structure 42 which is secured along one edge to a tubular member 43 rotatably supported upon a rearwardly extending stationary tube 44. This tube is supported at one end in the channels 35 and 36 of the carrier frame 13 at a central position between its ends. The tubular member 43 is retained upon the tube 44 by a suitable thrust collar 45'.

The roll-over frame is selectively swung to bring the right-hand plow gang or the left-hand plow gang into operative position, by an actuating mechanism carried by the carrier frame 13. As shown generally in Fig. 2, and more specifically in Fig. 6, the actuating mechanism includes a sector pin gear 45 which is secured to the forward end of the tubular member 43 so as to be rotatable as a unit therewith. The pin gear 45 is operatively associated with a driving member 46 consisting of a flat plate 47 which is secured to a turning bracket 48 as by bolts 49 and 50. The bolt 50 further serves as a pivot of rotation for the plate 47, this bolt being mounted in a bearing bracket 51 supported on the adjacent portion of the carrier frame 13.

The outer edge of the plate 47 is provided with spaced indentations 52 which extend generally in a radial direction from the rotational axis of the plate and open outwardly for driving cooperation with pins 53 in spaced apart relation adjacent the peripheral edge of the sector gear 45. The spacing between the indentations defines spaced projection lobes 54 adapted to successively extend between the pins during driving operation, as shown in Fig. 6.

Actuation of the driving member 46 is accomplished by means of a fluid cylinder 55 extending transversely with respect to the axis of rotation of the roll-over frame, and having one end anchored to a suitable bracket 56 carried by the associated end of the carrier frame 13. Associated with the cylinder 55 is a power delivery element 57 which is connected to the outer end of the turning bracket 48 by means of a connection bolt 58.

A stop bar 42' is secured to the tubular member 43 adjacent the pin gear 45 so as to extend substantially radially therefrom. This bar swings with the roll-over frame and serves to stop the roll-over movement at the operative positions of the respective plow gangs. The stop position is determined by abutment plates 43' and 44' secured at opposite ends of the carrier frame 13, the plates being in the path of travel of the outer end of the stop bar.

The roll-over frame is further locked in the respective operative positions of the plow gangs by providing abutment shoulders 54' at the endmost indentations 52 of the plate 47. As each plow gang is moved to its operative stop position an abutment shoulder 54' engages back of the associated pin 53 to oppose reverse drive of the plate by movement of the pin gear 45. The locking shoulders and stop bar thus automatically cooperate in holding the roll-over frame in the operative positions of the plow gangs.

Referring again to Figs. 1 and 2, it will be observed that the depth gauging wheel 17 is positioned at the rear-end of the roll-over frame 14 and is supported at the outermost end of an arm 59 having a pivotal connection at its innermost end on a bracket 60 secured to an adjacent portion of the roll-over frame structure. The pivot support for the arm 59 provides for swinging movement of the arm about a pivot member 61 and about a pivot 62, these pivots being in right angle relation. Adjacent the innermost end of the arm 59, a plate 63 is supported on the bracket 60, this plate having a plurality of openings 63' therein for the reception of abutment pins 64 which are adjustably positionable on the plate to determine plowing depth. These pins are adapted to make engagement with a stirrup 65 on the back side of the arm 59.

Briefly the operation of the gauging wheel 17 is as follows: Let it be assumed that the right-hand plow gang 16 is in operating position, as shown in Fig. 2, and it is desired to turn the roll-over frame so as to bring the left-hand gang into operative position. At the point where the right-hand gang leaves the ground, the weight of the wheel 17 will cause the arm 59 to swing about the pivot 61 until it is limited in this movement by a restraining member such as a chain 66 extending between the plate 63 and the free end of the arm 59.

During roll-over movement, the weight of wheel 17 causes chain 66 to be tensioned, and the arm 59 will then swing about pivots 61 and 62 simultaneously, describing an arc relative to the roll-over frame, this arc having a radius which is determined by the length of the chain 66.

Since the center of gravity of the wheel and arm assembly is below the pivots 61 and 62 and the point of suspension of the chain, the wheel will move continuously to the lowest possible position allowed by the restraining chain. At the completion of the roll-over, the wheel assembly is prevented from dropping to a position directly below the suspension points by abutment of stirrup 65 against plate 63. This is accomplished without shock or impact because of the free suspension of the arm.

As the left-hand plow gang enters the ground, tension is relieved on the chain 66 as the wheel 17 strikes the ground, and arm 59 is swung about pivot 61 until the stirrup 65 engages the lower side of the appropriate abutment pin 64, thus limiting the plowing depth of the left-hand gang. By adjusting the positions of the abutment pins, and the position of a cooperating depth gauging adjustment on the carrier frame which will subsequently be described, the plow is properly adjusted for a desired plowing depth.

Referring now to Fig. 5, the depth control adjustment on the carrier frame, and the articulate interconnection between the rear-end of the tongue structure and the carrier frame 13 will now be described. The depth control embodies an arm 67 which is sufficiently enlarged at one end to form an annular end portion adapted to surround the shaft 20 and thus support the arm for swinging movement. The arm 67 is retained against longitudinal movement of the shaft 20 by means of a pair of laterally spaced plate members 68 and 69 which are welded or otherwise secured directly to the shaft 20. These plate members are interconnected between their outer edges by a bridging block 70 which is welded to the plate members and forms an abutment which is en-

gageable by a shoulder 71 formed on one side of the arm 67.

The outer end of the arm 67 pivotally connects through a pivot pin 72 with one end of an adjustable turnbuckle link 73, the other end of this link having a pivotal connection 74 with a bracket 75 secured to the adjacent portion of the carrier frame 13.

It is believed that it will be readily apparent that by increasing or decreasing the length of the link 73, the position of the arm 67 may be varied with respect to the shaft 20 and as a consequence change the position at which the shoulder 71 will be engaged by the bridging block 70. As a consequence, the angle of the arms 22 which carry the wheels 11 and 12 may be varied so as to determine the height of the shaft 20 with respect to the ground surface. The link 73 will be extended in its length to obtain shallow plowing, whereas by shortening the link 73 deeper plowing may be secured.

The foregoing structure, in addition to providing for an adjustment of plowing depth, is also designed to form motion compensating means between the frame structure 13 and the tongue, by providing an articulate connection which cooperates with the depth gauging wheel reactive forces so that vertical swinging movements of the tongue, within the usual operating limits met with in practice, will be substantially ineffectual to vary the plowing depth. In order to accomplish this result, the link lengths and positioning of the pivotal points of the articulate interconnection are so chosen that the shifting movements of the axles of the wheels 11 and 12 will be substantially and mainly along a horizontal plane rather than a vertical plane.

The interaction of the linkage connection parts may be more or less diagrammatically explained by reference to Fig. 5 wherein it is assumed that the operating depth position of the plow is represented by reference line 76, and for discussion purposes, this reference line is considered as being fixed. The normal position of the tongue is indicated at A, and in such position the shaft 20, arm 67, link 73 and carrier frame 13 will be in the full line positions as shown. Let it now be assumed that the maximum operating range of swinging movements of the tongue structure is between raised position A' and lowered position A''.

If the tongue structure is now placed in the raised position A', the central axis of shaft 20 and the pivot pin 72 are shifted along arcuate paths about the pivot bolt 41 and connection point 74 in such direction that the central axis of the axle 23 will be shifted from its normal position to a point B' lying on horizontal projection line C.

If the tongue structure is now lowered to position A'', the resulting shift of the axis of axle 23 will be as indicated at B'' which is also on the projected horizontal line C. From the above and since the axle 23 operates at a fixed height above the ground, it will be evident that, within the maximum operating range, the vertical swinging movements of the tongue will have little or no effect upon the plowing depth as represented by the reference line 76 which corresponds with the central axes of tubes 43 and 44. In the foregoing description, the swinging movements of the tongue structure have been considerably exaggerated over the movements which would be met with in practice, so that in the main, it may be considered that for normal vertical swinging movements of the tongue there is no change in the plowing depth.

A further feature resides in the provision of mechanism whereby as the plowing elements are raised from the plowing position by rotation of the shaft 20, the roll-over frame 14 and connected plow gangs will be lifted with a delayed cantilever action as fully raised position is approached.

This is accomplished by the interconnection shown in Fig. 3 which includes a pair of spaced plates 77 and 78 which are secured to the shaft 20 so as to provide a pro-

jecting arm structure to which one end of a tension link 79 is pivotally connected by a pivot pin 80. The other end of the link 79 is provided with an elongate slot 81 which cooperates with a connecting pin 82 to provide a lost motion connection with an upstanding bracket formed by spaced angle members 83 and 84, these members being secured at their lowermost ends to the adjacent structure of the carrier frame 13, as shown. During plowing operation and the initial phase of lifting operation, the link 79 is ineffectual during rotations of the shaft 20, but upon approaching fully raised position, the link 79 is shifted so that the pin 82 will be moved against the end of the slot 81 to cause the link to act as a tension bar and pivot the carrier frame 13 about its pivotal connections on the pivot bolts 41 so as to raise the rear-end of the roll-over frame with a cantilever action.

Referring now to Fig. 4, it is desired to point out that the lowermost end of the floating link 32, which is pivoted on pivot pin 33 is provided with a projecting end portion 85 for the purpose of engaging with the adjacent surface of the shaft 20 in order to prevent movement of the arms 22 supporting the wheels 11 and 12 past a vertical center line into a position where the actuating mechanism would be rendered inoperative.

Should it be desired to utilize the wheeled tongue structure and its lifting mechanism with other types of earth working tools, other than a two-way plow assembly, the two-way plow is readily adapted for such purpose. The carrier frame 13 and associated roll-over frame and plow gangs may readily be detached as a unit simply by removing the two pivot bolts 41, the pivot pin 80 and pivot pin 72.

The wheeled tongue structure is then available for the connection of other types of earth working tools, as shown in Fig. 7. For such purpose, it is only necessary to position a tool bar 86 in the notches 87 provided in the end brackets 39 and 40. The bar 86 is retained by means of a clamp bar 88, as shown in Fig. 8, this clamp bar being engaged by the ends of a U-bolt 89 which extends around the pivot bolt 41. The tool bar 86 may be utilized for supporting tools, for example, earth working tools such as indicated at 90<sup>a</sup> which may be clampingly secured along the bar.

As an alternative to the arrangement shown in Fig. 8 an adjustable tilting mechanism is provided for the tool bar 86, as shown in Fig. 9. In this arrangement, the notches 87 are formed in a movably mounted bracket 88' instead of in the end brackets 39 and 40. One of the brackets 88' is pivoted on each of the bolts 41 and cooperates in each case with one of the clamp bars 88 which is secured above and below the tool bar 86 by nuts 89' on an elongate threaded stud 90'. The studs 90' extend forwardly and are respectively fitted with an adjustable abutment end nut 91' adapted to engage an extended side of bridging plate 92' forming a part of the bracket 39 or 40. Since the nuts 91' are on opposite sides of the pivot bolt 41 the tool bar 86 may be tilted merely by loosening one of the nuts 91' while tightening the other with respect to the adjacent abutment surface of the associated bridging plate 92'.

In order to adjust the operating depth of tools which may be carried on the bar 86, an adjustable turnbuckle may be connected between a lug 90 on the side rail 19 of the tongue structure and the extreme end of the arm 67 by means of a suitable pivot pin which may be inserted through an opening 91 provided for such purpose. This connection would serve the same purpose as the turnbuckle link 73, which is utilized when the two-way assembly is connected to the wheeled structure. If desired, the fluid cylinder 55 and its power delivery element 57, utilized for the operation of the roll-over frame, may be connected in lieu of a manually adjustable turnbuckle, as shown in Fig. 1 in dotted lines, thus giving power control of the depth adjustment.

With further reference to Fig. 4, it will be noted that

the side plates 28 and 29 are provided with aligned openings 92 and aligned openings 93 for the mounting of a conventional turnbuckle third link of a standard three-point lift for earth working tools, when such an arrangement is desired to be utilized with the tongue wheeled structure described above.

Various modifications may suggest themselves to those skilled in the art without departing from the spirit of our invention, and hence, we do not wish to be restricted to the specific form or forms shown or uses mentioned except to the extent indicated in the appended claims.

We claim:

1. Earth working equipment, comprising: a wheeled assembly including a pair of laterally spaced ground-contacting wheels; a pulling tongue pivoted on said assembly for vertical swinging movements; a carrier frame; a pulling pivotal connection between said tongue and carrier frame; right-hand and left-hand plow gangs supported on said carrier frame for selective movements into operative positions; power means for relatively raising and lowering the rear-end of said tongue with respect to said wheels; and a floating articulate other connection between the forward end of said carrier frame and said wheeled assembly.

2. Earth working equipment, comprising: a wheeled assembly including a pair of laterally spaced ground-contacting wheels; a pulling tongue pivoted on said assembly for vertical swinging movements; a carrier frame; right-hand and left-hand plow gangs supported on said carrier frame for selective movements into operative positions; power means for relatively raising and lowering the rear-end of said tongue with respect to said wheels; and plowing depth regulating means including a lost motion linkage connection between the forward end of said carrier frame and said wheeled assembly.

3. Earth working equipment, comprising: a tongue; a first pivot means supporting said tongue for vertical swinging movements; a pair of laterally spaced ground-contacting wheels supporting said pivot structure for wheeled movement; a frame structure connected with said tongue by a second pivot means and adapted to support an earth working tool; and a separate floating link connection between said frame structure and said tongue operable, upon normal vertical swinging movements of said tongue, to substantially minimize transmission of the vertical component of the raising and lowering movements of said tongue to said frame structure.

4. Earth working equipment, comprising: a tongue; a first pivot means supporting said tongue for vertical swinging movements; a pair of laterally spaced ground-contacting wheels supporting said pivot structure for wheeled movement; a frame structure connected with said tongue by a second pivot means and adapted to support an earth working tool; and motion compensating means between said frame structure and said tongue operable in response to the normal vertical swinging movements of said tongue during the operation of said tool, to substantially minimize transmission of the vertical component of the raising and lowering movements of said tongue to said frame structure.

5. Earth working equipment, comprising: a pulling tongue; a shaft at the rear-end of said tongue pivotally supporting the tongue for vertical swinging movements; laterally spaced ground-contacting wheels carried by said shaft, said wheels having axes of rotation offset with respect to said shaft; means connected between said tongue and said shaft operable to rotate said shaft and swing said wheels to raise and lower the rear-end of said tongue; an earth working tool carrier frame pivotally connected with the rear-end of said tongue; a ground contacting element on said carrier frame rearwardly of its pivotal connection with said tongue; an abutment on said shaft; an arm supported on said shaft for swinging movement towards and away from said abutment, said arm when engaged against said abutment limiting rotation of said shaft in a direction to lower the rear end of the tongue

but enable free rotation in a direction to raise the rear end of the tongue; and a link pivotally connected at one end to the outer end of said arm, and at its other end to the carrier frame, said link being adjustable to vary the position of said arm and its engagement by said abutment, whereby said link and ground contacting element cooperate to control the plowing depth.

6. Earth working equipment, comprising: a pulling tongue; a shaft at the rear-end of said tongue pivotally supporting the tongue for vertical swinging movements; laterally spaced ground-contacting wheels carried by said shaft, said wheels having axes of rotation offset with respect to said shaft; means connected between said tongue and said shaft operable to rotate said shaft and swing said wheels to raise and lower the rear-end of said tongue; an earth working tool carrier frame pivotally connected with the rear-end of said tongue; a ground contacting element on said carrier frame rearwardly of its pivotal connection with said tongue; an abutment on said shaft; an arm supported on said shaft for swinging movement towards and away from said abutment; and a link swingably connected at its ends to said arm and said carrier frame respectively, said link being adjustable as to length and cooperating with said element for determining the operating depth of the earth working tool.

7. Earth working equipment, comprising: a tongue; a pivot structure including a shaft forward of the rear end of said tongue supporting said tongue for pivotal vertical swinging movements; a pair of laterally spaced ground-contacting wheels carried by said shaft, said wheels having axes of rotation offset with respect to said shaft and supporting said pivot structure for wheeled movement; a frame structure having articulate connection with the rear end of said tongue and adapted to support an earth working tool rearwardly of said wheels; depth gauging means associated with said frame structure; and means interconnecting said frame structure and said pivot structure cooperative with said depth gauging means and said ground contacting wheels to minimize transmission of the vertical component of the swinging movements of the forward end of said tongue to said frame structure.

8. Earth working equipment, comprising: an articulate frame structure adapted to be towed by power means including front and rear sections, said front section comprising a pulling tongue pivotally connected with said rear section; an earth working tool supported on said rear section; wheel supporting means for said frame structure including a depth gauging wheel carried by each of said sections; and means other than said pivotal connection interconnecting said front and rear sections, and arranged to operate independently of said power means and in cooperation with said gauging wheels to minimize transmission of swinging movements of said tongue to said rear section.

9. Earth working equipment, comprising: a wheeled assembly including a shaft and a pair of laterally spaced ground-contacting wheels having axes of rotation offset with respect to said shaft; a pulling tongue pivoted on said shaft for vertical swinging movements; a carrier frame; right-hand and left-hand plow gangs supported on said carrier frame for selective movements into operative positions; power means for rotating said shaft for relatively raising and lowering the rear-end of said tongue with respect to said wheels; pivot means detachably connecting the carrier frame with said tongue, said tongue and wheel assembly, upon detachment of said carrier being adapted to serve as a mobile support for other earth working tools; and depth gauging means operatively associated with said shaft including elements selectively connectible with the connected carrier frame and with said pulling tongue, upon disconnection of said carrier frame.

10. Earth working equipment, comprising: a pulling tongue; a shaft at the rear-end of said tongue pivotally

supporting the tongue for vertical swinging movements or its forward end; laterally spaced ground-contacting wheels carried by said shaft, said wheels having axes of rotation offset with respect to said shaft; an earth working tool carrier frame; means for rotating said shaft to relatively raise and lower the shaft with respect to said wheels; means for adjusting the working depth of said earth working tool; and a floating articulate connection between said carrier frame and said shaft including a lost motion connection with said carrier frame responsive to shaft rotation for raising the earth working tool with delayed cantilever action.

11. Earth working equipment, comprising: a pulling tongue; a shaft at the rear-end of said tongue pivotally supporting the tongue for vertical swinging movements; laterally spaced ground-contacting wheels carried by said shaft, said wheels having axes of rotation offset with respect to said shaft; an earth working tool carrier frame; a floating articulate connection between said carrier frame and said tongue operable to determine the working depth of said tool at a predetermined lowered position of said shaft; means for rotating said shaft to relatively raise and lower the shaft with respect to said wheels; and a lost motion connection between said shaft and said carrier frame for raising the earth working tool and its carrier frame with delayed cantilever action, when the shaft is actuated in a shaft raising direction from said predetermined lowered position of said shaft.

12. Earth working equipment, comprising: a pulling tongue; a shaft at the rear-end of said tongue pivotally supporting the tongue for vertical swinging movements; laterally spaced ground-contacting wheels carried by the ends of said shaft, said wheels having axes of rotation offset with respect to said shaft; an earth working tool carrier frame; a floating articulate connection between said carrier frame and said tongue operable to determine the working depth of said tool at a predetermined lowered position of said shaft; means for rotating said shaft to relatively raise and lower the shaft with respect to said wheels; an arm secured to said shaft for unitary rotation therewith; and a lost motion link pivotally connected between said arm and said carrier frame arranged to form a tension bar for raising the earth working tool

and the carrier frame with delayed cantilever action in response to predetermined shaft rotation in a shaft raising direction from said predetermined lowered position of said shaft.

13. Earth working equipment, comprising: a tongue; a pivot structure including a shaft forward of the rear end of said tongue supporting said tongue for pivotal vertical swinging movements; a pair of laterally spaced ground-contacting wheels carried by said shaft, said wheels having axes of rotation offset with respect to said shaft and supporting said pivot structure for wheeled movement; a frame structure having articulate connection with the rear end of said tongue and adapted to support an earth working tool rearwardly of said wheels; depth gauging means associated with said frame structure; and pivotally connected link members interconnecting said frame structure and said pivot structure cooperative with said depth gauging means and said ground contacting wheels to minimize transmission of the vertical component of the swinging movements of said tongue to said frame structure.

#### References Cited in the file of this patent

##### UNITED STATES PATENTS

|           |          |               |
|-----------|----------|---------------|
| 1,969,684 | Bird     | Aug. 7, 1934  |
| 2,138,304 | Le Bleu  | Nov. 29, 1938 |
| 2,194,202 | Graham   | Mar. 19, 1940 |
| 2,228,865 | Bird     | Jan. 14, 1941 |
| 2,324,840 | Hipple   | July 20, 1943 |
| 2,464,615 | Sawall   | Mar. 15, 1949 |
| 2,552,097 | Kaltoft  | May 8, 1951   |
| 2,617,342 | Meissner | Nov. 11, 1952 |
| 2,625,090 | Pursche  | Jan. 13, 1953 |
| 2,691,930 | Forge    | Oct. 19, 1954 |
| 2,704,015 | Wilson   | Mar. 15, 1955 |

##### FOREIGN PATENTS

|         |               |                |
|---------|---------------|----------------|
| 689,592 | France        | May 27, 1930   |
| 278,904 | Great Britain | Oct. 20, 1927  |
| 415,253 | Great Britain | Aug. 23, 1934  |
| 541,436 | Great Britain | Nov. 26, 1941  |
| 703,890 | Great Britain | Feb. 10, 1954  |
| 459,670 | Italy         | Sept. 25, 1950 |